Fairchild "Cornell" Trainer

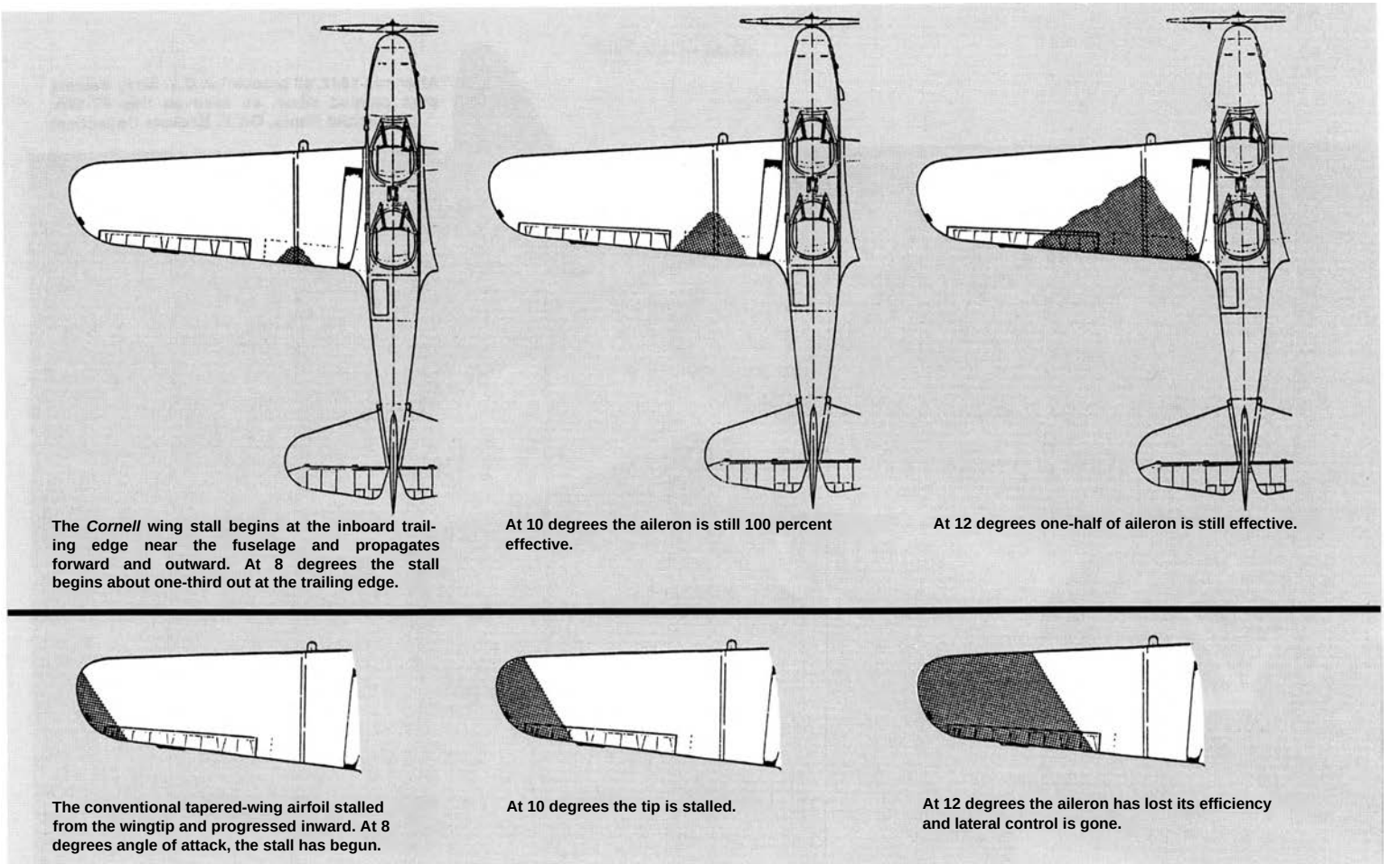
by Kent A. Mitchell

AS LATE AS 1938, MOST PILOTS (civilian and especially military) received their initial flight training in biplanes. (Both the U.S. Army and Navy used the Stearman-Boeing PT-13 and PT-17 as their primary trainer aircraft—even though all of the pilots' later flying would be in low-wing monoplane advanced trainer and combat or transport aircraft.) This was described as akin to ". . . trying to ride a motorcycle after receiving instruction on a tricycle." More progressive people in the training business were concerned that learning to fly in a biplane and then transitioning to a monoplane precluded direct continuity of training right from the start. It was felt that fledgling pilots should get the feel of monoplanes from the beginning.[1]

Therefore, the management folk at Fairchild Aircraft reasoned that the market was ready for a new trainer of modern design. With their own initiative and resources, the company began developing a new monoplane trainer which would meet the requirements of the military as well as civilian flying schools.[2]

Given the task for the design of the new plane was Fairchild's chief engineer, Armand J. Thieblot. Knowing that looming war clouds over Europe meant that aircraft aluminum would be allocated to the production of fighters and bombers, Thieblot conceived a tandem cockpit fuselage of welded steel tubing, fabric-covered, and with all wood wings, horizontal stabilizer and vertical fin. The wings and tail were cantilever structures (no struts, braces or

After mid-1942, all production U.S. Army trainers were painted silver, as seen on this PT-19A. (Fairchild Photo, Ott F. Beckner Collection)



The *Cornell* wing stall begins at the inboard trailing edge near the fuselage and propagates forward and outward. At 8 degrees the stall begins about one-third out at the trailing edge.

At 10 degrees the aileron is still 100 percent effective.

At 12 degrees one-half of aileron is still effective.

The conventional tapered-wing airfoil stalled from the wingtip and progressed inward. At 8 degrees angle of attack, the stall has begun.

At 10 degrees the tip is stalled.

At 12 degrees the aileron has lost its efficiency and lateral control is gone.

wires) and were covered with thin laminated plywood for torsional rigidity and aerodynamic smoothness. Hand-actuated split trailing edge flaps could be lowered to 50 degrees for landing. The aileron, elevator and rudder surfaces were fabric-covered.

Sherman Fairchild had already decided that the new plane would be powered by the corporation's own six-in-line cylinder *Ranger* engine. The 165-hp version of the engine was then currently being used in the four-place Fairchild F-24K cabin plane, so that engine-cowling installation was adopted as the firewall-forward design for the new trainer prototype. The cowling configuration was such that its air scoop provided enough air for cooling even at engine idle speeds. The air scoop was closed at the back so that the resulting back pressure provided an airflow which was even across all six cylinders.

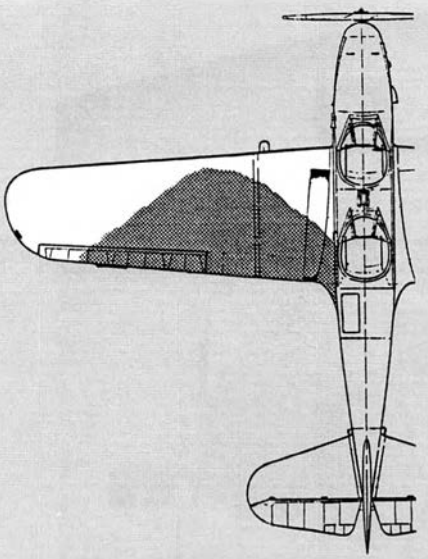
Given the Fairchild engineering model designation of M-62, the airplane was designed to look, feel and fly like tactical types then in service—with one exception. In order to make the trainer a safe and not a tricky plane to fly, special emphasis was placed on the wing design so that the student pilot could avoid the dreaded "stall-spin accident.''

Ordinarily, a tapered wing airfoil stalls from the wingtip inward. At increasing angles of attack, the airflow over the upper surface of the wing begins to break away from the surface—beginning at the wingtip trailing edge and creeping forward to the leading edge as the stall progresses. Unfortunately, the aircraft's ailerons are located near the wingtips—and on the trailing edges. Therefore, with conventional wings of the period, the first indication the pilot had that his aircraft was approaching a stall condition was when he had little or no aileron control. Also, at the same time, because the pilot had allowed his airspeed to decrease to that point, the reduced airflow over the elevators and rudder greatly reduced their effectiveness. The combination of all of these effects usually occurred at low altitude during takeoff or landing—producing a stall and a spin—usually with disastrous results.[3]

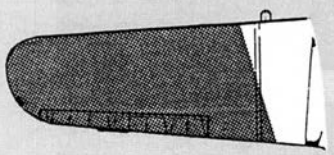
The Thieblot-Fairchild Aircraft wing for the M-62 was designed so that at high angles of attack the stall condition begins at the *inboard* trailing edge near the fuselage and propagates forward and outward. Basically, this was accomplished by utilizing a NACA (National Advisory Committee for Aeronautics) 2416 airfoil at the wing root, tapering to a NACA 4408 airfoil at the wingtip. Motion picture footage of an M-62 "tufted wing" in flight at increasing angles of attack clearly shows a stall developing about one-third out on the trailing edge and progressing outboard toward the tip. At an angle of attack of 12 degrees, where a conventional wing had lost its aileron control, the M-62's wing still had effective aileron response.

Other design features of the M-62 which made learning to fly less traumatic for the student pilot included a wide-track landing gear—which was more difficult to "ground loop." Then, too, the student pilot (or solo pilot) flew the airplane from the front cockpit. This provided improved visi-

Experimental airplane NX18689, Fairchild Model M-62, runs up prior to first flight.
(Fairchild Photo, Richard D. McNeal Collection)



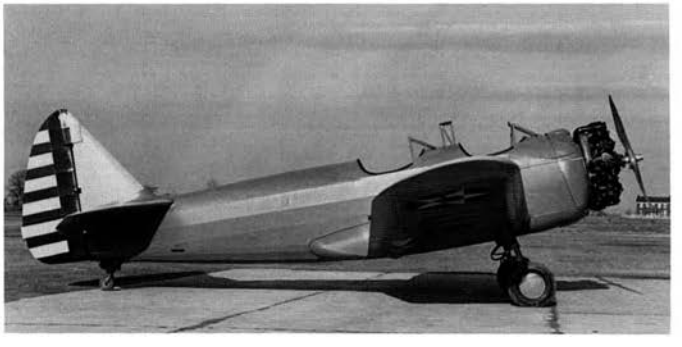
At 14 degrees part of aileron is still effective.



At 14 degrees entire wing has lost its flying power.

This spectacular photo shows what was almost the demise of the M-62A prototype. Notice the wingtip and its shadow on the ground—they touch! And, the up aileron indicates that pilot Dick Henson is still maintaining the turn.

(Photo by Hans Groenhoff, Richard A. Henson Collection)



bility forward and down for formation flying and for landings. A mirror mounted on the front wind screen allowed the instructor to view the student's facial expressions—and vice versa.

The prototype M-62 first flew in 1938 as experimental airplane NX18689. This aircraft was distinguishable from all the others that followed in that it had landing gear strut and wheel fairings and the aft fuselage longerons were curved upward to meet the horizontal stabilizer—giving a "sway-back" appearance. After an initial flight test program, the plane was modified by lowering the horizontal stabilizer, the longerons were straightened, an uprated engine of 180 hp was installed, and the landing gear fairings and cockpit canopy were removed. With these changes the model designation became the M-62A.

By early 1939 the Army decided to expand its pilot training and had created the Civilian Pilot Training Program, a system of civil contract primary flight training schools, and was in the market for a new training plane. In the summer of 1939, two Fairchild trainers were entered in an Air Corps competition at Wright Field in a group of 17 aircraft manufacturers. The M-62A won the contest and was awarded a $1,586,000 contract for 270 of the planes, to be designated the Army PT-19. For a company whose market had been the private owner and whose largest previous order was for 20 planes, the contract was gigantic.[4]

The first production PT-19 rolled out the factory door of Fairchild's Hagerstown, Maryland plant in February 1940. By the end of that year, two and three airplanes a day were being produced. However, also by the end of that year, Fairchild had received contracts from the Army for additional numbers of the trainer—completely overwhelming the company's production capabilities. Although new factory buildings were being built adjacent to the Hagerstown Municipal Airport, they were not scheduled for completion until early 1941. In the meantime, unable to wait that long to meet their contractual obligations, Fairchild formulated the "Hagerstown System."

The "system" was to buy, lease, or rent every available building in the Hagerstown area for use producing small parts or materials storage and utilizing local industries as subcontractors to produce aircraft subassemblies. The exhibition hall at the fairgrounds, empty automobile dealer garages, a silk hosiery mill (out of business for the duration of the war), and an old foundry became numbered plants

M-62B prototype (NX28535) with Warner S-165 engine. Note metal propeller.
(Photo by Lyle S. Mitchell)

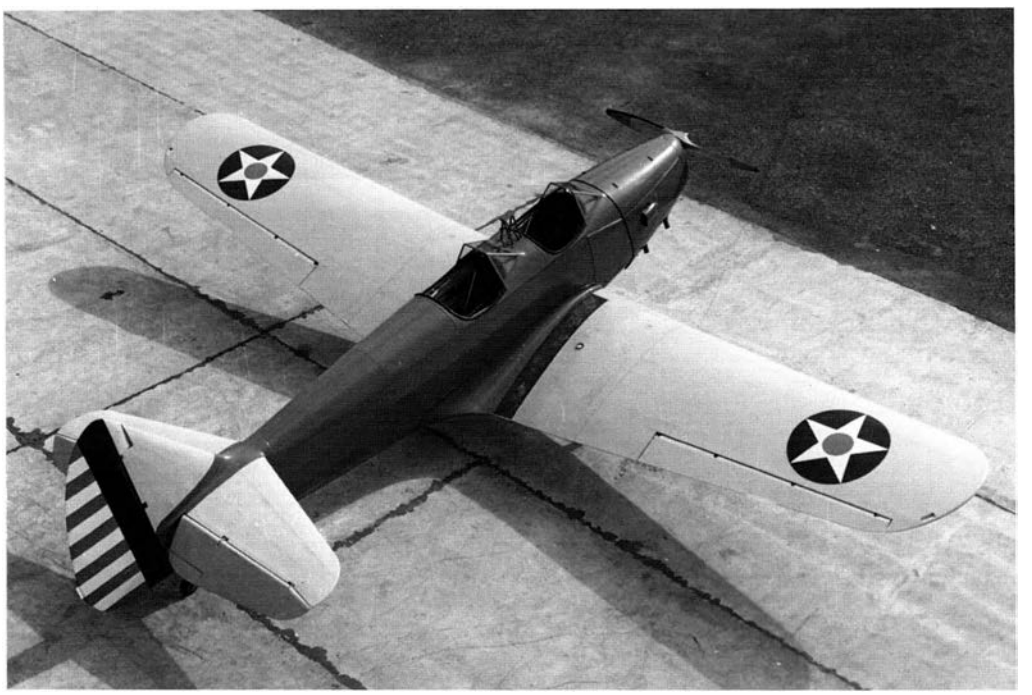
The XPT-23, a modified PT-19A with a Continental R-670-5 radial engine. This was the only blue and yellow PT-23—all production models were silver in color. (Photo by Lyle S. Mitchell)

PT-19 with standard Army trainer blue and yellow paint ready for delivery.
(Photo by Lyle S. Mitchell)

Prewar aerial photo of PT-19s awaiting delivery. Planes were built in the Hagerstown, Maryland plant with final assembly and flight test at the municipal airport. (Photo by Lyle S. Mitchell)

View from hangar roof shows PT-19 planform.
(Photo by Lyle S. Mitchell)

Flying the open-cockpit Fairchilds often required wool-lined leather cold weather suits, as seen worn here by Civilian Pilot Training Program instructor pilot Ott Beckner.
(Photo by Lyle S. Mitchell)



of an airplane factory. The M.P. Moller Organ Works, the largest plant in the world devoted exclusively to building pipe organs, converted its woodworking skills to the production of center sections and outer wing panels for the *Cornell*.[5]

With most all of the production output of *Ranger* engines committed to the PT-19, Fairchild decided to install a 165-hp Warner *Super Scarab* in the trainer, producing the M-62B, for sale to civilian flying schools and foreign countries. The engine-cowling installation design was borrowed from the company's F-24W airplane. Although the M-62A had been certified as a civil model in April 1940 (Approved Type Certificate 724) with the *Ranger* engine, the M-62B with the Warner engine (NX28535) was somehow also certified under the same ATC.

The PT-19s were quickly placed into service at Army and civilian pilot training schools throughout the U.S. Also, the Norwegian Air Training Camp in Toronto, Canada, received its first PT-19 on August 23, 1940, and by November 1941 they had received 36 of the open-cockpit Fairchilds.[6] By mid-1941, the Fairchild trainer fleet was logging an average 1,411 flying hours every day.[7]

However, after December 7, 1941, the increased requirement for trained pilots became such that Fairchild could not produce airplanes fast enough. Consequently, two other U.S. manufacturers were licensed to build the PT-19—Aeronca Aircraft, Middletown, Ohio, and St. Louis Aircraft of St. Louis, Missouri. The government of Brazil also had a license to manufacture the trainer in Rio de Janeiro. While Fairchild was building the PT-19A, Aeronca-built planes were designated as the PT-19A-AE and St. Louis produced the PT-19A-SL.

The addition of an electrical system resulted in the PT-19B, used for night and instrument flight trainers. Aeronca also built a quantity of these as the PT-19B-AE.

Facing a possible shortage of *Ranger* engines, and feeling that the Warner-engined M-62B was underpowered, Fairchild once again sought an alternative engine installation. In 1942, a PT-19A was modified by installing a 220-hp Continental R-670-5 radial engine, thus becoming the Fairchild M-62C and the Army XPT-23. After flight testing, the project was temporarily shelved. Fairchild then later built two PT-23 production prototypes with R-670-4 engines installed. These were the only PT-23s built by Fairchild. All of the remaining PT-23 trainers were to be built by four other aircraft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manufacturers: Aeronca Aircraft, St. Louis Aircraft, Howard Aircraft Corp. (Chicago, Illinois) and Fleet Aviation Ltd. (Fort Erie, Ontario, Canada). Known as the PT-23 Group, the activities of these manufacturers were coordinated by a committee headed by Brig. General K.B. Wolfe.

Fairchild was also by then building trainers for Canada under a Lend-Lease program and, at the request of the Royal Canadian Air Force, had reinstituted the enclosed cockpit sliding canopy—more suitable for their climate. This airplane was designated the PT-26 (Fairchild Model M-62A4). The Norwegian training operation in Canada also elected to purchase 86 PT-26s for their protection against the Canadian winters. The PT-26 used the 6-440C-5 version of the *Ranger* engine.

The different dash number *Ranger* engines which were installed in the PT series of Fairchild trainers were the 175-hp 6-440C-2, 180-hp -3, 190-hp -4, and 200-hp 5—all of which were the same basic engine—the differences in produced horsepower accomplished by the use of domed pistons to increase compression ratios and increased aviation fuel octanes with corresponding ignition timing adjustments.

Paint scheme differences may also be noted in the early production aircraft. Prior to June 1942, all U.S. Army PT-19s (and the single XPT-23) were painted with the then-standard blue fuselage and chrome yellow wings and tail. The aircraft rudders also sported a single vertical blue stripe and horizontal red and white stripes. After mid-1942, all production Air Corps trainers leaving the factory were given an all-silver finish. (Already delivered airplanes were not repainted unless undergoing repair or recovering.[8]) Every PT-26 delivered to Canada's RCAF was chrome yellow all over. Colors for other countries' PT-19s and U.S. civilian M-62s were per sales orders.

Most of the Fairchild PT-series trainers were built with wooden propellers; however, numerous photographs show PT-19s awaiting delivery with metal props—as well as the Warner-powered M-62B prototype and the XPT-23-

By 1943, Fairchild was not only turning out thousands of PT-19 and PT-26 aircraft, but was also producing wing panels for the Martin Model 187 *Baltimore* attack bomber and had signed on as the sole source subcontractor for Martin to build the outer wing panels for their Navy PBM-3C *Mariner* flying boats. In addition, the Hagerstown factories were delivering 525 of the popular civilian F-24 models painted in military colors and redesignated the UC-61 *Forwarder* Utility Transport. During the period, Fairchild was also producing 106 of the twin-engine AT-21 *Gunner* trainer aircraft. (See the author's article, "The Saga of the Fairchild AT-21,'' which appeared in Vol. 32, No. 3, Fall 1987, AAHS *Journal)* On top of all that—Fairchild's drawing boards were busy and the manufacturing folks were gearing up to build the to-be-famous C-82 Flying Boxcar!

In order to increase efficiency and make way for new developments at Fairchild's Hagerstown facilities, under a new alignment plan, it was decided that Aeronca would build PT-19s exclusively and Fleet would devote its factory to the manufacture of the PT-26s. Howard and St. Louis would continue to produce the PT-23s.[9] Belatedly, the peak of the Army's pilot training program had been reached in early 1943. Therefore, the last Fairchild-built *Cornell* was manufacturer's serial number 5,048 and was delivered in April 1944. Fairchild's maximum monthly delivery rate peaked at 178 planes.

By 1944, more World War II pilots had received their first military flight training in *Cornells*, than in any other aircraft. In addition to U.S., British, Canadian and Norwegian pilots, Latin-American students could be seen wearing the uniforms of Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, and Uruguay at CPTP schools.

A total of 58 PT-19s also saw service in Mexico—52 in the Mexican Air Force and six at the Mexican Navy Aviation School.[10]

Although the war was not officially over until 1945 (Germany surrendered May 7—Japan, August 14), commencing in March 1944 more than 5,000 trainers were declared surplus and put up for sale. These were aircraft that had been purchased by the U.S. Government for the civilian pilot training pro-

Profile view of a Hagerstown-built PT-26. Note the retracted instrument flying hood in the rear cockpit. (Photo by Lyle S. Mitchell)

Women's Auxiliary Ferrying Service (WAFS) pilots at Hagerstown airport ready for flyaway mission in PT-26s. (Fairchild Photo No. 3157)

Early 1942 lineup of improved PT-19A models. (Photo by Lyle S. Mitchell)

PT-26 runs up at the Hagerstown airport as seen beneath the rudder of a sister ship.
(Photo by Lyle S. Mitchell)

The 5,000th airplane buzzes Fairchild foremen in a "very unofficial" photograph.
(Fairchild Photo, Lyle S. Mitchell Collection)

gram.[11] Many of these planes were Fairchild PT-19, PT-23, and PT-26 trainers. Despite war restrictions upon private flying, approximately 40,000 bids were received for the 5,000 surplus planes.

After the war, the availability of the surplus trainers (along with more than adequate supplies of spare parts and engines) on the civilian market at give-away prices—and the educational provisions of the newly created GI Bill of Rights—resulted in a booming flight school industry. Civil Aeronautics Administration figures showed that on January 1, 1946, there were 405 approved flight schools in operation in the U.S.—eight months later the number had reached 1,281!

By September 1946 the Lend-Lease PT-2 6s had been returned from Canada and could be bought for $750 each.

However, soon after the initial post-war rush of interest in private flying (and not so coincidentally, most student pilots had used up their GI Bill training funds), most trainers could be found tied down on the ground rather than flying. Those PTs not owned as trainers were also flown infrequently as the average private pilot found a fuel consumption of nine to 10 gallons per hour financially prohibitive. Consequently, many unflown aircraft soon deteriorated from lack of maintenance and exposure to the weather. The M-62 series of Fairchild aircraft were particularly susceptible to "dry rot" in the wooden center section. Repair costs which would exceed its purchase price usually meant the end of such a plane.

Therefore, of the well over 7,000 M-62s built, today only approximately 100 are airworthy. Most of the owners of these belong to the Fairchild Fan Club, an organization of enthusiasts who are pilots and historians of Fairchild aircraft [all models].[12] Getting together at Fly-Ins or corresponding in their newsletter, these pilot-owners exchange information, buy and sell parts—and continue their dedication to the preservation and fun of flying the remaining examples of the Fairchild *Cornell* trainer. □

RANGER ENGINES

Model 6-440C-2
Type: Four cycle, air cooled, in line, six cylinders, inverted.
Specifications: Bore 4.125 in., stroke 5.5 in., displacement 440 cu. in., compression ratio 6 to 1, fuel 65 octane, weight 376 lbs., overall dimensions—length 52.906 in., width 20.156 in., height 30.968 in., rated normally 175 hp at 2450 rpm.

Model 6-440C-3
Specifications: Same as 6-440C-2 except compression ratio 6.2 to 1, fuel 73 octane, 180 hp at 2450 rpm.

Model 6-440C-4
Specifications: Same as 6-440C-2 except compression ratio 6.8 to 1, fuel 80 octane, 190 hp at 2450 rpm.

Model 6-440C-5
Specifications: Same as 6-440C-2 except compression ratio 7.5 to 1, fuel 87 octane, 200 hp at 2450 rpm.

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10. Santiago Flores Ruiz, "Mexican Naval Aviation (1917-1979)," AAHS *Journal,* Vol. 25, No. 3, Fall 1980, p. 182.
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12. The Fairchild Fan Club, P.O. Box 127, Blakesburg, Iowa 52536.

ABOUT THE AUTHOR

Aviation historian Kent Mitchell points to the PT-19 *Ranger* engine on a original 1940 pencil sketch by an unknown Fairchild illustrator. An AAHS member since 1965, Mitchell has had numerous articles appear in the *Journal* and usually writes about one-of-a-kind or little-known aircraft—lest they be forgotten. However, he could not resist writing about the well-known Come//—if only as an excuse to display some more of his collection of photographs, many taken by his father Lyle and heretofore unpublished.

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SYNOPSIS--THE FAIRCHILD *CORNELL*

Model Designation			Engine Data		Production Data			
Army	**Fairchild**	**Manu.**	**Model**	**HP**	**Gross Wt.**	**Year(s)**	**Quantity**	**Remarks**
—	M-62	Ranger	6-410B-2A	165	2300	1938	1	Experimental Airplane (NX 18689)
—	M-62A	Ranger	6-440C-3	180	2450	1939	(1)	Modified M-62 became the M-62A Prototype. Fairchild drawing numbers 69101, 69103 (3-view), 69102 (inboard profile)
PT-19	M-62A	Ranger	6-440C-2	175	2450	1940-1941	270	
PT-19A	M-62A	Ranger	6-440C-5	200	2450	1942-1944	3181	A-model incorporated minor improvements
PT-19A-AE	M-62A	Ranger	6-440C-5	200	2450	1942-1943	477	Built by Aeronca Aircraft, Middletown, Ohio
PT-19A-SL	M-62A	Ranger	6-440C-5	200	2450	1942	44	Built by St. Louis Aircraft, St. Louis, Mo.
—	M-62AS	Ranger	6-440C-3	180	—	—	0	Float plane design
—	M-62A-2	Ranger	6-440C-4	190	2450	—	0	Design study
—	M-62A-2S	Ranger	6-440C-4	190	—	—	0	Float plane design
—	M-62A-3	Ranger	6-440C-5	200	2450	—	—	PT-26 design, Fairchild drawing nos. SK-1857, SK-1858
—	M-62A-3S	Ranger	6-440C-5	200	—	—	0	Float plane design
PT-19B	M-62A	Ranger Ranger	6-440C-2 6-440C-5	175 200	2518	1943-1944	774	Electrical system added
PT-19B-AE	M-62A	Ranger	6-440C-5	200	2518	1942-1943	143	Built by Aeronca Aircraft
—	M-62B	Warner	S-165	165	2450	1 940-?	?	Fairchild drawing 691101
XPT-23	M-62C	Continental	R-670-5	220	—	1942	(1)	Modified PT-19A
PT-23	M-62C	Continental	R-670-4	220	2580	1942	2	Production prototypes
—	M-62CS	Continental	R-670-4	220	—	—	0	Float plane design
PT-23-AE	M-62C	Continental	R-670-4	220	2580	1942-1943	375	Built by Aeronca Aircraft
PT-23-HO	M-62C	Continental	R-670-4	220	2580	1942-1943	199	Built by Howard Aircraft Corp., Chicago, Illinois
PT-23-SL	M-62C	Continental	R-670-4	220	2580	1942-1943	200	Built by St. Louis Aircraft
PT-23-FE	M-62C	Continental	R-670-4	220	2580	1942-1943	93	Built by Fleet Aviation Ltd., Fort Erie, Ontario, Canada
PT-23A-HO	M-62C	Continental	R-670-4	220	2580	1943-1944	150	Built by Howard Aircraft
PT-23A-SL	M-62C	Continental	R-670-4	220	2580	1943-1944	106	Built by St. Louis Aircraft
PT-26	M-62A4	Ranger	6-440C-5	200	2650	1942-1944	670	Built at Hagerstown
PT-26A	M-62A4	Ranger	6-440C-5	200	2650	1943-1944	807	Built by Fleet Aviation Ltd.
PT-26B	M-62A4	Ranger	6-440C-5	200	2650	1943-1944	250	Built by Fleet Aviation Ltd.
—	M-62D	Lycoming	R-530-DZ	190	2450	—	0	Design study
—	M-62DS	Lycoming	R-530-DZ	190	—	—	0	Float plane design
—	M-62E	de Havilland	Gipsy	—	—	—	0	Design study

NOTE: Over a period of years, the author has seen various numbers reported as the cumulative foreign sales has not been determined. Then too, other numerical variations may have been total of *Cornelia* built. Because most production records are long gone it is difficult to verify the caused by the difference between those aircraft *scheduled* to be built and those *actually* built actual total at this late date. The number of M-62s built by Fairchild as civilian models for U.S. and before the cutbacks at war's end.