



# Taylor Made

MARK STEWART'S 1935 E-2 CUB  
BY HAL BRYAN

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hen he flies, Mark Stewart, EAA 412692/VAA 22984, isn't in much of a hurry. The single-mag

Continental A-40-2 that powers his 1935 Taylor E-2 Cub puts out all of 37 hp and gently pulls the less-than-thousand-pound airplane along, covering 60 miles and sipping a miserly 3 gallons of gas every hour.

"They're not a great airplane. I mean, they are a lot of fun to fly, just a hoot to fly," he said. "It's just so

much fun to fly. The engines are a fair amount of maintenance. On a hot day, with a passenger, boy, you've got to be paying real close attention, because you can stall out so easily. It just doesn't have the power. So, it's grossly underpowered, and nobody really wants them or cares about them."

Mark's appreciation for early Cubs like his E-2 and his brother's J-2 goes back long before he was born. It all comes down to two words: family history.

"[If] we didn't have family history," he said, "I wouldn't screw with them."



## A Little Genealogy

Mark's father, Bob Stewart Sr., was working as an auto mechanic who was looking for a hobby, something — anything — other than working on cars, when he took his first flight at the dawn of World War II.

"In September of '39, he went for an airplane ride in a J-2 Cub and just loved it," Mark said. "[He] came home, told his brother, Donald, that they had to get an airplane. Donald had never flown. They paid \$600 for a J-2, which we have today. We have that airplane. And they borrowed \$300 from their dad, my grandfather, who gave them 300 silver dollars as part of a loan in '39."

As luck would have it, Bob's friend Ralph Avery was already a pilot and owned a J-2. As fate, perhaps, would have it, many years later, Mark married Ralph's daughter, Martha. Bob and Don learned to fly in 1939 near Erie, Pennsylvania, both soloing and passing their checkrides in the J-2 before trading it for a Franklin-powered J-3.



It takes just 37 hp to pull Mark's Cub along at a gentle 60 mph.

Bob kept at his flight training and then spent some time instructing as part of the Civilian Pilot Training Program (CPTP), flying PT-17s and PT-19s at Schrom Airport in Greenbelt, Maryland. He tried to enlist in 1942, but flight instructors were in such high demand that the Army turned him down. They relented the following year, and Bob spent most of the war moving bombers around the European theater as part of Ferry Command. His brother Donald did his bit, too, flying Stinson L-5s in the China-Burma-India theater. After the war, Bob and Donald came home to Erie with the intent of finishing building an airstrip that they'd started on the family farm years earlier. The local utility company had other ideas and came in and condemned part of the brothers' property to build an electric substation.

That devastating blow ended up leading Bob to a different career.

"He was broke," Mark said. "The only asset that he owned was the bulldozer that he bought to level off the farm. So, he took the bulldozer and went into the earth-moving business for the next 40 years."

Like all Cubs, the E-2's cockpit is simple and inviting.



## The Next Generation

Bob was eventually able to put in a strip on the family farm, and in 1955, he bought a Piper Pacer.

"My first memory of flying was with him in the Pacer, coming in to land at the airport on our family farm," Mark said. "I was 5 years old. I was on my knees looking over the dash as we came in on final. That's my first flight memory."

Over the next several years, Bob flew his family whenever he could, including an epic trip in a rented Bonanza from Erie to Disneyland in the early '60s.

"But it wasn't until '72 that [Dad] decided to buy a J-3, which I still have, and taught me to fly the J-3," Mark said. He soloed in August of 1972, at age 18. Mark spent a few years in the family earth-moving business and then started a career with General Electric. He married Martha in 1975, and flying took a back seat for a while as he focused on career and family. Then, in the late 1980s, Mark found his way back into the air, initially flying rented 172s and Cherokee 140s.

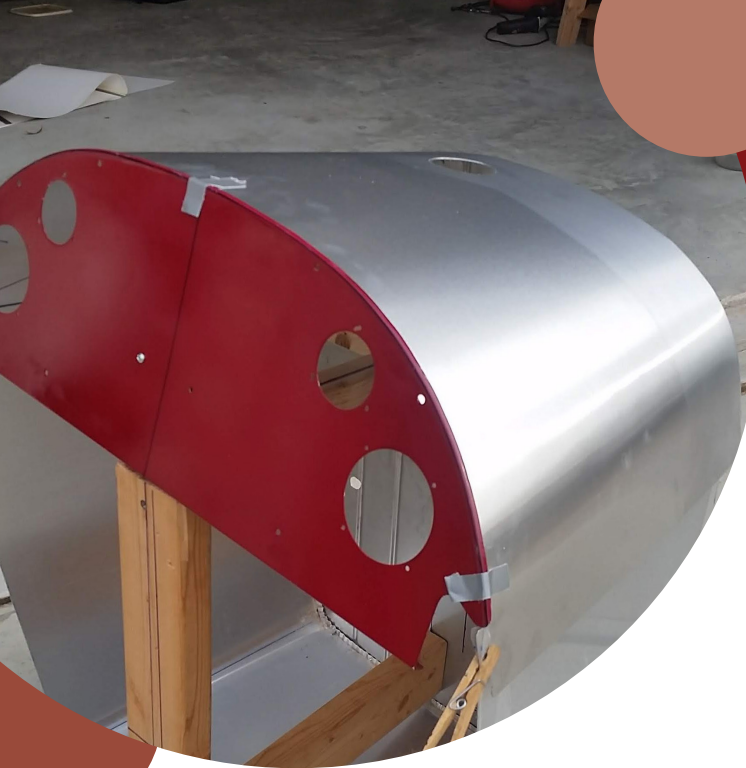
"Flying was the only activity that would so engross you that you couldn't think about anything else," he said. "I couldn't think about work. I couldn't think about bills and everything else. When I was flying, I was 100 percent focused on flying. And that was a great relief from everything else I had going on in my life. So, that was the motivation. It was such an intense and enjoyable activity, that it just broke up all of the stress and strain of everyday living."

Mark spotted his dad's first airplane on the FAA register in 1990, and after some patient negotiation, the J-2 found its way back to the Stewart family more than 50 years after Bob and Donald had learned to fly in it. Not only did Bob get to fly it for several years, but Mark's daughter April also soloed in it in 1998 when she was 16. You can read the full history of the Stewart clan's J-2 in the story "Family Cub," published in the January 1998 issue of *Vintage Airplane*.



*When I bought it in 2018, it was all re-covered, basically ready to paint. The engine needed to be overhauled, and it was missing some instruments, but otherwise it was a pretty complete airplane.*





The E-2's instrument panel coming together.

When Mark went to look at it, the E-2 hadn't flown in more than 40 years. Bob Whittier, EAA 1235, a prolific aviation writer who'd been contributing to EAA publications since the beginning, had purchased the airplane from the Washington, D.C., Soaring Club in 1962, where it had spent hundreds of hours training pilots, and had been repaired at least a dozen times. Somewhere along the way, the original engine, serial No. 374, was replaced with a slightly younger sibling, serial No. 452, but the lack of complete logs means that Mark's not sure exactly when that happened. Bob flew the airplane until about 1975, and then set it aside. Years turned into decades until 2005, when Bob decided it was time to restore the little Cub. He re-covered the airplane, but by the time Mark found it in 2018, Bob realized it was time to sell. Bob died in December of 2019 at the age of 97.

"When I bought it in 2018, it was all re-covered, basically ready to paint," Mark said. "The engine needed to be overhauled, and it was missing some instruments, but otherwise it was a pretty complete airplane."

## Selling Gauges, Buying an Airplane

As the 1990s gave way to the 2000s, Mark was thinking about starting a Waco 10 project. He amassed a good collection of vintage instruments over the years but eventually realized that he wanted to go in a different direction. He decided to sell off the bits he'd collected.

"I was calling various people that I knew to see if they had any interest in this stuff," he said. "And one conversation led to another, and a guy said, 'Well, I think there's an E-2 for sale.' And I said, 'Great. I'd love to have an E-2.'"

The E-2 turned out to be NC15009, serial No. 174, a rare surviving example of the 350 or so Cubs built in Bradford, Pennsylvania, by the Taylor Aircraft Co. C. Gilbert Taylor and William T. Piper were partners in the company until 1935, when Piper bought Taylor out. Taylor went on to form Taylorcraft, and after a fire in 1937, Piper moved the company to Lock Haven, renamed it after himself, and the rest — including the tens of thousands of Cubs and their descendants that followed — is history.



PHOTOGRAPHY COURTESY OF MARK STEWART

*"Of course, with 37 hp, you can't afford to lose anything."*

## The Restoration

"First thing I did was, of course, a complete inspection of the airplane to see what the hell it is I bought," Mark said. "And it was pretty well done. The recovery work was done well; it was all signed off. And so, I ended up sanding the whole airplane, the fuselage, tail feathers, and wings, and then painted ... the fuselage, tail feathers, wings, painted the NC-numbers on it, instrument panel, etc."

Mark made a new boot cowl, but he called in reinforcements to help with some of the other metalwork.

"Jim Reddick out in Peoria, Illinois, made new engine cowlings for me," he said. "So, there's a nose bowl, a top cowl, and a bottom cowl. ... So, I had new cowlings on the front end, new instrument panel, new windshield, everything painted. And then I went to work on the engine."

Over the years, Mark has overhauled a number of Continental A-40s, for the family J-2 and a number of other J-2/E-2 owners whom he has to come to support.

"They're pretty much a lawn mower engine — there's not much to them," he said. "They're very easy to disassemble, overhaul, and reassemble. There's just not a lot to them. ... There's an aluminum head on the engine. And that's a one-piece head that covers two cylinders. ... The head is removable. It's got a head gasket under it. ... Unlike a modern engine that has an overhead valve, when you look at a modern engine, all you see are the rocker arm covers, right?"

"Well, we don't have rocker arms. Ours are like a flathead Ford, or a lawn mower. They're in a block."

When he's flying off grass, the E-2 is equipped with a typical tailskid that helps keep it straight and slow it down, which is useful in the absence of brakes, though he has a tail wheel that he installs when he's going to be operating on a hard surface, or in a congested area — think Sentimental Journey — where he wants better control and maneuverability.

PHOTOGRAPHY BY JIM BUSH



Most of the time, Mark flies the E-2 with a traditional, two-blade Sensenich wood prop.





The instrument panel on Mark's E-2 is stock and clean as can be. There's a Waltham tachometer, an oil temperature gauge and an oil pressure gauge, both by U.S. Gauges, and a Zenith altimeter, all period correct and all nicely restored. When he bought the airplane, the only gauge that came with it was the tachometer, and it was frozen. He took it apart and cleaned and re-lubed everything, then calibrated it, and now it works just fine.

The altimeter, what Zenith called a height meter, was a rare find that came through thanks to eBay. Getting it refreshed and functional was a serious restoration project in and of itself.

"I had to take it all apart, new glass, sandblast it, paint it, lube up the insides, free it all up, make it work again, calibrate it, put it all back together," he said. "There's 100 hours in that restoration.

**BELOW:** Sourcing and restoring the gauges for the E-2's panel took up a big chunk of the project.



*"Nobody wants the stuff anymore, right? So, it just gets thrown in a box with a whole bunch of other stuff. And it sits there, and it rusts away for 80 years. And then, silly people like me come along and say, 'Hey, I want it.'"*

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"Nobody wants the stuff anymore, right? So, it just gets thrown in a box with a whole bunch of other stuff. And it sits there, and it rusts away for 80 years. And then, silly people like me come along and say, 'Hey, I want it.' ... A lot of them don't have that brass knob at the bottom. The screw falls out, and the knob falls off. ... Either they all have broken glass and some of them work, some of them don't. But in this case, I was lucky mine worked. The bellows were still intact. The other problem is once the glass cracks, they get water in them and then everything inside rusts. It can get to be a really ugly restoration if it's been exposed to water."

About the only thing on the panel that isn't original is the red line, set at about 2575 rpm, on the tach. With no airspeed indicator, Mark wanted to make sure that anyone who flies his airplane — and he's pretty generous about that — has a constant reminder not to overdo it.

"I have a lot of people that fly [the E-2 and the J-2]," he said. "So, I put that red line on there so that I don't have somebody in a dive, rev it too high, and throw a tip off a prop."

And, speaking of prop tips, while he usually flies with a wooden two-bladed Sensenich, he also has a wooden single-bladed prop by Everel.

"The single-blade propeller was designed to be a variable pitch propeller, and that's why it's only one blade," he said. "Because if you reduce the pitch on one side, it would increase the pitch on the other side. So, you had to cut that other side off. So it's just a single-blade propeller that's variable pitch. The problem with the single-blade propeller was A), it didn't work as a variable pitch propeller, and B), it was always out of balance."

The Everel prop was an expensive option back in the '30s, costing up to 10 times as much as a standard Sensenich.

"The Everel propeller has a very complex hub in it, and that hub has a pivot inside it, which allows the wood to rotate," he said. "If you were to look down the end of the propeller, you could rotate it clockwise or counterclockwise on the airplane. You could twist it. There was a set of pivots in there, or brass bushings in there, that allowed it to rotate and change pitch. And it's all that complex machining on that hub in those pivots that made it \$200. And it's heavy. It weighs 22 pounds. ... It had no springs, it had no counterweights, it had no controls inside the cockpit. It was all self-adjusting based on rpm."



## Specs

### Aircraft Make and Model: 1935 Taylor E-2 Cub

CERTIFICATION:	Standard
LENGTH:	22 feet, 5 inches
WINGSPAN:	35 feet, 3 inches
HEIGHT:	6 feet, 6 inches
MAXIMUM GROSS WEIGHT:	970 pounds
EMPTY WEIGHT:	525 pounds
FUEL CAPACITY:	9 gallons
SEATS:	2
POWERPLANT MAKE & MODEL:	Continental A-40-2 (single mag)
HORSEPOWER:	37
PROPELLER:	Sensenich wooden two-blade or Everel wooden single-blade
CRUISE SPEED/FUEL CONSUMPTION:	60 mph/3 gph
POWER LOADING:	26.2 pounds/hp
WING LOADING:	6 pounds/square foot
V <sub>NE</sub> :	80 mph
V <sub>SO</sub> :	30 mph





Pitch trim is operated by pulling on one side or the other of a looped cotton clothesline that connects to the stabilizer via a pulley.

Once lined up, Mark will add power and use a bit of forward stick to raise the tail. Mark said that during the takeoff run, he sees about 2200 rpm, which equates to about 32 hp.

“As it starts to get light and bounce, you just lift it off the ground and then hold it about 3 feet in the air in ground effect, and let it accelerate from basically 40 miles an hour to about 55 miles an hour, which is 2500 rpm. ... Once you get airborne, you can get it up to 2500, which is your 37 hp. And at that point you can commit to a climb. And what we do is climb at about 2400 rpm, which is basically 34 hp ... it’ll struggle to get to 300 feet a mile off the end of the runway.”

When airborne, Mark goes nowhere fast, cruising gently over the vineyards that surround his home base at Moorhead airport and produce the fruit that ends up in Welch’s grape juice, covering a mile a minute. The throttle stays full until he’s back at the airport on downwind, ready to land.

Mark’s E-2 can also fly behind an Everel single-bladed propeller that, believe it or not, is considered to be variable pitch.



## Low and Slow

When it’s time to fly, Mark pointed out that the simplicity of the A-40 engine comes at a price, as it requires a little bit of extra attention.

“The big downside to that design is that the valves don’t get oiled,” he said. “There’s no way to get oil on the valve guides as the valves work up and down, opening and closing. And so, before every flight, you have to go around and oil the valves to get oil up into the valve guide to keep the valves from seizing. And if you don’t, the guides tighten up as it gets hot, then they start to seize a little bit and you’ll lose power. And of course, with 37 hp, you can’t afford to lose anything.”

In addition, as the Cub isn’t equipped with a primer, another preflight ritual comes into play.

“To get it started, we’ll give it a shot of ether,” he said, and the engine starts on the first or second pull, every time.

“It’s a single mag, no impulse, and it fires right up. There’s no engine checkout, there’s no run-up. There’s not anything you can do. If the engine’s running, the mag is working. So, there’s no mag check. The other thing you can do is check for oil pressure and oil temperature before you take off. So, make sure the fuel’s on [and] controls are free. ... And so, pretty much taxiing out, you’ve done your pre-take-off checklist.”

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*My wife has said, “You own enough airplanes,” Mark said. “I own four. She said five is beyond the pale. But I keep telling her there’s always room for one more in the hangar, but she’s not buying it.”*

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“We keep about 1500 rpm on final, which will keep you at about 50 miles an hour,” he said. “Stall speed’s 38. And of course, as you cross the threshold, close the throttle. And being that it’s only 550 pounds empty weight, it just floats down the runway forever. If you practice a little bit, you can roll the wheels in the grass without putting any weight on the wheels.”

## Expanding the Fleet

While Mark stays plenty busy helping friends with their E-2 and J-2 restorations — he’s involved to some extent in more than two dozen projects — he doesn’t foresee adding anything to his personal collection anytime soon.

“My wife has said, ‘You own enough airplanes,’” Mark said. “I own four. She said five is beyond the pale. But I keep telling her there’s always room for one more in the hangar, but she’s not buying it.”

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