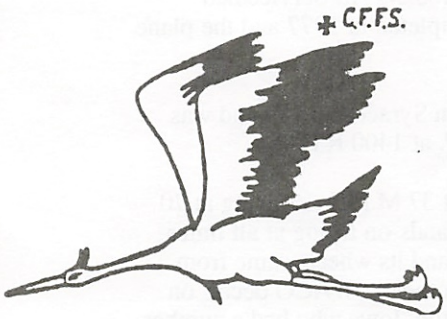
CROSSWINDS

No.92



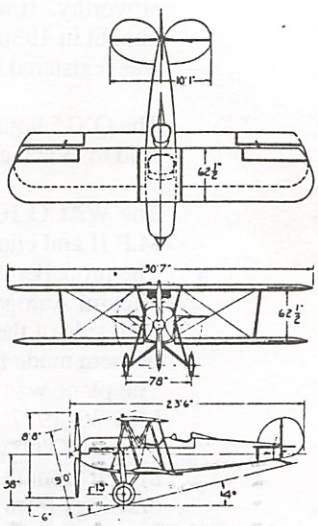


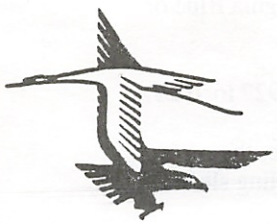
WACO 10

SPECIFICATIONS

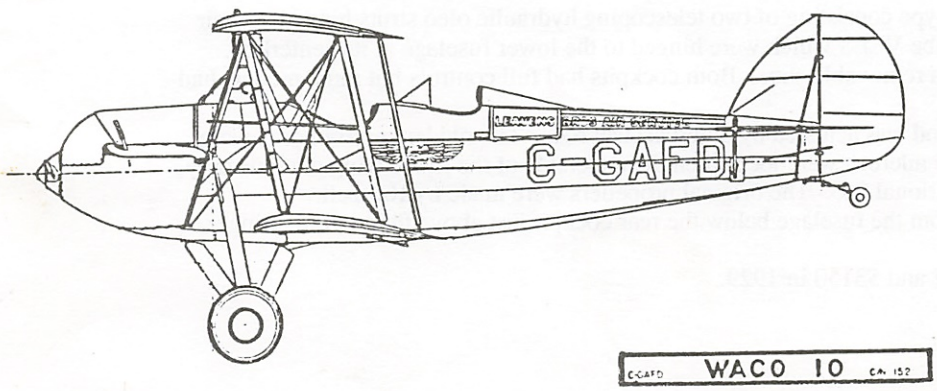
Manufactured by Advance Aircraft Company, Troy, Ohio.
Class: Approved type No. 13. Type: 3-place, open, land, biplane.
Dimensions: Length overall, 23 ft. 6 in. Height overall, 9 ft. 10 in. Upper wing span, 367 in. Lower wing span, 351½ in. Upper wing chord, 62½ in. Lower wing chord, 62½ in.
Areas: Wings (incl. ailerons), Upper 155 sq. ft., Lower 133 sq. ft. Ailerons, 27.6 sq. ft. Rudders, 7.8 sq. ft. Fin, 4.86 sq. ft. Stabilizer, 16.1 sq. ft. Elevator, 15.88 sq. ft.
Weights: Empty, 1225 lbs. Useful load, 1075 lbs. Pay load, 400 lbs. Gross weight loaded, 2300 lbs. Wing loading, 7.98 lbs. per sq. ft. Power loading, 25.55 lbs. per h.p.
Power Plant: Curtiss OX-5. Rated, 90 h.p. at 1400 r.p.m. Type, 8-cyl., water-cooled, Vee. Fuel capacity, 37 gals. Oil capacity, 4 gals.
Performance: High speed, 100 m.p.h. Landing speed, 35 m.p.h. Cruising speed, 80 m.p.h. Climb (at sea level), 750 ft. per min. Service ceiling, 13,000 ft. Cruising range, 450 mi.
Construction: Fuselage, welded steel tubing. Wings, wood. Covering, fabric.
Price (at factory): $3,135 with new OX-5 motor.

ADVANCE AIRCRAFT COMPANY
TROY, OHIO
"WACO TEN"
ENGINE: CURTISS OX-5





CROSSWINDS
Stephen Griebling
753 Cliffside Drive
Akron, OH 44313-5609



C-GAFD WACO 10 CAN 152

THE WACO 10 BACKGROUND

The Waco 10 represented by these plans was built in 1928 in Troy, Ohio and has the serial number 1521. It was purchased by Art LeMay in 1972 from a man in Oklahoma. Prior to that it was owned by Carroll McVey of Anderson, Indiana and bore the registration N5478.
In 1974 it was purchased by Chuck Leavens in Roswell, New Mexico and trucked to Oshawa, Ontario for restoration. Although the airplane was quite complete, it did require considerable work to make it airworthy. It was purchased, to represent WACO 10 CF-AFD the Leavens Brothers Air Service had bought in 1930, to celebrate their 50th year in business. Restoration was completed in 1977 and the plane was registered as C-GAFD.

The OX-5 liquid cooled engine was built in 1918 by the Willis-Morrow Co. in Syracuse, N.Y. and was sold to Waco as war surplus from World War I. The engine develops 90 H.P. at 1400 R.P.M.

The WACO 10 is said to handle much like a Piper Cub J-3 model, stalling at 37 M.P.H., cruising at 70 M.P.H and climbing at 55. Its take-off run is about 300 feet and it requires hands-on flying at all times. The propeller on C-GAFD was made by Ole Fahlin of Sunnyvale, California and its wheels came from a Pitcairn Autogyro the Leavens Brothers had flown in the 30's and 40's. The authentic WACO decals on each side of the fuselage were obtained from Ralph R. Driscoll of Mount Vernon, Iowa who had a number of them made for his WACO restoration projects.
The plane was assembled in Walt Martin's shop in Milton, Ontario and made its first flight as C-GAFD on May 26, 1977. It has made a number of flights to the WACO fly-in at Wynkoop airfield at Mount Vernon, Ohio where it has been seen and photographed by at least Russ Brown, Martin Braunlich and myself from the CFFS. It is the only WACO 10 registered in Canada. I picked up the full sized aircraft drawings from the CAHS Journal at Mt. Vernon in the summer of 1995, and used them to layout the plans for the model.

Del Balunek, of the CFFS, allowed me to borrow his numbered edition of the book "Aviation Quarterly" published by AirTrails Inc. Box 7070 Arlington, VA 22207 © 1975.
In this book WACO 10 NC7970 is shown all yellow with black trim ,which at the time had been fitted with an OXX-6 engine. Its first flight after restoration had been with an OX-5 on June 10, 1971. The OXX-6 was installed Nov. 25, 1974. WACO aircaraft were never painted yellow at the factory, however. Standard factory colors were Vermillion with Silver wings and horizontal tail surfaces, but Insignia Blue or Stinson Green were also used on the fuselage.

The WACO 10 was the most successful biplane of its time. Over 1500 were produced from 1927 to 1929.

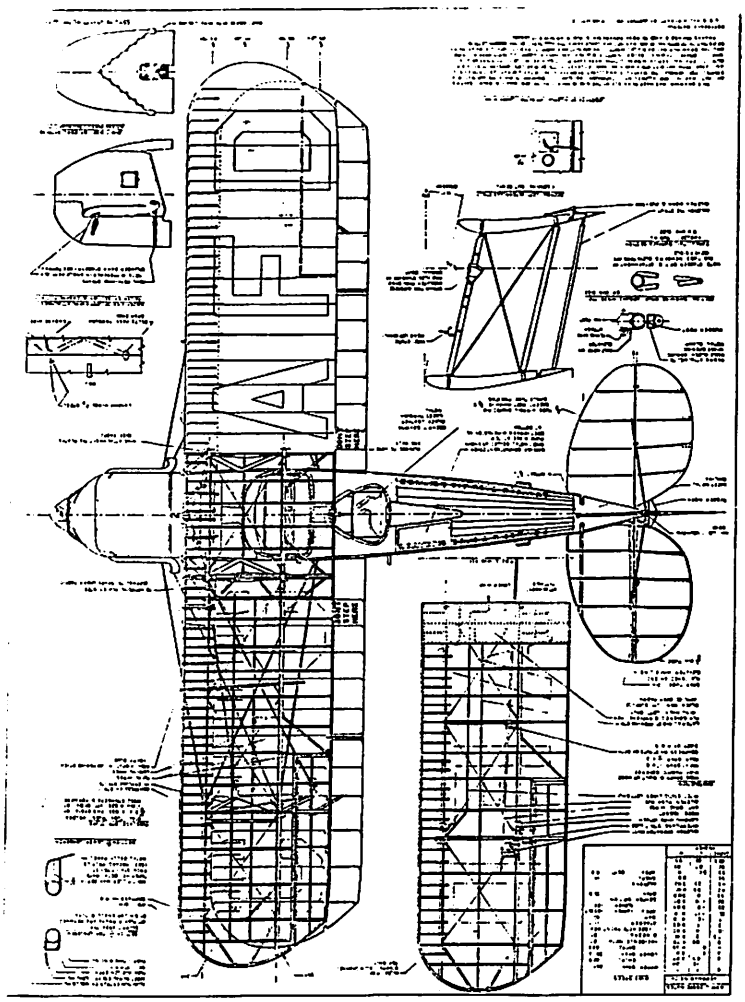
Engines available were the OX-5, the OXX-6, the model A Hispano-Suiza, the Siemens-Halske, the Fairchild Caminez and the Wright J-4, J-5 and J-6 "Whirlwinds"which required re-designed cowling since they were radials.
The WACO 10 design was started by Sam Junkin prior to his death in November, 1926 and was completed by Edward E. Green and Bud Schulenberger. It was a three place, open cockpit, single bay biplane. It was unusually comfortable with good wind shielding but poor visibility due to the lower wing and engine cowling.
The cowling was secured with two leather straps on early models.
Construction was welded chrome-moly steel tubing for the fuselage and empennage. Wings and stringers were wood. Ailerons were fitted to all four wings and the stabilizer incidence was adjustable from the cockpit.
The landing gear was the split axle type consisting of two telescoping hydraulic oleo struts hinged at their top ends to the apices of two steel tube VEES which were hinged to the lower fuselage at its centerline.
The tail skid was a leaf spring with a removable shoe. Both cockpits had full controls but most models had instuments in the rear cockpit only.
The stabilizer had no control horns and was actuated by internal steel rods. The rudder control horns were below the stabilizer and those for the ailerons were located on the underside of the lower wing ailerons only.
The spinner was optional for an additional $65. The original propellers were made by Hartzell.
There is a tubular step protruding from the fuselage below the rear cockpit just above the bottom stringer.

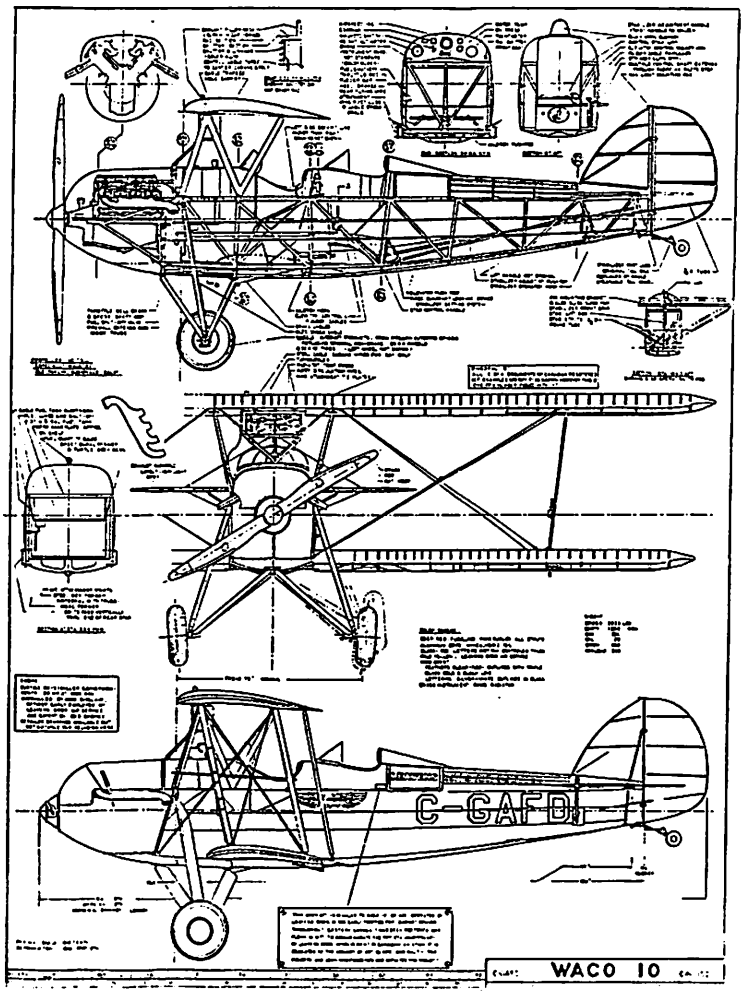
The selling price was $2385 in 1927 and $3150 in 1929.

WACO was the most popular light plane maker inthe USA at the time.

I wish to thank Russ Brown for providing the three view drawings of the Whirlwind versions of this WACO and to give credit to the CAHS Journal Nov. 25, 1977 drawing by D. E. Anderson which was made to specifically describe the WACO restored by Leavens Brothers and registered as C-GAFD in Canada. upon which these model aircraft drawings were based. Thanks too to Martin Braunlich and Russ Brown for their excellent photographs of C-GAFD which are printed in this issue of "Crosswinds".

Please note that the Leavens WACO had a deep red fuselage and vertical tail, with silver-gray wings and horizontal tail. The "LEAVENS BROS AIR SERVICE" was pale yellow and the registration markings are black. Exhaust stacks were polished chrome and the radiator was brass tirimmed with a brass filler cap above the top wing.
The WACO emblem just below the rear cockpit, on each side, has clear red feathers outlined with a triple gold/black/gold line. Its WACO letters are silver/white outlined with black. The original tailskid has been replaced with a tail wheel and the main wheels have brakes installed(which was a factory option) and balloon tires from the Pitcairn Autogyro instead of the original WACO narrow section tires and wheels.





LEAVENS BROTHERS AIR SERVICE

Leavens Brothers Air Service was started in 1928 by Art Leavens.
Art learned to fly in a Curtiss JN-4 (Jenny) in St. Louis, Mo. where one of his instructors was Charles Lindbergh. He soloed in Jan., 1927 and purchased a two place "Swallow" biplane in February and was soon giving sightseeing rides at the rate of $3.00 for 10 minutes. In the spring he flew the "Swallow" back to Canada, but found that structural deficiencies prevented it from being certified for air-worthiness in Canada, so it was traded for a "Jenny".

His brothers, Walt and Clare joined him and started the Leavens Brothers Air Service in 1928 at a field near the Belleville, Ontario fairgrounds. Walt then built up 50 hours of flying time, received his commercial pilot's license and soon purchased a cracked-up WACO 9 registered as G-CAII. The company barnstormed that summer. In the fall an Eaglerock biplane CF-AAR was added to the fleet and after its restoration the Jenny was sold. Airframe and engine repairs were carried out in winter months. Ski flights from frozen lakes started in February and wheels were put back on in May so sightseeing flights from local southern Ontario farm fields could be flown.
In the spring of 1929 they moved their operations to their own 80 acre orchard farm but had to clear off many large trees to make a suitable flying field.
In the summer of 1930 they did barnstorming as far west as Alberta, giving thousands of Canadians their first airplane ride. Meanwhile Clare, who wore glasses and could not qualify as a pilot, purchased a WACO 10 CF-AFD and hired Lorne Hicks to do local barnstorming.
In the summer of 1932 a Pitcairn Autogyro CF-ASQ was added to the fleet - the second one in Canada. The Pitcairn was used for forest spraying, banner towing, photography and passenger rides. As the depression-wracked 30's worn on, it was necessary to sell rides for a penny a pound of weight to attract customers and make a profit.
In 1936 the company moved to Toronto at Barker Airport along Dufferin street, north of town. Instructors Len Tripp and Pat Patterson were added and a flying school was started.

Art Leavens was killed in a deHavilland Puss Moth CF-AGQ allegedly from a structural failure of the right wing on June 21, 1937 at age 34.
From 1927 to 1937 an estimated 60,000 passengers had flown in Leavens Aircraft without a single serious injury. By 1938 Leavens was the largest flying school in Canada and became the Canadian distributor of Taylorcraft airplanes.
In September 1939 the school had branches in four locations: Toronto Island, Walker, Windsor and at Larder Lake in Northern Ontario. At that time the fleet consisted of two 40 h.p. Piper Cubs, two 50 h.p. Taylorcrafts, a 50 h.p. Taylorcraft on floats, a Gypsy Moth, a 65 h.p. Taylorcraft, a Fairchild 24 and a deHavilland Dragonfly.
In 1940 the facilities at Barker were converted to overhaul elementary training aircraft for the RCAF - mostly Tiger Moths.
From 1940 to 1944 Leavens trained hundreds of navigators and bombardiers at the Air Observer School in London, Ontario in Avro Ansons prior to their assignments in Lancaster or Halifax bombers.
In 1944 the company became Canadian distributors for Aeronca aircraft and the Republic Seabee, but a lack of business in private aviation caught them with a large inventory and few buyers, however, their autogyro and several special crop dusting aircraft from the USA were needed to spray for an infestation of spruce budworms and pea aphids.
By 1953 the fleet consisted of the Pitcairn, 4 Stearmans and 7 modified Piper Cubs.
In 1940 Leavens began serving Pelee Island from Leamington, Ontario with a five passenger WACO and a 3 seat Fox Moth and later a Cessna T-50 which was replaced by a Piper Apache in 1960.
Barker Airport was closed on June 19, 1958 and Leavens took up selling boats G.M. automobiles and used cars there but this operation was sold off in 1967. Headquarters were then centered at the Toronto International Airport near Malton. At that time Leavens became distributors for the Mitsubishi MU-2 nine seat, jet prop all- weather business twin.
In 1972 the company moved to 2555 Derry Road East in Mississauga, Ontario, with branches in Edmonton and Calgary, Alberta as well as at Montreal, altogether employing 80 people and serving 4000 customers. Their present location is at the Toronto International Airport, now named Pearson International, at 2555 Derry Road East, Mississauga, Ont. L4T 1A1 Canada.

Walt Leavens died in 1968 and Clare in 1972.

Between 1965 and 1970 Doug built a deNien "Sparrow Hawk" biplane, one of only two in existence.
In 1975 Leavens became a full line Cessna dealer.
Clare's four sons, John, Charles, Douglas and Robert carried on the business but John was killed in a scuba diving accident in 1974 and Chuck then became general manager.
John found the WACO 10 aircraft featured in this issue of "Crosswinds", in New Mexico and hauled it back to Mississauga where it was completely re-built. Mr. Mike Sinclair, one of the first aircraft engineers in Canada, worked for Leavens Brothers during the early years and maintained CF-AFD. He was in charge of refurbishing the OX-5 engine during the re-building. Mr. Wott Martin was brought in to assist in the re-covering job. Leavens Brothers Aviation celebrated their 50th anniversary with the restoration and flight of this WACO 10 in the summer of 1977.
Douglas Leavens was killed in an the deNien Sparrowhawk in June 1997. His death has left the WACO 10 without a pilot, but it is currently kept at the Brampton Flying Club, north west of Toronto.

I wish to thank Del Balunek for making the "Antique Airplane Digest" 1st Quarter 1977 issue, and the book "Aviation Quarterly" available, from which some of the above information was derived. Del also provided the address of the manager of the WACO Club, Ray Brandly.
I also wish to thank Mr. Brandly for taking the time to respond to my request for information and for making corrections to the Air Trails material. The WACO Club is located at 700 Hill Ave., Hamilton, Ohio 45015. They offer the following books for sale:
WACO Production $16.95, WACO History $20.50, Taperwing WACOs $15.95. Postage is $2.00 each.
Thanks also to Stuart Leavens of Leavens Aviation Inc. for his kindness in supplying additional facts regarding the Leavens family and their company history. Mr. Leavens expressed pleasure that "Crosswinds" would feature this historical aircraft and his company.



Photo by Martin Braunlich

CROSSWINDS readers with red feather scratched renewal issue codes lower than this #92 can avoid KAPUT chop to the address label by sending $12.00 to RUSS BROWN, 4909 N. Sedgewick, Lyndhurst OH 44124.

WACO PRODUCTION AND IDENTIFICATION

Waco production began in Troy, Ohio shortly after March 16th of 1923 in a building formerly used for the manufacture of horse-d[illegible] carriages. Clayton J. Brukner and Elwood "Sam" Junkin named their company the Advance Aircraft Company. The following W[illegible] were manufactured under that name, which was later changed to Waco Aircraft Company.

1923	1924	1925	1926	1927	1928	1929
Waco 6 OX-5 90 hp	Waco 7 OX-5 90 hp Waco 8 Liberty 6 250 hp	Waco 9 OX-5 90 hp	Waco 9 OX-5 90 hp	Waco 10 GXE DSO ASO BSO Waco 125	Waco 10 GXE DSO ASO BSO CSO ATO CTO Waco 125	Waco 10 GXE DSO ASO BSO CSO ATO CTO JYM JWM

Engine designations 1927 thru 1929

G	OX-5 90 hp, OXX-6 100 hp, Tank	115 hp
D	Hispano-Suiza 150-	180 hp
A	Wright J5	220 hp
B	Wright J6-5	165 hp
C	Wright J6-7	225 hp
J	Wright R-975	330 hp
125	Siemens-Halske 100-	122 hp

While several 1929 models continued to be produced after 1930, a new identification system was used thereafter. See 1930 thru 1942 production and identification chart for revision of engine designation letters.

WACO PRODUCTION AND IDENTIFICATION (1930 thru 1942)

OPEN COCKPIT

1930	1931	1932	1933	1934	1935	1938	1937	1938 - 39	1940 - 41	1942
RNF	RNF QCF-2	UBF-2	UBF-2	UMF-3	UMF-5					
INF	INF PCF-2	PBF-2	PBF-2	YMF-3	YMF-5	YPF-6	YPF-7	YPF-7		
KNF	KNF	KCA IBA				ZPF-6	ZPF-7			
MNF	MNF	RCA RBA			CPF	CPF-6	VPF-7	VPF-7		
		PCA PBA	PLA					UPF-7	UPF-7	UPF-7
BSO	BSO	UBA	ULA							
CSO	CSO	CSO	CSO	WHDA				WHD		
CTO	CTO	CTO	CTO	S3HD	S3HD-A			JHD		
CRG			JYO							
PSO										
CABIN MODELS	QDC	UEC OEC	UIC	UKC YKC CJC	UKC-S YKC-S CJC-S	YKS-6 ZKS-6 DKS-6	YKS-7 ZKS-7 UKS-7	YKS-7 ZKS-7	YKS-7 ZKS-7	
					UOC	YQC-6	VKS-7	VKS-7	VKS-7	VKS-7F
					YOC	ZQC-6	ZGC-7	ZGC-8	ARE	
					CUC	AQC-6	AGC-7	AGC-8	SRE	SRE
						DQC-6	DGC-7		HRE	
						EQC-6	EGC-7	EGC-8		
								ZVN-8		
								AVN-8		

Letters used to designate engine installation 1930 thru 1942

A	Jacobs L-6MB	330 hp
B	Wright R-540	175 hp
C	Wright R-760	250 hp
D	Wright R-760-E1	285 hp
E	Wright R-760-E2	350 hp
H	Lycoming R-680-E3	300 hp
I	Kinner B-5	125 hp
J	Wright R-975-E1	365 hp
K	Kinner K-5	100 hp
M	Menasco C-4	125 hp
O	Kinner C-5	210 hp
P	Jacobs LA-1	170 hp
Q	Continental A-70	165 hp
R	Warner "Scarab"	125 hp
S	Pratt & Whitney 420-	450 hp
U	Continental R-670	210 hp
	W-670K 225 hp; W-670-6	220 hp
V	Continental W-670M	240 hp
W	Wright R-975E3	450 hp
Y	Jacobs L-4MB	225 hp
Z	Jacobs L-5MB	285 hp

The Waco Aircraft Company did not use Lycoming engines until the model "E" was produced in 1940, and used the 210 hp Kinner on only two airplanes. The 160 hp Kinner R-5 was never used or approved for any Waco Airplane.

WACO IDENTIFICATION

First, it is necessary to understand the meaning of the letters designating each model. The first letter always denotes engine make and horsepower; the second letter indicates wing and fuselage design; and the third letter denotes model type or series, such as "S" for Standard and "C" for Custom among the cabin models. Beginning in 1930, a new series of open cockpit three-place Wacos designated by the letter "F" became the popular production model. If an open model used a different third letter, it was a special design for a specific purpose. Such models included the sportsmans two-place Waco "A", the JYM and CRG, and the military Waco "D", which was also offered as the ultimate "sportsmans plane".

Now, let's suppose you are told there is an open cockpit Waco for sale at a nearby airport. At first sight of this Waco you notice it has an out-rigger type landing gear. This means it could be either a late-model Taperwing, a Straightwing or the first Waco "F". Next you notice it is powered by a Warner engine and the fuselage is rather short or compact. This identifies it as being one of the first "F" models. Now, since the letter "R" denotes Warner engine and the first "F" models were designed from drawings identified by the letter "N", you now have identified this Waco as being an RNF.

While admiring this little jewel, you notice that a beautiful cabin Waco has just landed. As it taxies in, you notice the lower wing panels are much smaller than the upper panels. This immediately indicates that it is one of the Custom models. Next you notice the landing gear is rather wide. This narrows the identification to either a C-7, C-8 or the "E" model. Upon closer inspection you find that the wings have a plywood surface under the fabric covering. This identifies this Waco as being an "E" model and after finding that it is powered by a Pratt & Whitney engine, which is identified by the letter "S", and since all "E" models were designed from drawings identified by the letter "R", you now have determined that this Waco is an SRE.

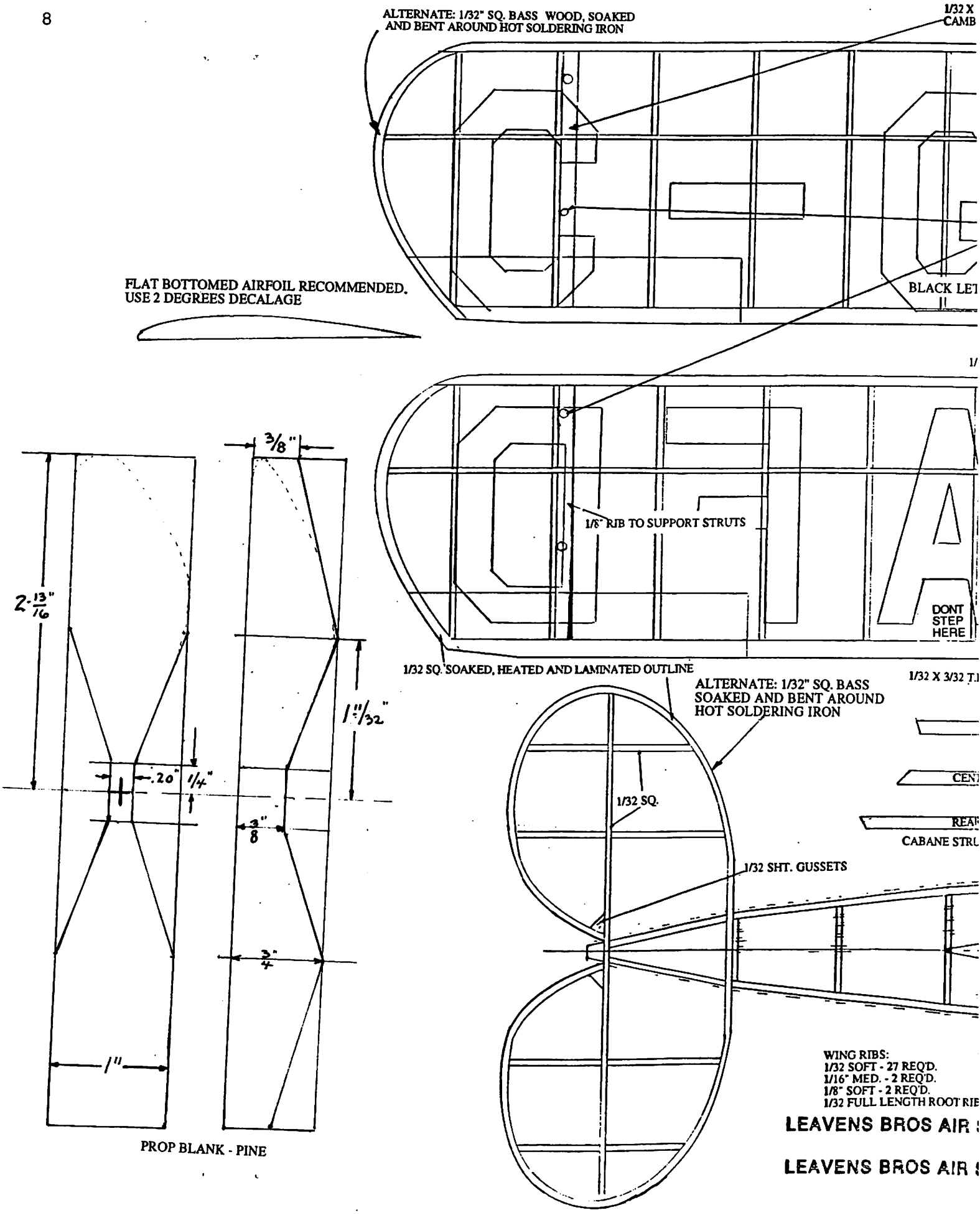
Standard cabin Wacos all have four wing panels of the same size or area and all four wings are equipped with metal ailerons. Landing gears and windshields are the most important factors in determining the model designations of the different Standard models. Custom cabin models have ailerons on the upper wings only. The 1935 Customs are the only ones with metal ailerons, all other Custom models have fabric covered ailerons. The 1935 and 1936 Customs used mid-chord flaps on the upper wings, while all others used split-type trailing edge flaps. The tricycle geared "N" models used split-type flaps on all four wing panels. The last Standards, the VKS-7F, were the only Standards to use flaps, a mid-chord flap similar to the 1936 Custom. With the information shown here, anyone should be able to determine fairly accurately, the model of any Waco, unless it has been highly modified.

The most common error made in Waco identifications, is the assumption that the suffix number, such as -6, refers to a certain year. Suffix numbers were used to denote the actual number of a certain series, such as F-5 for the fifth model of the 'F' series and S-6 and C-6 for the sixth models of the cabin series.

Current registration records show many Wacos registered with incorrect model identification letters and suffix numbers.

WACO 10 MODEL COMMENTS

My first "WACO 10" model featured the Aeromarine, scale, airfoil and the decalage shown on the three view drawings from the CAHS Journal. It was impossible to trim and was quite unstable, (see the full scale comment about hands-on flying at all times!) so I replaced the wing with a flat bottomed airfoil and the other flying surfaces since they had become rather disfigured from all the attempts at trimming.
In addition to the thin, flat bottomed airfoil, I reduced the decalage to 2 degrees. This time the model flew successfully, but required a fair amount of downthrust and a bit of down elevator, so I would recommend a thin shim of about .020" thickness be placed under the leading edge of the stabilizer when it is mounted to the fuselage. This should make additional downthrust un-necessary, but a little right thrust will probably still be required. An alternative solution would be to attach only the trailing edge of the stab. and cement the soft balsa fairing only to the last fuselage former and the stabilizer spar, leaving a gap between the fairing and the leading edge of the stab. so shims could be placed either under or over its leading edge for trimming.
I also noted that the model required a fair amount of nose weight, so I replaced the balsa prop. with one carved from pine. I have reasoned that the best way to add nose weight, when required, is to use a heavier prop., moving the weight as far forward as possible, so the total weight of the model can be kept to a minimum. Since propeller blades must always be thin for maximum efficiency, I find it effective to make them of a hard wood so they will be strong, thin and light. I have used walnut, poplar and pine for them depending upon the need for weight and what I happen to have in my workshop at the time! Select a piece of pine without knots or excessive sap. The blank should be 1" wide and 5/8" to 3/4" thick at its maximum section. See the sketch on the plan for a recommended layout. Trim the tips so the rear edges slant forward to a small tip radius. This will result in a lower pitch at the tip to reduce tip stall. I generally carve about 1/16" undercamber in a 6" prop. The total weight of the model was 12.5 grams and it required a loop of 1/8" flat Tan II for power.
You will notice that I recommend soft 1/20" sq. for the longerons. This is quite sufficient because there are two side stringers of 1/32" sq. which help support the basswood rear motor anchor so there is plenty of strength without using heavier wood. I always use basswood for the rear motor anchor because it resists wear as the rear peg is inserted and removed. It can be made a little narrower than balsa to keep the weight down. I was delighted with the shape of the WACO 10 fuselage. It is wide enough at the rear anchor to allow plenty of room for rubber bunching and its beauty is reason enough to build the model!
On my re-build I also substituted 1/32" sq. Basswood for all the flying surface tips. The bass does not require lamination and can easily be formed while wet by bending it around a fairly hot 75 watt soldering iron shank. I do the bending while near the plan so I can check the amount and placement of the curvature as I go. One piece is used for the entire stabilizer outline. The bass seems to resist warpage better than balsa and is very pretty since it is so tiny in section! If you decide to use it, simply follow the outside lines on the plan since the inside lines are for laminated tips.
On my first model I used my last sheet of silver (JCI) tissue and noticed that color photos all turned out quite blue on those surfaces. The photos that Russ, Martin and I took at Mount Vernon made the flying surfaces look white, so I covered the wings and stab. of my re-built model with white Ganpi tissue and applied the license, construction and hinge lines directly to the paper using various widths of black felt tip markers. I attach the tissue to the frames with thinned Tite-Bond glue, then shrink it with a very fine mist from an ultrasonic sick-room humidifier. Pin the flying surfaces down **immediately** to prevent warpage and let them dry thoroughly. Once dry, I set the felt tip ink with a very light spray of clear Krylon. Hold the sprayer about 18" from the surfaces so the spray is nearly dry when it lands on the tissue. This will prevent the ink from bleeding. It is wise to identify the type of ink provided in the felt tip markers. Some are water soluable and some are dissolved by ketones such as acetone and MEK. In any case, the use of a very light water mist and almost dry solvent spray will usually prevent ink-bleeding problems. An alternative method is to pre-shrink the tissue on a frame, apply the light coating of Krylon and then add the felt tip registration markings.
If you decide to draw wing ribs etc., I recommend doing that after the surfaces are covered so you can get perfect alignment. I make a "ruler" for the ribs out of a piece of soft ,thin aluminum (dryer vent pipe) about 1" wide and shaped to conform to the contour of the airfoil. Mark off the spacings with tiny dots from your fine felt tip marker at the leading edge then proceed with ruling on the "fake ribs". (Incidentally, silver tissue is much more difficult to decorate than other colors because its coating resists "wetting".)
The plans include two entries "LEAVENS BROS AIR SERVICE" in outline letter font. Color the inside of the letters with a narrow, yellow felt tip marker and between, and around the letters with a red flet tip marker. Cut out the entire rectangle including these letters with the narrowest possible margin and attach


ALTERNATE: 1/32" SQ. BASS WOOD, SOAKED AND BENT AROUND HOT SOLDERING IRON
1/32 X
CAMB
FLAT BOTTOMED AIRFOIL RECOMMENDED.
USE 2 DEGREES DECALAGE
BLACK LET
1/8" RIB TO SUPPORT STRUTS
DONT STEP HERE
1/32 SQ. SOAKED, HEATED AND LAMINATED OUTLINE
1/32 X 3/32 T.
ALTERNATE: 1/32" SQ. BASS SOAKED AND BENT AROUND HOT SOLDERING IRON
1/32 SQ.
CEN
REAR
CABANE STRU
1/32 SHT. GUSSETS
3/8"
2-13/16"
1"
.20"
1/4"
3/8"
1-1/32"
3/4"
1"
PROP BLANK - PINE
WING RIBS:
1/32 SOFT - 27 REQ'D.
1/16" MED. - 2 REQ'D.
1/8" SOFT - 2 REQ'D.
1/32 FULL LENGTH ROOT RIB
LEAVENS BROS AIR
LEAVENS BROS AIR

them to the fuselage with polyvinyl glue so the ink will not bleed. If your felt tip "red" is close to the color of your red tissue the edges will be barely visible.
The WACO logos are handled in a similar manner. The "WACO" name is silver and can be drawn with a fine silver marker, but it's tricky! I used gold Floquil enamal for the gold feathers and for the radiator outline under the top wing.

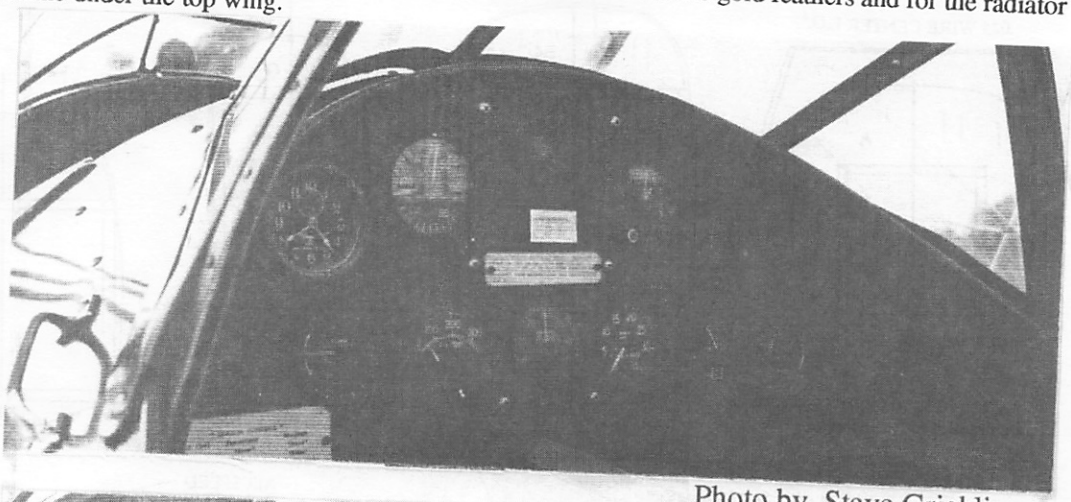
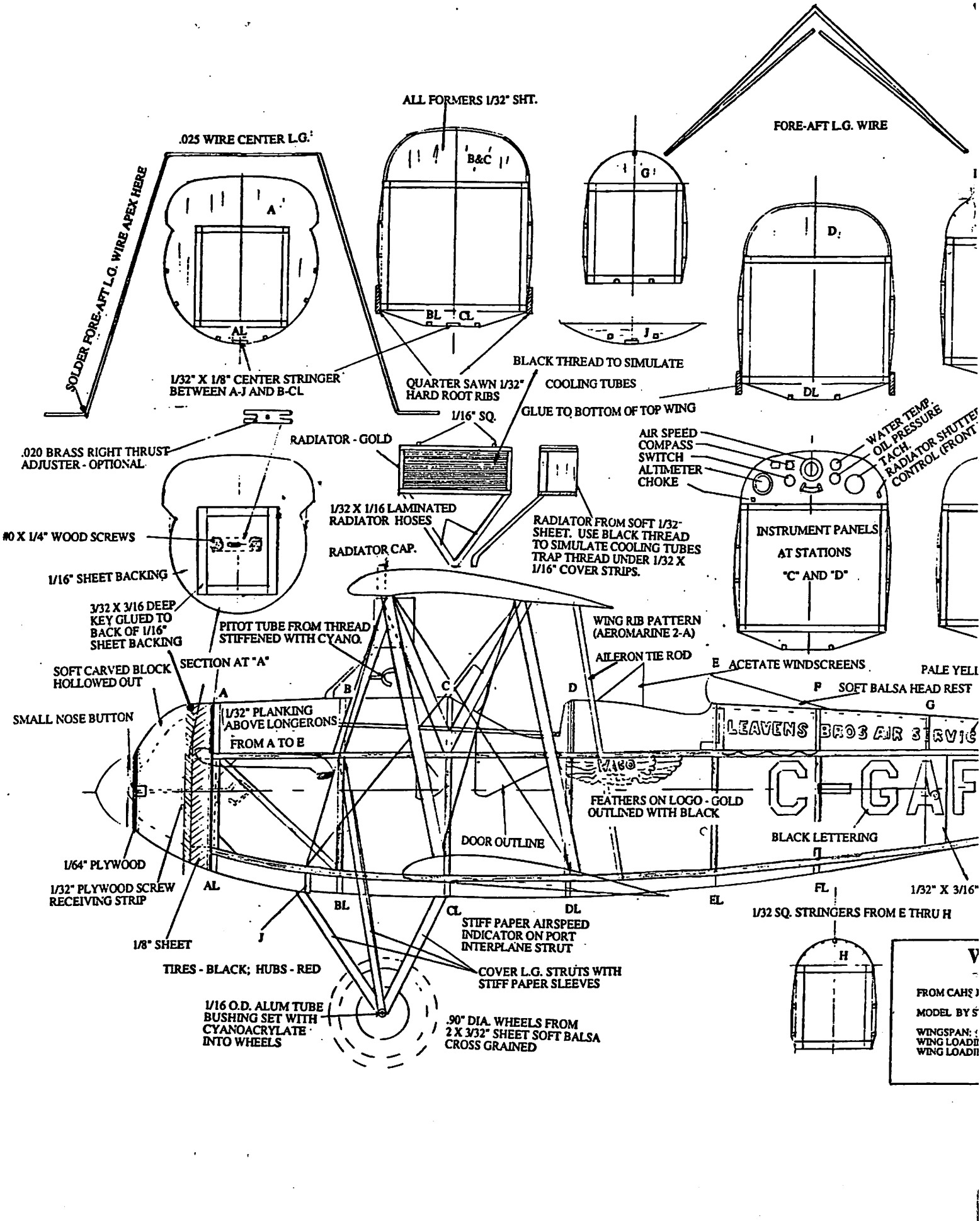


Photo by Steve Griebling

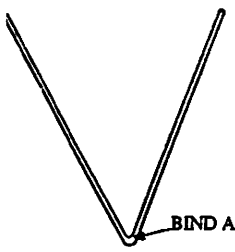




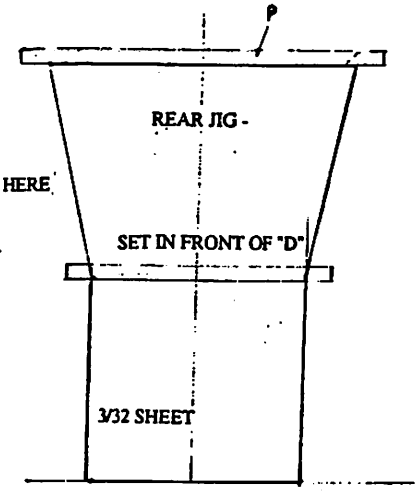
Photo by Russ Brown


ALL FORMERS 1/32" SHT.
.025 WIRE CENTER L.G.
FORE-AFT L.G. WIRE
SOLDER FORE-AFT L.G. WIRE APEX HERE
A
B&C
G
D
AL
BL
CL
J
DL
1/32" X 1/8" CENTER STRINGER BETWEEN A-J AND B-CL
QUARTER SAWN 1/32" HARD ROOT RIBS
BLACK THREAD TO SIMULATE COOLING TUBES
GLUE TO BOTTOM OF TOP WING
1/16" SQ.
.020 BRASS RIGHT THRUST ADJUSTER - OPTIONAL
RADIATOR - GOLD
AIR SPEED
COMPASS
SWITCH
ALTIMETER
CHOKE
WATER TEMP.
OIL PRESSURE
TACH.
RADIATOR SHUTTER CONTROL (FRONT
#0 X 1/4" WOOD SCREWS
1/32 X 1/16 LAMINATED RADIATOR HOSES
RADIATOR FROM SOFT 1/32" SHEET. USE BLACK THREAD TO SIMULATE COOLING TUBES TRAP THREAD UNDER 1/32 X 1/16" COVER STRIPS.
INSTRUMENT PANELS AT STATIONS "C" AND "D"
1/16" SHEET BACKING
RADIATOR CAP.
3/32 X 3/16 DEEP KEY GLUED TO BACK OF 1/16" SHEET BACKING
PITOT TUBE FROM THREAD STIFFENED WITH CYANO.
WING RIB PATTERN (AEROMARINE 2-A)
SECTION AT "A"
AILERON TIE ROD
E ACETATE WINDSCREENS
PALE YELL
SOFT CARVED BLOCK HOLLOWED OUT
A
B
C
D
F SOFT BALSA HEAD REST
G
SMALL NOSE BUTTON
1/32" PLANKING ABOVE LONGERONS FROM A TO E
LEAVENS BROS AIR SERVICE
C-GAF
FEATHERS ON LOGO - GOLD OUTLINED WITH BLACK
BLACK LETTERING
DOOR OUTLINE
1/64" PLYWOOD
1/32" PLYWOOD SCREW RECEIVING STRIP
AL
BL
CL
DL
EL
FL
1/32" X 3/16"
1/32 SQ. STRINGERS FROM E THRU H
STIFF PAPER AIRSPEED INDICATOR ON PORT INTERPLANE STRUT
1/8" SHEET
J
TIRES - BLACK; HUBS - RED
COVER L.G. STRUTS WITH STIFF PAPER SLEEVES
H
1/16 O.D. ALUM TUBE BUSHING SET WITH CYANOACRYLATE INTO WHEELS
.90" DIA. WHEELS FROM 2 X 3/32" SHEET SOFT BALSA CROSS GRAINED
FROM CAHS
MODEL BY S
WINGSPAN:
WING LOADI
WING LOADI

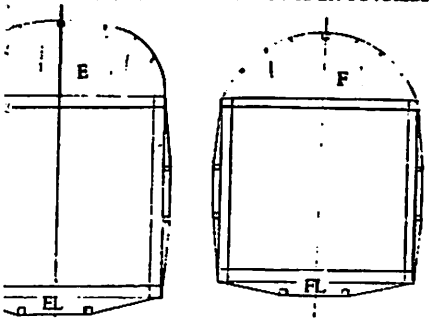
FIXTURE FOR SETTING CABANE STRUTS. (MUST BE VERY ACCURATE)
TRIM ENDS OF STRUTS TO BE FLUSH WITH TOP OF PLATFORM.



BIND AND SOLDER FORE-AFT WIRE APEX HERE.

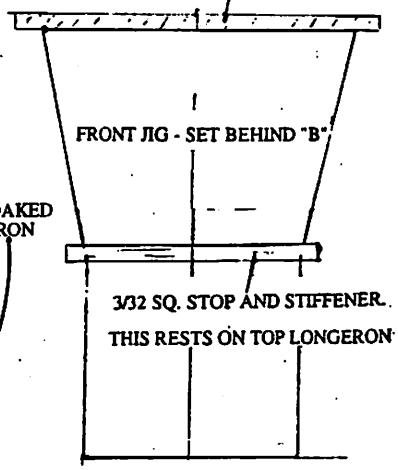


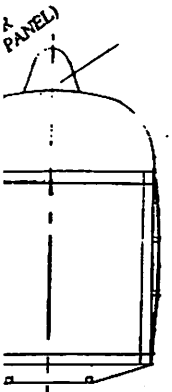
.G. WIRE .020 DIA. BIND AND SOLDER TO AXLES ON CENTER



AFTER PLANKING,
GLUE TINY TRIANGULAR BLOCKS BETWEEN STRUTS AND PLANKING TO REINFORCE ATTACHMENT POINTS

PLACE ASSEMBLED FIXTURE IN FUSELAGE BEFORE PLANKING.

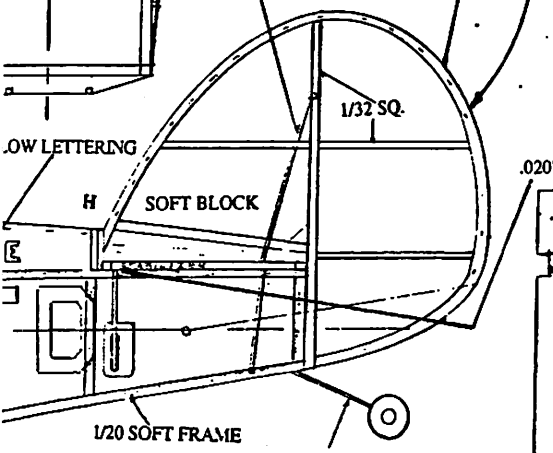




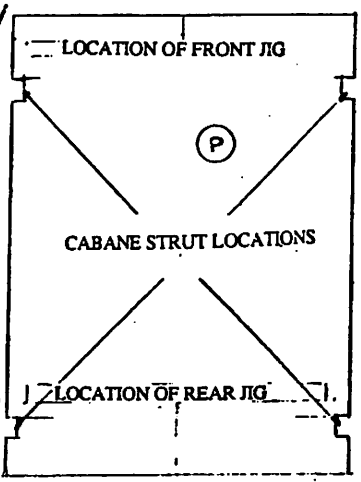
ALTERNATE: 1/32" SQ. BASS WOOD, SOAKED AND BENT AROUND HOT SOLDERING IRON

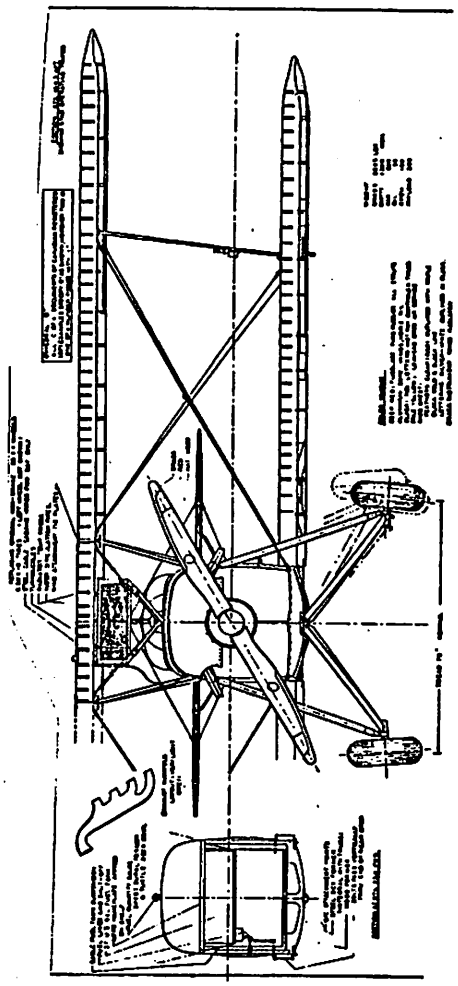
1/32 SQ. SOAKED AND BENT AROUND HOT SOLDERING IRON. (LAMINATED)

SILK THREAD BRACING



.020" SHIM UNDER LEADING EDGE OF STAB.





BASS MOTOR ANCHOR

.020 WIRE. FORM LOOP TO SIMULATE TAIL WHEEL. FILL LOOP WITH 1/32 SHEET BALSA AND PAINT CENTER - SILVER; TIRE - BLACK

VACO 10 C - GAFD

OURNAL NOV. 25, 1977 DRAWN BY D.E. ANDERSON

TEVE GRIEBLING - CFFS (FLYING ACES-STORK SQUADRON)

", AREA: 53.45 SQ. INCHES, TARGET WGT.: 15 GMS.
NG WITHOUT MOTOR: .28 GMS./SQ. INCH
NG WITH 15% MOTOR: .32 GMS. /SQ. INCH

WACO AIRPLANES WACO AIRPLANES



WACO TEN — OX-5 MOTOR
1927, 1928 and 1929

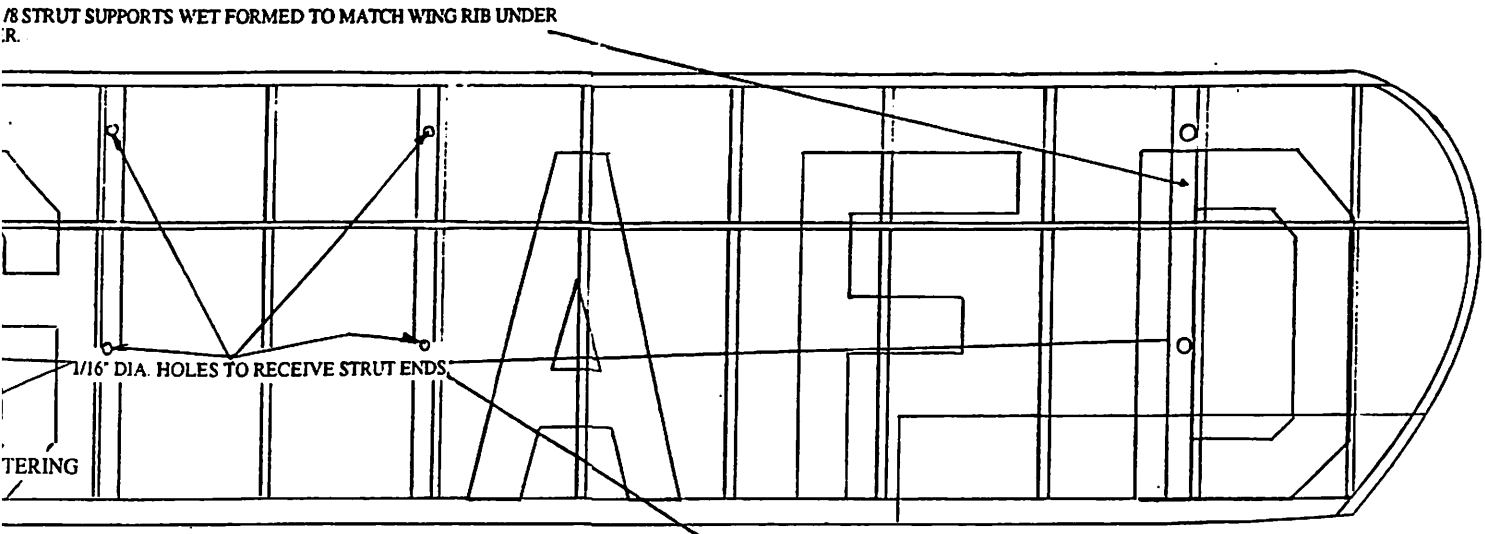
Design started by Elwood J. "Sam" Junkin, finished by Edward E. Green
Engineering by J. G. "Bud" Schulenberger

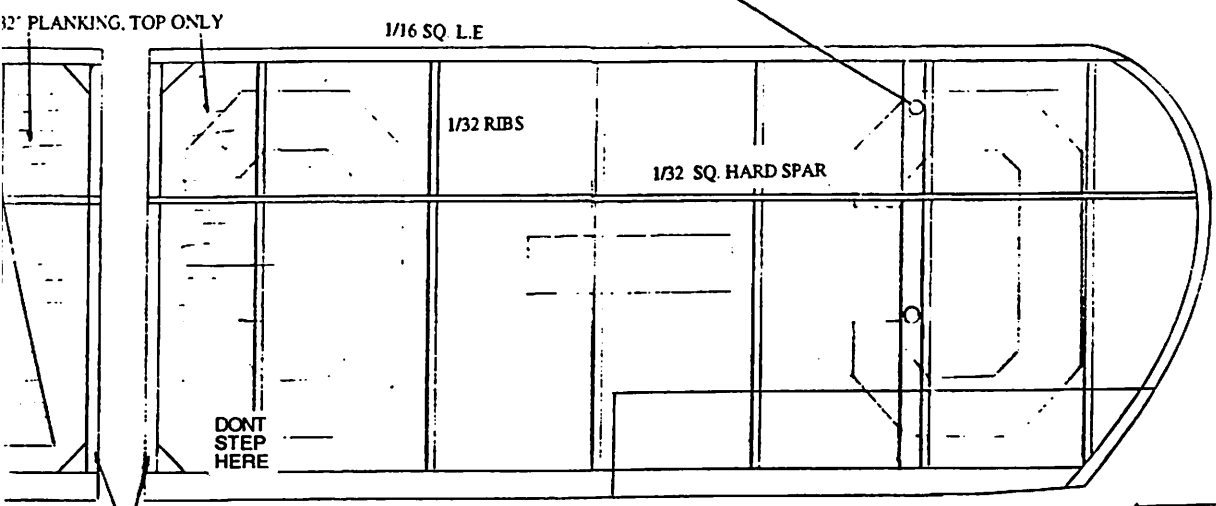
WACO MODEL GXE ATC #13

General Description	3-place open land biplane
Power Plant	Curtiss OX-5, 90 hp or OXX-6, 102 hp engine
Propeller	Hartzell (wood)
Top Speed	96 mph
Cruising Speed	85 mph
Landing Speed	35 mph
Landing Run — no brakes	220 feet
Climb First Minute	550 feet
Service Ceiling	13,000 feet
Normal Fuel Consumption	7½ gallons per hour
Fuel Capacity	37 gallons
Oil Capacity	3¾ gallons
Airfoil	Aeromarine 2-A
Chord	62.5 inches
Stagger	10.5 inches
Span	30 feet 7 inches
Length Overall	23 feet 6 inches
Height	9 feet
Gear Tread	78 inches
Tires	26 x 4
Empty Weight	1199 lbs.
Gross Weight	2025 lbs.
Price with Standard Equipment	$2385.00

Colors: Vermilion, Insignia Blue
or Stinson Green Fuselage
with Silver Wings

Number Sold — 1,152





E.

1/16 MED. ROOT RIBS

FRONT

TER

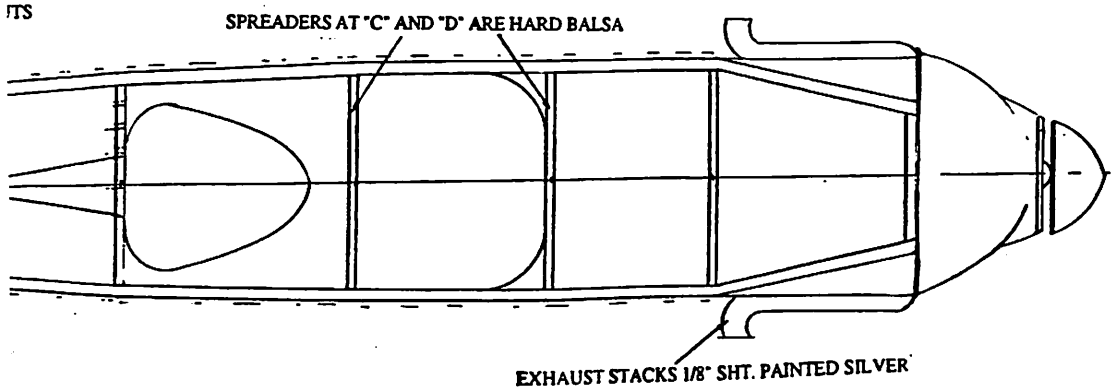
ITS

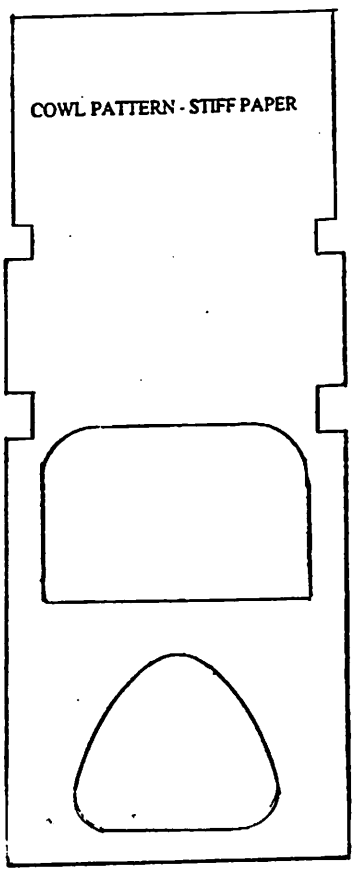
1/32 X 3/32 BASS STRUTS

FRONT

INTERPLANE STRUTS

REAR





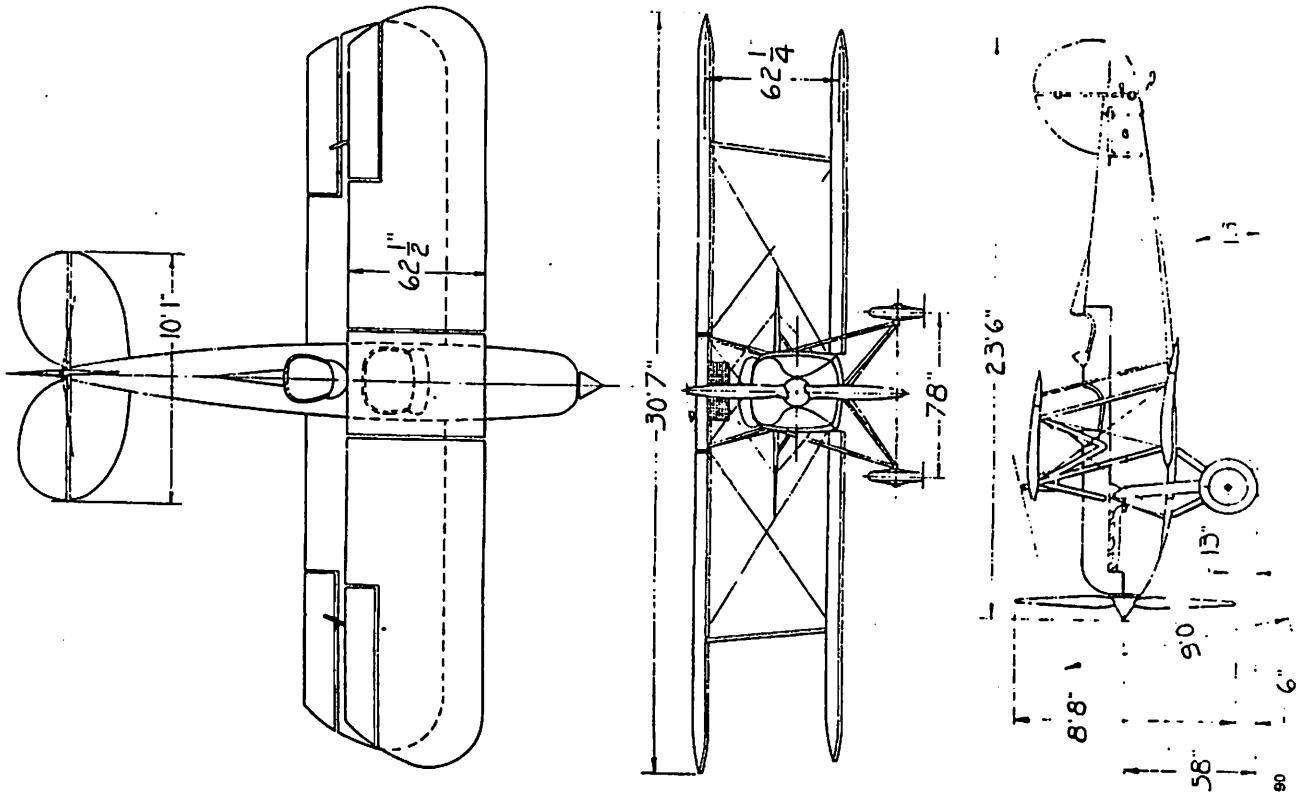
IS - 2 REQ'D.

SERVICE

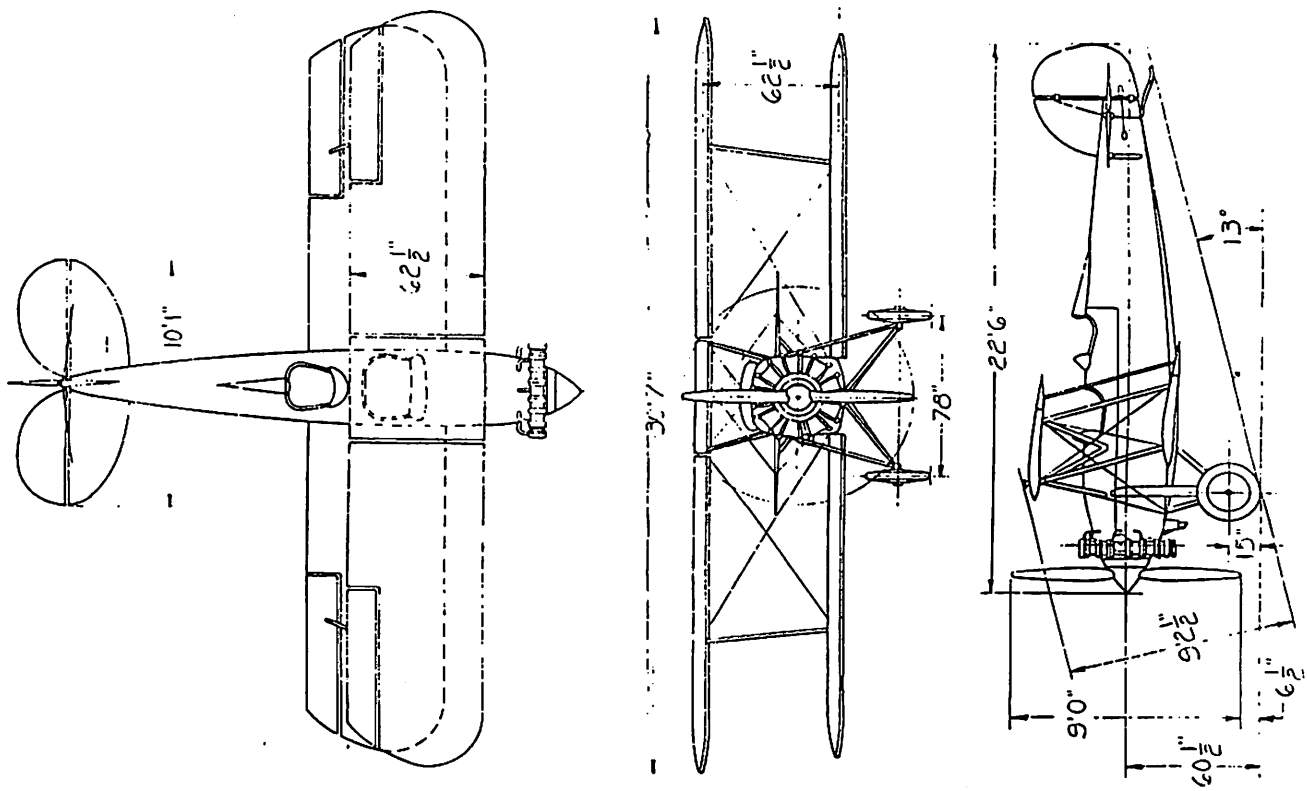
RUDDER AND FUSELAGE - RED; WINGS AND STAB- WHITE

SERVICE

WACO 10 OX5



WACO 10 WHIRLWIND





10 beauty transcends all ages at the '96 WACO Fly-In. NC 6513 resides at Wynkoop Field, Mt. Vernon, Ohio. The pristine Queen wears gloss black and vermilion red with silver flying surfaces. The fuselage decal is white and black with gold edges and wings. White lettering outlines are black The wing mounted radiator box is brass yellow. These irrestible breathtaking colors flashing from the box Brownie of Russ Brown are available for $ 2.00 to Steve Griebling or Russ Brown Computer color prints are courtesy Will Hubin.

Lundy Goesling this is not a WACO!
Cadet Lt. Jack Bredehoft enjoys a
hop with Conrad Balunek in J-3 Cub
after flying models at CFFS FAC
contest at LCCC Sept. 1997.
Lundy Goesling photo.

Vermilion red and black with silver wings and tail WACO 10 NC 6513 is next to
Leavans brothers WACO 10 C-GAFD from Toronto, Canada. Center color photo by
bob Brownie shows NC 6513 taxiing on sod at '96 WACO Fly-IN at Mt. Vernon, OH.
J-3 Cub below was there and gave this airport bum a flying view. Thank you CB.
Conrad Balunek will have Cub or Taylorcraft at WACO Fly-In 6/27-28 and at T-Craft Fly-IN 7/10-12 at Alliance, Ohio
unless towing banners at other air events.

SOURCES OF HARD TO FIND MATERIALS , ETC.

Silver Japanese tissue (and many other colors): $58.25 for 25 sheets including shipping.
Jim Caley, 655 State College #19, Fullerton CA 92831. Phone: 1- (714) 773-9048
Jim is hiring additional help to get his orders out more quickly. He apologized for the delay in his last shipment, so things should improve. (My order took over five months to fill.)

Tiny "O" rings, balsa strip cutter, indoor type torque meter and other indoor specialties:
Jim Jones, 36631 Ledgestone Drive, Clinton Twp. MI 48035-1618.
Phone: 1- (810) 791-0651
I suggest you phone for his small catalog.

ESAKI "LITE FLITE" TISSUE $.85 per 18" x 24" sheet. (Yellow, white, red, blue, orange, black, green.)
Campbell Model Supply Co. 37742 Carson St., Farmington Hills, MI 48331
(Postage and handling $3.00 U.S., $4.00 Canada-Mex. $5.00 overseas.
Michigan residents add 6% sales tax. Free peanut plan with order.)

Ganpi Tissue and other special model A.C. items: (flammable liquids no longer shipped by mail)
Micro X Products P.O. Box 1063Lorain OH 44055 (Price for Ganpi tissue is $6.95 per sheet.)

Ganpi Tissue: Aiko's Art Materials Import, INC. 3347 N. Clark St., Chicago IL 60657.
Phone: 1- (773) 404-5600. Closed Sunday and Monday.
Ask for "Dark Ganpi" which defines the 20 x 30" sheet size. (Price is $6.75 per sheet plus shipping and handling, which was $5.60 for ten sheets.)

Model kit listings and documentation for Warplanes:
Dr. John Fredriksen, 461 Loring Ave., Salem MA 01970. Phone: 1- (508) 745-9849
Dr. Fredriksen is selling off his inventory of the 1996 edition of "Model Warplanes, 1996" at $5.00 per copy or $25.00 per set of five (plus $3.00 postage) in order to make room for a new edition. Booklets show the countries of origin, the original dimensions of the planes, the kits or plans available and three view drawings. Book Number 1 covers W.W.I models.
Many of the older kits are for rubber power, as you would expect, but R.C. and control line figure in to many of the more recent listings.

Curved tip injectors for cement, stainless steel small bore tubing, tiny machine screws etc.
Small Parts Inc., 13980 NW. 58th Court P.O. Box 4650, Miami Lakes FL 33014-0650.
Phone: 1- (800) 220-4242
Not inexpensive, but they have a remarkable 1/2" thick catalog with lots of goodies.

Specialty items such as small bore tubing and threaded brass bushings,kits, etc.:
"SAMS" The Chapel, Sandon, Buntingford HERTS. SG9 OQJ England.
Send a $8.00 cash for their catalog. After that they will take Visa and Mastercard and will calculate the exchange rate for you. Tel (01763) 287 606 or 288 384
FAX (01763) 288 490. Call early in the day because of 5 hour time difference.

WW II model kits and plans: Diels Engineering P.O. Box 263 Amherst OH 44001. Catalog $2.00, free with order. A few plans are in the Golden age period. and are well done.

Rubber and Electric kits and plans: Bell Model Aircraft Co., 650 Pinjecrest Dr., Largo, Fl. 33770. Send #3.50 for 16 page catalog.

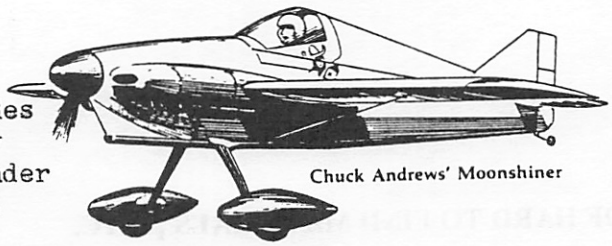
Raceplanes brochure: R.S. Hirsch, 8439 Dale St., Buena Park Ca. 90620. $3.00 for brochure. He will sell Goodyear/F1 plans at the Air Racing Symposium, May 1-3 at Cleveland Holiday Inn. W. 150th & I71.

Aviation books, model plans etc. : Hannan's Runway, Box 210, Maglia, Ca. 95954-0210.

Model plans: Volare products, 7686 B Drive South, Battle Creek Mi. 49017. $2.00 for catalog.

RED X ALERT

Address renewal issue codes for this #92 or lower may send $12 four issue extender to Russ Brown. Thank you!



Chuck Andrews' Moonshiner

CROSSWINDS
RUSS BROWN
4909 N. SEDGEWICK
LYNDHURST. OH 44124

GOODYEAR MIDGETS

FAC GHQ confirms the GOODYEAR Peanut Scale Mass Launch event is for all midget racers, Formula 1 and Formula V from 1947 start through recent races. We celebrate the wide choice of subjects, including CROSSWINDS 91 feature Idgit's Midget with a photograph from Martin Braunlich. Race number 82 and registration N 82 BC were applied to the now Flying Frenchman of owner Bill Chevalier. The color is blue, with a dark blue nose and bright red stripe. Stay with the bright yellow trim No. 66 for flying model visibility. N 82 BC is vertical on the rudder. Race number 82 is white, with black left and down shadow on the left wing and fuselage sides. The red trim is on the fuselage center line, wheel pants, wing tips, and along the near front edge of the horizontal tail A female art form hangs from the fin top. This tail weight adds lightness; 'Nes Paw?



1978 Cleveland Burke Apt. photo by Martin Braunlich is a bold ploy to show CHUCK'S GLIDER SUPPLIES van of Chuck Slusarczyk HAWK UL.

Bill Chevalier No 82 N82BC in '78 form is mid blue with dark blue nose trim back to slant up and back from low rear corner of canopy hole. Bright red trim looks dark on fuselage and stab l.e. but lighter on curved wing tip trim. Tricky shade work there Martin !

The Polish CGS HAWK did beat the Frenchman Moonshiner in the Great Race to Cedar Pt. by years - light years, no photo finish!

FINAL PYLON-DARK SLIDE IN

Cleveland friends and air racing enthusiasts lost Al Chute on March 14, 1998 after a tiresome illness. For many of his 69 years, Al enjoyed indoor and Navy Carrier model flying and scale judging. Al and brother Robert filmed air racers coast to coast and Reno until the need of extra oxygen restricted activity. While the treasure of his film remains, the great knowledge and insight goes beyond our western view.

Choice photos from Al Chute illustrate racing planes in the new World Wide Directory of Racing Airplanes, Volume 2 by Don Berliner. Volume 2 will be out about July, 1998 from Wallace Kemper at Aviation Publishing, Inc. Phone 1-800-748-9308. P.O. Box 5674 Destin, FL 32540-5674. Vol 1 covering air racing from 1909 to 1949 at $ 34.95 plus $ 4.50 is almost ready, but missed the Cleveland Symposium on May Day weekend. Ask for the two set cost next July.

Robert Hirsch sent a two vol. set of his GOODYEAR & FORMULA ONE AIR RACING books to the Air Racing Historians Symposium for the fund raiser auction. I had to out bid the entire group to latch on to these drawings for future CROSSWINDS subjects. FAC GHQ just got his from Bill Hannan at P.O. Box 210 Magalia, CA 95954-0210. Send a smoke signal to Bill up his Wind Canyon, as Bill broke his phone crank. Haw-w.

MAY 1- 3 AIR RACING SYMPOSIUM AT CLEVELAND HOLLIDAY INN, W. 150th AT RT. 71. INFO: TONY AMBROSE 7161 Burridge Ave. Mentor, OH 44060 440-255-8100.

Sun. 5/3 CLOUDBUSTERS INDOOR AT FLINT, MI INSIDE SWING GOLF DOME. 810-329-6833,

Wed. 5/ 6 SAM 39 O.T. R/C & FF Fun Fly at Shelby, OH Airport Rt. 96 1½ Mi. W. Shelby.

Sat. 5/9 ERIE FAC AT PRANGMORE PA. 10 AM- 5 PM. Ross Mayo 814-833-6855. 833-4985.

Wed. 5/20 SAM 39 Old Timer at Schroeders Farm. RT 61 3 Mi. S. of New Haven RT. 224.
Wed 6/ 3 SAM 39 O.T. at Shelby Airport.

Sat. 6/6 ERIE FAC FF AT PRANGMORE 10-5 Rt. 91 Exit 5 N. to Millfair, Rt. to field.

JUNE 14-15 Inter City FF at WPAFB, Dayton, OH.

Sun. 6/14 CFFS FAC FF AT LORAIN COUNTY COM. COL. 10-5 CD Jim Hyka 216-481-6525 & RB.

Wed. 6/17 SAM 39 O.T. Fun Fly R/C & FF (Smaller) at Schroeders Farm.

Sat. 6/20 McCOOK SQ'DN FAC AT DAYTON, OH WPAFB. CD Frank Scott 937/335-3057 9-4:30.

JUNE 27-28 ANNUAL WACO FLY-IN AT WYNKOOP AIRPORT, MT. VERNON, OH.

Wed. JULY 1 SAM 39 O.T. FUN FLY AT SHELBY AIRPORT.

JULY 10-12 ANNUAL TAYLORCRAFT FLY-IN AT BARBER FIELD, ALLIANCE, OH.

Wed. 7/15 SAM 39 FUN FLY at Schroeders Farm.

JULY 16-19 FAC NATS MK. XI AT GENESEO, NY. CD LT. COL. LIN REICHEL 814-833-0314.

JULY 24-26 AIRCRAFT PAST & PRESENT AIR SHOW, ELYRIA, OH 440-323-9469.

Sun. 7/26 CFFS FAC FF AT LCCC 10-5 CD Gordon Roberts 216-749-4817, Russ Brown 382-4821

Wed. 7/29 SAM 39 O.T. FUN FLY RC & FF AT SCHROEDERS FARM, SHELBY, OH. 6 Mi N. RT.61.
WED 8/ 5 SAM 39 O.T FUN FLY AT SHELBY, OH AIRPORT. 1½ Mi. W. of Shelby on Rt. 96.

Sat. 8/ 8 ERIE FAC FF AT PRANGMORE, ERIE PA. CD VIC DIDELOT 814-838-3263.

Wed. 8/26 SAM 39 OT FF AT SCHROEDERS FARM.

Sun. 8/16 CFFS FAC FF AT LCCC. 10-5 CD PETER ZBASNIK 216-476-4824, Russ B. 382-4821.

SEPT 9/ 2 SAM 39 O.T AT SHELBY AIRPORT.

Sun. 9/13 CFFS FAC FF AT LCCC, ELYRIA, OH. CD RUSS BROWN & JIM HYKA 216-382-4821.
9/ CLOUDBUSTERS / FLINT, MI. FAC FF. Date pending.

SEPT 25-27 1ST. FUNK EASTERN REGION FLY IN. SITE MAY BE AT FUNK ORIGIN, AKRON AIRPORT.

Wed. 9/23 SAM 39 O.T. FF AT SCHROEDERS FARM.

Sat. 9/26 ERIE FAC FF AT PRANGMORE 10-5 CD ROSS MAYO 814-833-6855.

OCT. / 4 CFFS FAC FF AT LCCC. CD RUSS BROWN & GORDON ROBERTS.
10/ CLOUDBUSTERS / FLINT MI FAC FF. date pending.

CFFS CONTEST EVENTS 10AM-5PM AT LORAIN COUNTY COM. COL. ELYRIA, OH I-90 EXIT 148 TO 301 S. ENTER AT HOAG RD. IF WIND IS FROM NORTH, OTHERWISE ENTER AT L.C.C.C.

1. FAC PEANUT SCALE, FULL PTS.
2. HI-WING CABIN PEANUT EXP.
3. HI-WING CABIN PEANUT PRODUCTION.
4. DIME SCALE
5. COMET & GOLDEN AGE RUBBER SCALE
6. FAC RUBBER SCALE
7. PIONEER THRUU1914 RUBBER SCALE
8. NO. CAL. PROFILE SCALE
9. EMERYO ENDURANCE (JR.) (SR) (Ø)
10. FAC CO2 & ELECT. POWER SCALE
11. O.T. REPLICA CO2 & ELECT. PRECISION
12. JR. FUSELAGE RUBBER (JR.)
13. JR. STICK RUBBER (JR.)
14. HAND LAUNCH GLIDER (J)(S)(O), POT PRIZE
15. HAND CATAPULT 6" STICK GLIDER,POT PRIZE
16. FAC O.T. RUBBER 36" MAX. $ POT PRIZE.
17. FAC O.T. STICK 36" MAX. $ POT PRIZE.
18. JIMMIE ALLEN BEST 3 OF 6, 120 MAX.
19. WW I PEANUT BIPE. MASS LAUNCH AT 11:00
20. WW I FAC DOGFIGHT MASS LAUNCH AT 11:30
21. WW II NO. CAL. ONE M. LAUNCH AT 12:00
22. FUNK & WACO ONE MASS LAUNCH AT 12:30
* 23. GREVE RACE / INLINES M. L. AT 1:00
* 24. PRE WW II BENDIX RACE M.L. AT 1:30
25. WW II PEANUT COMBAT M. L. AT 2:00
26. GOODYEAR F.1, F.V ONE M.L. 13" AT 2:30
* 27. THOMPSON TROPHY RADIALS RACE AT 3:00
* 28. WW II FAC COMBAT AT 4:00

THE 15% MAX. RUBBER WEIGHT FAC RULE IS APPLICABLE TO FAC SIZE MASS LAUNCH EVENTS * BRING DIME SCALE, OLD TIMER, AND JIMMIE ALLEN PLANS FOR CONSTRUCTION VERIFICATION.

PICK A PLAN PRIZE AND $1 ENTRY FOR POT PRIZE EVENTS.

SUNDAY JUNE 14 CFFS AT LCCC 10AM-5 PM CD JIM HYKA 216-481-6525. INFO; RUSS BROWN

SUNDAY JULY 26 CFFS AT LCCC 10AM-5 PM CD GORDON ROBERTS 216-749-4817 & RUSS BROWN

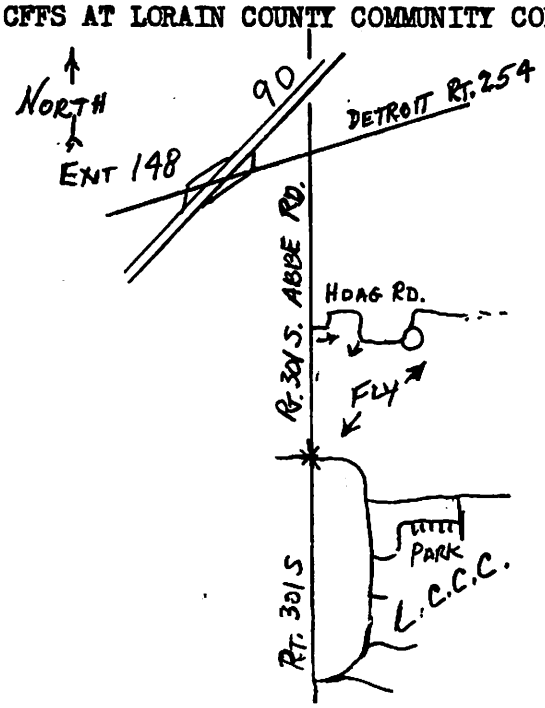
SUNDAY AUG. 16 CFFS AT LCCC, CD PETE ZBASNIK 216-476-4824. CO-CD RUSS BROWN

SUNDAY SEPT 13 CFFS AT LCCC, CD RUSS BROWN 216-382-4821. CO-CD JIM HYKA

SUNDAY OCT. 4 CFFS AT LCCC, CD RUSS BROWN. CO-CD GORDON ROBERTS

SAM 39 OLD TIMERS FLY RC & FF ON 1ST WED. OF MONTH AT SHELBY AIRPORT RT. 96, AND A 3RD, 4TH, OR 5TH WED. AT SCHROEDERS FARM RT.61 (314), 6MI N. OF SHELBY,OHIO. DATES ARE 4/22F,5/6A, 5/20F, 6/3A,6/17F, 7/1A, 7/15F, 7/29F, 8/5A, 8/26F, and 9/23 FARM. SAM CHAMPS ARE SEPT 14-18 AT MUNCIE, IN.

CFFS AT LORAIN COUNTY COMMUNITY COLLEGE



SAM 39 AT SHELBY, OHIO

