PEMBERTON & SONS' WACO EQC-6 CABIN

STORY AND PHOTOGRAPHY BY MOOSE PETERSON

Looking out in every direction all we saw was snow, from field to mountaintops, as the hangar door slowly folded open. The hangar had been packed the night before for the day's flying. The snow had been moved, so getting to the ramp and field would be smooth going. It was a gorgeous winter day in Spokane. There were clear skies overhead, and the air temp hovered just below the 30-degree mark as Tony the Towbot scooped up the Waco's tail wheel, pushing it out the door. As the aircraft slipped from the darkness, its vermilion color took on a glow in the winter sun. The grinding noise continued for a few minutes and then stopped as it retreated to the dark corner of the hangar to await our return. It was going to be a great day of flying!

Many pilots don't like flying their "antique" aircraft in the winter. Not only are the skies predominantly gray, but it's also just plain cold! An open cockpit with an air temp below freezing and the wind zipping by at 90 knots brings frigid temps right inside. Flying in a cabin allows the heat from the engine to make a difference and makes flying possible. It's the only reason we had a full load for the photo flight, which included Mr. Bear (the plane's mascot). Wearing a dress shirt and tie just as they did back in the day, the pilot and ground crew got everyone settled in their seats, belted in and headsets on, and then yelled "CLEAR!" as the Wright turned the prop in the crisp air. All were genuinely excited to fly and see the Washington state landscape carpeted in white from 2,000 feet.

Back in the day, the Waco EQC-6 would bring folks to Spokane to go skiing. Today's owner of the Waco came for the skiing, too. Mount Spokane is a favorite locale, so that was our destination for this flight. Radar indicated possible clouds and snow flurries in the area of Mount Spokane as we left the ground. The launch was so smooth that only the disappearing runway told us we were up. We climbed and banked left out of the pattern on a heading northwest. It was a great day to fly!

THE WACO EQC-6

In 1924, Advance Aircraft Co. of Troy, Ohio, designed and built the first cabin Waco, the Model 8. Able to carry six passengers inside the cabin and two in the open cockpit, only one of them was made. In 1931, Waco produced the QCF-2, at the time the industry's highest-performance open-cockpit biplane. In 1932, Beech first flew its gorgeous Staggerwing, putting pressure on Waco for a cabin aircraft. This prompted Waco's engineers to start designing a four-place cabin aircraft with similar performance to the QCF-2. They also wanted it to have the ability to land and launch from small fields just like the QCF-2. If all of that weren't enough of a challenge, the Waco engineers wanted to maintain the low weight and small size of their biplane but design it with better vision — while keeping the price below $6,000. That was a tall order that was quickly not only met but exceeded in the Waco Model C.

Advance Aircraft Co. sold 37 1931 Waco Model C QDC cabin aircraft (along with 149 open-cockpit models) at a time when most aircraft companies were struggling. This great success pushed Waco to further improve its series. The 1932 cabin series saw further refinements and improved power while keeping the price below the targeted threshold. Along with the significant "blind area" improvement, this made Waco the most bought cabin (and open-cockpit) aircraft in 1932. In 1933, Waco brought its cabin series to the next level with the introduction of the UIC and its ad campaign "Fly on Silver Wings."

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— ADDISON PEMBERTON

The new paint schemes and more luxurious interior of the UIC, along with a wood grain instrument panel, got aviators and especially executives looking at the new UIC. It could take off or land in less than 100 yards, had lower operating and maintenance costs, and featured controlled ventilation and greater visibility. This made the silver wings and vermilion fuselage that much more attractive. Waco sold 83 of the aircraft, along with its open-cockpit airplane, that year. Waco continued this pace of improvement, refinement, power, and luxuriousness in 1934 and through 1935, when it introduced the Standard series (renaming the Model C) at lower prices and with more power. The new Standard series was a new custom cabin aircraft.

The list of improvements and refinements on the 1935 Standard series is lengthy. Highlights were various powerplants; rounded windows; a nonglare instrument panel; a direct-drive electric starter; a safety glass windshield; front adjustable seats, fore and aft; a stabilizer control mounted on the steering column; and independently controlled mid-chord flaps (made from corrugated aluminum). The Standard series made the Waco Aircraft Co. feel very optimistic for a bright sales year, and the company named the new cabin aircraft the "Four Aces of the Air."

In 1936, Waco's refinements and improvements produced what many say are the finest aircraft Waco ever produced! Waco wowed the aviation world in 1936 at the National Pacific Aircraft and Boat Show with its 1936 line of cabin aircraft. With a starting price of $4,995 for the S-6 cabin and maxing out with the gorgeous C-6 cabin at $9,650, Waco increased sales and production with new designs that grabbed everyone's attention. The Standard S-6 featured new landing gear and a new engine cowling. The Custom C-6 featured new landing gear, a new engine cowling, a longer fuselage, and fabric-covered ailerons. The C-6 was the high-performance model with a top speed of 176 mph.

Waco would go on to produce new, improved, and refined cabin aircraft until 1940. Many feel that it set the standard for the golden era of luxurious, fast flight. The one confusing thing about Waco is the coding or naming structure for its aircraft. While some of it is perfectly clear, there is also some variance. But, basically, the first letter indicated the powerplant, the second stood for the basic airframe, and the third was the series and dash, which generally indicated the year of manufacture. For example, EQC-6 equates to:

E =	Wright R-760E2, 350 hp
Q =	1936 custom cabin types and 1930 National Air Tour Special
C =	All cabin models 1931–1935, and custom cabin models from 1936
-6 =	1936

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– Addison Pemberton

PEMBERTON & SONS' EQC-6 (N16591) STORY

Addison Pemberton and his sons have a well-earned reputation for restoring gorgeous aircraft. In the fall of 2007, their restoration on the Boeing 40 was in its final stages. At that time Addison went out looking for their next project. At Blakesburg, Iowa, the Waco Cabin series grabbed his attention, and after doing lots of homework and talking with a number of folks, in May 2008 he found and purchased EQC-6, N16591, serial No. 4490. Pemberton purchased the EQC-6 from the Gomoll family, who had owned the aircraft since the 1960s. N16591 left the factory on October 3, 1936 (as a DQC-6). It was purchased by Howard Aircraft and then went to the Wallace Air Service (as an EQC-6) at Felts Field a few years later. Felts is the home base for Pemberton & Sons Aviation, so it was, in a way, going home.

The ferry trip from Minneapolis back to Spokane was completed in under 12 hours (excluding the two days they spent waiting out a freak late-May snowstorm in North Dakota and an incident where the exhaust fell off over Mobridge, South Dakota). Amazingly, the EQC-6 cruised at 145 mph at 7,500 feet (and at 55 percent) all the way back to Spokane, burning only 18 gph. The supercharged Wright R-760-E2 was strong and smooth, especially considering it was just 50 hours since major overhaul 16 years prior to the ferry flight.

As winter approached in 2008, the Waco was rolled into the main work hangar as the restoration process began, starting with the engine, propeller, accessories, and instruments going out for overhaul. The landing gear went out to John Nace, with the tail wheel and trim jackscrew going to Joe Maridon. As the EQC-6 was being carefully torn down, Addison was amazed to see "PK screws drilled right through longerons and major structure wherever Waco decided to mount whatever." He went on to say, "I also discovered large segments of the fuselage wood that was taped with friction tape and doped into position. I also found scary stock brass cone water valves for the fuel valves — all original. The airplane has beautiful lines, but [it was made using] many very crude building practices."

The fuselage was actually in really good condition, despite all the PK screw holes, which were remedied with minor welding repairs made by Ryan Pemberton. It was bead-blasted, epoxy-primed, and painted with gloss black polyurethane paint. One mod was made with FAA field approval: The rudder pedals were switched to PT-19 (on both sides) and five-eighths modern brake master cylinders. The PT-19 pedals were reworked, and the Fairchild casting logo was replaced with Waco logos. This mod also required designing new linkage with clever pedal geometry to prevent pedal angle change throughout the pedal stroke. With this accomplished, a new one-quarter Baltic birch floor was installed onto the C-6 "roller coaster floor."

Pemberton & Sons spent 10 months re-creating all-new wood longerons from the original parts. Using the original longerons as a pattern, new ones were manufactured for the EQC-6 and the process was pretty much straightforward. The challenge came with the crescent-shaped longeron shape formers. Pemberton & Sons was able to find a cabinet shop in Spokane with tooling capable of cutting the inside and outside shape even for the 18-foot sections! These were all made from spruce spar stock. The wood fuselage parts all fair in the metal fuselage 4130 chromoly structure. The long, crescent-shaped wood longeron parts attach to steel longerons that neatly blend in the wood stringers that make up the fuselage shape. One deviation from the original fuselage is a removable belly aluminum panel center section from the firewall to aft of the front seats. This permits easier access for annual inspection and for servicing primary flight controls.

When Pemberton & Sons got to the wings of the Waco, the company had just spent four years building the wings of the Boeing 40. It found that the lower wings required minor rib repair and several spar plate replacements. The upper wing spars were badly fuel-stained, and there were minor cracks outside of most of the spar plates. In addition, the spar plates were squared off with sharp transitions, as opposed to the tapered transitions typically seen in wood-wing aircraft. It was decided that Pemberton & Sons would take on the lower wings and the upper wing would be sent to John Pike at Big Sky. It was a good call, as Pike had the wing back in 12 weeks, on budget and looking great! After work was completed on the gas tanks, ailerons, and tail, everything was fitted and rigged before being covered.

Because of the cold winter temperatures in Spokane, working with cloth and paint is a summer task. In this case, it consumed June to September 2011. Addison's wife, Wendy — who does gorgeous work — covered the surfaces and produced award-winning results. Ceconite 102 fabric, nitrate, and butyrate dope were used throughout the process. Thirteen coats were applied, creating the perfect base for the Randothane polyurethane topcoats. All the wood was painted with Stits two-part epoxy varnish, which is resistant to dope and Super Seam cement. There was an issue with orange peel until the topcoat was thinned to twice the recommended amount.

The majority of the sheet metal was remade from 5052-H34 using original parts as templates. The 5052-H34 worked well with the planishing hammer and English wheel. Because of the extreme forming required, dead soft 3003 was used for the compound shoulder fairings where the landing gear exits the fuselage. All metal parts were acid-etched, epoxy-primed, and finished with Randothane polyurethane.

It now came down to finishing details. The supercharged Wright R-760-E2 was hung, and all the overhauled instruments were installed along with some new avionics. Cessna 310 Cleveland wheels and brakes were installed with an FAA field approval. Final assembly was completed with all-new hardware, wiring, cables, and bearings. A new leather interior was installed, along with mohair headliner and pile carpeting with soundproofing. And with that, Pemberton & Sons basically had a brand-new 1936-era Waco EQC-6 with some really nice upgrades.

SPECS

Airplane Type and Model:
1936 Waco EQC-6 N16591

ENGINE:	350-hp supercharged Wright R-760-E2
FUEL:	94 gallons
FUEL BURN AT 28 INCHES MANIFOLD PRESSURE/1900 RPM:	18 gph
GROSS WEIGHT:	3,650 pounds
FLAP EXTENSION SPEED:	108 mph
BEST GLIDE:	95 mph
HIGH-SPEED CRUISE:	170 mph
MAX SPEED "DIVE":	214 mph
NORMAL CRUISE:	145 mph
MAX POWER 1 MINUTE:	35 inches MP/2400 rpm
METO POWER:	32 inches MP/2200 rpm
NORMAL CLIMB:	30 inches MP/2000 rpm
CRUISE:	28 inches MP/1900 rpm
SLOW CRUISE:	22–26 inches MP/1800 rpm

On July 14, 2012, N16591 made its first flight. Addison said of the flight, "Engine was smooth and powerful, and the airplane flew hands off. The freshly rebuilt oleo landing gear made the first landing as smooth as a butterfly with sore feet." That was a 45-minute flight over the airport. The restoration took three years and nine months and cost $75,000; $25,000 went to the firewall forward, $10,000 to cover and paint, and $10,000 to avionics (this does not include the purchase price).

You can see the Pemberton & Sons Waco EQC-6 flying year-round in the skies of Spokane and elsewhere. It's an incredibly easy, comfortable, and luxurious ride — and it doesn't stay in the hangar much. Way back in 1936, Waco's engineers knew how to produce a cabin aircraft for aviators. The EQC-6 is living testimony to their skill, talent, and dreams. Simply a gorgeous aircraft!

Many thanks to Addison Pemberton for flying the Waco EQC-6 through the snow and to Ryan Pemberton, photo platform pilot, for a great flight!