

BRINGING BRITISH COLUMBIA'S AVIATION PAST INTO THE FUTURE

CANADIAN MUSEUM OF FLIGHT

TECHTALK: WACO AQC-6



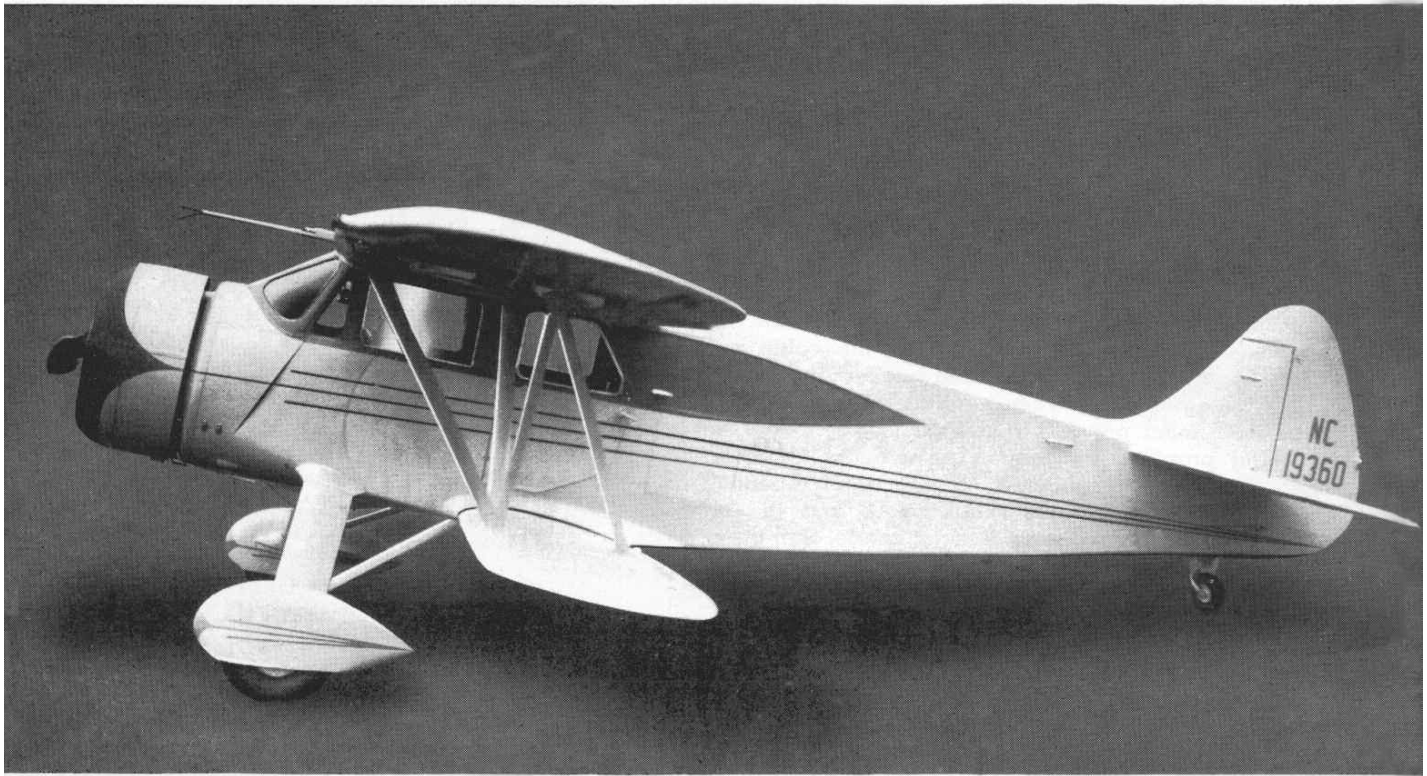
The Canadian Museum of Flight is presenting a series of informal technical talks on aircraft in its fleet. These talks will cover topics ranging from the history of the company; the history of the aircraft type; its development; production methods and places; the history of the engine and its development.

Also covered will be the challenges in maintaining and flying these classic aircraft in today's environment; how the mechanics find the parts and how the pilots keep current on flying a 70 year old flying machine designed before the dawn of the jet age.

This will be followed by details of how the aircraft is prepared for flight; how the engine is started; followed by an engine start and flight.

During the proceedings a draw will be conducted entitling the lucky winner to a flight in the aircraft being discussed (some conditions apply).

The New WACO "C"



This latest WACO model is offered for your consideration with a great deal of sincere pride by its makers. No effort or cost has been spared to make this airplane the finest, most attractive, personal transportation unit available in its class.

WACO airplanes have been noted for more than fifteen years for their sturdy rugged structure and their ability to stand a maximum of abuse, and for the quick take-off and slow landings that have made them invaluable for flying in regions where airports do not abound.

To these under-the-cover features have been added the finest results of the coach-builders art.

Exterior finishes using the best available material are carefully and completely rubbed by hand to an extreme high luster. These finishes remain pliant through long periods of exposure and may be polished and waxed again and again, and their full luster retained over a period of years.

Interiors please the most exacting. Laidlaw broadcloth, as used in high-priced motor cars, is carefully and attractively patterned over full deep springs, resulting in a luxurious interior that must be seen to be fully appreciated.

Like its predecessors, this model is likewise offered with a freighter interior and may also be equipped as an aerial ambulance. When so equipped, the stretcher is concealed when not in use and the usual passenger interior remains unimpaired.

THE HISTORY OF THE WACO FAMILY OF AIRCRAFT



First, the Waco name

WACO (referring to the aircraft) is usually pronounced “wah-co” (the first syllable pronounced as in “water”), not “way-co” like Waco, Texas, whose name is entirely unrelated. The name comes from a field near Troy, Ohio - Waco field, which in turn received its name from a local war-cry, which had several variations. Although an acronym, the company was universally referred to as “Waco.” (Remember, Waco rhymes with taco).

Garages and fields across America were filled with eager aircraft experimenters after World War One. Pilots, mechanics, and enthusiasts were sure that aviation was going to be a major new business and they rushed to find some way to participate. The early days of aviation’s Golden Age saw hundreds of shifting partnerships and companies, many advertising undeveloped products using outrageous performance claims.

One such group of enthusiasts, all in their early 20’s, formed the first of the companies that later produced Waco aircraft. George “Buck” Weaver was a flight instructor and barnstorming pilot. Elwood “Sam” Junkin had been a draftsman and worked together with Clayton “Clayt” Brukner, an assembly foreman, at Curtiss and another aircraft company. Constantly seeking development funds, these three combined their talents to try building airplanes. Like many before and since, they learned that designing and building airplanes was much more difficult than flying them and that building a successful airplane company was even more challenging.

Their early efforts would have discouraged a less enthusiastic group. While still in high school, Junkin and Brukner made an unsuccessful attempt at building a biplane powered by a motorcycle engine. Their second design was a flying boat that turned out far too heavy to fly. Their third aircraft, the parasol-design “Waco Cootie,” looked promising, but it crashed on its first test flight, destroying the plane and leaving Weaver with extensive injuries. They continued to advertise it for sale, however, with exaggerated performance claims. The Weaver Aircraft Company, as it was then known, was in constant need of money to fund development. The partners barnstormed using war surplus airplanes, dropped samples of candy and cereal, did odd jobs and sold shares in the company to optimistic investors.



Waco Cootie biplane

A redesigned “Cootie,” now a biplane design, had more success. It set the stage for their first commercial success, the “Waco Four” three-person biplane. With a small family to support, Buck Weaver left the group to seek other opportunities. Junkin and Brukner each learned to fly and continued testing new designs, now as the Advance Aircraft Company. Their products continued to carry the Waco name, however.

The Waco Nine biplane firmly established “Waco” as a respected trademark. In 1926, it became the country’s most popular mass-produced airplane, costing about \$2,500 with a production rate of one per day. About 75 men and boys built the airplanes in a former horse wagon factory. A key to the low price of the Waco Nine was its relatively inexpensive and readily available Curtiss OX-5 V-8 engine. The engine’s low power (90 hp) limited the airplane’s performance, however.

In 1927, the Waco Ten was delivered, still using the OX-5, but also able to accommodate more powerful engines. The Model Ten had major design improvements, such as “oleo” strut hydraulic landing gear, a larger cockpit and a horizontal stabilizer that could be adjusted in flight. Improvements continued with introduction of the famous Waco Taperwing design in 1928. Company employment grew to almost 200 and production was moved from the wagon factory to a new facility built with its own airfield on the outskirts of Troy, Ohio.

The Great Depression, which started in 1929, forced many airplane companies out of business. The popularity of Waco designs allowed the company to survive, although with a reduced production rate. To meet varied customer needs, different Waco models were developed and produced simultaneously, many with fully enclosed cabins. A complex system of letters and numbers was used to identify Waco models in the 1930s. While design improvements continued, most Waco models remained as biplanes with a welded tubing structure, wooden wing spars, and fabric covering. In its hey-day Waco produced 400 aircraft per year compared to Boeings 25.

World War II created needs for different styles of airplanes, emphasizing higher speeds and metal construction.



**The Waco AQC-6
when in service with
Dr. Jack Pickup flying
out of Alert Bay, BC**



Waco continued as a supplier of various aircraft subassemblies and was famous for producing CG4-A troop carrying gliders. The company that was so nimble in adapting to customer needs in the 20's and 30's was unable to adapt its designs to compete in the post-war market. After Waco ceased production the remaining Waco airplanes have been prized by collectors and aviation enthusiasts for their rugged and handsome design.

Of the three early principals, only Clayton Brukner survived to see the full span of Waco history. Buck Weaver and Sam Junkin each died before reaching the age of thirty and without knowing the impact the Waco name would have on aviation history.

Wacos were purchased for many different uses. The Waco Taperwing Models ATO and CTO were known for their outstanding acrobatic qualities and were also used for air racing. Waco won the 1928 and 1929 Ford Reliability Tour also known as the National Air Tour, which was a transcontinental race sponsored by Ford pitting over 25 aircraft manufacturers against each other. Wacos raced in the famous National Air Races in Cleveland, Los Angeles and Chicago and placed first in many events. One Waco was even invited to participate in the Paris International Air Show in 1936 where it placed first in the acrobatic events. Other Wacos were purchased and used for military fighters in Central and South American countries such as Uruguay, Nicaragua, Brazil, Argentina, El Salvador and Cuba. Many wealthy sportsmen also purchased Wacos such as Howard Hughes, Roscoe Turner, Gar Wood, Powell Crosley, Jackie Cochran, and Henry King, just to name a few.

A. Francis Arcier

Born in London, Alex Francis Arcier was an aviator, scientist, designer and engineer whose pioneering work in aviation design spanned six decades. Among his designs are the Barling Bomber and the Fokker TriMotor.

In 1930, Arcier became Chief Engineer of Waco. He worked for Waco for 17 years in various capacities. Arcier and the Waco Aircraft Company made many contributions to the National Defense Program during World War II, such as the Model UPF-7 primary trainer.

The Waco Company was entrusted with the entire combat and cargo glider program of the U.S. Army Air Forces. This was initiated in an Army Design Competition that the company won and resulted in a program involving the design, prototype construction and, in some cases, production construction of some twelve models ranging from Model CG-3A to the CG-15A. These gliders were built by the thousands under Arcier's technical direction by sixteen prime contractors and many hundreds of sub-contractors throughout the nation. In 1948, Arcier became Chief Scientist for U.S. Air Force Intelligence at Wright-Patterson AFB until he retired in 1963.

DEVELOPMENT OF MODELS/DESIGNATIONS

Waco O series

In 1928, after the Waco 10 had entered production, Waco changed its designation system so that the basic model 10, powered by a 90 hp (67 kW) Curtiss OX-5 engine became the GXE. The OX-5 was also used in the Waco 9, and this led to the confusing popular description of both aircraft as Waco 90, after the power. Later aircraft used a three-letter designation, the first denoting the engine, the second, S or T meaning Straight or Tapered wing and the final O indicating it belongs to the Waco O series for open cockpit. An -A suffix indicated an armed variant intended for export

Waco Taperwing

The Waco 10 was developed in the mid 1920s, but was not the docile airplane designers had expected. In 1928, the aircraft underwent quite a remarkable transformation when the wings were swapped for a set of tapered wing panels. This alteration earned the airplane the nickname "Taperwing," and the Waco 10 turned out to be a fabulous airplane. The Taperwing prototype was powered by a Curtiss OX-5 engine and became a proven success, and after replacing the engine with a Wright J5, the airplane finally realized its full performance potential. A number of Taperwings were exported to Central and South America—Brazil bought 13 CTOs with twin machine guns.



Waco CTO Taperwing, 1928

Waco F series

The Waco 'F' series of biplanes supplanted and then replaced the earlier 'O' series of 1927/33. The F series had an airframe that was smaller and about 450 pounds (200 kg) lighter than the O series, while continuing to provide ac-

commodation for three persons in tandem open cockpits. A similar performance to the earlier model was obtained on the power of smaller and more economical engines.

The initial models were the INF, 125 hp (93 kW) Kinner engine, KNF, 100 hp (75 kW) Kinner, and the RNF, 110 hp (82 kW) Warner Scarab, all of which had an externally braced undercarriage and a tailwheel. Many further sub-models followed with more powerful engines of up to 225 hp (168 kW). The most powerful in the range was the ZPF of 1936/37, intended for executive use.

The F series was popular with private owner pilots for sporting and other uses and continued in production through the late 1930s. The tandem cockpit UPF-7 version was adopted by the Civilian Pilot Training Program and continued to be built in large numbers (over 600) until 1942.

The Museum's Waco INF was built in 1930 as an RNF with a 110 hp Warner engine. It was converted to the INF standard by fitting a 125 hp Kinner engine.

Note: to identify a later-model Waco look inboard from the right wingtip – the three wing struts between the upper and lower wings will form the letter N.



Waco INF

Waco D series

By the early 1930s, no Waco aircraft had been ordered by the U.S. military services, with the exception of a single Waco 9 ordered by the USAAS in 1926. In an effort to remedy this situation, the Model D was introduced. A single-bay staggered biplane with a faired undercarriage, the type seated the pilot and observer/gunner in tandem cockpits with sliding canopies.

The Model D was unusual in that the upper wing was supported by a strut that met the fuselage in the pilot's line of vision. Landing lights, flares and blind-flying instrumentation were standard, while armament consisted of one or two 0.30 in (7.62 mm) Browning machineguns with 1,000 rounds in the lower wing; optional was a flexible rear-mount machine gun of similar caliber with 500 rounds. It could also be equipped with two USAAC A-3 bomb racks mounted in tandem on the fuselage capable of carrying five 25 lb (11 kg) bombs or two 125 lb (57 kg) bombs.

The Model D was advertised as being able to perform no less than twelve military functions; these included fighter, bomber, observation post, photographic aircraft, mail plane, ambulance, trainer and seaplane. About a dozen of the Model D were produced, but the advent of the monoplane was quickly to render the type obsolete.

In the comprehensive Waco designation system the following codes were used for the produced Model D versions: WHD, S3HD and JHD. The first letter indicated the engine, W for Wright R-975-E3 of 450 hp, S for the Pratt & Whitney R-985 of 420 hp (the 3 in S3HD meant upgraded to 450 hp), and J for the Wright R-975-E1 of 365 hp. The second letter indicated the basic airframe, in this case the Model D, while the third letter D stood for military, while armed aircraft had the suffix A.

Waco N series

Waco introduced the luxury N series biplane in 1937. It was based on the Waco C series five-seat Custom Cabin Waco with that model's curved pointed wings, but with an unusual fixed tricycle undercarriage and a modified tail with a lower rudder extension to give increased side area. The Waco N was fitted with flaps on all four wings to improve the aircraft's landing characteristics.

The prototype, was designated ZVN-7, with the '7' indicating its year of manufacture (1937), and was powered by the 285 hp (213 kW) Jacobs L-5 engine. Only around 20 examples of the N series were completed, as the AVN-8, and ZVN-8. The AVN-8 was powered by 300hp Jacobs L-6. It had a span of 34'9" length: 27'7" and cruise speed of 139 mph. Cost was \$12,800.

Waco E series – the Aristocrat

The E series was the final development of the prewar Waco line of biplane designs. A full four-seater, it had the best performance of any of the Wacos. First flown in 1939, it had a much slimmer and more streamlined fuselage than earlier Waco C and S models and heavily staggered unequal-span parallel-chord wings with rounded tips. Wings were plywood-skinned, and also had wire cross-bracing between the wings in place of the solid struts used on previous models.

Engines varied in power from 285 to 450 hp (213 to 336 kW), giving the E series a high cruising speed for the period of up to 195 mph (314 km/h). Production ceased in 1942.

The E series was sold to wealthier private pilot owners who required the comfort of a fully enclosed cabin and a high cruising speed, combined with a longer range. Because of the type's good performance, 16 examples were impressed by the United States Army Air Force during World War II for communications work as the C-72.

Were all WACOs stubby little biplanes with big radial engines?

The answer is no. Although they are mostly remembered as the classic biplane with a radial engine, the designers were very innovative with different engine installations to appeal to many customers.



1938 Waco AVN with a 330 hp Jacobs L-6MB



Waco EGC-8 with a 200 hp Menasco D-6



Another variation is the Waco RPT of 1940 powered by a 125hp Warner Scarab; span 31' 4" length 25' with a cruise speed of 115mph. This was the only production monoplane from Waco. Only one prototype of this aerobatic trainer was built for USAAF trials. The project was halted with the arrival of a large order for the UPF-7. The aircraft was restored in Missouri with 160hp Kinner and a canopy.

The Waco glider story

The Waco primary glider or simply Waco glider, was an early product of the Waco Aircraft Company. The low cost glider was intended to be flown from low hills or towed by a vehicle. The Waco glider was marketed as a low-cost training aircraft for individuals or glider clubs. About 300 were produced between 1930 and 1931. The glider was designed to fly at low airspeeds. It could maintain flight at 20 mph (32 km/h) with a 15 to 1 glide ratio. The fuselage is made of welded steel tubing. The wings use spruce spars, are wire supported and fabric covered. A releasable tow hook was mounted on the front.

The CG-3 was the USAAF's first production troop-carrying glider. 300 CG-3A gliders were initially ordered, but 200 of these were cancelled. The 100 built were used as trainers for the improved CG-4A, which had been ordered.

The Waco CG-4A was the most widely used United States troop/cargo military glider of World War II. It was designated the CG-4A by the United States Army Air Forces, and named Hadrian in British military service. Flight testing began in May 1942, and eventually more than 13,900 CG-4As were delivered.

The CG-4A was constructed of fabric-covered wood and metal and was crewed by a pilot and copilot. It had two fixed mainwheels and a tailwheel. The CG-4A could carry 13 troops and their equipment. Cargo loads could be a quarter ton truck (Jeep), a 75 mm howitzer, or a ¼ ton trailer, loaded through the upward-hinged nose section.

The USAAF CG-4A tow line was 11/16-inch-diameter (17 mm) nylon, 350 feet (107 m) long. The CG-4A pickup line was 15/16 inch- (24 mm)-diameter nylon, but only 225 ft (69 m) long including the doubled loop.

C-47s were usually used as tow aircraft. A few C-46 tugs were used during and after Operation Plunder. CG-4As went into operation in July 1943 during the Allied invasion of Sicily. They participated in the American airborne landings in Normandy on 6 June 1944, and in other important airborne operations in Europe and in the China Burma India Theater.

The Waco CG-15 was developed from the CG-4. Although outwardly similar to its predecessor and carrying the same number of passengers, a number of changes in the design, including shortened wings and a more streamlined nose enabled it to travel faster. 1,000 were ordered and 473 were delivered before production ceased. One unit was converted into an XPG-3 powered glider which used two Jacobs R-755-9 radial engines.

The Waco C-62 transport

Another little-known twist to the Waco story is the C-62 of 1942. This project was a short- to medium-range troop transport/cargo carrier made of non-strategic wood, similar in size and capacity to the Douglas C-47. It was to be pow-

ered with two P&W R-1830 engines. Orders in Oct 1941 and Jan 1942 for 253 planes were cancelled in Sep 1943 after none were built because of production problems.

The last Waco – the Aristocraft

The last design from the original Waco company was an futuristic design, the Aristocraft, that was filed with the United States Patent Office in September 1947.

The Model W Aristocraft was the final original design of the Waco Aircraft Corporation. The aircraft was registered NX34219 and no further examples were built, although it was reported that construction on a second improved aircraft had started when all work on the Model W project was terminated in 1947. The aircraft featured an unusual semi-retractable tricycle-gear, two-control design with a pusher prop driven by a shaft from the engine mounted in front. It first flew on 31 December 1946 and the proposed cost was \$9,980. The engine was one 215 hp Franklin 6A8-215-B9F and performance included maximum speed 154 mph, cruise 135 mph, climb rate 960ft/minute, ceiling 17,500ft and range 520 miles. Wingspan was 38ft. length 25ft 6in and height 7ft 8in.

How much does a Waco cost today?

Here's a recent sample from a popular aviation sales website;

1929 WACO CTO TAPERWING • \$285,000

1932 WACO IBA • \$95,000

1932 WACO UBA • \$185,000

1933 WACO UBF-2 • \$189,000

1940 WACO UPF-7 • \$220,000

2011 WACO YMF-5D • \$355,500

Today, many Wacos still fly. They are restored and maintained by enthusiasts who appreciate their history and the reward of flying these magnificent aircraft. To quote the Waco Aircraft Company slogan,

“Ask any pilot”

The new WACO

WACO Aircraft, a family-owned, American company, was founded in 1983 as Classic Aircraft Corporation. The company started off with a simple dream: To revive the Golden Era's open cockpit flying experience. The founders of Classic in Battle Creek, Michigan were determined to reincarnate the original Waco YMF. In the history of aviation, no company had ever taken a 50-year-old design and manufactured it as a new FAA certified aircraft.

To accomplish this mission, Classic hired experienced engineering talent from Piper, Taylorcraft and Ford. While maintaining the sanctity of Waco's original masterful design, this team modernized the aircraft with more than 300 engineering changes, redesigning over 1400 drawings and building new tooling for production.

In March 1986, the first Waco YMF Classic rolled off the assembly line and received FAA certification under the original Waco type certificate. This unique biplane was not a rebuild or a kit plane, but a brand new FAA-certified production aircraft, with such improvements as the use of sturdy 4130 steel for the fuselage frame, modern hydraulic toe brakes and advanced avionics.

In 1991, the company introduced its first Waco YMF-5C Super. This modern day barnstormer boasted more improvements, such as greater internal width, more legroom, increased useful load, a balanced rudder and large front entry door. Recently, the company introduced its newest model, the Waco YMF-5D Super.

DEVELOPMENT OF THE CABIN SERIES

Waco's first attempt to produce a cabin biplane was the Model 8 built in 1924, capable of carrying six persons in the cabin and two in the open cockpit. It was powered by a 250 hp Liberty engine. Only one Model 8 was built.

Standard Cabin

The standard cabin series were Waco's first successful cabin biplane design, and was developed to accompany the F series airframe in their lineup. The Model C series had the top longerons raised to form a four-seat cabin which was entered through a door between the wings on the left side and had a rather distinctive rear-view window that was cleaned up, and then dispensed with in the later standard cabins. The initial QDC model of 1931 was offered with a 165 hp (123 kW) Continental A70 cowed engine, or as the BDC, ODC, PDC and UDC with other engines. 1932 saw the introduction of the OEC and UEC models. Continuous refinement and improvement by Waco Aircraft resulted in production of various sub-models continuing until 1939.

Sesquiplane

Variations on the biplane concept include the sesquiplane, where one wing (usually the lower) is significantly smaller than the other, either in span, chord, or both. Sometimes the lower wing is only large enough to support the bracing struts for the upper wing. The name means “one-and-a-half wings.” This significantly reduces interference

drag while retaining the structural advantages of a biplane. Probably the best known examples of sesquiplanes are the Nieuport single and two-seat military aircraft of World War I, from the Nieuport 10 of 1915 through to the Nieuport 27 of 1917. Later the Waco Custom Cabin series proved to be a popular example in general aviation. Although this was an off-used layout throughout the 1920s and 30s, it was superseded by improvements in structural design that made monoplane designs more practicable.

Design

Waco Custom Cabins were powered by radial engines and the purchaser could specify almost any commercially available engine and Waco would build an aircraft powered by it, hence the profusion of designations, as the first letter indicates the engine installed. Some models were offered in case someone wanted a specific engine but not all were built. Fuselage structure was typical for the period, being welded steel tubing with light wood strips to fair the shape in. The wings were made of spruce, with two spars each, and ailerons only on the upper wings mounted on a false spar. Split flaps were installed on the undersides of the upper wings, though two designs were used depending on model - either mid chord (OC, UC and QC), or in the conventional position at the trailing edge of the wing (GC and N).

The model N was unusual in being the only model with flaps on the lower wings while the model E was the only one with plain flaps. Wing bracing was with a heavily canted N strut joining upper and lower wings, assisted by a single strut bracing the lower wing to the upper fuselage longeron, except on the E series which replaced the strut with flying and landing wires. Elevators and rudder were counterbalanced aerodynamically and braced with wire cables. Both could be trimmed, the rudder via a ground adjustable tab, the elevators via jack screw on the OC, UC and QC, while the GC, E and N used a single trim tab on the left elevator. The main undercarriage was sprung with oleo struts, and a castoring tailwheel was fitted on all versions except the VN model, which had a nosewheel.

Designation Clarification

Waco had been building a series of successful cabin biplanes when in 1935, they introduced a new series of up-market cabin sesquiplanes intended for the wealthy private individual or business. The original biplanes had been given a designation ending in C, however with the new Custom Cabin, Waco decided to differentiate the new design and existing C types that remained in production were recoded as C-S types to indicate Standard Cabin, until Waco changed their designation again in 1936 to just an S. For example, the 1934 Standard Cabin YKC was redesignated as a YKC-S in 1935, and as a YKS-6 in 1936. 1936 also saw adoption of a numerical suffix to indicate the model year of the design, as "-6" for 1936, "-7" for 1937, etc. Since it referred to a model and not the year of production, the "-7" was carried into 1939 for some Custom Cabins, while others were designated "-8". In 1936, Waco started using a short form to refer to the types of aircraft without the engine and model identifiers resulting in C-6, C-7 and C-8 however as Waco only built one type of Custom cabin in each of those years, they refer to the QC-6, GC-7 and GC-8 series respectively.

Operational history

The Custom Cabin series, with its improved performance proved to be popular and many were purchased by small commercial aviation firms and non-aviation businesses. Approximately 300 Custom Cabin Wacos of all types (excluding the Waco E series & the Waco N series) were produced between 1935 & 1939. Some were employed as "executive transports." Many served in the Canadian bush country, where they normally operated on skis in winter and EDO floats in summer. Many of these Canadian Wacos were ordered & built as freighters with additional doors. In 1936 an EQC-6 operated by Speers Airways of Regina, Saskatchewan was the first non-military government operated air ambulance in Canada.

With the onset of World War II, examples were impressed into the air forces of many Allied nations, including the US (USAAC and US Navy), the United Kingdom, South Africa, Australia and New Zealand. Most were used as utility aircraft, however a small number were operated by the US Civil Air Patrol, conducting anti-submarine patrols off the US coastline from March 1942 to August 1943 armed with 50 or 100 pound bombs.

Variants

The Waco Custom cabin series included all of the enlarged cabin sesquiplanes from 1935 and can be further divided into six basic models, OC, UC QC, GC, RE and VN, with additional sub-types differing primarily in engine installation (indicated by the first letter of the designation or by a low



Waco Model 8



Waco C prototype

dash number ie -1, -2) and by model year (dash numbers -6, -7, -8). Letters were not used sequentially. Each basic type was offered with almost any engine the customer wished and designations were created accordingly, however some engines were more popular than others resulting in some types being offered, but never built. Due to the wide variety of engines already offered, it was both relatively easy and common to change the installed engine, resulting in a lot of confusion as to the correct designation to use for a specific airframe.

Waco C model production

Different models built in 1936 as example of model codes assigned, but not necessarily produced.

1936 QC Series (C-6) (120 built)

AQC-6: 330 hp (246 kW) Jacobs L-6 engine. 7 built. 1 impressed by USAAF as UC-72G.

AQC-6 Freighter: At least 2 aircraft ordered through Fleet Aircraft and built for use in Canada with additional freight doors on both sides of the fuselage and equipped for floats. Engine same as for standard AQC-6.

CQC-6: 250 hp (186 kW) Wright R-760-E engine. None built.

DQC-6: 285 hp (213 kW) Wright R-760-E1 engine. 11 built.

EQC-6: 320 hp (239 kW) Wright R-760-E2 engine. 20 built. USCG used 3 as J2W-1

SQC-6: 300 hp (224 kW) Pratt & Whitney Wasp Jr. engine. None built.

UQC-6: 210 hp (157 kW) Continental R-670; or 225 hp (168 kW) hp W-670-K; or 220 hp (164 kW) hp W-670-6.

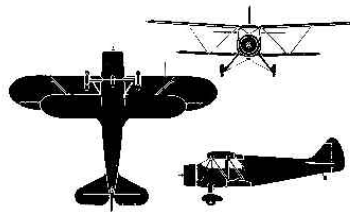
None built.

VQC-6: 250 hp (186 kW) Continental W-670-M1 engine. 1 built.

YQC-6: 225 hp (168 kW) Jacobs L-4 engine. 13 built. 1 ex-RAAF example re-engined with 200 hp (149 kW) De-Havilland Gypsy 6 inline engine.

ZQC-6: 285 hp (213 kW) Jacobs L-5 engine. 68 built. 1 impressed by USAAF as UC-72Q and 5 as UC-72H.

ZQC-6 Freighter: At least 8 aircraft ordered through Fleet Aircraft and built for use in Canada with additional freight doors on both sides of the fuselage and equipped for floats. Engine same as for standard ZQC-6.



CMF PILOT'S NOTES: WACO AQC-6

General:

Empty weight - 2569 Gross Weight - 3500

Engine - 330 HP Jacobs L-6MB

Fuel - 360 litres (79 Imp gallons, 92 US gallons), Fuel consumption = 80 lt. per hour

Oil - 4.2 Imp. gallons, fill to 3.5 on dip stick, 100 mineral

Oil Temp - 48°C - 82°C, desired 60°C (120°F - 180°F, desired 140°F)

Oil pressure - 60 - 90 PSI

Cylinder Head Temp - 300°F - 425°F in cruise, max. 450°F

Ignition - MAG (Left), BATT. (Right) - (BATT. position is Coil/Distributor for starting)

No Flaps installed on this aircraft CF-CCW

Walk Around:

Remove tow handle and stow in baggage compartment

Control lock consists of seat belt looped through control wheel - Unlock

Cockpit fuel switches - both to ON

Pitot cover - Remove

Pull prop through 10 blades to check for hydraulic lock in lower cylinders

Using a ladder, check fuel level in each wing tank using L and R dip sticks

Check oil level in tank

Drain fuel strainer to check for water

Inspect aircraft - fabric, wing struts, flight controls, fairings - for security

Baggage door - Closed

Before Start:

Adjust control column and seat to desired position

Ensure tailwheel unlocked by pulling up and securing handle located on floor just forward of pilot's seat

Seat belts only - no shoulder harness installed
Entry doors - Closed

Engine Start:

Master ON, Generator ON, Check battery voltage
Rotate primer lock 90° clockwise, then prime 10 - 12 strokes for Cold engine or 6 strokes for Warm engine
Start engine with ignition switch on BATT, then to BOTH after engine starts
Prop pitch - push to full Fine
Idle initially at 600 RPM, slowly increasing to 800 RPM
Check pressures, temperatures and generator charging
Radios ON - frequencies and Transponder code set

Taxi:

Ensure Tailwheel Unlocked
Use rudder and differential heel brakes for taxiing
Poor forward visibility on ground - use safety person in right seat.
S-turn as required to ensure visual clearance on taxiway

Run-up:

At 1500 RPM exercise Prop Pitch to full Coarse and back to Fine - 2 or 3 times
Use 1700 RPM for run-up
Check temps and pressures
Check Left (Mag) and Right (Batt) Ignition
Check Carb Heat
Check Generator charging
Check idle; Check Mixture at Cut Off
Check Flight Controls for free and proper movement
Trim Set - ¼ from full nose up (1/2 fuel + 2 POB) - trim handle on control column

Takeoff:

Tailwheel - Lock when aligned with runway - turn handle and lower to engage locking pin to avoid tailwheel shimmy
Advance throttle - Max. 2200 RPM + 26" MAP (1 min. max.)

Climb:

2100 RPM + 24.5" MAP
80 - 90 mph

Cruise:

1900 RPM + 20" MAP (210 HP) - Max cruise RPM 2000 + 23" MAP
Lean out fuel mixture as required/desired

Approach and Landing:

Stalls at 61 MPH (1/2 fuel + 2 POB with slight power on)
Approach at 80 mph, pitch full Fine, mixture Rich
Use a higher than normal glide path angle to assist with seeing over the nose for landing
Land on Main Wheels, then lower tail; Brake using moderate pressure on Heel Brake pedals
Unlock tailwheel when slowed down and still straight on runway

Shutdown:

Live Mag check; Idle for 30 seconds with prop in Coarse pitch then Mixture to Cut Off

Technical Details:

Serial: 4646, CF-CCW	Range: 550 mi (885 km)
Manufactured: 31 August 1937	Empty weight: 2,569 lb (1,165 kg)
Engine: 330 hp Jacobs L-6MB, 7-cylinder radial	Loaded weight: 3,500 lb (1,587 kg)
Max Speed: 170 mph (274 km/h)	Span: 35 ft (10.7 m)
Cruising Speed: 155 mph (249 km/h)	Length: 26 ft 8 in (8.1 m)
Service Ceiling: 18,500 ft (5,638 m)	Height: 8 ft 8 in (2.6 m)
	Wing Area: 244 sq ft (22.7 sq m)

ENGINE IN THE MUSEUM AQC-6

The Jacobs radial engine began life in 1930 as a 3-cylinder engine producing 55 hp. and a 7-cylinder producing 150 hp. The 3-cylinder was soon made redundant with the 7-cylinder becoming the engine that was developed over the years.

By 1933, Jacobs had developed its most famous engine, the L-4 seven-cylinder radial air-cooled engine with a power rating of 225 horsepower and a displacement of 757 cubic inches (12.4 litres). It was better known by its military designation, the R-755. At the time Jacobs became known as the best producers of engines in the 200-400 horsepower range. Jacobs were the first to start making their engines using forged aluminum pistons, sodium-filled exhaust valves and magnesium alloy crankcases.

The L-4 developed 245 hp for takeoff and was still in production in the 1970s. The 831 cubic inch L-5 (285 hp) produced from 1936, and the L-6 or R-915 (330 hp) were the largest American seven-cylinder engines until the post-war Cyclone Seven was built.

The Jacobs engine is unusual in that it uses a combination of magneto and battery ignition – one set of spark plugs is powered from the magneto, while the other is powered from the battery via a coil and distributor system. The engine was nicknamed “Shaky Jake.”

The Jacobs engine, along with its contemporaries, originally had the rocker arms lubricated manually by a mechanic with a grease gun. When the engine was developed further one improvement was to provide an oil source from the main pressure oil system to the rockers, resulting in a greater system oil capacity. However, the sump capacity was not increased leaving the reservoir of oil somewhat lacking in comparison to later engines. Modifications by modern overhaul facilities increase the sump capacity and also offer fuel injection to give a smoother-running engine. Non-supercharged radial engines can suffer uneven running – the carburetor usually located at the bottom of the engine and the fuel-air mixture having to travel a different distance to each of the cylinders. Installing a fuel injection system solves this problem.

This series of engines (L-4, L-5 and L-6) were used extensively in the 1930s and 40s on the Avro Anson II, Beechcraft Model 18, Beechcraft Staggerwing, Boeing-Stearman 75, Cessna Crane, Cessna 195, Fleet 50, Grumman Ag Cat, Howard DGA-8, the Kellett KD-1 autogyro and the Waco Cabin series.

General characteristics

Type: 7-cylinder air-cooled radial piston engine

Bore: 5.5 in (140 mm)

Stroke: 5.5 in (140 mm)

Displacement: 914 cu in (15 L)

Length: 40 in (1,030 mm)

Diameter: 45.5 in (1,160 mm)

Dry weight: 555 lb (252 kg)

Components

Valvetrain: 2 valves per cylinder, pushrod-actuated, sodium cooled exhaust valves

Fuel system: Single Stromberg NA-R7A carburetor

Fuel type: 73 octane minimum

Oil system: One pressure pump, two scavenge pumps

Cooling system: Air-cooled

Reduction gear: Direct drive, right hand tractor

Performance

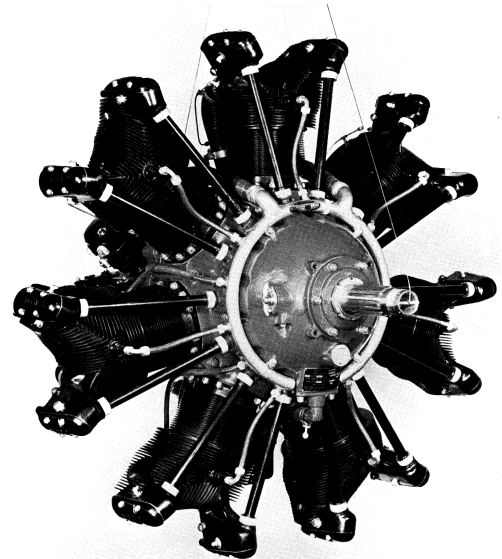
Power output: 330 hp (246 kW) at 2,200 RPM at sea level

Specific power: 0.36 hp/cu-in (16.4 kW/L)

Compression ratio: 6:1

Power-to-weight ratio: 0.6 hp/lb (1 kW/kg)

Propeller: 98 inch diameter, Hamilton Standard variable pitch



Jacobs L-6MB

Today there are 23 Wacos registered in Canada. Some of them are in flying condition, while others are in need of restoration. Some ‘flyers’ are in immaculate condition in museums that choose not to fly them. The Aero Space Museum of Calgary has a 1936 EQC-6, and The Canada Aviation and Space Museum in Ottawa has one of the two 1928 Waco GXEs (with a Curtiss OX-5 engine) in this country. Of the 12 Waco Model Fs registered in Canada, the Museum’s INF is the oldest with a manufacture date of 30 July 1930, while a UIC in Alberta was built in 1933. In the USA there are only 15 INF’s registered. There are many Waco Series C to be found around the world.

This is the first in a series of photographs of the Museum's Waco AQC Cabin bi-plane, titled '**Summer Cabin.**' This photograph is for sale at the Museum Gift Shop. Watch for further images in a series of this classic Waco Cabin in all seasons.



The Waco goes travelling...



Farewell to the Back-to-Baddeck flight at Langley



Fuel stop at Sparwood, BC



Approaching Nanton, AB



Arrival at Wetaskiwin, AB



The Waco at Alert Bay, BC



Stocky Edwards of Comox, BC

THE WACO CODING SYSTEM

First letter = POWERPLANT (MOTOR CODES)

Second letter = AIRFRAME DESIGN (Indicated specific drawings or design changes, varying considerably within individual models).

Third letter = SERIES

Suffix = REMARKS (Dash number generally indicated first year of production).

MOTOR CODES 1927-1929:

125 = 125hp Siemens-Halske

A = 220hp Wright J-5

B = 165hp Wright J-6-5

C = 225hp Wright J-6-7

D = 150/180hp Hisso A/E

G = 115hp Curtiss OX-5, 100hp OXX-6, 115hp Tank

J = 330hp Wright R-975

MOTOR CODES 1930-1942:

A = 330hp Jacobs L-6MB

B = 175hp Wright R-540

C = 250hp Wright R-760

D = 285hp Wright R-760-E1

E = 350hp Wright R-760-E2

H = 300hp Lycoming R-680-E3

I = 125hp Kinner B-5

J = 365hp Wright R-975-E1

K = 100hp Kinner K-5

M = 125hp Menasco C-4

O = 210hp Kinner C-5

P = 170hp Jacobs LA-1

Q = 165hp Continental A-70

R = 125hp Warner Scarab

S = 420-450hp P&W Wasp Jr

U = 210hp Continental R-670, 225hp W-670-K,
220hp W-670-6

V = 240hp Continental W-670-M

W = 450hp Wright R-975-E3

Y = 225hp Jacobs L-4MB

Z = 285hp Jacobs L-5MB

Lycomings were not used until model E in 1940. Kinner C-5 was only on two planes, and the 160hp R-5 was never used.

BASIC AIRFRAME

A = Primary Glider

B = Open types, 1932 & 1933

C = 1931 open types with P & Q engines
(LA-1 & A-70)

D = 1931 cabin types

E = 1932 cabin types

G = C series closed types as from 1937

H = All D series

I = 1933 cabin types

J = 1934 cabin model with Wright engine

K = 1934 cabin models with Continental & Jacobs engines and standard cabin models from 1935

L = 1933 (last) A series

M = 1934 open types

N = 1930 open types

O = 1935 Custom cabin with Continental & Jacobs

P = All open types from 1936

Q = 1936 Custom cabin types and 1930 National Air
Tour Special

R = 1939 E series

S = Straightwing variants of basic model 10

T = Taperwing variants of basic model 10

U = 1935 Custom cabin with Wright engines

V = All N series

Y = Version of the Taperwing with Wright R-975

X = Variant of the basic model 10 with OX-5 or OXX-6

SERIES

A = Two-place with side-by-side seating 1932 & 1933

C = All cabin models 1931-1935, and Custom cabin models from 1936

D = Military series 1934-1937

E = Variants of the basic model 10 with OX-5 or OXX-6 and "Executive" cabin models from 1939

F = Tandem cockpit 2 & 3-place open models
1930-1937

G = 1930 National Air Tour Special; two CRGs only,
c/n 3349/3350

M = See second letter Y

N = Tricycle-gear cabin series 1937-1938

O = Open models 1927-1929

S = "Standard" cabin models 1936-1937

T = Model RPT; one only, c/n 6000

W = Postwar "Aristocraft"; one only, c/n 9600

Z = Primary glider

REMARKS

A = Armed variants of the D series

S = Used in 1935 to differentiate between the current versions of the earlier (or "standard") cabin series and the newly introduced "Custom" cabin series. Became third letter in 1936, i.e.: model YKS introduced in 1934, was YKC-S and YKS-6 in 1936 (all were built under the same ATC)

1,2,3 = Used in 1935 to identify higher-powered versions of the Wright R-760, Jacobs, and P&W Wasp Jr engines. See first letters C, S, Y, Z, and second designation of D and E (e.g.: S3HD-A, CUC-1, YOC-1)

(Courtesy of **Aerofiles**)

DR. JACK PICKUP AND THE WACO AQC-6, CF-CCW

The Waco was purchased new by the Department of National Defence, Ottawa in 1937, and was operated by the Department of Transport until 1949. In 1951 it was sold to an owner in Medicine Hat, and in 1952 brought to the West Coast (Malpass Logging, then BC Air Lines). Dr. Jack Pickup of Alert Bay was the next owner, who acquired the airplane in 1953 and routinely used it as a "flying doctor" float plane. During its long career it suffered several landing accidents.

Dr. Pickup qualified as a surgeon and general practitioner, at Queen's University, Kingston, Ontario, in 1942. After some time in hospitals and then in practice at Dryden, Ontario, in 1949 he decided to move west. Hearing of a job in Alert Bay, he accepted without even knowing where Alert Bay was. Jack Pickup never really thought of himself as a flying doctor, just as a doctor who used his aircraft to get to patients in areas very difficult to reach by surface transport.

He soon realized that to get quickly to men injured in accidents and if need be get them to hospital, the trip by sea took far too long, as well as wasting his own valuable time. Aviation was the answer. There was no charter service nearby, even if it could be afforded. The solution was obvious; he would learn to fly. He took three week's leave to go down to Vancouver, took flying lessons, sat his exams, and in September 1950 won his licence on a Luscombe 8A flying from the grass between the runways of the international airport. Then he looked round for an aircraft. "There were patients to look after, and I couldn't afford to waste any time," he says. He chose a Piper PA-12 Super Cruiser CF-EFC, with only 72 hours since a complete rebuild, which he bought for \$3,500.

In 1953 he traded it in and for another \$6,000 bought Waco AQC-6 cabin biplane CF-CCW. With its 330 hp Jacobs engine, the Waco cruised at 120 mph with floats, a third faster than the Piper. After a quick trip from Vancouver to Nanaimo and back to learn about the constant-speed propeller, Pickup was back on his rounds in this classic aircraft, which was to service his practice for 27 years.

In 1958 the Waco sank when it hit a submerged log on take-off (forward visibility over the radial engine is non-existent). It was soon back in service and he soon learnt to use a "Spitfire" approach, or curved, sideslipping path for landing.

Towards the end of 1992, at the age of 73, he formally retired from medicine.

The aircraft was gradually overhauled to flying condition as a tribute to a great pilot who used his skills to further his services to the community. No one knows how many lives he saved in the process. He could hardly have made more friends. Jack kept on flying himself until he was 67, and only disposed of his last aircraft, a Piper Arrow, early in 1994. However much he denies it, not only are there thousand of residents who owe a lot to Doctor Pickup, but there are many who, without the arrival by air of this great man, would not be alive today.

The Waco was donated to the Canadian Museum of Flight in 1980 by Dr. Pickup. Although the aircraft was donated on floats, it is now operated on wheels. The first flight in over 30 years was carried out on February 13th, 2002 after a twenty-year restoration by volunteers at the Canadian Museum of Flight.

For more information on the history of this aircraft, please see **Dr. Jack Pickup, British Columbia's Flying Doctor** in the **History** section of the Museum website. Original drawings are required to perform a certified rebuild. The Smithsonian Institute graciously provided the Canadian Museum of Flight with all the necessary drawings to complete this project.

The Museum's Waco Cabin was restored by a huge effort by many volunteers over many years at two locations. The restoration was started when the Museum was located at Crescent Beach in Surrey, BC. The work was completed at the present Museum location. Volunteers included Werner Griesbeck, Dan Holliday, Mike Davenport, Hank Koehler, Doug Moan, Bob Fowles, Don Butterley, Jack Lingham, Ted Harris, Gogi Goquillot, Lou Hansen, John Clark and Mark Zaleski. Maxcraft Avionics of Pitt Meadows provided the radio installation.

From 2004 until 2008, the Waco sat idle on display in the Museum hangar. However, the aircraft has been flown extensively since then. CF-CCW appears regularly at local flying events and airshows including Abbotsford, Chilliwack, Princeton, Boundary Bay, Pitt Meadows, Hope and Everett. In 2009, she was flown across southern BC and into Alberta as part of a coast-to-coast-to-coast relay flight to celebrate the 100th anniversary of powered flight in Canada. Flight crew, Bill Findlay, Dave Beales and Doug Moan, guided the Waco on this seven day aviation adventure, stopping at several BC communities including Penticton, Oliver, Nelson, Creston and Sparwood, and then on to Nanton and Westaskiwin in Alberta.

In 2012, the Waco carried out two important sorties to Vancouver Island. One was to Comox, where the crew were privileged to visit with and to interview Stocky Edwards, Canadian WW2 fighter pilot ACE. The other was to the northern island airports of Port McNeill and Alert Bay. It was here at Alert Bay that Doc Pickup had flown CF-CCW on floats during his many years as BC's Flying Doctor. This was the first time that the Waco had been back to this area in over thirty years. Many local residents turned out to the H.J. Pickup Airport to see Big Red during the weekend visit, many of them relating interesting and humorous stories about the Doc Pickup years. Preparations are now being made for another busy flight operations schedule for the Waco.



Dr. Jack Pickup

A PHOTO HISTORY OF WACO AIRCRAFT

Waco Seven (1924)

Capacity: 3-place
Length: 24 ft (7.3 m)
Wingspan: 30 ft (9.1 m)
Height: 8 ft 10 in (2.7 m)
Wing area: 279 ft² (25.9 m²)
Empty weight: 1,100 lb (499 kg)
Loaded weight: 1,850 lb (839 kg)
Powerplant: Curtiss OX-5, 90 hp (67 kW)
Maximum speed: 92 mph (80 knots, 148 km/h)
Cruise speed: 84 mph (73 kts, 135)
Range: 425 mi (684 km)
Service ceiling: 19,000 ft (5791 m)
Rate of climb: 480 ft/min



Waco 8 (1924)

Capacity: 6-place cabin, 2-place cockpit
Length: 32 ft (9.7 m)
Wingspan: 40 ft (12.2 m)
Empty weight: 1,900 lb (862 kg)
Loaded weight: 3,373 lb (1530 kg)
Powerplant: Liberty 6, 250 hp (186 kW)
Maximum speed: 90 mph (145 km/h)
Cruise speed: 80 mph (129 km/h)



Waco 10 (1927)

Capacity: 3-place
Length: 23 ft 6 in (7.2 m)
Wingspan: 30 ft 7 in (9.4 m)
Height: 9 ft (2.8 m)
Empty weight: 1,200 lb (544 kg)
Loaded weight: 2,025 lb (918 kg)
Powerplant: Curtiss OX-5 90 hp (67 kW), or
 OXX-6 102 hp (76kW)
Maximum speed: 96 mph (154 km/h)
Cruise speed: 85 mph (137 km/h)
Service ceiling: 13,000 ft (3962 m)
Rate of climb: 500 ft/min



Waco CTO Taperwing (1928)

Capacity: 3-place
Length: 22 ft 6 in (6.8 m)
Wingspan: 30 ft 5 in (9.3 m)
Height: 9 ft (2.8 m)
Empty weight: 1,585 lb (719 kg)
Loaded weight: 2,600 lb (1180 kg)
Powerplant: Wright J-6, 250 hp (186 kW)
Maximum speed: 138 mph (222 km/h)
Cruising speed: 118 mph (190 km/h)
Service ceiling: 17,000 ft (5181 m)
Rate of climb: 1,100 ft/min

**Waco INF (1930)**

Length: 21 ft (6.4 m)
Wingspan: 29 ft 6 in (9 m)
Height: 8 ft 9 in (2.7 m)
Empty weight: 1,135 lb (515 kg)
Loaded weight: 1,938 lb (879 kg)
Powerplant: Kinner B-5, 125 hp (93 kW)
Maximum speed: 108 mph (174 km/h)
Cruise speed: 92 mph (148 km/h)
Service ceiling: 14,000 ft (4267 m)
Rate of climb: 625 ft/min

**Waco WHD-A (1935)**

Length: 25 ft 5 in (7.7 m)
Wingspan: 32 ft 9 in (10 m)
Height: 8 ft 11 in (2.7 m)
Empty weight: 2,474 lb (1122 kg)
Loaded weight: 3,800 lb (1723 kg)
Powerplant: Wright R-975, 450 hp (335 kW)
Maximum speed: 188 mph (302 km/h)
Cruising speed: 160 mph (257 km/h)
Rate of climb: 1350 ft/min



Waco YKC (1934)

Capacity: 4-place
Length: 25 ft 4 in (7.7 m)
Wingspan: 33 ft 3 in (10.1 m)
Height: 8 ft 6 in (2.6 m)
Empty weight: 1,808 lb (820 kg)
Loaded weight: 2,850 lb (1293 kg)
Powerplant: Jacobs L-4, 225 hp (168 kW)
Maximum speed: 146 mph (235 km/h)
Service ceiling: 15,000 ft (4572 m)
Rate of climb: 800 ft/min



Waco CG-4A (1942)

Capacity: 2 Pilots, 13 passengers
Length: 48 ft 8 in (14.8 m)
Wingspan: 83 ft 8 in (25.5 m)
Height: 15 ft 4 in (4.7 m)
Wing area: 900 ft² (84 m²)
Empty weight: 3,900 lb (1769 kg)
Max. takeoff weight: 7,500 lb (3402 kg)
Maximum speed: 150 mph (241 km/h)
Cruising speed: 72 mph (116 km/h)
Load: 2 crew, 13 passengers - 4197 lb.;
2 crew, 4 passengers, 1 Jeep - 4197 lb.;
2 crew, 3 passengers, 75mm Howitzer.



Waco Model W Aristocraft (1947)

Length: 25 ft (7.6 m)
Wingspan: 38 ft (11.6 m)
Height: 7 ft 8 in (2.4 m)
Empty weight: 2,237 lb (1015 kg)
Max. takeoff weight: 3,200 lb (1451 kg)
Powerplant: Franklin 6A8, 215 hp (160 kW)
Maximum speed: 154 mph (248 km/h)
Cruise speed: 135 mph (217 km/h)
Range: 520 mi (837 km)
Service ceiling: 17,500 ft (5334 m)
Rate of climb: 960 ft/min



WACOS IN CANADIAN SERVICE



Waco YKC S/n 3976 CF-AWI manuf. 14 November 1934.
Delivered to Austin Airways, Toronto ON



Waco YKC S/n 4201 CF-AWE manuf. 25 July 1934.
Delivered to Robert Cockeram, Clarkston ON



Waco YKC-S S/n 4239 CF-AWK manuf. 20 May 1935.
Delivered to Dominion Skyways, Montreal QC



Waco YKS-6 S/n 4451 CF-AYQ manuf. 21 May 1936.
Delivered to Speers Airways, Regina, SK



Waco ZQC-6 S/n 4449 CF-AZM manuf. 6 July 1936.
Delivered to United Air Transport, Edmonton, AB



Waco YKS-6 S/n 4461 CF-AZN manuf. 25 June 1936.
Delivered to Air Travel & Transport, Vancouver BC



Waco ZQC-6 S/n 4472 CF-AQO manuf. 24 July 1936.
Delivered to H. McLean, Merricksville ON



Waco ZQC-6 S/n 4481 CF-AZP manuf. 20 Sept. 1936.
Delivered to Wings Ltd. Winnipeg, MB



Waco ZQC-6 S/n 4497 CF-BBO manuf. 24 July 1936.
Delivered to Wings Ltd. Winnipeg, MB



Waco ZQC-6 S/n 4591 CF-CCU manuf. 29 Mar 1937.
Delivered to Department of National Defense, Ottawa ON



Waco AQC-6 S/n 4646 CF-CCW manuf. 31 Aug 1937.
Delivered to Department of National Defense, Ottawa ON



Waco AQC-6 S/n 5036 CF-DTC manuf. 2 Jan 1939.
Delivered to Department of Transport, Ottawa ON