

# Step Up To The Super

*Plane & Pilot*

*By Bill Cox, James Lawrence*

To stare out at the world from either seat in a Waco is to wonder where we've been and where we're going. At first, it seems a confusing *mélange*: struts and brace wires and fairings and wings and wind and sky everywhere.



This is definitely old-school flying: a throwback to an easier time when skies were uncongested and life was less complicated. In those days, most airplanes had one round engine; fixed, conventional gear; and little more than needle, ball and airspeed on the panel. Most often, the sky above or the earth below (assuming you weren't inverted) was separated from the aviator by nothing but air. Open cockpits, goggles and leather helmets were the rule rather than the exception, though with an eye to the future, Waco was also building a few cabin biplanes.

It's true, from a distance, the 2010 Waco YMF-5D doesn't look all that different from the old Waco UPF-7 of the '30s, and that's deliberate rather than accidental. Waco Classic Aircraft of Battle Creek, Mich., wanted to preserve the classic, art-deco lines of the original airplane, and to that end, you can be forgiven if you regard a new Waco as an incredibly well-built replica.

Under the skin, however, you'll find a myriad of improvements, something like 300 in all. After all, despite appearances, the 2010 Waco is a new machine, from spinner to tailwheel. Just as in the 1930s, each Waco is built entirely by hand, involving some 5,000 hours of labor. The fuselage is now constructed of 4130 steel tubing rather than the milled steel used in the 1930s. The Clark Y wing is still meticulously glued together with Sitka spruce, the original material, and the airplane is fabric covered, both highly labor-intensive pursuits.

It's a design true to the original concept of the Waco UPF. A team of fanatical engineers and craftsmen set about producing a modernized, authentic replica of the antique biplane in 1986, and since then, Waco Classic has produced some 120 examples.

If you deal in averages, that's only five airplanes a year, a rate that would bankrupt other companies, but Waco is a very small manufacturer, not looking to sell in volume. In fact, the very scarcity of the type unquestionably contributes to its novelty value on the ramp and in the sky. Waco owner Peter Bowers purchased the company in 2008, and he hopes to eventually sustain production at eight airplanes a year.



***The modern panel includes a JPI EDM-930 engine analyzer, Garmin G600, Garmin GNS 430 and an L-3 Trilogy standby instrument.***

Waco's sister company in Battle Creek, Centennial Air Service, may be able to pick up the slack if demand diminishes. The hope is that the renovation business might be able to absorb any reasonable slowdown and provide a buffer against layoffs.

The engine remains the original Jacobs R-755 seven-cylinder radial, though it has been upgraded to an A2M configuration, boosting horsepower from 275 to 300 (at 2,200 rpm). The prop is now a German MT, elliptical-tip design, a fixed-pitch tractor made of wood rather than MT's more conventional composite material, and it's lighter and more efficient than the Sensenich it replaces. The new prop features the same diameter—92 inches—but with a 60-inch pitch rather than the previous blades' 68-inch camber. The result is better cruise and improved climb, a seeming contradiction in terms. An all-metal, constant-speed, 93-inch-diameter Hamilton Standard 2B20 is an option.

These days, the STC for all things Jacobs is owned by Air Repair Inc. of Cleveland, Miss. Air Repair produces a variety of overhauled round mills—Jacobs, Continental and Lycoming—for a number of pre- and post-WWII airplanes. Air Repair still maintains the Waco engine and recently completed a top-to-bottom update on the Shaky Jake.

TBO on the Jacobs R-755-A2 is 1,400 hours, a tribute to the fact that the new engine incorporates much more than a few improved metal pieces. Overhaul interval on the original engine back in the '30s was more like 1,000 hours. Air Repair looked at all components and modernized and improved everything that made sense without excessive production incorporation costs.

More horsepower wasn't the only improvement in the move from the 5C to the 5D. Out in front of the firewall, in addition to the new prop, there's upgraded battery capacity, an improved oil cooler, upgraded magnetos and an Air Wolf oil filter system.

On the panel, Waco installed a JPI EDM-930 color engine analyzer that offers an electronic readout of all engine instruments in a single digital gauge. The company also installs a Garmin G600 system, a WAAS-enabled Garmin GNS 430, a Garmin GPSMAP 696 and an L-3 Trilogy standby instrument that displays attitude, altitude and airspeed. The panel itself has been redesigned with improved vibration dampeners. Digital avionics are especially popular on the Waco, not only because of their more efficient, modern presentation but also because digital avionics aren't susceptible to tumbling from aerobatics.

There's an improved landing-gear design; LED landing, taxi and position lights; and a new circuit-breaker panel and location. Plus front cockpit brakes are now standard, and there are about 20 other improvements we don't have space to list. The modern Waco may look pretty much the same as the antique model, but as mentioned above, there are literally hundreds of improvements under the skin.

What went before and still remains, however, makes the Waco YMF-5D perhaps the most unusual new aircraft on the market. From a distance, most pilots who didn't come of age in the 1930s probably couldn't tell the difference between a YMF-5D and one of the older open-cockpit Waco biplanes.

Today's modern Waco is a three-seater, with an extra-wide bench seat up front and a single bucket in back. Wacos were popular barnstorming airplanes in those early years, and they continue to serve that market today. (In fact, as this article goes to press, Waco has announced a dedicated Barnstormer Edition, a more basic model intended specifically for hopping passengers in the front pit. One operator in Sedona, Ariz., uses a pair of bright-red YMF-5Cs for sightseeing flights around the red rock canyons of central Arizona.)

Climbing into the back pit of a Waco is exactly that, a climb, though not a long one. You step up and over the sidewall, lowering yourself into a world of luxurious leather. The front pit, sometimes referred to as the "money pit" by those who barnstorm their Wacos, has a door on the left side, a partial concession to the proximity of the top wing. Or perhaps it was intended to accommodate someone in a dress. Either cockpit is a comfortable enclosure, more than adequate to accommodate even big folks.

The sticks are conventional joysticks with polished wood hand grips, a nice touch of luxury somehow only appropriate to an airplane in this class. "This class," incidentally, starts at \$395,000 for the basic VFR airplane, transitions to \$423,245 for an IFR Waco and can escalate to as much \$495,000 if your credit line can bear the strain.

Engine start with the big, seven-cylinder radial is more satisfying than with the standard horizontally opposed powerplants. There's that reassuring chug-a-put when the engine catches, then a series of puffs of smoke and bangs as all the cylinders vote on whether to run,

and finally a smooth idle as everything settles down. The airplane comes off the blocks with minimum power, and the steerable tailwheel keeps the tail behind the pilot at all times.

I launched out of Florida's Plant City Airport with Waco's Bob Wagner in the back pit. Wagner is an air show pilot with thousands of hours in type, including carrying a wingwalker. He did most of the flight-test work on the D model, so if anyone should know the airplane, Bob would be the one.

Make no mistake, the Waco is one big biplane, especially in contrast to the Pitts or Great Lakes. Wagner and I were flying on the wing of a Skyhawk for Jim Lawrence's camera, and the Waco dwarfed the little Cessna. Conversely, the YMF-5D's easy formation manners made it a simple task to keep the airplane somewhere near where Lawrence needed it for air-to-air photos.

As with the T-6 and other big taildraggers, the tailwheel is lockable for takeoff, a hedge against overcontrolling on the ground. Gross weight is only 2,950 pounds, so full power produces reassuring pressure against the back rest. The Waco leaps into the air with either the standard 275 hp or optional 300 hp engine out front.



*The radial Jacobs R-755 is upgraded to provide 300 hp on takeoff.*



When unrestricted by a Skyhawk with a window open, a moderately loaded Waco manages about 750-800 fpm from sea level. Optimum cruise height of 6,500-7,500 feet comes up in 10 minutes.

Considerations of cruise speed and fuel burn pale to insignificance in the Waco, but this isn't a one-trick pony, suitable only for hamburger flights on CAVU Sundays and holidays. Pilots WILL take them cross-country from time to time. While fun is more often the goal than speed or range, fuel capacity is 48 gallons, so the new YMF-5D offers about 2.5 hours' endurance plus reserve at 15 gph, trucking along at 105 knots max. If you're determined to cover longer distances, you can add a pair of 12-gallon aux tanks that can extend endurance to four hours and range to 420 nm.

It's true the more common application of the big biplane is local cruising with perhaps a loop or roll thrown in just to keep things interesting. The Waco is easily tough enough for most basic aerobatics, but it was never designed for hard acro. Roll rate is a leisurely 50-60 degrees per second, so a full-aileron-deflection roll requires about seven seconds. Loops can be pretty much as you like them, depending upon how hard you're willing to pull. (G-limit is 5.5.) The airplane also does a reasonable hammerhead turn to the left with full left rudder and opposite aileron to avoid rolling onto your back.

The Waco IS an open-cockpit airplane, and that might seem to present problems in winter, but Waco is way ahead of you. The company has paid special attention to the problem of heating the airplane's two, open-air pits. The windshields do a good job of deflecting airflow away from the pilot/passengers, and heat floods up from the floors to keep everyone comfortable and warm in temperatures that might surprise you. It's true I was flying in Florida in April, so the problem was minimal, but the heater is alleged to be phenomenal at suppressing the cold of those Battle Creek winters.

The Waco's 51-knot stall speed makes the airplane friendly down to approach speeds of 65 or even 60 knots if you need to plunk it on and stop it short. The airplane provides so much aerodynamic warning of an impending stall, you'd have to be in a narcoleptic trance not to recognize it. Three-point touchdowns or wheel landings work equally well, and the biplane goes almost exactly where you point it on the ground with the help of that big, steerable tailwheel.

Waco's YMF-5D is the oldest general aviation airplane design still in production. Fortunately, that doesn't portend bad things. The model has a good safety record, and a nearly fanatical following among its owners. One of them, a prominent real estate broker in Santa Ana, Calif., once misjudged a desert crosswind, lost control on landing and put his Waco on its nose, doing substantial damage. The tough steel-tube structure kept him from harm, and as he was sitting in the airplane, hanging from his straps and waiting for the crash crew, he pulled out his cell phone, dialed the factory in Battle Creek and ordered a new one. Now, that's dedication.