



# Sport Aviation®

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## Bob Hoover

Tribute to a legendary aviator

## Fly Baby Biplane

A vintage homebuilt in uniform

## RotorWay

Celebrating 50 years of homebuilt helicopters

# Built to Inspire

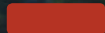
 Metal-wing AirCam



# protégé

## PROJECT

BUILDING THE NEXT GENERATION AIRCAM



BY GREG LASLO







JUST TO  
SET THE  
RECORD  
STRAIGHT,

## MATT TISDALE

DIDN'T  
PLAN ON  
BUILDING  
AN  
AIRCAM.



He didn't have much use for the "dorky-looking" airplane, what with a J-3 Cub that he'd restored in college and a second nearing completion that he planned to sell.

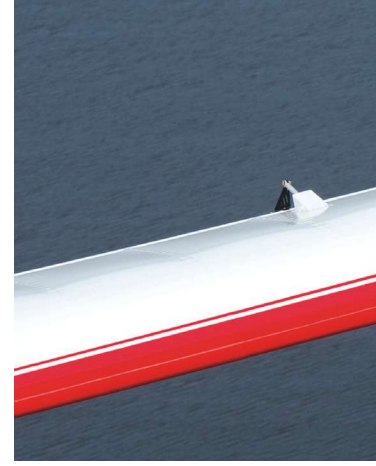
So a pusher twin wasn't really on his radar until it turned out to be the focus of an interesting opportunity: the chance to build one for someone else — something of a prolonged job interview on the way to something interesting — and more importantly, a free hand to do what he could to build it better.

For a 20-something airplane guy with the head of a mechanical engineer and the hands of a natural tinker, that was too tempting to pass up.

From there, though, the story wallows into the scud of *be careful what you wish for*. For someone schooled in the ways of the certificated world, the AirCam was a challenge. "I'd only seen RV kits go together; the holes line up perfectly, and you can drop a Cleco in," he said. Indeed, everything he touched required work, and he said the only things that are original — at least on the wings — are the tube spars, and much of his work is hidden underneath the wing covering from the naked eye. And, really, there's a lot of smart stuff going on.

That's what happens when you mix up a batch of determination, creativity, and mentoring. You not only get a next-generation airplane, but also end up with a next-generation homebuilder, too. "I would never have one," Matt, EAA 1211209, said of the design. "But after flying [this], it's hard to beat."

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#### BUILDING EXPERIENCE

Matt's first venture into airplanes was a 1946 J-3 Cub owned by his grandfather, Douglass Tisdale. The elder Tisdale bought the airplane in the early 1950s; his brother had married into a flying circus family that taught Douglass to fly, and he became something of a local legend for his derring-do. Matt never knew him — Douglass died when Matt was 4 — but he'd heard stories. "He sounded like a pretty neat guy," he said.

Douglass traded the airplane for a car with a revenue agent who wanted it to find moonshiners. The revenuer flew it for a while, until the grade A cotton covering needed replacing. Once he cut it off, he realized he didn't know what he was getting into, Matt said, and the airplane sat until Douglass got it back. Long story short, it ended up hanging from the rafters of one of the family business buildings near Macon, Georgia. After more than five decades, that's where Matt collected it.

In the meantime, he'd found his own interest in aviation. He seemed born with the aviation bug, and after first taking intro flights at 13, he'd learned to fly during his sophomore year at Clemson University. He spent hard-earned dollars flying someone else's Cessna 152s, when he thought, *Now, wait a minute, I've got an airplane; I'll just take it down and fix it.* He'd already worked on tractors and boats, so how hard could it be? Besides, he figured his grandfather would certainly have wanted to see it fly again, especially in the family.

So he took a semester off from school to do the project. But this is an airplane, so he ended up working another year — or about 3,000 hours, according to his logbooks — before the Cub made it into the air. He re-enrolled, flew the airplane to school, and finished up his degree.

At the start, he admits he didn't know an AN bolt from hardware store parts. "I learned about it one piece at a time using the

internet, talking to old guys once in a while," Matt said. "I ended up doing a pretty good job on that one."

He was in with both feet. He already had his second project, another Cub that he'd bought from a restorer who got in over his head, and that was the focus of his attention when he flew up for a day trip to Triple Tree Aerodrome, in Woodruff, South Carolina. He met the founder, Pat Hartness, and they talked about the J-3, the quality of work Matt had done, and whether he might be interested in moving up to start a restoration shop for the organization, which operates a fleet of antiques and offers educational events that promote a passion for aviation, particularly among young people.

Not long afterward — and unbeknownst to Matt — a friend flew in an AirCam, and after an intro ride, Pat called Matt to ask if he could build one. When Matt said yes, Pat asked if could he be there in a week; he'd ordered a kit.

Their goal was simple: feel each other out while creating a versatile airplane that could not only take volunteers on thank-you rides, but also tow aerodrome gliders. For the first, Pat told Matt they'd know soon enough if he was capable. For the second, the AirCam seemed perfect for Triple Tree's needs.

And, as it turns out, it is, whether they're flying kids or retirees, Matt said. When passengers land, they get a picture taken that goes on a bulletin board. "We call it the AirCam smile, because everybody's grinning," he said.

And that goes for him, too. From the front seat, it's easy to fly, docile, and cheap to operate — plus it starts like a car. And thanks to the two engines, it climbs out at 2,000 fpm and flies low and slow at treetops with a built-in backup. Unique looks notwithstanding, the airplane is pretty special. "You're sitting out on the nose — it's like standing on the edge of a building," Matt said.



#### SPREADING HIS WINGS

But getting there didn't involve following the directions. In fact, the AirCam was built more from Matt's previous experience than from the kit. He knew it had a funky wing and a bunch of wires everywhere, but that was about it. "I started looking into it and figured out the heritage," he said.

The AirCam sprouted from the ultralight world. Starting as a Maxair Drifter, the single-engine airframe was used in the early 1990s as a National Geographic Society camera platform in Namibia. After training the husband-and-wife filmmaking crew to fly the airplane, designer Phil Lockwood argued the single-engine design was unsafe flying low level over unlandable terrain.

With the Society's blessing, he took to designing the prototype AirCam with two 64-hp Rotax 582 engines to photograph another project, the largely inaccessible Nouabalé-Ndoki National Park in the Democratic Republic of the Congo. The airplane needed short-field performance, fuel efficiency, and above all, reliability. That airplane, AirCam 001, resides in the EAA AirVenture Museum, but the design morphed into a production kit, with an upgraded fuselage and a pair of Rotax 912s.

And that's essentially the kit that Matt received. "It still had a lot of ultralight stuff in it — stuff like plastic fittings and that sack you pull on the wings," Matt said. "But this thing's, like, a 1,700-pound gross weight airplane now."

When he flew other examples, he noticed the wings washed out, and without anything attaching the wing envelope to the ribs, the bottom fabric bowed and upper surface flexed up to the point that it looked like it was being sucked off. To get around that, he'd have to properly re-create the wings both to improve performance and to ensure greater longevity.

He'd replace the bent-aluminum ribs with "real" ones, so that the wing could be conventionally covered. While he first considered building the ribs from aluminum, or

even redesigning the wing with a NACA airfoil, construction speed led him to a third option: fiberglass ribs built to the specs of the aircraft's center section. He called Rick Berstling, who builds the AirCam's fiberglass nosebow, and asked if he could lay up two wings' worth of ribs off Matt's measurements that would slide onto the tube spar. He could, and they fit perfectly. "Because the ribs are bonded to the spars, it's got a lot of torsional resistance, so the wing's not trying to wash out so much," Matt said.

Matt also re-engineered the compression tubes and added anti-crush brackets that fit inside the spar for solid attachment to prevent inevitable wallowing out of the bolt holes. Then he added an aluminum D-cell leading edge, which he did in three sections that ran all the way back to the high section of the ribs. The middle portion, where the highest bending moments are, would be covered in 0.023 aluminum sheets, while the outer and inboard sections would be 0.020 sheets. He supported each with J-section stiffeners. He also covered the wing with the Poly-Fiber method in the manner used on Aeronca aircraft: anti-chafing tape, covering, reinforcement tape, pulled fabric rivets with small washers under the rib, and finishing tape.

Then, for the fuel tanks, he avoided the typical flexing and bending from the fiberglass tanks, which sometimes caused leaks, with welded aluminum cells. He took measurements off the originals, sent them to a friend who had a laser cutter, then welded them up and sealed and leak-tested them. He lost about half a gallon on each side with the simplified tanks — he took out some complex bends — but that made it easy to fabricate without sacrificing much endurance. He also moved the tank drains inboard. Finally, to square the wing, he added new drag wires — with actual turnbuckles — to replace the original cables that are simply twisted tight.

The result was a real wing. "It's now actually lifting the airplane instead of bending," he said.



## FINE-TUNING, AND FINISHING

He also wanted to address the fabric gap seals on the flaps. As it was, a Velcro flap attached the flap to the wing, creating essentially a speed brake. As a work-around, he riveted a piece of metal to the rear spar so that, when the flaps dropped down, it allowed airflow between the surfaces, and when they came up, the gap closed. Turns out, that gives him better performance; there's no indicator, so he gauges flap angle by when they reach the drag wires — that's about 40 degrees — where he gets the most lift and slowest descent.

The ailerons were another issue. While he wanted to change their design outright — he said it “rolls like a B-17” — he was cautious about trying too much. So he stuck with fixing that gap seal, too, and he installed a piece of PVC pipe notched to fit on the trailing edge of the wing to create a nice, smooth edge the aileron could pivot around.

And while he wanted to make the cover for the aileron control linkage pretty, he figured nothing else about the airplane was “pretty,” so he went with functional instead: an aluminum box. That did pose something of a challenge; in his Cubs, he could disassemble the wings slowly, note where each part was attached, and know where to put holes in the fabric. In this case, he was working from scratch, and he'd never seen the airplane together. Plus, the linkage made a funky sweep as the bell crank moved back and forth, so it took some experimenting to determine its path before he could cover the wing and cut a hole in the fabric — not to mention determine where to put inspection holes and panels. The result is what it is, and it works.

In all, Matt spent about six months on the wings; on a normal build, that'd only take about two weeks, he said. In return, he noticed one major change. The wing now offered a stall buffet, instead of just breaking. It flies better, feels more solid, and offers more control authority than he expected.

Still, the rest of the airframe would take another year.

To finish that up, he looked at what else he needed to do to make it a better airplane. Just as with the wing, he wanted to attach fabric covering to the elevator and rudder. In the latter case, left untended, the rudder envelope tends to billow out, become an airfoil, and push that control surface in the opposite direction. He could feel it in the rudder



*Matt takes pride in the modifications he made to the AirCam kit and had fun finding solutions for parts of the plans he wanted to build differently. The AirCam is already satisfying Triple Tree's mission to encourage people to explore their passion for aviation.*

pedals when he flew stock examples. He fixed it by fabric-covering those surfaces, too.

Next he turned his attention to the tail wheel. To tow a glider, the tail needed beefing up and a tow hook needed to be welded to the gear springs (plus a release handle was needed in the cockpit). But that required some additional modifications; while the tail wheel is braced appropriately for normal upward loads, with a glider, that load moves backward, so he built brackets that doubled up the longerons to spread the load onto those and into the skin, then added extra mounting locations to further distribute the force.

And, as a finishing touch, he modified how all the fairings fit on the wing. Instead of using Velcro — which he said was a “hodgepodge” solution that invariably pulled off paint with the glued-on hook-and-loop fastener — he put in rib nuts and nut plates. Altogether, the new-and-improved AirCam is still just a low-and-slow airplane — one in which he and his passengers can wave to people in their backyards below. “This is the only one I've really felt comfortable in, flying right on the treetops,” Matt said. And with Dynon SkyView primary and multi-function displays, he sees any obstructions that might interfere with that mission, 70-knot cruise notwithstanding. Even when he's

distracted, obstacles will show up in the synthetic vision and audible alerts will advise him of a “Tower!” Likewise, the engine monitors have intuitive red, yellow, and green arcs to keep him advised.

The only thing he didn't include was an autopilot. He reasoned that airplane's stick forces were stronger than a system could keep up in anything but perfectly smooth air, and it'd just add more weight, complexity, and cost. Besides, the point is to pop up, go around the field, and land — not exactly a mission that required an extra hand.

As the airplane came together, it started to change how he looked at it and at aviation. The problem-solving of the kit touched a nerve. “I'm mentally hooked on homebuilts now,” Matt said. “After doing the Cub exactly as a Cub should be, I learned what traditional methods are that helped a lot with this. But when I see something, and I want to do it different; that's fun.”

If the goal of Triple Tree is to encourage younger people to explore their passion for aviation, the AirCam seems to have done exactly that, and Matt's already working on getting the restoration shop off the ground. Sometimes all it takes is a problem that needs to be solved. *EAA*

**Greg Laslo** is a writer and editor in Kansas City, Missouri.