



The Bicycle Mechanic's Flying Dream

Two brothers' journey toward a flying homebuilt parallels another pair of brothers. *Well, kinda.*

BY TIM BAYER

For years, I have commuted to and from work using my bicycle, rolling up thousands of pedaling miles along the way. Through repeated repair and maintenance on my two-wheeled transportation, I managed to turn myself into a proficient bicycle mechanic. And those of us enamored with the aviation segment know full well that the dream of powered flight was brought to reality by the Wright brothers, two bike shop owners in their own right.

Like my long-ago brethren, I too had the dream to one day own an aircraft and become a pilot. In the meantime, with a little imagination, riding a bicycle through the wind was sort of an earthbound version of flight. In my aviation fantasy world, I became adept at drawing astonishingly far reaching comparisons between the Wright brothers, and, of course, me. The Wright brothers were bicycle mechanics... I am a bicycle mechanic. The Wright brothers had the dream of flight... I have a dream of flight. The Wright brothers were amazingly ingenious... I am... a bicycle mechanic!

Although I longed for flight, I was saddled with problems familiar to many earthbound aspiring pilots—no airplane and a lack of funds. Without a sufficient bankroll, I couldn't just wander into the local aircraft dealer with my checkbook and emerge an airplane owner. I derived solace from the fact that the Wright brothers could not wander into a local aircraft dealer, either.

The Tide Turns

Alas, I did have a few allies in my corner—a number of friends in the aviation community and my brother, who is an ultralight pilot and mechanic. Timing, luck and generosity would combine to produce my eventual aviation opportunity. It began with a phone call.

"The plane is free?" I asked.

"Yep. If you want it, Joe will give the plane to you," my brother Mark assured me. But why? Twelve years earlier, when Joe Hines purchased it, the used 1982 Rotec Rally 2B ultralight was in flying condition. He disassembled the Rally, brought it home and stored it for the winter. Unfortunately, right after the plane's arrival, Joe's dad got sick. Joe assumed responsibility of dealing with the issues associated with the care for his dad, and the plane sat untouched.

Mark filled me in on three key points about the potential project: First, the Rally had been stored for 12 years, so it would need work to get it in flying condition. Second, the plane was available to a good home, provided that it would be kept and flown. Joe would not give it to me if it were going to end up on eBay. Finally, the original, complete Rotec Rally assembly manual—an essential ingredient—was, indeed, still with the aircraft.

Hmmm, I wondered, how *much* work could I handle? The Cuyuna 430 engine would need a bunch of tinkering. My mechanical ability allowed me to success-



Mark Bayer examines the improvised throttle cable for the 32-mm Mikuni carburetor.



Key to the Rally project? The 35-hp Cuyuna 430 powerplant meant to power the plane. The heads and cylinders were in good condition, so it was workable.

fully distinguish a bludgeoning implement (a hammer) from a polygon torque lever (a wrench), but my engine repair aptitude declines sharply after the tool ID process.

Mark, however, is unquestionably at the opposite end of the engine skill

spectrum—an outstanding mechanic. The man can seemingly fix anything: automobiles, motorcycles, lawnmowers, aircraft, electrical appliances, portable generators. I, of course, possess excellent supervision skills, and I have personally witnessed Mark repair those items, just to name a few. Mark was well aware of the limits of my mechanical abilities and that engine work would be a stumbling point for me. If Mark were interested in working on the Rotec Rally motor refurbishing, I was confident I had the supervision skill to watch him do it.

During that initial discussion, I paused with anxious hesitation before I posed the query. There was a complete, unspoken understanding that the go/no-go decision would rely on Mark's willingness to perform the engine work.

"What do you think about taking on this project?" I asked. My immediate flying future hanging in the balance...

"Let's do it," Mark replied.

Fishing for Parts

A day later, the Rotec Rally was transported from Stittville, New York, to my garage in Webster. Mark and I wasted no time examining our little jewel. First, engine check! The Cuyuna turned over (it hadn't seized), but it was a ways away from running condition. We removed the engine from the frame of the Rally and placed it on the workbench in the garage. The plan was to get the motor running smoothly while it was attached to a workbench. It would be much easier to monkey with the motor on the bench instead of at the 6-foot elevation mounted on top of the Rally frame.

We removed the heads and inspected the cylinders. There was absolutely no carbon on the heads or the cylinders. The cylinders were smooth, no wear or defects, leading to the conclusion that the motor was probably rebuilt before the plane was stored and may have never been started after the rebuild. The rubber carburetor boot was dry rotted from sitting for years, and the exhaust manifold gaskets were cracked. The spark plugs did not produce a spark when the engine was pulled over. Obtaining new engine parts would be the first challenge on my path



Here's the high-tech fuel system for the test setup: The Bayer brothers routed a fuel line from the makeshift fuel tank, a recycled 16-ounce soda bottle, to the Mikuni carb.



The moment of truth: Author Tim Bayer (background) pulls the start rope while Mark operates the throttle via the improvised cable.

to flight. Solving the problem would involve research and consulting my aviation resources.

I contacted powered parachute manufacturer Nick Viscio of Heldeberg Designs and learned that Cuyuna was out of business, but the engines and parts were purchased by the engine company Two Stroke International (2si). I e-mailed 2si about parts availability and was informed that the company no longer built, serviced or supplied parts for Cuyuna engines. One step backward.

Next, I searched the web for a rebuilding kit for the 28-mm Mikuni carburetor. Nada. But my research did uncover a lead to Roger Zerkel at ZDE Engines in Flat Rock, Illinois. I called Roger and he said that rebuilding kits for a 28-mm Mikuni carburetor are no longer manufactured. A second step backward.

But... Roger also informed me that the 32-mm Mikuni carburetor is a suitable replacement and will fit on the Cuyuna 430. The 32-mm carburetor is commonly used these days, and parts are widely available. According to Roger, the larger



The Mikuni carb assembly did not include a choke, so the brothers resorted to pumping the carb with starting fluid.

carburetor would likely add 2-4 horsepower to the Cuyuna 430's power output. Cool! And Roger had the parts I needed in stock. Double cool! I ordered the carburetor, air cleaner and rubber carburetor boot. I also ordered spark plugs, plug wires, condensers, new points and exhaust manifold gaskets. Three steps forward.

Fueling Around

The replacement parts arrived shortly, and Mark and I installed them into the motor. Actually, Mark installed the parts while I supervised the operation. He fabricated some brackets out of steel, and we bolted the motor to the workbench in the garage and connected the new 32-mm Mikuni carb to the Cuyuna. To be able to provide throttle control, we attached a short, improvised cable to the carburetor. My management of the process was stellar, and I may have to give myself a hefty bonus and a pay raise.

Next, we needed a temporary gas tank. The solution? We modified a 16-ounce Mountain Dew bottle so a fuel line could be attached to its mouth. The other end of the fuel line, of course, was attached to the carburetor, and we filled the bottle with two-stroke gas/oil mix fuel. The two-stroke fuel was mixed at 32:1 for my lawn mower; the Cuyuna feeds on a 40:1 mixture, but for testing, we figured the 32:1 mixture would do. To provide a cradle and suspension hook, we bent up a coat hanger and suspended the bottle from a cabinet above the engine. This gave the impression of an IV bottle supplying fluids to a patient—rather appropriate in view of the ailing “patient” bolted to the workbench.

First problem of the day: no choke. New to buying parts for aircraft engines, I was unaware that choke mechanisms aren't included with the purchase of a carburetor. The excitement of seeing the shiny new aluminum Mikuni carburetor fresh out of the box was dampened a bit when inspection revealed that the carburetor did not have a choke.

Second problem of the day: fuel leak. The improvised fuel line from the Mountain Dew tank was too large for the nozzle on the carburetor. A quick run to the local hardware store for a smaller fuel line, and we were once again in the garage



Oops! Vapor lock! A quick vent of the high-tech fuel tank solved that problem.



With no choke, the author used the palm of his hand to mimic the choke's operation and inhibit airflow down the barrel of the carburetor.



Ouch! Backfire! The author second-guesses that hand-as-choke method after getting a blast of hot air.



With the engine running successfully, the next challenge for the Bayer brothers is to return the Rally airframe to flying condition.

wrenching on the motor. Even without a carburetor choke, we were ready for our attempt to get the beast running. Who needs a choke when you have starting fluid?

The Moment of Truth

For those of you keeping score at home, it's worth noting that one of the most important characteristics of starting fluid is that it is highly flammable. Spray a liberal amount of starting fluid into the carburetor, and you get a wonderfully combustible mixture in the engine cylinders. So combustible that, in this instance, when the motor was pulled over, flames jetted out of the barrel of the carburetor accompanied by a loud *bang!* [This is where we would, had we no sense of humor, insert the seemingly obligatory caution about not trying this at home. Ever. —Ed.]

Accustomed to tuning motors and unaffected by the backfire, Mark did not jump. I did. Mark looked over at me and quietly chuckled to himself. He turned in the carburetor fuel mixture adjustment screw to the stop point and then backed it off two turns for a rough fuel mixture setting. The improvised throttle cable required that Mark use both hands for throttle operation. With one hand, he held the cable housing; with the other, he moved the throttle cable. My job was to pull over the motor. A few tugs on the pull start rope, and the engine sputtered a bit and almost started. A quick shot of starting fluid and another tug. The engine started to run, but it soon stalled.

Third problem of the day: vacuum lock. The Mountain Dew bottle was sealed. As the running engine drained fuel, a vacuum was created in the bottle, inhibiting further fuel flow to the motor. We used a jackknife to puncture a small hole in the plastic bottle to allow venting.

With the vented Mountain Dew gas tank, we started 'er up again. Without a choke for the carburetor, the cold engine struggled a bit, bogged down and then died. OK, let's think for a minute, here. I knew that a choke essentially inhibits the airflow down the barrel of the carburetor. I also knew that if I placed the palm of my hand over the barrel of the carburetor, I could simulate the action of the choke mechanism. Because Mark was

using both hands to adjust the throttle, here was an opportunity for me to be useful! Note to self: Add "Manual Carburetor Choke Operations" to the experience section of my résumé.

Again, I pulled over the motor—it started. Each time it began to bog down, I choked the engine by covering the barrel of the carburetor with the palm of my hand. This maneuver was successful in keeping the engine from stalling. The two-person, three-handed engine controls worked fine, right up until a slight miscommunication.

With the engine warmed up and running well, Mark decreased the motor throttle. I thought the engine was stalling, and I choked the carburetor with my hand. To keep the motor running, Mark instinctively pulled the throttle cable, dumping fuel into the carburetor and... *Pow!* Backfire.

In the case of a backfire when performing Manual Carburetor Choke Operations, not only do you get the loud bang and flash of flame, you also get the tactile input from a blast of hot air onto the palm of your hand. I was several feet away from the engine before the echo from the backfire faded. Immediately realizing by my reaction that I was startled but uninjured, Mark found the split-second spectacle quite entertaining.

Victory! And Good Fortune...

After testing, we were satisfied that the new 32-mm Mikuni carburetor and the Cuyuna engine functioned properly. The carburetor would need to be tuned, but the motor was operational.

And that challenge solved, my path to the sky was under construction. My shortage of start-up capital was offset by the generosity of a fellow homebuilder, who had spotted me an aircraft. The engine repair wizardry of my brother and the fact that the original Rotec Rally assembly manual was in my possession moved me closer to a journey to an airstrip. The possibility of flight was migrating from a dream to an attainable goal.

Like the Wright brothers, I was a bicycle mechanic solving the problems in pursuit of the dream of flight. †