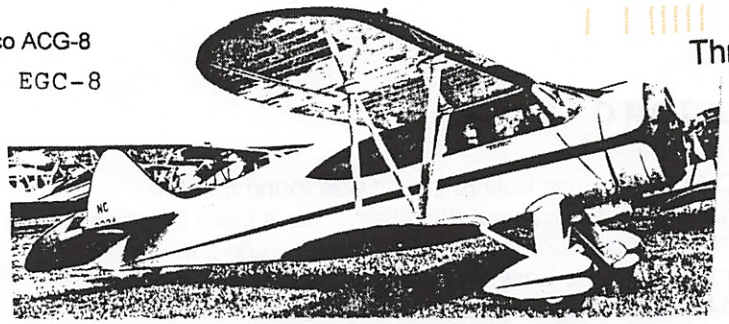
X Waco ACG-8
Waco EGC-8

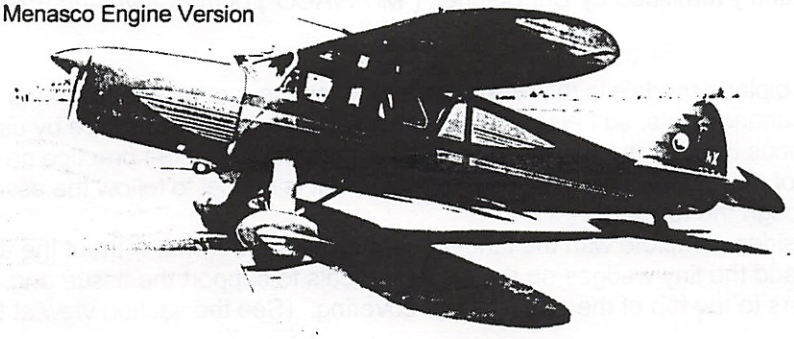


Three Peanut Size Waco Cabin Biplane Plans

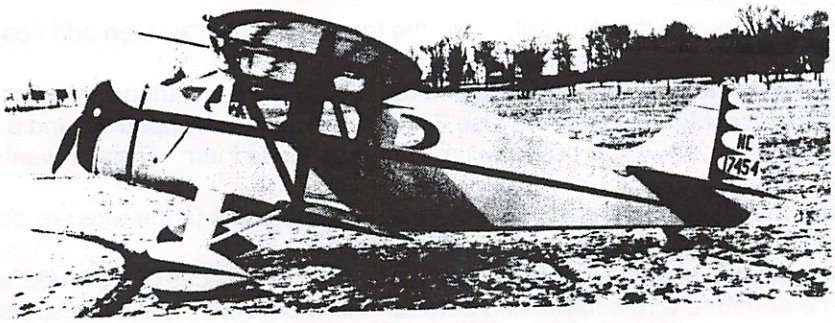
CROSSWINDS

#120

Waco C-8 Custom, Menasco Engine Version



First Waco ZGC-7

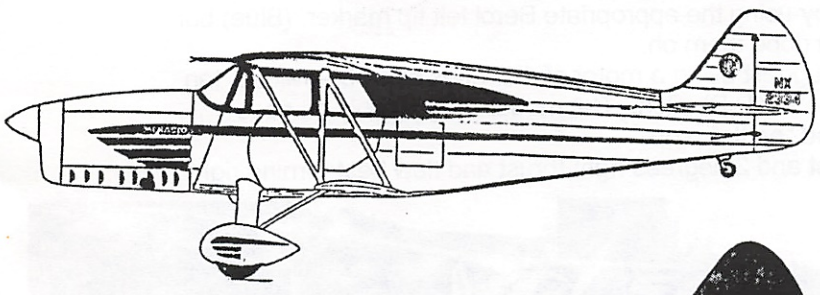


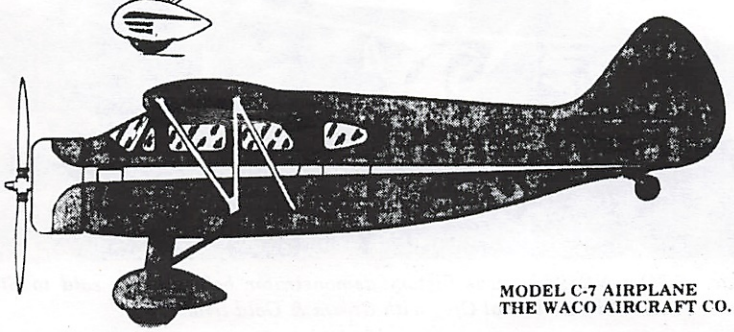
"CROSSWINDS"
Russ Brown
4909 N. Sedgewick
Lyndhurst, OH 44124

WACO AIRPLANES
"Ask Any Pilot"



Howard Hughes





MODEL C-7 AIRPLANE
THE WACO AIRCRAFT CO.

44034+8476

13" WACO CUSTOM C – 8 (1938)

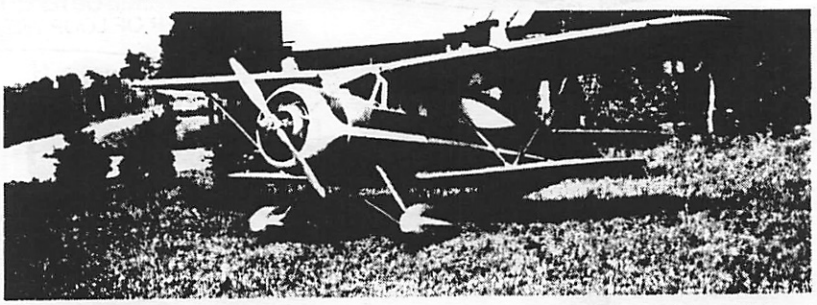
This project started out with a study of the "WACO Custom" Easy Built Kit, but it was found that the dimensions on their plan were not to scale, and the model year was not identified. I have been told that the Easy Built kit would be acceptable to enter in "Flying Aces" competitions, however, since it is commercially available. The rudder and stabilizer shape on the Easy Built plan suggests that it is the 1938 model C-8 that was intended, so I went from there to design a peanut size C-8 using a more accurate three view drawing kindly furnished by Del Balunek ("Mr. WACO") of the Cleveland Free Flight Society.

The principal appeal of cabin biplane models is that the cabin simplifies the mounting of the wing by avoiding those troublesome cabane struts, so I elected to take full advantage of this feature by using one piece wings that were continuous through the fuselage, even though that was not the practice on the full size aircraft. The framework of the model is conventional except that it is critical to follow the assembly steps to extend the wings through the fuselage:
Build and cover the fuselage sides complete with the landing gear armature but with without the top and bottom stringers. Be sure to add the tiny wedges on the cabin verticals to support the tissue and acetate windows from the side stringers to the top of the cabin before covering. (See the section view at the top left corner of the plan).

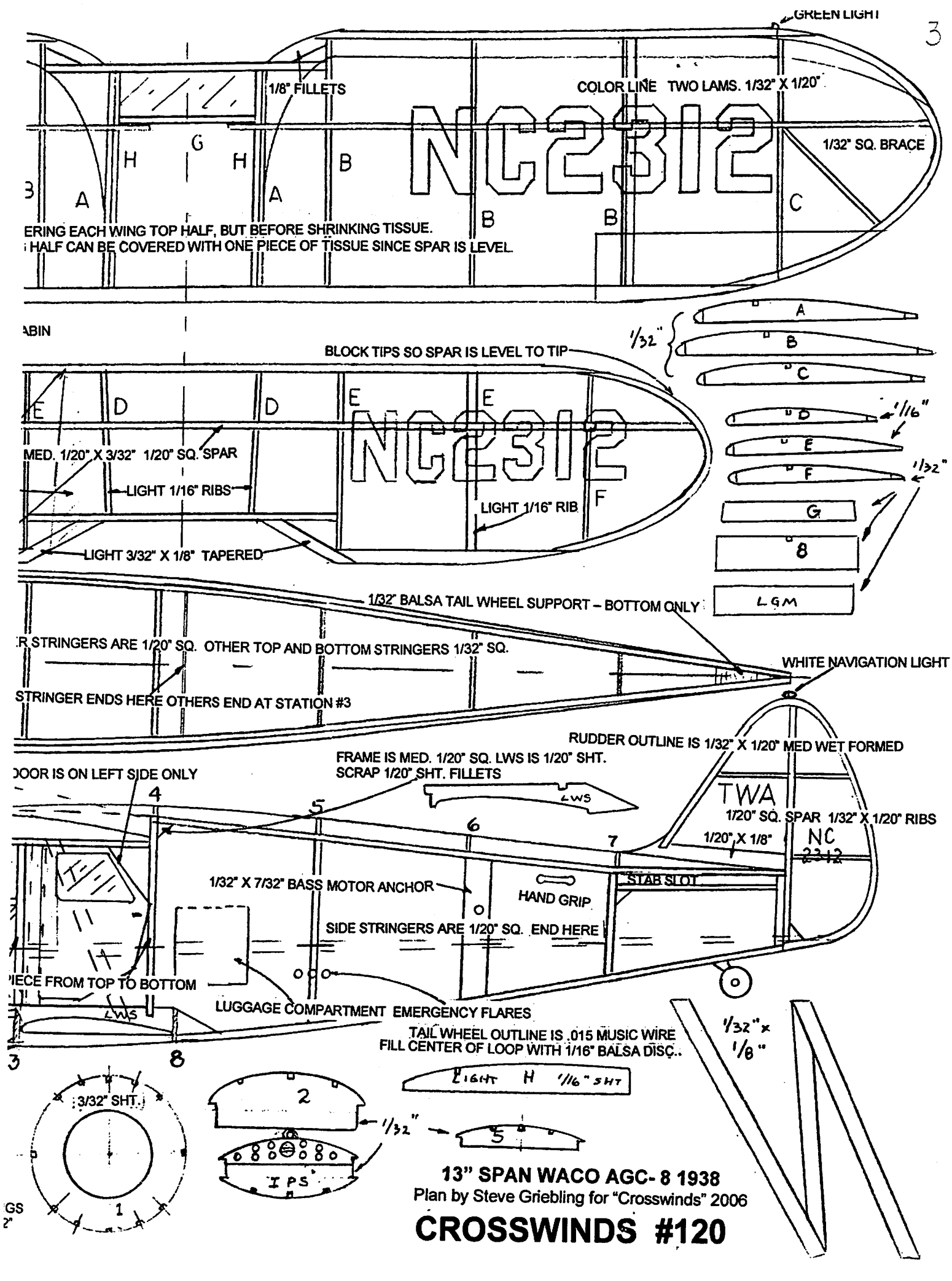
1. Build the wings, set the dihedral, cover the top wing to ribs "A" then add ribs "H", shrink the tissue and dope them.
2. Add the wings to the fuselage, then add the top and bottom stringers and sand the fuselage frame to blend all the contours smoothly. Use 320 grit sandpaper wrapped around a ½" diameter dowel to scallop the formers where tissue will not be attached to them. (This prevents the ugly starved horse look).
3. Add the wheels and pants and glue the inside of the pants to the wire armature. When dry, Cover the top and bottom of the fuselage, shrink and dope the tissue.
4. Add the landing gear struts. These are made from two pieces of light 1/32" sheet balsa for each strut with the armature wire sandwiched between the two pieces. Sand the struts to a streamlined shape and cover them with tissue.
5. Add the acetate windows then add the wing struts. Refer to the three view drawing for the strut locations. The position of the struts is shown on the plan with small marks on the compression ribs on the top wings and on the 1/16" ribs on the bottom wing. The "N" pattern at the bottom right corner of the plan is approximately correct, but I suggest you cut the struts a bit long in order to fit them by trial. They are simply pressed lightly into shallow grooves filed in to the compression struts in the top wings and into the 1/16" ribs in the bottom wings, then glued.
6. I suggest using elastic thread for the Vee brace between the landing gears. A tiny teardrop shaped piece of balsa will anchor this to the fuselage centerline. Use elastic thread for the diagonal landing gear braces too.
7. Add the stabilizer and rudder, but glue the rudder only at the sternpost till you have completed flight trimming, then put a drop of cement at the leading edge of the rudder to hold its position.

The color scheme for the TWA plane registered as NC 2312, was light gray with blue trim edged by red. I suggest chalking white tissue with Nu Pastel light gray chalk on the rough side. I like to draw the license characters directly on the tissue before covering by using the appropriate Berol felt tip marker, (Blue) but you may wish to cut them from colored tissue and dope them on.
My model weighed 11.1 grams without motor. I suggest using a motor of 4 strands of 1/16" braided, tan rubber powering a 5" to 6" prop with low (about 1.1:1 = P:D) pitch. The model will probably be nose heavy, unless you use a carved balsa or basswood "bottle" prop.
My model required about 3 degrees of down thrust and 2 degrees right thrust and flew best turning right.

Steve Griebling for "Crosswinds", 2007

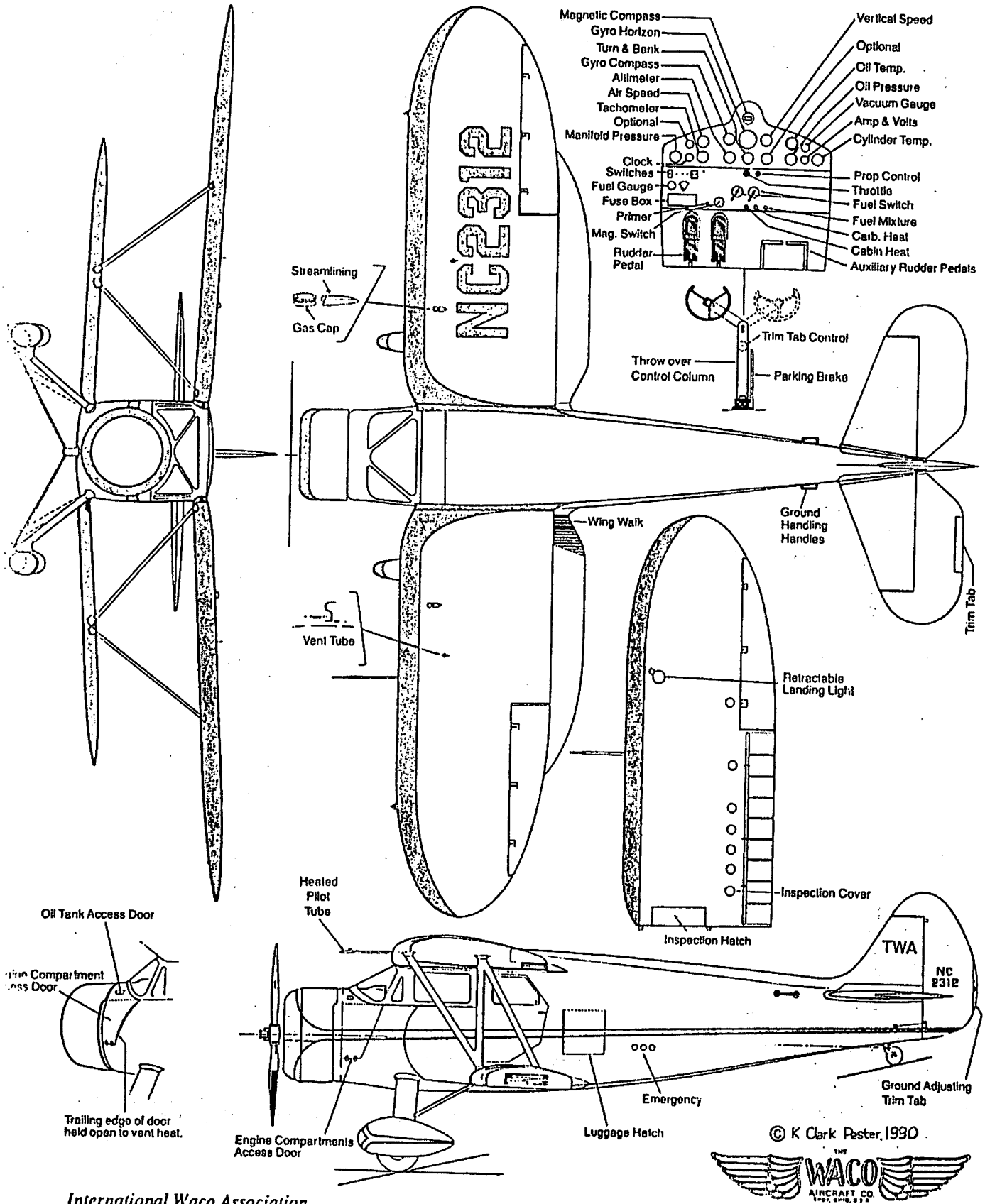


Waco EGC-8 NC19365, was factory demonstrator before being sold to State of Ohio. Finished in Gunmetal Grey with Cream & Gold trim.


GREEN LIGHT
1/8" FILLETS
COLOR LINE TWO LAMS. 1/32" X 1/20"
1/32" SQ. BRACE
NG2312
ERING EACH WING TOP HALF, BUT BEFORE SHRINKING TISSUE.
HALF CAN BE COVERED WITH ONE PIECE OF TISSUE SINCE SPAR IS LEVEL
BLOCK TIPS SO SPAR IS LEVEL TO TIP
MED. 1/20" X 3/32" 1/20" SQ. SPAR
LIGHT 1/16" RIBS
LIGHT 1/16" RIB
LIGHT 3/32" X 1/8" TAPERED
1/32"
1/16"
1/32"
1/32" BALSA TAIL WHEEL SUPPORT – BOTTOM ONLY
R STRINGERS ARE 1/20" SQ. OTHER TOP AND BOTTOM STRINGERS 1/32" SQ.
STRINGER ENDS HERE OTHERS END AT STATION #3
WHITE NAVIGATION LIGHT
RUDDER OUTLINE IS 1/32" X 1/20" MED WET FORMED
FRAME IS MED. 1/20" SQ. LWS IS 1/20" SHT.
SCRAP 1/20" SHT. FILLETS
OOR IS ON LEFT SIDE ONLY
TWA
1/20" SQ. SPAR 1/32" X 1/20" RIBS
1/20" X 1/8"
NC 2312
1/32" X 7/32" BASS MOTOR ANCHOR
HAND GRIP
STAB SLOT
SIDE STRINGERS ARE 1/20" SQ. END HERE
IECE FROM TOP TO BOTTOM
LUGGAGE COMPARTMENT
EMERGENCY FLARES
TAIL WHEEL OUTLINE IS .015 MUSIC WIRE
FILL CENTER OF LOOP WITH 1/16" BALSA DISC.
1/32" x 1/8"
3/32" SHT.
1/32"
LIGHT H 1/16" SHT
13" SPAN WACO AGC- 8 1938
Plan by Steve Griebling for "Crosswinds" 2006
CROSSWINDS #120

1938 Waco AGC-8

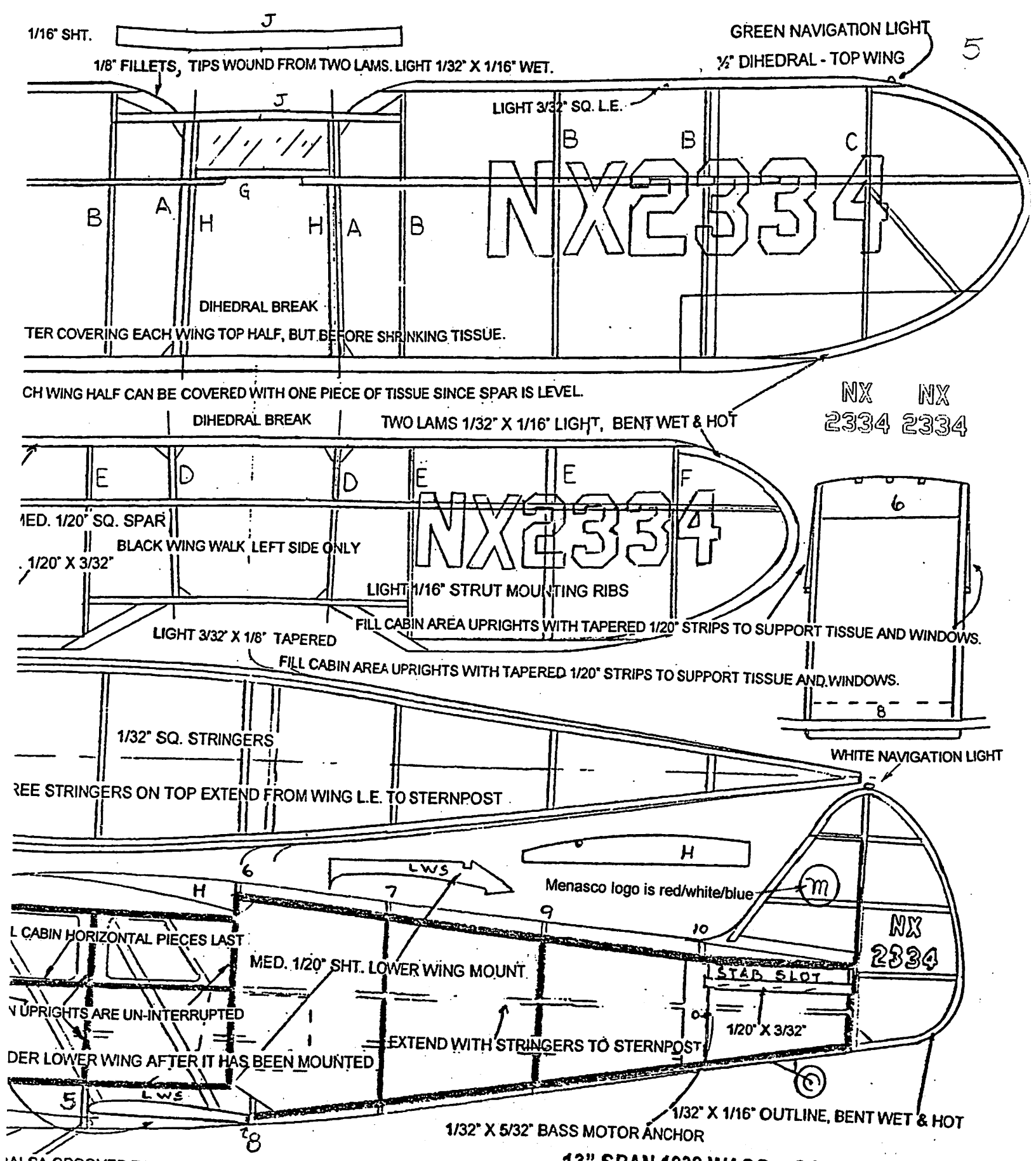
Drawings by K. Clark Pester



© K Clark Pester 1990

International Waco Association

1938 – Waco AGC 8



13" SPAN 1938 WACO GC-8 CUSTOM

COLOR SCHEME: GUNMETAL GRAY WITH MAROON TRIM OUTLINED WITH GOLD PIN STRIPES

PLAN BY STEVE GRIEBLING FOR "CROSSWINDS" 2006

painted Kensington Grey with Fokker Red and Gold trim.

CROSSWINDS #120

CLEVELAND FREE FLIGHT SOCIETY

MENASCO POWERED WACO GC-8 CUSTOM

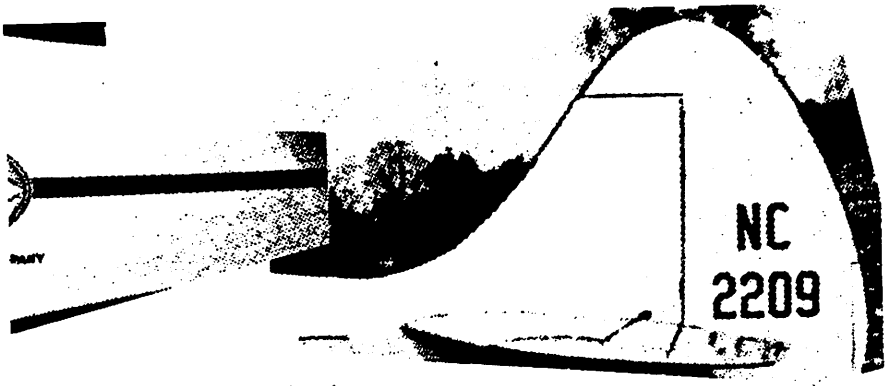
This beautiful Waco, S.N. 5065, was built for Lockheed Avaition to accommodate the Menasco 260 hp. Super Buccaneer engine in 1938. It was gunmetal gray with berry (maroon) red trim and gold pinstriping. There was no WACO code letter assigned to designate the Menasco engine. It was simply referred to as the GC-8.
A circular outline on the fin with the letter "M" inside further identified the Menasco version.
Howard Hughes probably purchased the plane directly from Lockheed after their experiments although Lockheed considered it not very satisfactory. The reason for its disappointing performance was not stated in the reference material I read, but I assume either the power or center of gravity was not ideal.

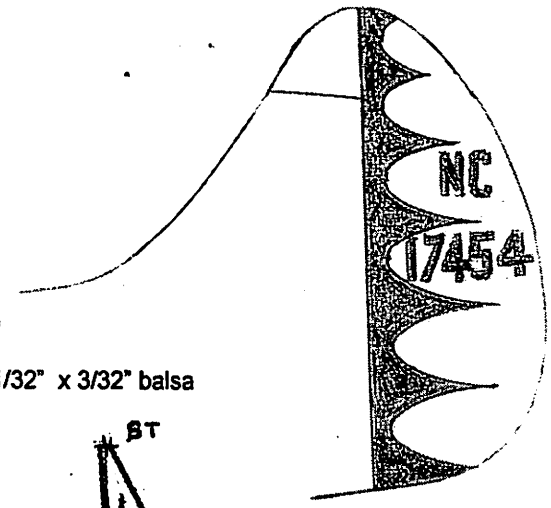
The GC-8 was purchased by Glenn E. Odekirk in Sept. 1943, who had flown for Howard Hughes. Odekirk converted the plane to use the Wright R-760-E2 350 hp. engine, and it was then redesignated EGC-8, the regular Waco nomenclature for a Wright powered C-8. It was never registered to Hughes. It was sold to the late Gordon Bourland in 1972 who had it painted cream with red trim. The original Menasco version (gray and maroon) was registered as NX 2334, but the Wright installation (cream and red) became NC 2334, reverting to the original registration assigned as if a radial engine had been installed at the factory. The Wacos shown on the cover of this "Crosswinds" are the same airplane!

Russ Brown supplied me with a fine model plan, originally designed by Bill Caldwell and beautifully redrawn by Joe Barna. I have tinkered with this plan a little so both wings would be continuous, in order to simplify their alignment and mounting. The very long nose had me concerned that the C.G. would be too far forward, so I moved the rear motor peg aft as far as practical to get more useful weight toward the rear. In other respects the construction is very similar to the radial engined model plan for the AGC-8 in a previous issue of "Crosswinds".
The main fuselage frame of 1/20" sq. is shown as gray on the plan. The uprights in the cabin area should be made of one piece extending from the lower longeron to the top of the cabin to keep them strong. The horizontal longerons just below the cabin may be interrupted without sacrificing strength. Note that the side stringers are extended from the nose to the tail post, and are superimposed over the cabin longerons then continue toward the sternpost.
Fill in above these stringers with tiny wedges of 1/20" balsa to support the windows and tissue in the cabin area and over the rear motor peg mount.
Install the stabilizer after the model is covered and doped, by cutting out a portion of the stern post. After the stab is in place, add the rudder, gluing it only at the sternpost till you have flight trimmed the model, so you can move its leading edge to get the desired turn.

I have recently been very happy with a stabilizer construction featuring medium hard 1/32" x 3/32" balsa spar and ribs set on edge. To keep everything flat on the building board and easy to lay out, I use 3/32" thick tips made from two laminates of light 1/32" x 3/32" balsa. The leading and trailing edge material is 3/32" thick as well. Sand the ribs to taper thinner toward the tips, and sand toward the leading and trailing edges to form a symmetrical airfoil. The final thickness of the leading edge should be 1/16" and the trailing edge about 1/32" thick. If you keep the stab from distorting, by laying it on a sheet of 220 grit sandpaper placed on a flat board while you sand, it is less likely to break.
Keep the spar and ribs at the center at the full 3/32" depth to resist warping.
I suggest using a 1/16" aluminum tubing thrust bearing to keep the weight down and to avoid the gap between the front plate and the spinner. You can adhere this to the 1/64" plywood nose plate and its hard balsa key with cyano. If you plan to fly the model outdoors, I suggest an external free wheeler since the spinner is quite small.
You may need to experiment to get the gunmetal gray color without using colored dope. I suggest you try white tissue and medium gray "Nu Pastel" chalk rubbed it to the rough side of the tissue.
The maroon striping will have to be opaque, so bond paper, "Trim Strip" or colored tissue may have to be used. Tissue can be colored maroon with dope or a Berol mahogany felt tip marker. The gold pinstripe edging can be applied with a gold gel pen if you have a steady hand. Apply the pin striping before you cut and apply the maroon striping to the model. Make the registration letters from colored tissue with the gold edging pre applied and carefully cut them out to reduce the pinstripe width. I used medium gray acrylic paint over the wheel pants and nose block, then added the striping.
Use elastic thread at very low tension for the diagonal and inner landing gear struts.
My model weighed 12 grams without motor. I suggest 4 strands of .060" rubber, 18" long, braided.
The low pitched prop, necessary for biplanes, should give you a fast climb with this power.

Steve Griebling for Crosswinds – 2007.

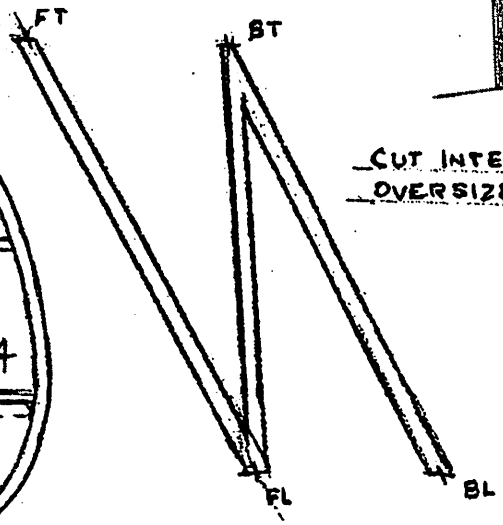




: to the rough side of white tissue.
/ to Waco sales in New York.

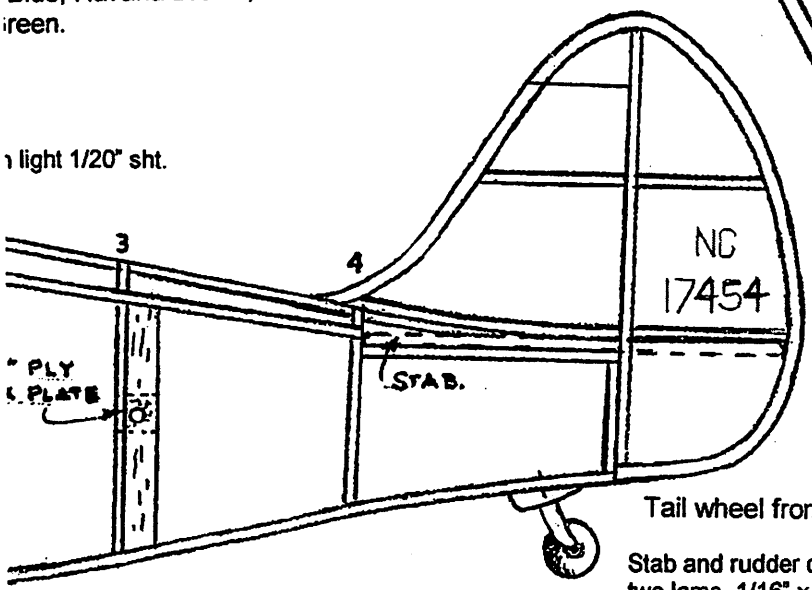
Blue, Havana Brown, Fokker Red
ireen.

Struts from hard 1/32" x 3/32" balsa



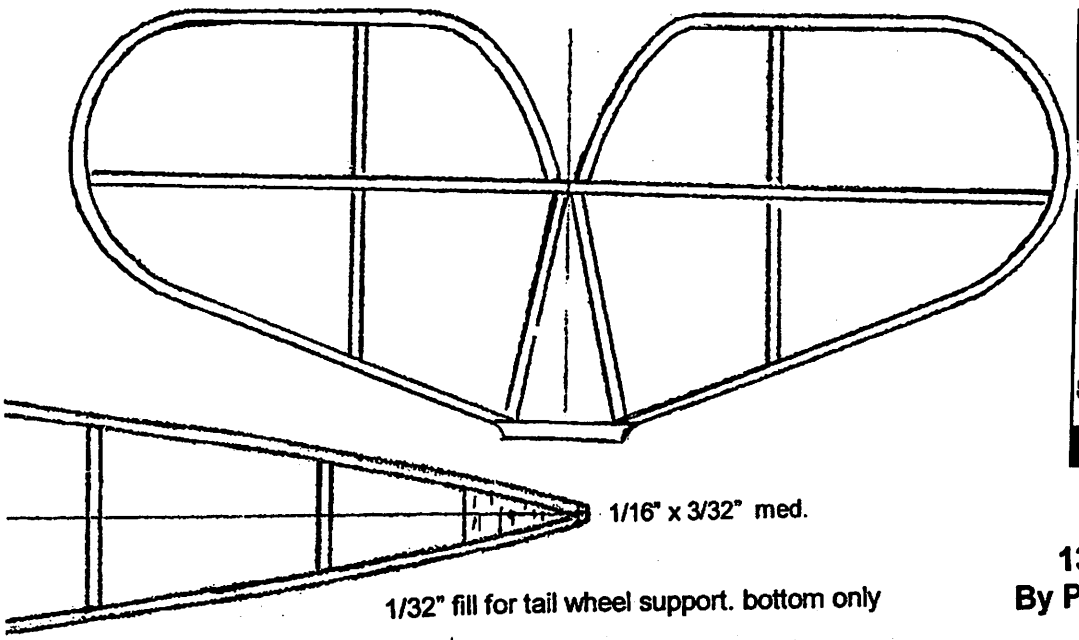
CUT INTERPLANES
OVERSIZE, TRIM TO FIT

ı light 1/20" sht.



Tail wheel from 1/16" sht., (surround with .015 wire)

Stab and rudder outlines from
two lams. 1/16" x 1/32" spar and ribs light 1/16" sq.



1/16" x 3/32" med.

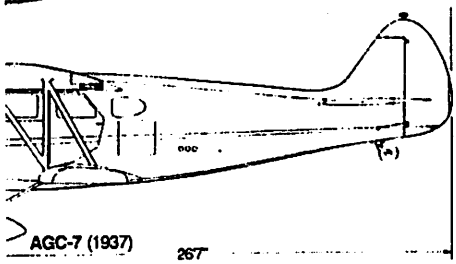
1/32" fill for tail wheel support. bottom only

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13" WACO C-7
By Paul Boyanowski



CROSSWINDS

CLEVELAND FREE FLIGHT SOCIETY

CROSSWINDS #120

THE WACO C-7

The Waco cabin series biplanes were introduced in 1924 with a rather awkward conversion of the open cockpit Model 8 Waco. It could carry six passengers in the cabin and two in the open cockpit. It was primarily used for photographic aerial mapping, but was crashed and destroyed at Richard Field in the Ozarks. This modified model 8 was powered with a 250 hp Liberty engine. Only one was built.

A more purposeful Cabin Waco was designed and built in 1931. It was a four place model powered with a 165 hp Continental A-70-2 engine. A total of 37 were produced. and were designated QDC. This then started the whole series of Cabin Wacos which were improved yearly until the last model, the E series of 1940, was designed.

In 1937 the Waco Aircraft Company added to its yearly improvements in the custom cabin series planes by increasing the landing gear tread to nine feet, eliminating the stabilizer to fin bracing wires, increasing the size of the split type, fabric covered, flaps, adopting toe operated hydraulic brakes and increasing the travel of the oleo struts. The custom cabin series was also equipped with luxurious automobile type upholstery and other interior details in the 1937 model year.

A total of 51 C-7 series aircraft were built. Thirty five of these were powered with Jacobs L5 285 hp engines, 7 with Jacobs L4 225 hp, 7 with Wright R760 E2 350 hp, and 2 with Wright 760 E1 285 hp engines.

Continental W670K 225 hp and 670M 240 hp engines were also offered, but none of the C-7s were so fitted.

Curtiss-Reed 99" dia.x 84" pitch propellers were supplied on all Jacobs L5 (ZGC-7s), but Hamilton Standard Controllable pitch props were standard on the Wright powered EGC-7s.

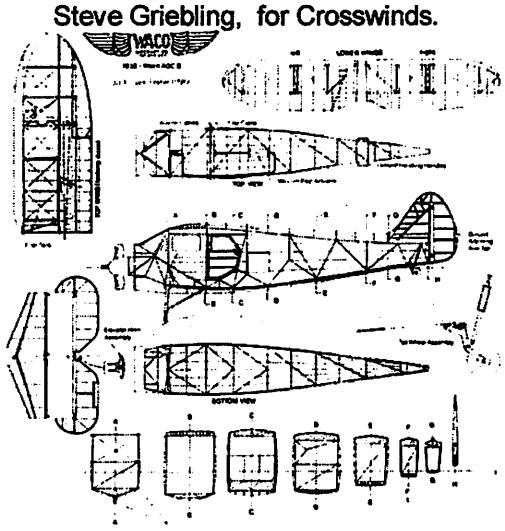
Registration number NC 17454 was the first C-7 produced in 1937 and was delivered to the Waco sales outlet in Mineola, Long Island, New York on January 20. Its cream overall color was decorated with black trim edged in red. This color scheme is particularly attractive for a model because its light background obviates the need for complicated and heavy striping, necessary for hiding darker background colors.

In addition to these Custom Cabin Wacos, 35 Standard Cabin Waco (S-7s) were built in 1937.

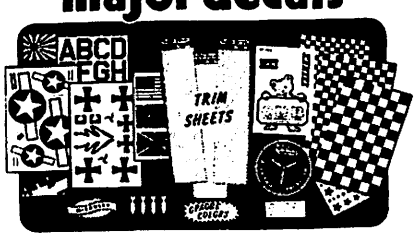
Crosswinds is particularly pleased to offer this peanut sized plan by one of the Flying Aces outstanding model builders and flyers – Paul Boyanowski, who generously contributed this plan for our subscribers. In fact, Paul drew up the plan at our request even thought he already had a plan for the C-7 with a 21.75" span!
Thanks, Paul!

Based upon my own experience with peanut Wacos, a motor made of 4 strands of braided 1/16" Tan II or Super Sport rubber should do the trick. Gordon Roberts usually used a 6" Tern Aero prop on his peanut Wacos, but a Peck prop should do fine as well.

Steve Griebling, for Crosswinds.



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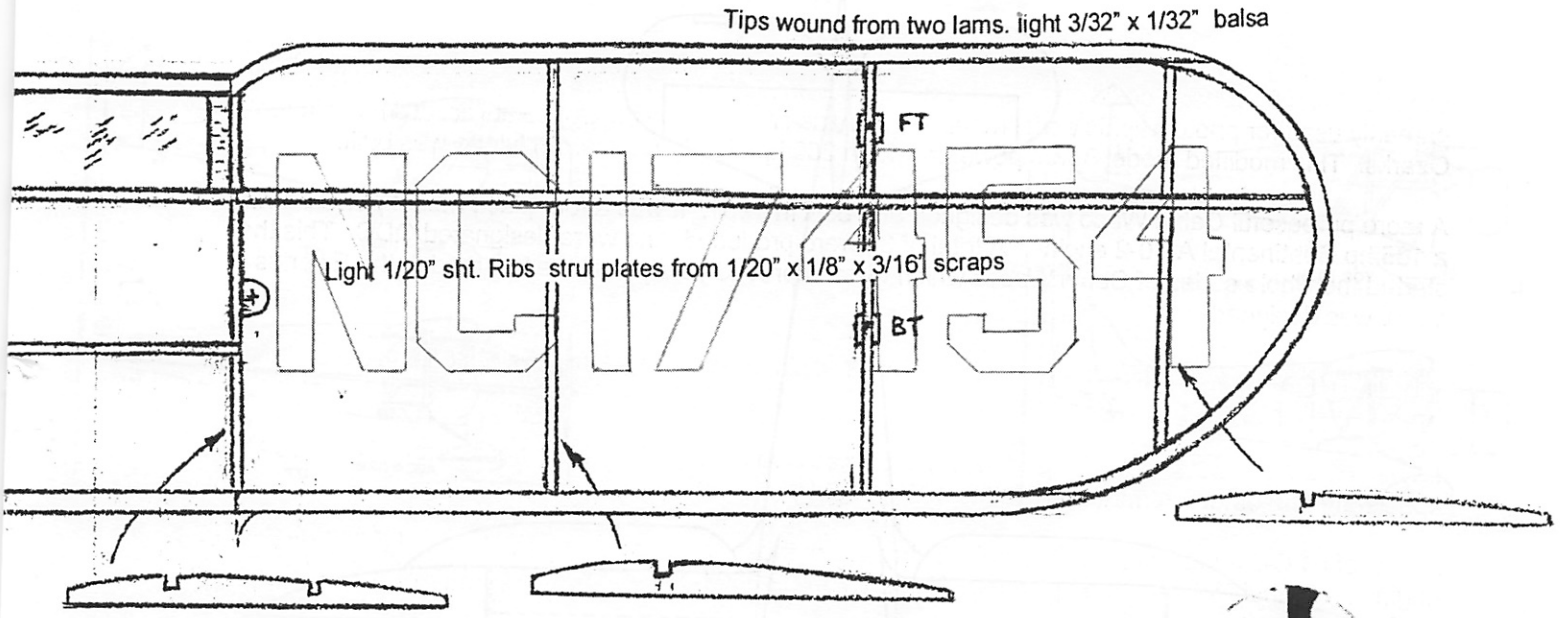
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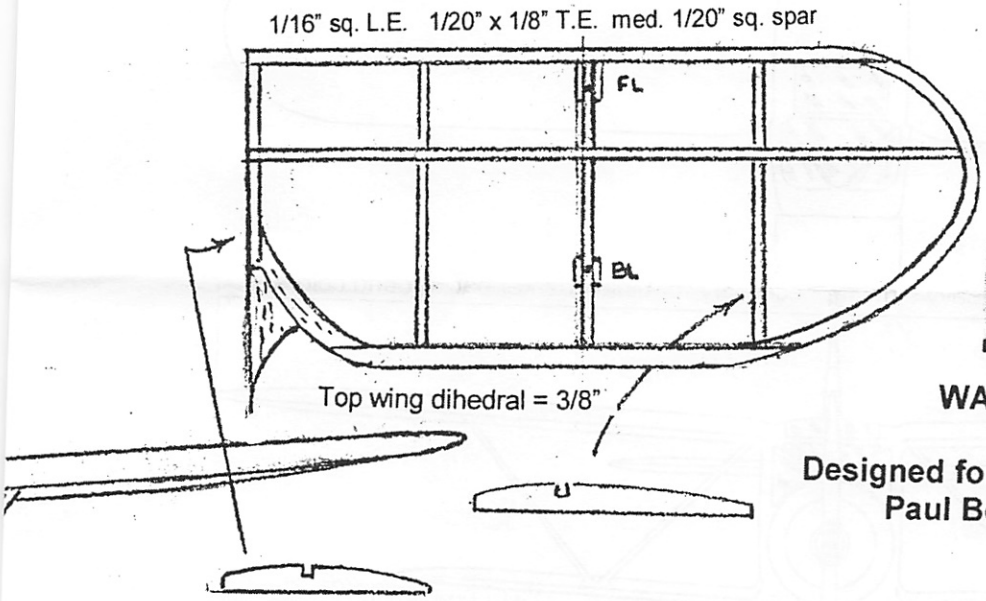
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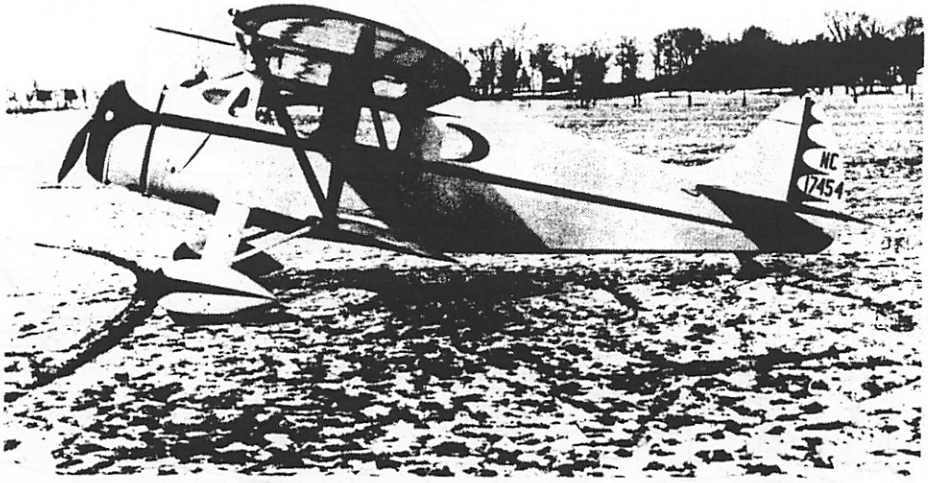






WACO C-7

Designed for Crosswinds by Paul Boyanowski

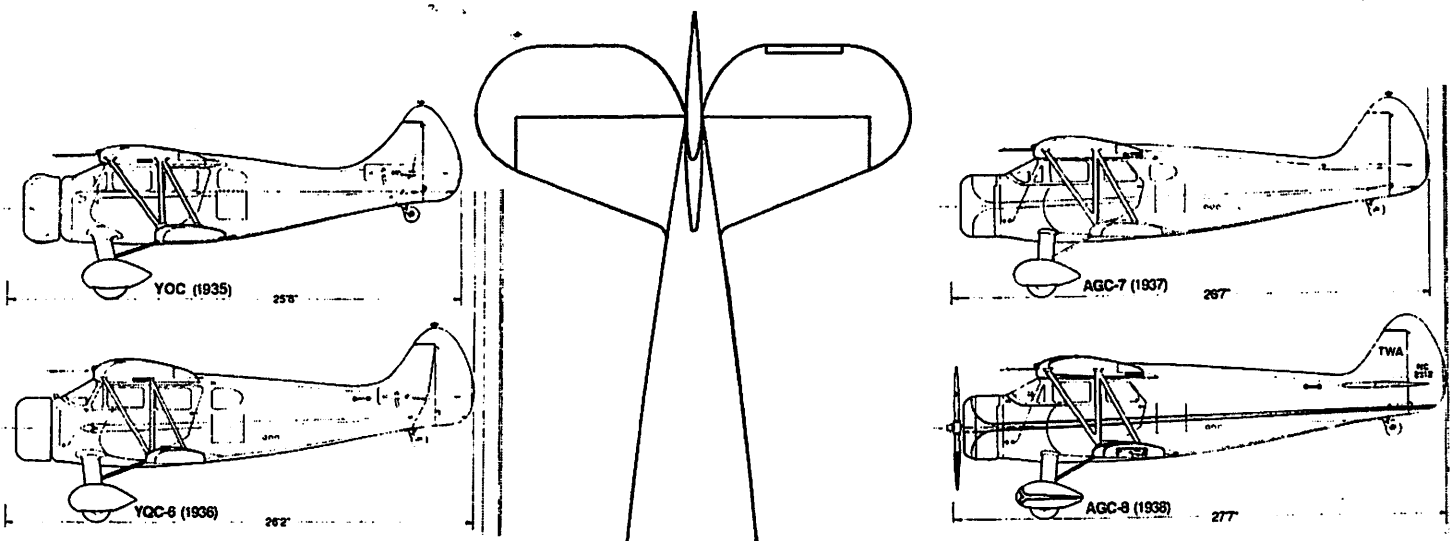


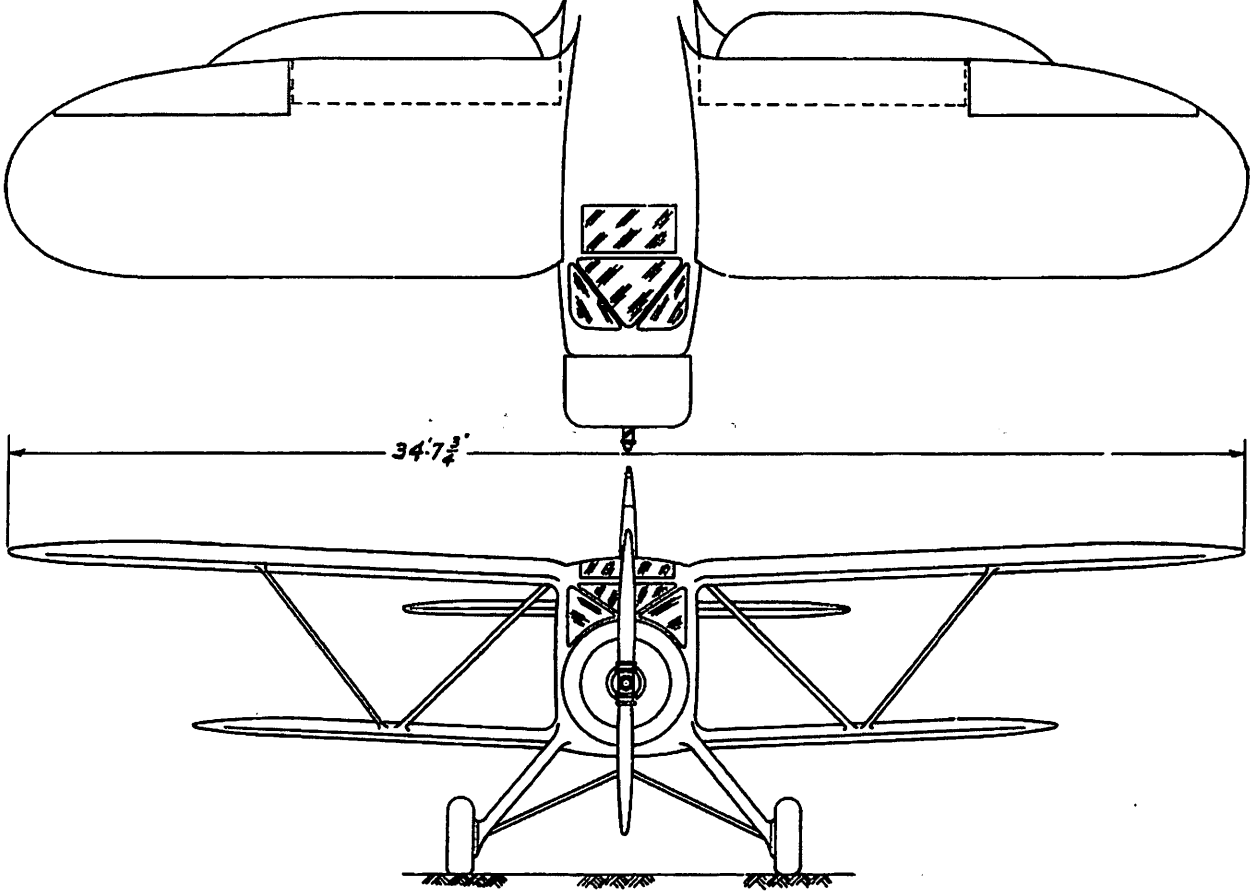
First Waco ZGC-7, ready for delivery to Waco Sales in New York, 1-20-37. This C-7 Custom finished in Cadmium Cream with Black trim edged in Red.

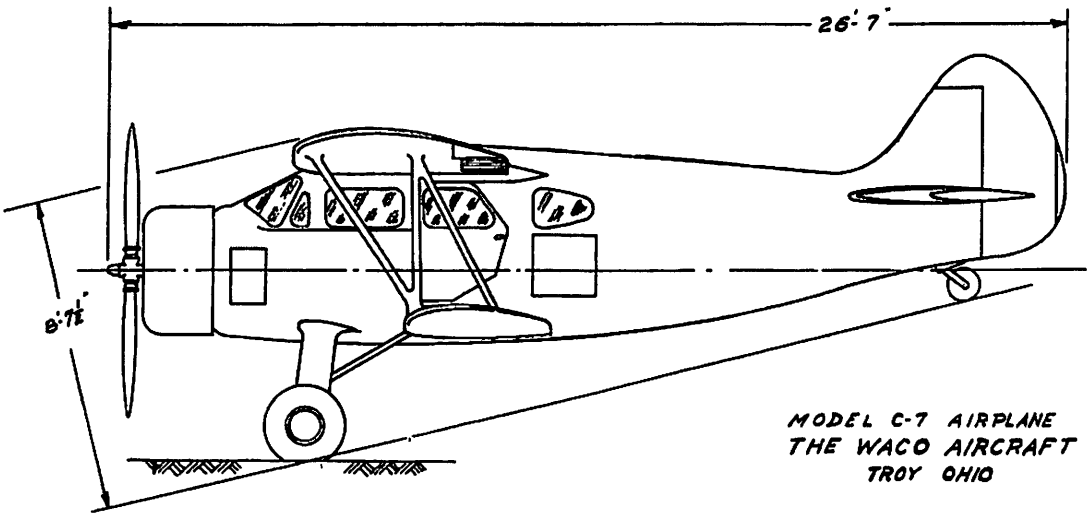
Z°

/32" balsa

ATION MUSEUM
BOR







MODEL C-7 AIRPLANE
THE WACO AIRCRAFT CO.
TROY OHIO

PINKHAM FIELD IRREGULARS
22 SQUADRON, FLYING ACES CLUB
4304 MADISON AVE.,
TRUMBULL,CT 06611

12/10/01

Hi Clubster,

Congratulations on the 100th Crosswinds published. Quite an achievement. As usual, the contents were of interest and a pleasure to absorb. Steve Griebling's article on his experiences with props on outdoor rubber jobs has driven me to write this bit concerning my own experiences over the years, for what it may be worth.

HIGH PITCH, LOW PITCH

A low P/D ratio prop gives a model a higher rate of climb, but a shorter motor run for a given cross section of rubber and number of turns. The high P/D ratio prop gives a lower rate of climb, and a longer motor run for the same cross section of rubber and number of turns. The high P/D prop also causes more reaction to torque, making the model more difficult to trim.

BLADE AREA

The model with high drag (multi-planes, dummy motors with free wheeling props) needs more blade area. This usually requires more rubber cross section, which is necessary to handle the higher drag. Whether the greater blade area is accomplished through a lower aspect ratio blade or increased diameter effects only the difficulty in trimming the model.

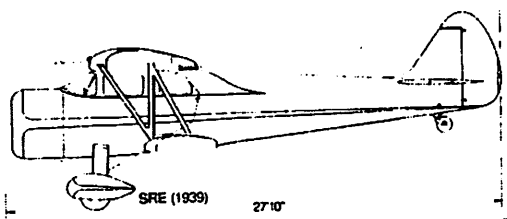
PLASTIC PROPS, CARVED PROPS

Plastic props work well. By heating them over a soldering iron some pitch change can be made to them. One reason they work well may be caused by the thin blade cross section they possess. If you are willing to spend the time, a carved prop offers many more options in design. True helical pitch, desired pitch, blade area, and diameter are yours.

Over the years, a carved prop with thin blade cross section, under cambered slightly from 1/2 the radius inward, and flat bottomed from 1/2 the radius to the tip have worked very well. The cross section has been kept at 1/16 the blade width. The tip shape has been a full radius. They take time to carve and are more fragile, but are worth the effort. And, in these days of Hot Stuff and Zap, field repairs are easy.

PROP SELECTION

The ancient rule of selecting a prop of 33% to 40% of the wingspan is pretty broad. Models with a high aspect ratio wing certainly do not need a prop this big. The 15% motor weight rule has caused some experiments in the use of props smaller than 33% of the span. Some of us are now accessing the wing loading and drag of a model, then calculating how much cross section of rubber the model might require. We then choose a prop diameter that will handle this motor efficiently. In many cases, the prop has ended up being only 25% of the wing span. In short, let the power required select the prop, rather than the prop driving the power requirement. The end result is a model that is easier to trim and has a better flight path.

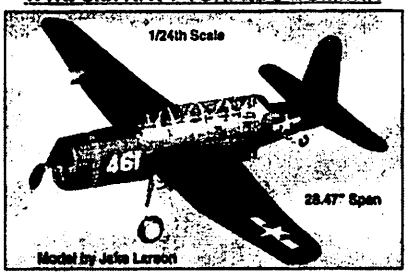


Happy holidays,

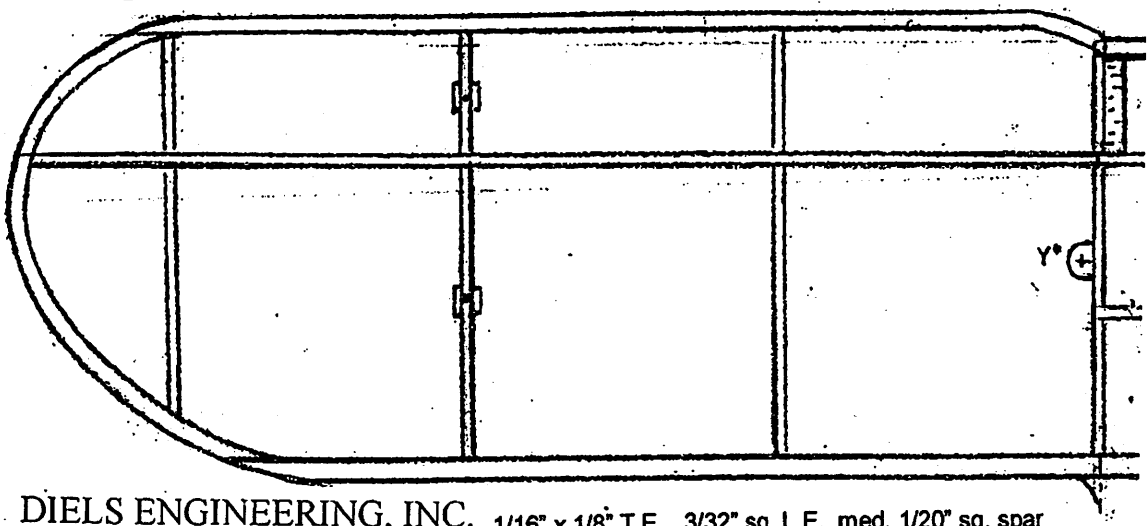
Dave

e-mail at dielsengr@kellnet.com
VISIT OUR WEB PAGE AT
http://pageproducer.acninc.net/dielsengr/

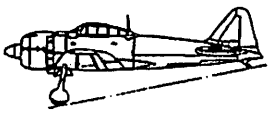
DIELS ENGINEERING, INC.
P.O. BOX 263
AMHERST, OHIO 44001
KIT #32 CONSOLIDATED TBY-2 SEAWOLF
WW2 U.S. NAVY TORPEDO BOMBER



The complete kit contains the usual high quality stuff including plans sheets with instructions, printwood, stripwood, plastic canopy, color decals, lightweight tissue, plastic prop, and hardware.
Price is $35.95 for ea. kit plus $7 ea. shipping.
Catalog $2 or free with order.
E-mail: dielsengr@kellnet.com
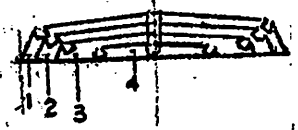


DIELS ENGINEERING, INC. 1/16" x 1/8" T.E. 3/32" sq. L.E. med. 1/20" sq. spar
KIT # 18. MITSUBISHI A6M2 ZERO.



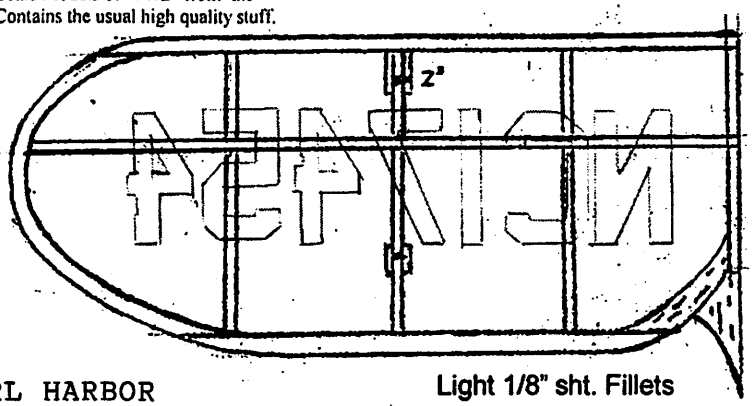
WW2 Japanese fighter plane 1/24 scale, about 18" span, from the Model Builder Book "Flying Scale Models of WW2" from the 1970's. Contains the usual high quality stuff.

TOP FUSE. FORMERS



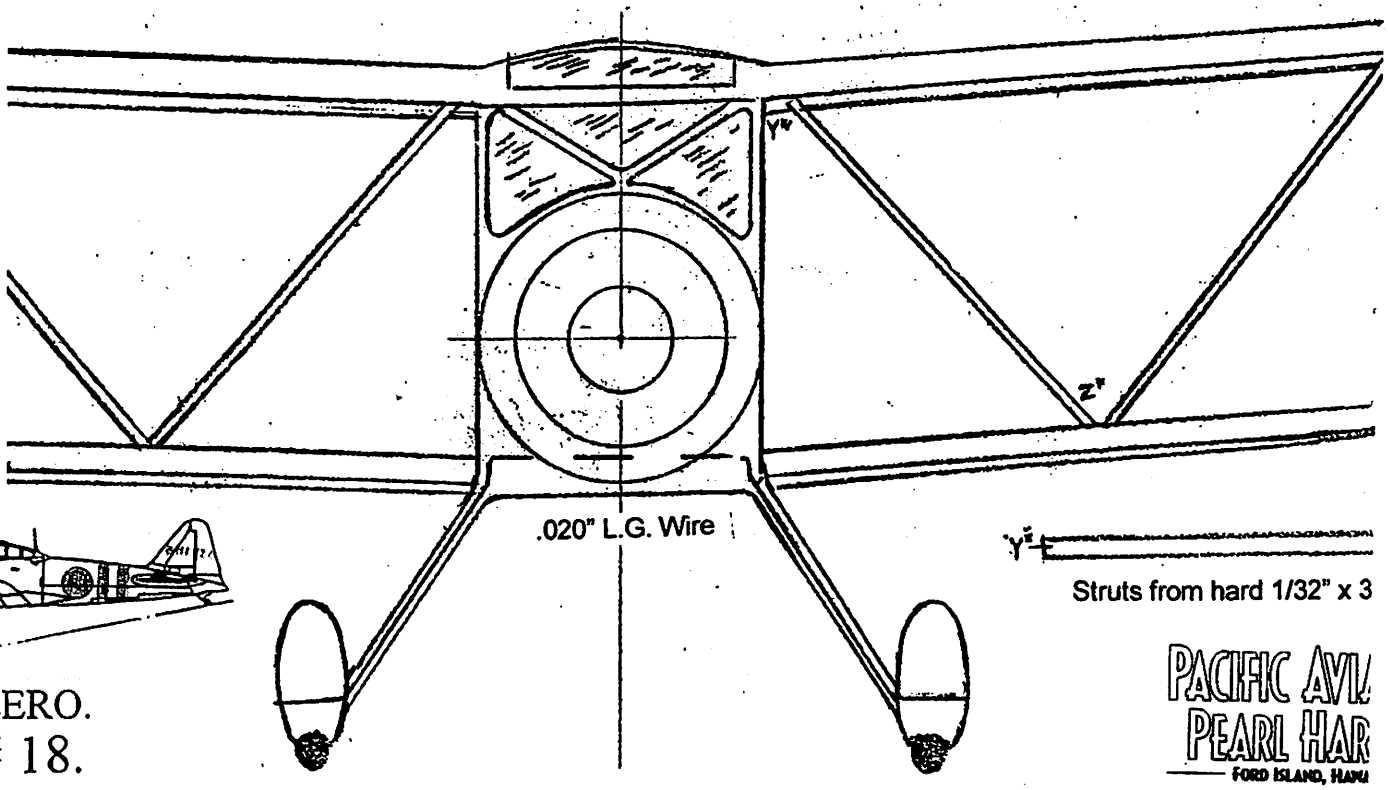
printed plans, printwood, building instructions, 3-views, plastic canopy, decals, plastic prop and hardware, stripwood, lightweight tissue

COVER FUSE WITH TISSUE LEAVING TOP UNCOVERED. COVER TOP WING LEAVING CENTER SECTION UNCOVERED. INSTALL TOP WING, ADD TOP FUSE FORMERS AND STRINGERS. FRAME-UP CAB N ROOF WINDOW, COMPLETE COVERING.



WW II Pacific Aircraft REMEMBER PEARL HARBOR

Light 1/8" sht. Fillets



Struts from hard 1/32" x 3

A6M2 ZERO.
KIT # 18.

PACIFIC AVI
PEARL HAR
FORD ISLAND, HAW

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.

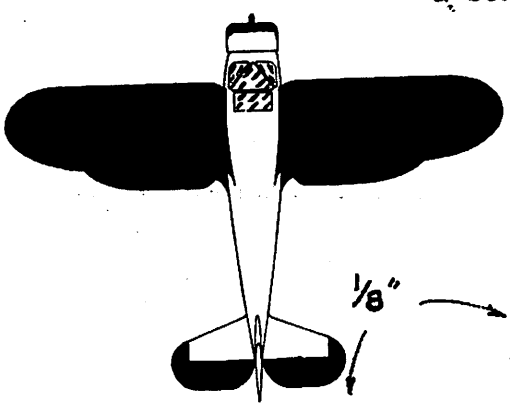
Current registration records show many Wacos registered with incorrect model identification letters and suffix numbers.

14

C-7 NC 2209 in Std. Oil White, Red stripe,
& SOHIO, Blue trim and struts.

THE STANDARD OIL COMPANY

OF OHIO CORPORATION

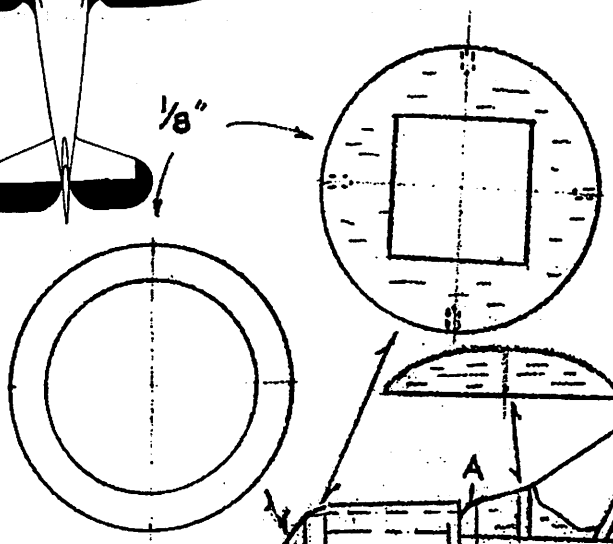


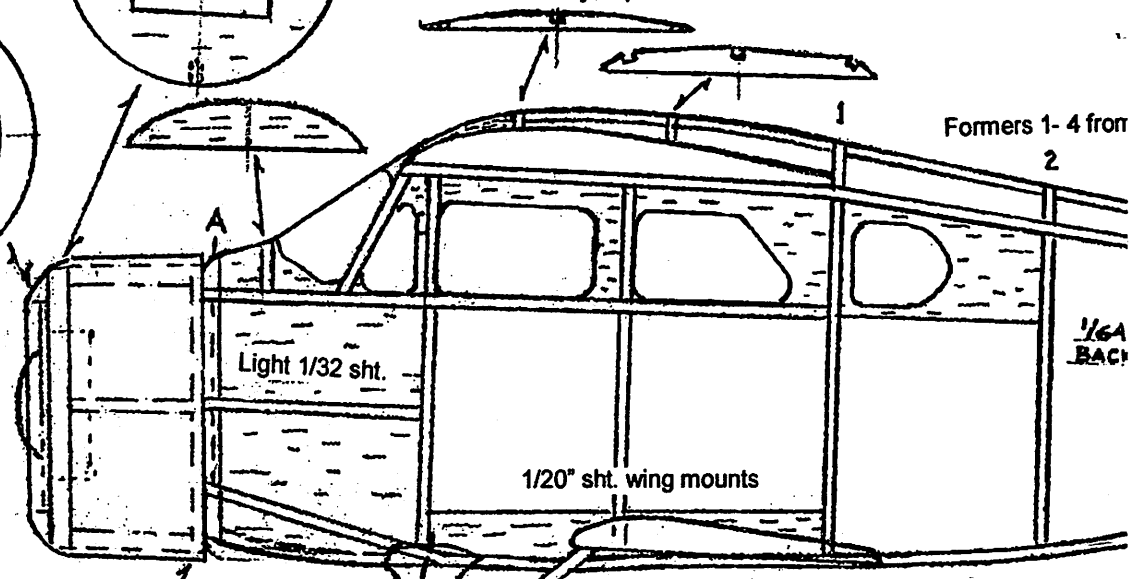


Suggested color scheme:

NC 17454 was cream with black trim edged in red.
Cream tissue may be produced by application of cream chalk
See the photo of this plane, the first ZCG-7, ready for delivery

Other color schemes were Vermilion , Diana Cream, Insignia
Gunmetal Grey, Spartan Green, Cadmium Green, Emerald G

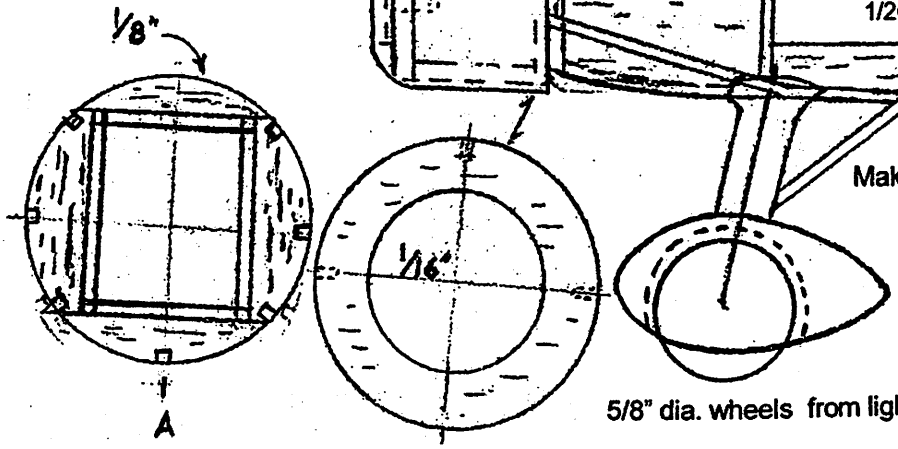




Formers 1- 4 from

1/64 BACK

Cowl is light 1/32" sht.



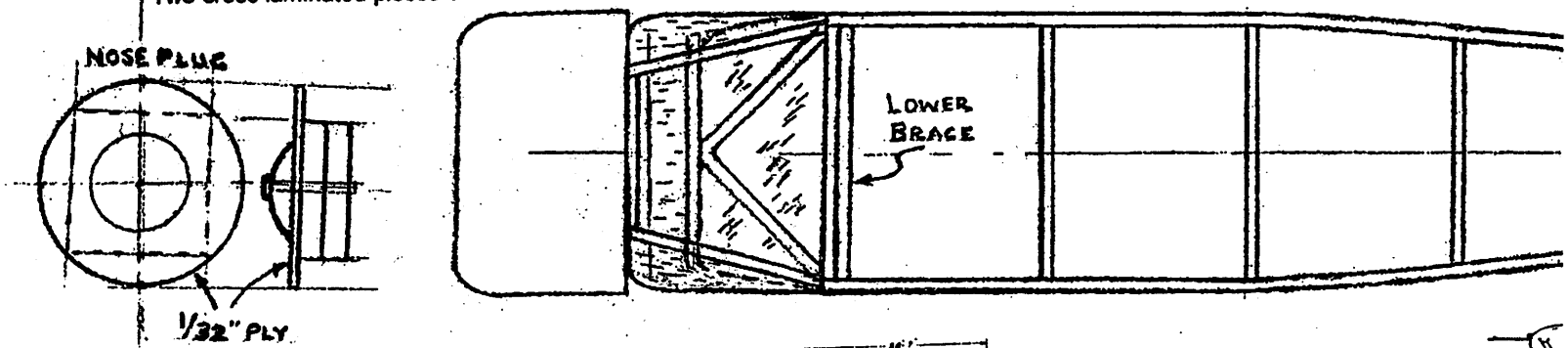
Frame and stringers 1/20" sq.

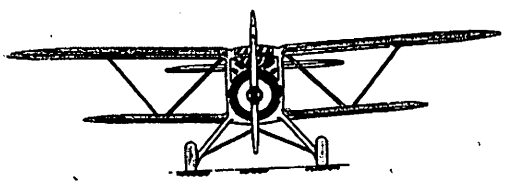
Make L.G. rear brace from elastic thread

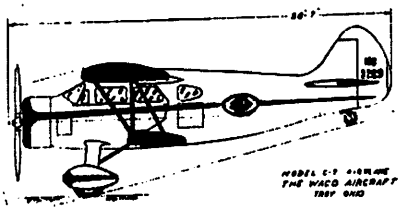
WHEEL PANTS: FOAM CORE, 1/32" SHEET BALSA SIDES

5/8" dia. wheels from light 1/8" sht. with 1/16" alum.tubing bushings

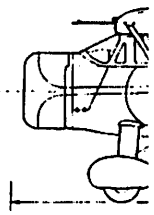
Two cross laminated pieces of 1/8" sht. for nose key

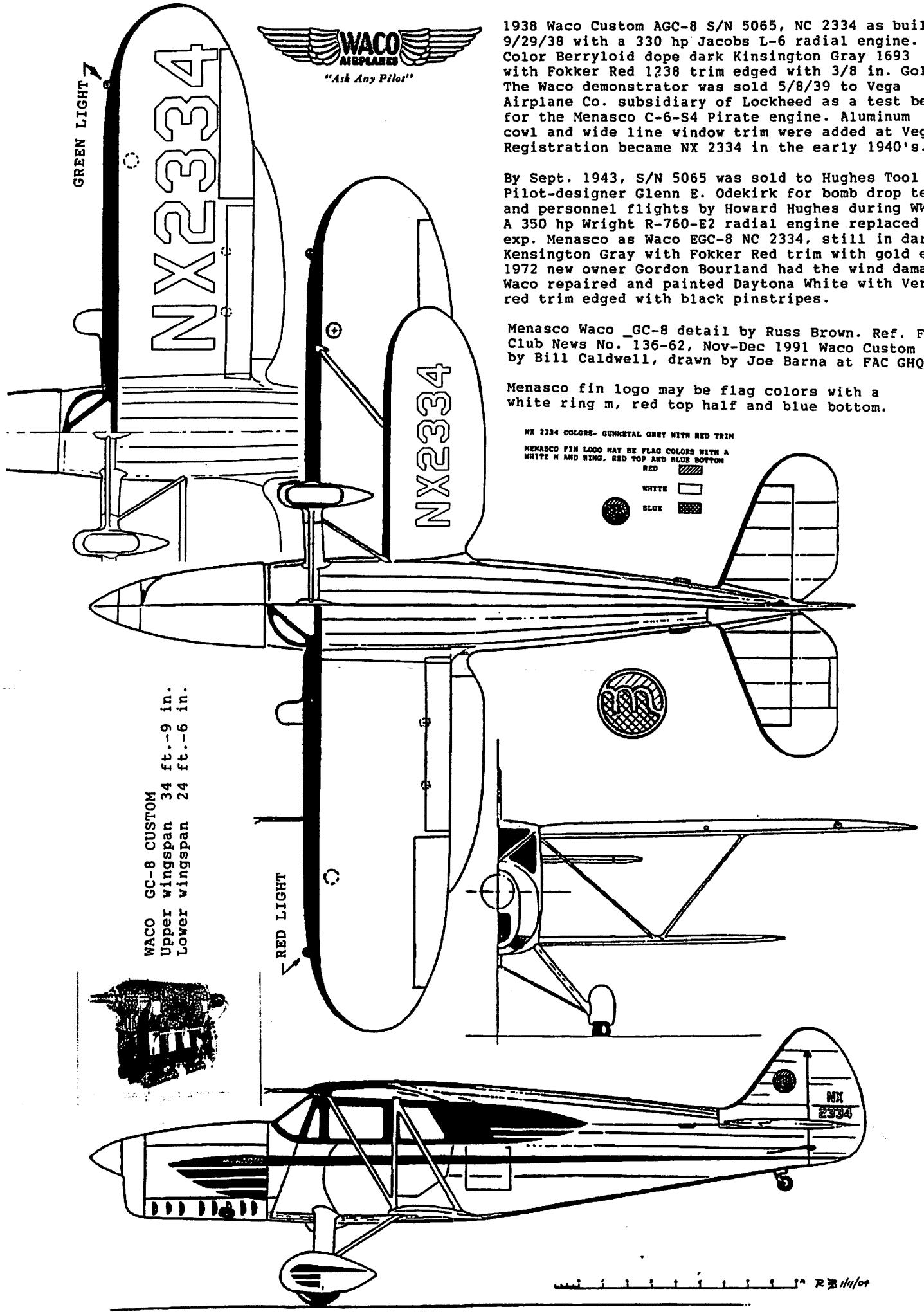






WACO EGC-7
1937



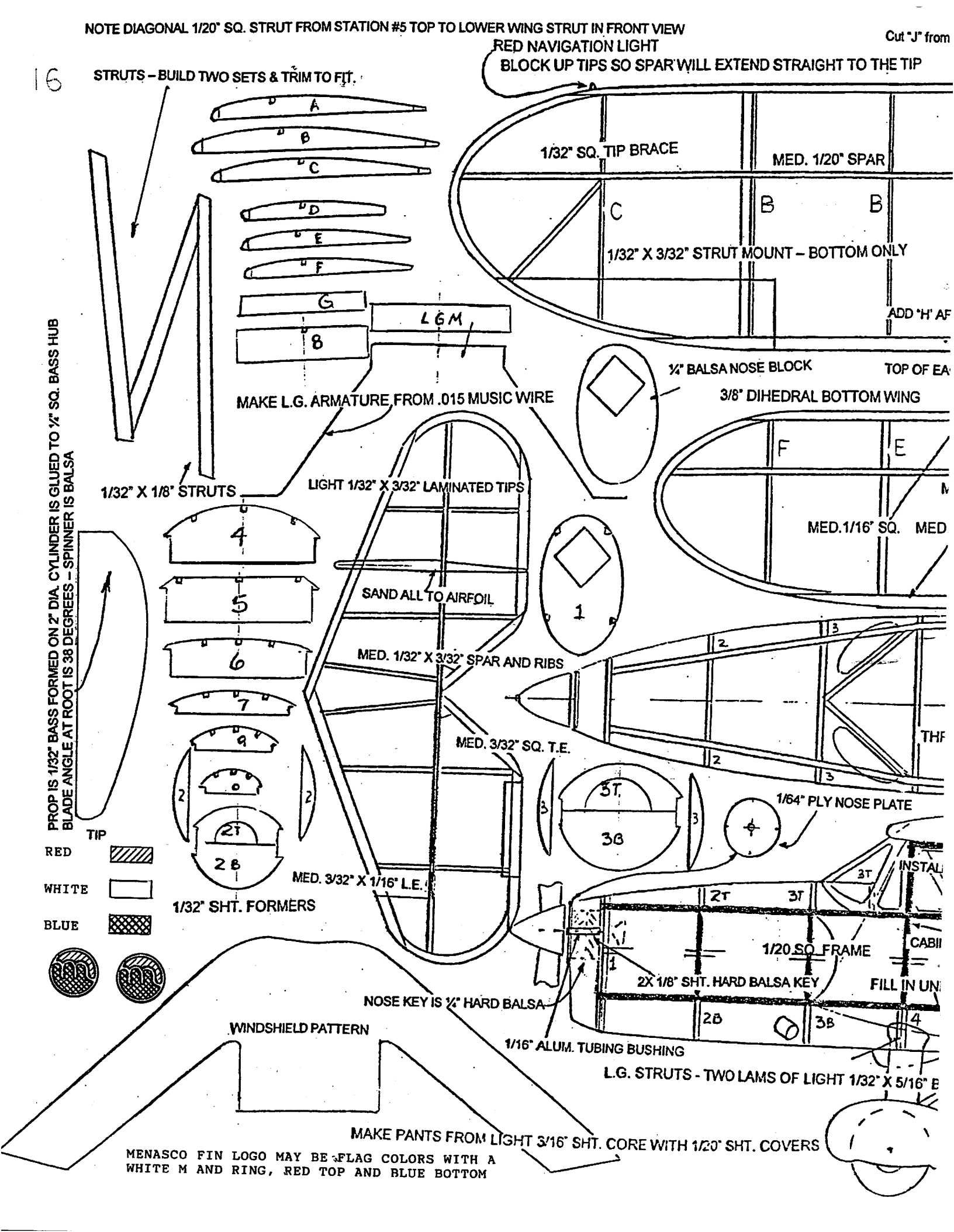


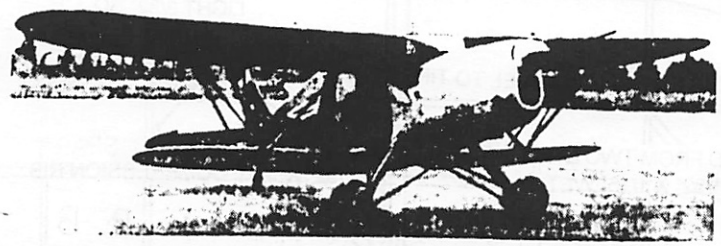
1938 Waco Custom AGC-8 S/N 5065, NC 2334 as built 9/29/38 with a 330 hp Jacobs L-6 radial engine. Color Berryloid dope dark Kinsington Gray 1693 with Fokker Red 1238 trim edged with 3/8 in. Gold. The Waco demonstrator was sold 5/8/39 to Vega Airplane Co. subsidiary of Lockheed as a test bed for the Menasco C-6-S4 Pirate engine. Aluminum cowl and wide line window trim were added at Vega. Registration became NX 2334 in the early 1940's.

By Sept. 1943, S/N 5065 was sold to Hughes Tool Co. Pilot-designer Glenn E. Odekirk for bomb drop test and personnel flights by Howard Hughes during WW II. A 350 hp Wright R-760-E2 radial engine replaced the exp. Menasco as Waco EGC-8 NC 2334, still in dark Kensington Gray with Fokker Red trim with gold edges. 1972 new owner Gordon Bourland had the wind damaged Waco repaired and painted Daytona White with Vermilion red trim edged with black pinstripes.

Menasco Waco _GC-8 detail by Russ Brown. Ref. FAC Club News No. 136-62, Nov-Dec 1991 Waco Custom -8 by Bill Caldwell, drawn by Joe Barna at FAC GHQ.

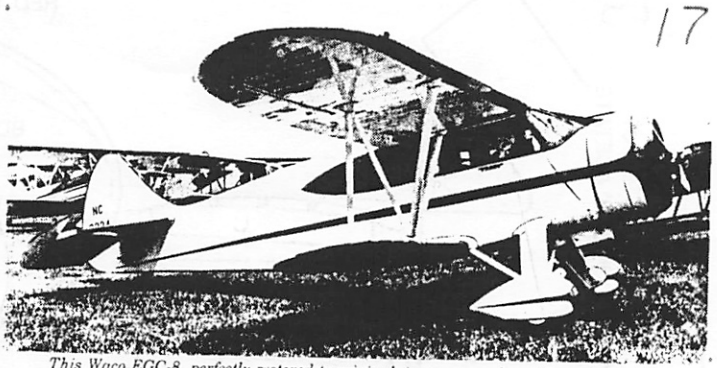
Menasco fin logo may be flag colors with a white ring m, red top half and blue bottom.


NOTE DIAGONAL 1/20" SQ. STRUT FROM STATION #5 TOP TO LOWER WING STRUT IN FRONT VIEW
Cut "J" from
RED NAVIGATION LIGHT
BLOCK UP TIPS SO SPAR WILL EXTEND STRAIGHT TO THE TIP
16
STRUTS – BUILD TWO SETS & TRIM TO FIT.
A
B
C
D
E
F
G
8
LGM
1/32" SQ. TIP BRACE
MED. 1/20" SPAR
C
B
B
1/32" X 3/32" STRUT MOUNT – BOTTOM ONLY
ADD 'H' AF
¼" BALSA NOSE BLOCK
TOP OF EA
3/8" DIHEDRAL BOTTOM WING
MAKE L.G. ARMATURE FROM .015 MUSIC WIRE
1/32" X 1/8" STRUTS
LIGHT 1/32" X 3/32" LAMINATED TIPS
F
E
MED.1/16" SQ.
MED
4
5
6
7
9
0
2T
2B
1
SAND ALL TO AIRFOIL
MED. 1/32" X 3/32" SPAR AND RIBS
2
3
THF
MED. 3/32" SQ. T.E.
3T
3B
1/64" PLY NOSE PLATE
INSTAL
2T
3T
1/20 SQ. FRAME
CABII
2X 1/8" SHT. HARD BALSA KEY
FILL IN UN
NOSE KEY IS ¼" HARD BALSA
2B
3B
4
1/16" ALUM. TUBING BUSHING
L.G. STRUTS - TWO LAMS OF LIGHT 1/32" X 5/16" B
MED. 3/32" X 1/16" L.E.
1/32" SHT. FORMERS
PROP IS 1/32" BASS FORMED ON 2" DIA. CYLINDER IS GLUED TO ¼" SQ. BASS HUB
BLADE ANGLE AT ROOT IS 38 DEGREES – SPINNER IS BALSA
TIP
RED
WHITE
BLUE
WINDSHIELD PATTERN
MAKE PANTS FROM LIGHT 3/16" SHT. CORE WITH 1/20" SHT. COVERS
MENASCO FIN LOGO MAY BE FLAG COLORS WITH A
WHITE M AND RING, RED TOP AND BLUE BOTTOM

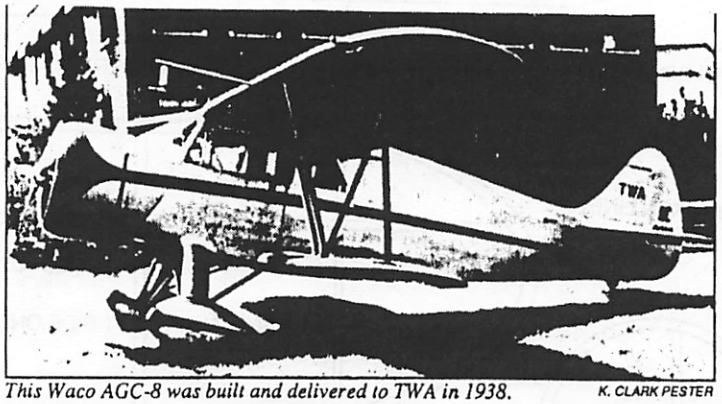


Unusual test installation of a Menasco C-6-S4 engine has been made in this Waco Model S custom job. The inverted six cylinder in-line type develops 290 h.p. for take-off.

C-8 NX 2334 in Dark Gray & Dark Red trim, Gold edge. New A1. Cowl for Menasco tests.

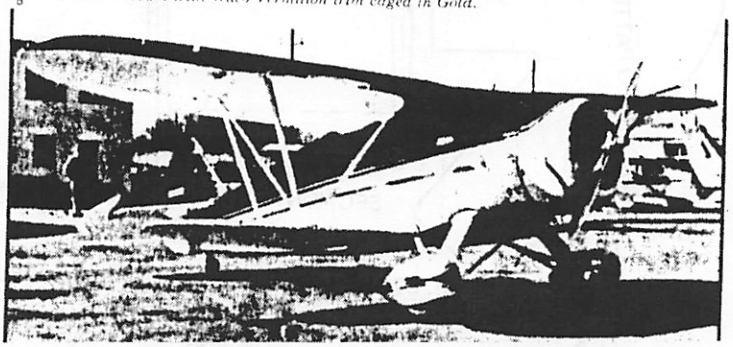


This Waco EGC-8, perfectly restored to original, is now owned and flown by Gordon Bourland of Fort Worth Texas. Once owned by the Vega Airplane Company where it used a Menasco engine and later was owned by the late Howard Hughes. Currently painted Cream with Waco Vermilion trim edged in Gold.

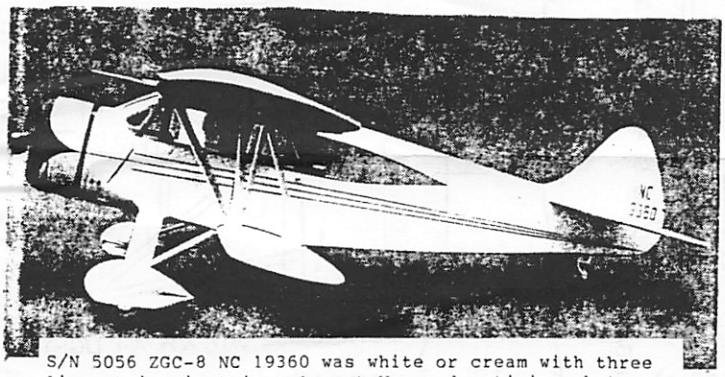


This Waco AGC-8 was built and delivered to TWA in 1938. K. CLARK PESTER

TWA's lt. gray with blue trim, red edge AGC-8 NC 2312



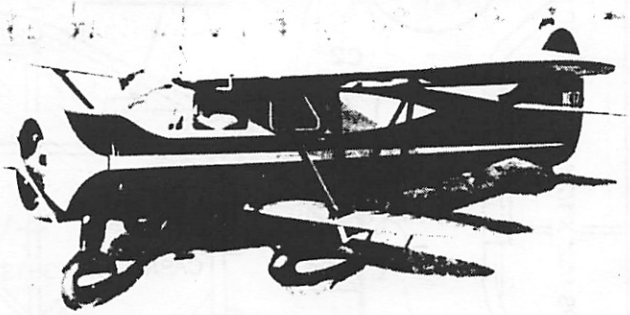
AGC-8 NC 2312 Repaint Bronze & White Black & Gloss Gold trim stripes.



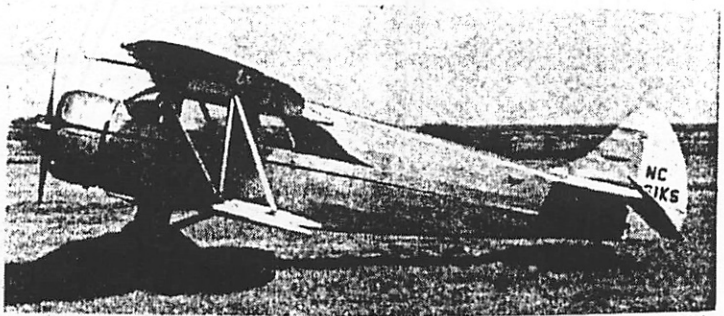
S/N 5056 ZGC-8 NC 19360 was white or cream with three line stripe in trim color at Waco advertising photo. Repainted color was yellow with green fuselage and fin.



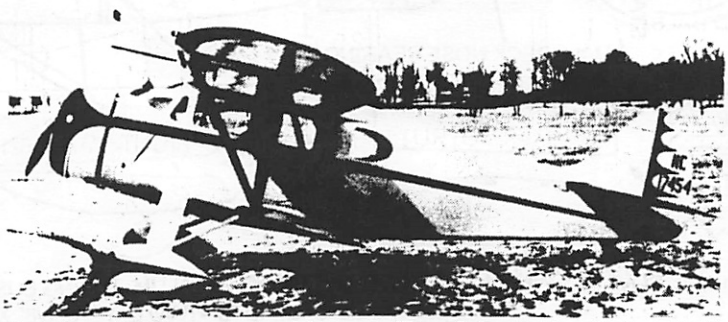
1938 Custom Waco ZGC-8 NC19360 with Glen Hanson at the controls. Now owned by Tony Barnum of Toledo, Ohio. Colors are Green with Yellow trim.



Waco AVN-8 purchased by the CAA Air Safety Board, November 1938.

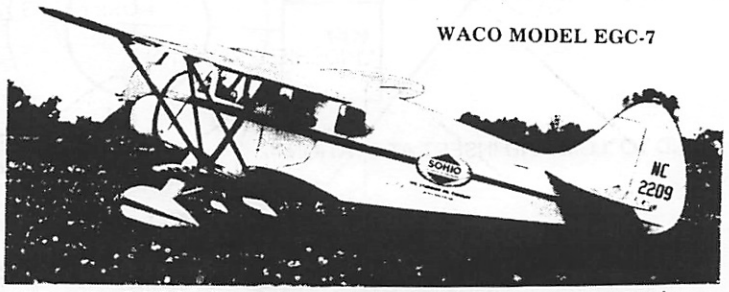


C.A.A. black & orange AGC-8s NC-8,53,59,60,61,62,103 & NC 104.

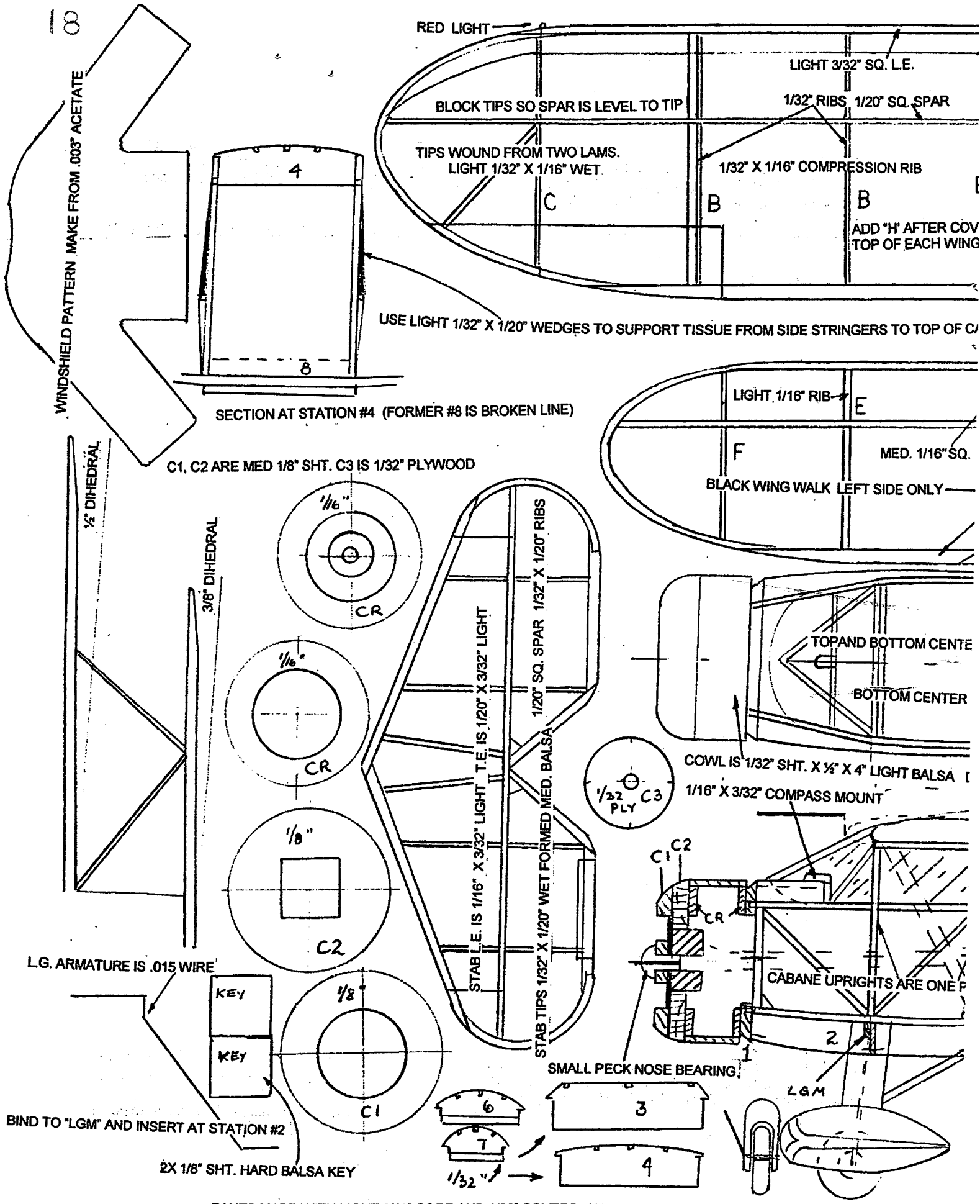


First Waco ZGC-7, ready for delivery to Waco Sales in New York, 1-20-37. This C-7 Custom finished in Cadmium Cream with Black trim edged in Red.

WACO MODEL EGC-7



C-7 NC 2209 in Std. Oil White, Red stripe, & SOHIO, Blue trim and struts.


WINDSHIELD PATTERN MAKE FROM .003" ACETATE
RED LIGHT
LIGHT 3/32" SQ. L.E.
BLOCK TIPS SO SPAR IS LEVEL TO TIP
1/32" RIBS 1/20" SQ. SPAR
TIPS WOUND FROM TWO LAMS. LIGHT 1/32" X 1/16" WET.
1/32" X 1/16" COMPRESSION RIB
C
B
B
ADD "H' AFTER COV
TOP OF EACH WING
USE LIGHT 1/32" X 1/20" WEDGES TO SUPPORT TISSUE FROM SIDE STRINGERS TO TOP OF CA
4
8
SECTION AT STATION #4 (FORMER #8 IS BROKEN LINE)
LIGHT 1/16" RIB
E
F
MED. 1/16" SQ.
BLACK WING WALK LEFT SIDE ONLY
C1, C2 ARE MED 1/8" SHT. C3 IS 1/32" PLYWOOD
½" DIHEDRAL
3/8" DIHEDRAL
1/16"
CR
1/16"
CR
1/8"
C2
1/8"
C1
KEY
KEY
L.G. ARMATURE IS .015 WIRE
BIND TO "LGM" AND INSERT AT STATION #2
2X 1/8" SHT. HARD BALSA KEY
1/20" SQ. SPAR 1/32" X 1/20" RIBS
T.E. IS 1/20" X 3/32" LIGHT
STAB L.E. IS 1/16" X 3/32" LIGHT
STAB TIPS 1/32" X 1/20" WET FORMED MED. BALSA
1/32 PLY C3
TOPAND BOTTOM CENTE
C
BOTTOM CENTER
COWL IS 1/32" SHT. X ½" X 4" LIGHT BALSA
1/16" X 3/32" COMPASS MOUNT
C1 C2
CR
CABANE UPRIGHTS ARE ONE P
SMALL PECK NOSE BEARING
2
1
LGM
6
7
1/32"
3
4
PANTS MADE WITH LIGHT 3/16" CORE AND 1/20" COVERS WHEELS ARE 9/16" DIA. WITH 1/16" ALUM. TUBING BUSHIN
L.G. STRUTS =TWO LAYERS 3/8" X 1/3

13" WACO AGC – 8

The WACO cabin series biplanes were first conceived in 1924, starting with a rather awkward conversion of the WACO 8. The first properly conceived prototype model appeared in 1931 and was derived from the popular open cockpit model "F". It was quickly followed with production of 38 planes designated QDC which were four place biplanes powered by either the 210 hp. Continental or 210 hp. Kinner engine.

Improvements to the Waco cabin class planes were made each year, eventually resulting in the very superior model "E" produced from 1939 to 1941. During world war II the WACO company was under contract by the department of defense to produce troop carrying gliders.

The rather mysterious designation of Waco cabin planes is summarized as follows:

1. The initial letter after 1932 identifies the engine.
2. The second letter refers to the length and/or passenger capacity.
3. The third letter designates the basic design. C = Cabin type.
4. The suffux, used after 1936, separates the Standard (S = economy) and Custom (luxury) models.
5. The Custom models had no additional "C" suffix to distinguish them from the "S" Standard models.

Years	First Letter	Engine	hp.
1931	Q	Continental	165
1932	O	Kinner	210
1932 &1933	U	Continental	210
1934 thru 1940	U	Continental	225
1934 &1935	C	Wright	250
1934 thru 1940	Z	Jacobs	285
1936 thru 1941	A	Jacobs	330
1934 thru 1940	Y	Jacobs	225
1939 & 1940	V	Continental	240
1936 & 1937	D	Wright	285
1940	H	Lycoming	300
1936 5hru 1939	E	Wright	350
	W	Wright	450 (never fitted)
1940 & 1941	S	Pratt & Whitney	450

The meaning of the second letter is less obvious:

Years	Second Letter	Length	Passengers	Tread Top	Wing Span	Wing Area
1931 & 1932	D	23' 2"	4	72"	33'3""	245Sq. ft.
1932	E	23'4"	4	72"	33'2"?	245
1934	I	24'8"	4	72"	33'3"	245?
1934	J	24'8"	5	74"	34'10"	157 + 107sq. ft.
1935	U	25'3"	5	87"	35'	165.6 + 73.2
1935	O	25'6"	5	86"	35'	165.6 + 73.2
1936 thru 1938	Q	24'6"	5	87"	35"	168 + 76 sq. ft.
1935 thru 1938	K	15'4-1/2"	5	108"	33'3"	240 sq. ft.
1938	V	27'7"	5	99"	34'9"	246
1938 thru 1940	G	27'4"	5	108"	34'9"	246
1939 thru 1941	R	27'10"	5	101"	34'9"	246

The third letter indicates the basic design and, after 1935, the model year is shown as a number suffix.

For purposes of model design, the total wing area and overall length of the 1938 model C-8 are very close to the dimensions of the later model "E". For a 13" span peanut model, the overall length difference is only 3/16", which might be explained as the difference in engine length alone. The wing plan, although having a little different shape in some three view drawings, would appear to be identical for the C- 8 and the model "E" since the spans and area are the same. The lower wing of the "E", however, has no notch in its trailing edge where it joins the fuselage. The stabilizer shape of the C – 8 and "E" appears to be identical, but on model "E" the stab is fixed and not adjustable as it was on all earlier cabin Wacos. The most striking differences in these two designs are the engine itself, the simpler fuselage lines of the "E" and the wing strut arrangements. The "E" has no strut from the cabin to the lower wing. For a scale model, the engine makes very little difference since it is usually represented by a more or less accurate paper drawing. The tail plane brace wires were discontinued in 1937.

Source: "The Versatile Cabin Series" Produced by Raymond H. Bradley and edited by Bonnie Jean Borish.

2007 CFFS CONTEST EVENTS AT LORAIN COMMUNITY COLLEGE FIELD
AT RT. 301S. ABBE RD. I-90 EXIT TO RT. 301S, HOAG RD. OR MAIN ENTRANCE, UPWIND

MAY 27 JULY 29 SEPT. 16

1. FAC PEANUT SCALE, FULL POINTS
2. HIGH WING CABIN PEANUT
3. FAC DIME SCALE
4. FAC RUBBER SCALE
5. EMBRYO ENDURANCE
6. FAC TWO BIT O.T. RUBBER
7. FAC FICTION FLYER
8. GOLDEN AGE CIVIL
10. LOW WING MILITARY TRAINER
12. HAND LAUNCH GLIDER
14. FUNK & WACO MASS LAUNCH 11:30
15. GREVE INLINES RACE M.L. 12:30
16. THOMPSON RADIALS M. L. 1:30
19. WW I MULTIWING PEANUT 2:30
20. WWI FAC MULTIWING M.L 3:30
23. ALL SCALE FLYING HOARD M.L. 4:30

JUNE 17 AUGUST 12 OCTOBER 7

1. FAC PEANUT SCALE
2. HIGH WING CABIN PEANUT
3. FAC DIME SCALE
4. FAC RUBBER SCALE
5. EMBRYO ENDURANCE
6. FAC TWO BIT O.T. RUBBER
7. FAC FICTION FLYERS
9. GOLDEN AGE MILITARY
10.6 P-20 ENDURANCE
11. NO.CAL. PROFILE
12. HAND LAUNCH GLIDER
13. 6" STICK CATAPULT GLIDER
14. FUNK & WACO MASS LAUNCH 11:30
17. BENDIX PRE WAR M.L 12:30
18. GOODYEAR, F1 RACE M.L 1:30
21. WWII PEANUT COMBAT M.L 2:30
22. WWII FAC COMBAT M.L. 3:30
23. ALL SCALE FLYING HOARD M.L. 4:30

FAC rules apply, with inspection of No. Cal., Dime and Combat for minimum detail. O.T.'s must be built to plan with plan provided for inspection. No size change for 25" Max.per O.T. plan. Flier must pre-select event for multiple option models. Special events earn double credit for CFFS year end prize. **Mass launch events will start at posted clock times! Be ready!**

CROSSWINDS READERS WITH THE DREADED RED X AT ISSUE RENEWAL CODE #122 OR LOWER CAN SEND $16 PER YEAR TO RUSS BROWN 4909 N. SEDGEWICK, LYNDHURST, OH 44124 – U.S.A.

SPECIAL EVENTS FOR CFFS YEAR END PRIZE ARE:

May: 27 Peanut Scale, Embryo Endurance, WW I Peanut, WW I FAC Dogfight
June:17 High Wing Cabin Peanut, Two Bit O.T. Rubber, WW II Peanut M.L. , WW II FAC Combat M.L.
July: 29 FAC Rubber Scale, Dime Scale, Greve Race M.L., Thompson Race M.L.
Aug:12 FAC Fiction Flyers, No. Cal. Profile Scale, Bendix Race M.L., Goodyear Peanuts M.L.
Sept:16 Golden Age Civil, Low wing Military Trainer, Funk & Waco M.L., WW I Peanut M.L.
Oct: 7 Golden Age Mil., FAC Fiction Flyers, Embryo Endurance, Two Bit O.T. Rubber, WW II Peanut M. L.

EVENTS LIST:

4/10 Air Racing Historians Dinner Meeting at Der Braumeister 6:30 – 10:00
3/13 – 4/15 Toledo Weak Signals R/C/ Trade Show at Sea Gate Center.
4/17 – 4/23 Sun & Fun EAA Fly-in at Lakeland, Fla.
5/4 – 5/6 FAC S.W. Regional at Perris, CA. Roger Willis C.D., (760) 603 –8877
5/4 – 5/6 ARHS Symposium at Cleve. Apt. Holiday Inn
Sunday 5/27 CFFS FAC & Duration FF Outdoor Meet at LCCC. Elyria, OH. 9: A.M. 4:30 P.M. R. Brown – C.D.
6/9 - 6/10 CIA & McCook Dayton FAC at Muncie, IN AMA Field
Sunday 6/17 CFFS FAC 7 Duration FF at LCCC, Elyria, OH, 9: A.M. – 4:30 P.M.- G8/ Jim Hyka - C.D.
6/21-6/24 Waco Fly-In at Wynkoop Field, Mt. Vernon, OH.
7/6- 7/8 Taylorcraft & Aeronca Fly-In at Barber Field. Alliance, OH. Breakfast - 7:30 – 11:30 A.M.
Thursday 7/19-Sat 7/21 FAC Non-Nats at Geneseo, NY, Lin Reichel, and GHQ Staff - C.Ds.
Sunday 7/29 CFFS FAC & Duration FF at LCCC, Elyria, OH, 9:00 A.M.– 4:30 P.M.- Michael Zand - C.D.
7/23 – 7/29 EAA Annual Air Venture Fly – In at Oshkosh, WI.
7/30 – 8/3 AMA FF Nats at Muncie, IN.
Sunday 8/12 CFFS FAC and Duration FF at LCCC Elyria, OH, 9A.M.– 4:30 P.M. - Peter Zbasnik,- C. D.
8/25- 8/26 EAA MERFI Mid-Eastern Regional Fly-In at Mansfield, OH Lahm Airport
September 1-3 Cleveland Air Show & ARHS Booth at Burke Lakefront Airport
September 8-9 FAC Outdoor Champs & Duration FF at Muncie, IN.
Sunday 9/16 CFFS FAC & Duration FF at LCCC, Elyria, OH, 9 A.M.– 4:30 P.M. - Dan Kane – C.D.
Sept. 21-23 WWI Fly-In & Exhibit at WPAFB, Dayton, OH.
Sept. 29-30 Gathering of Mustangs & Legends at Columbus, OH Rickenbacker Int, Apt.
October 6-7 CIA & FAC Ted Dock Memorial Contest at Muncie, IN www. GML 2007.COM.
Sunday 10/7 CFFS FAC & Duration FF at LCCC, Elyria, OH, 9 A.M.– 4:30 P.M. - Russ Brown – C.D.

Larry) A write up of the Indoor at Kent St. will be helpful! cc to Don. Russ

THE 2007 SPRING INDOOR FLING

An AMA Sanctioned Class AAA Contest

Contest Director
Dan Olah 248-542-8144

Event Managers
AMA-Bill Shailor 248-398-3766
FAC-Mike Welshans 248-545-7601
FAC-Dave Bubolz 248-685-3114
FAI- Fred Tellier 519-944-1933

Presented By: Cloudbusters Model Airplane Club, assisted by Detroit Balsa Bugs
When: Sunday, May 6 from 8:00 AM to 8:00 PM
Where: INSIDE SWING Golf Dome, Flint, MI., A Category III site



SOHIO

SOHIO



BERRY BROTHERS
Progressive Aircraft Finishes
DETROIT, MICH. WALKERVILLE, ONT.

Due to age of original chart colors may vary from original.

KENSINGTON GRAY 1693

FOKKER RED 1238

DIANA CREAM 829

STEARMAN VERMILION 1223

CURTISS BLUE 1263

GALATEA ORANGE 1034

