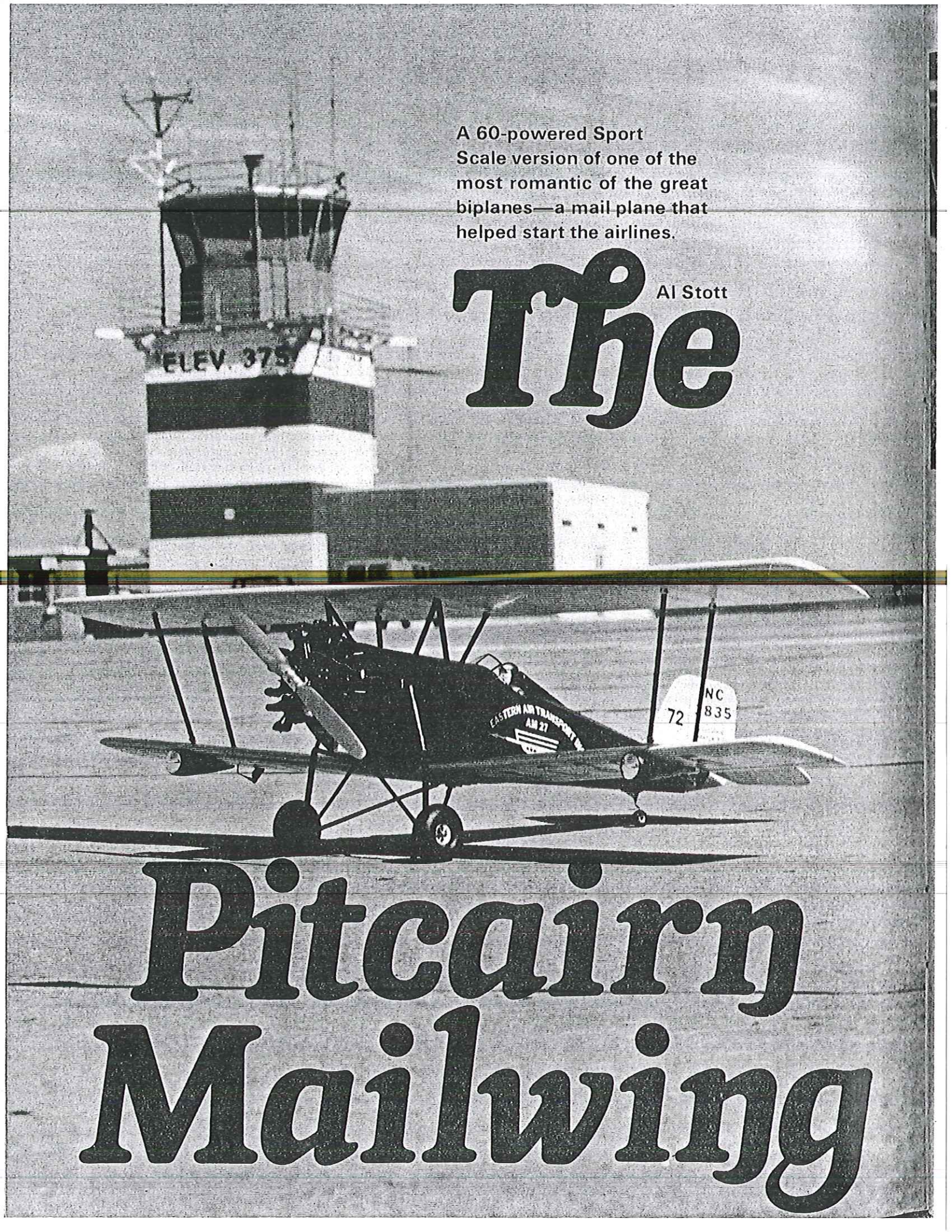
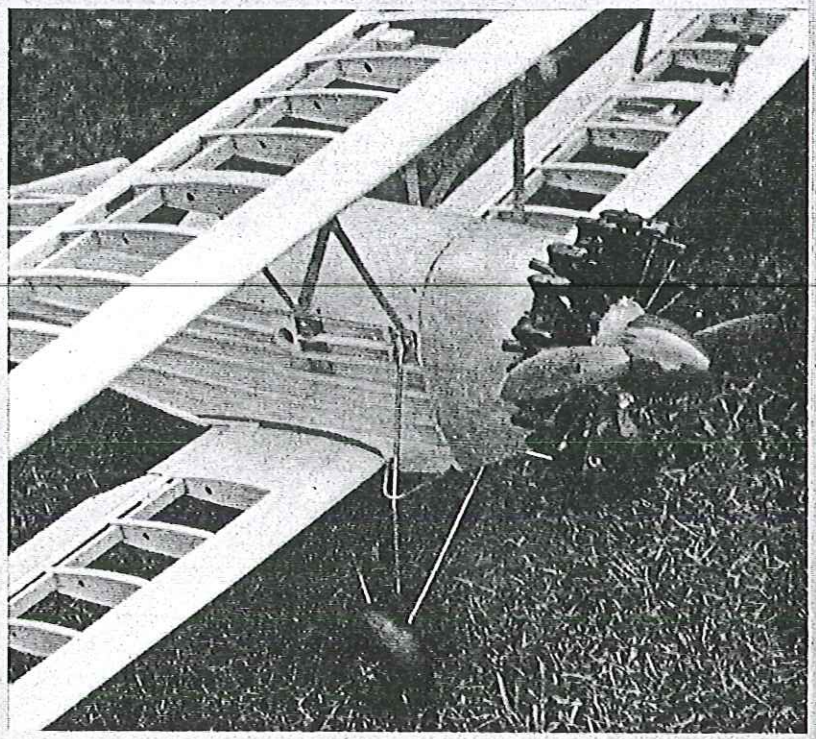
A 60-powered Sport Scale version of one of the most romantic of the great biplanes—a mail plane that helped start the airlines.

The Pitcairn Mailwing

Al Stott



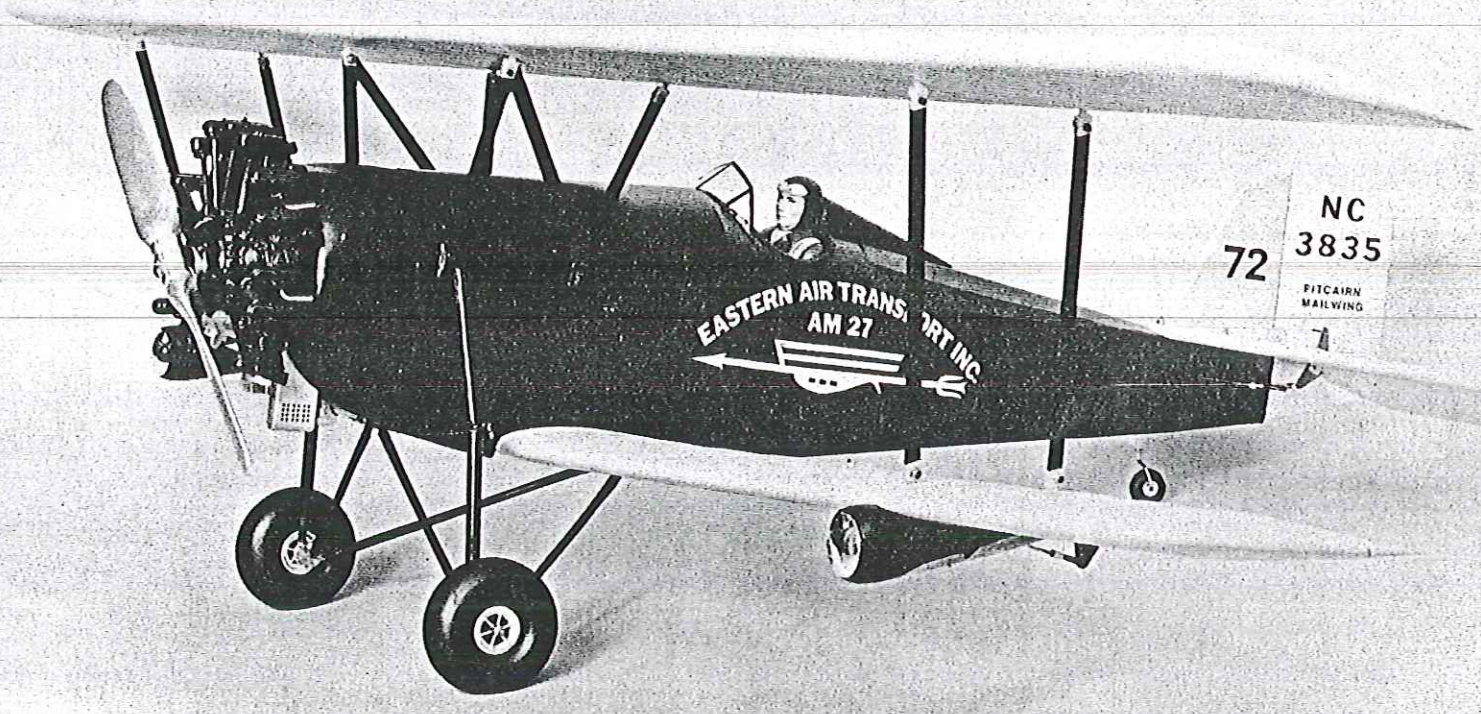


Because its designer had at first been wary of the landing gear construction, we have included these two closeups of its details to provide a ready comparison with the drawings. For a large, scale biplane, the remaining structure will pose no problems to skilled modelers.

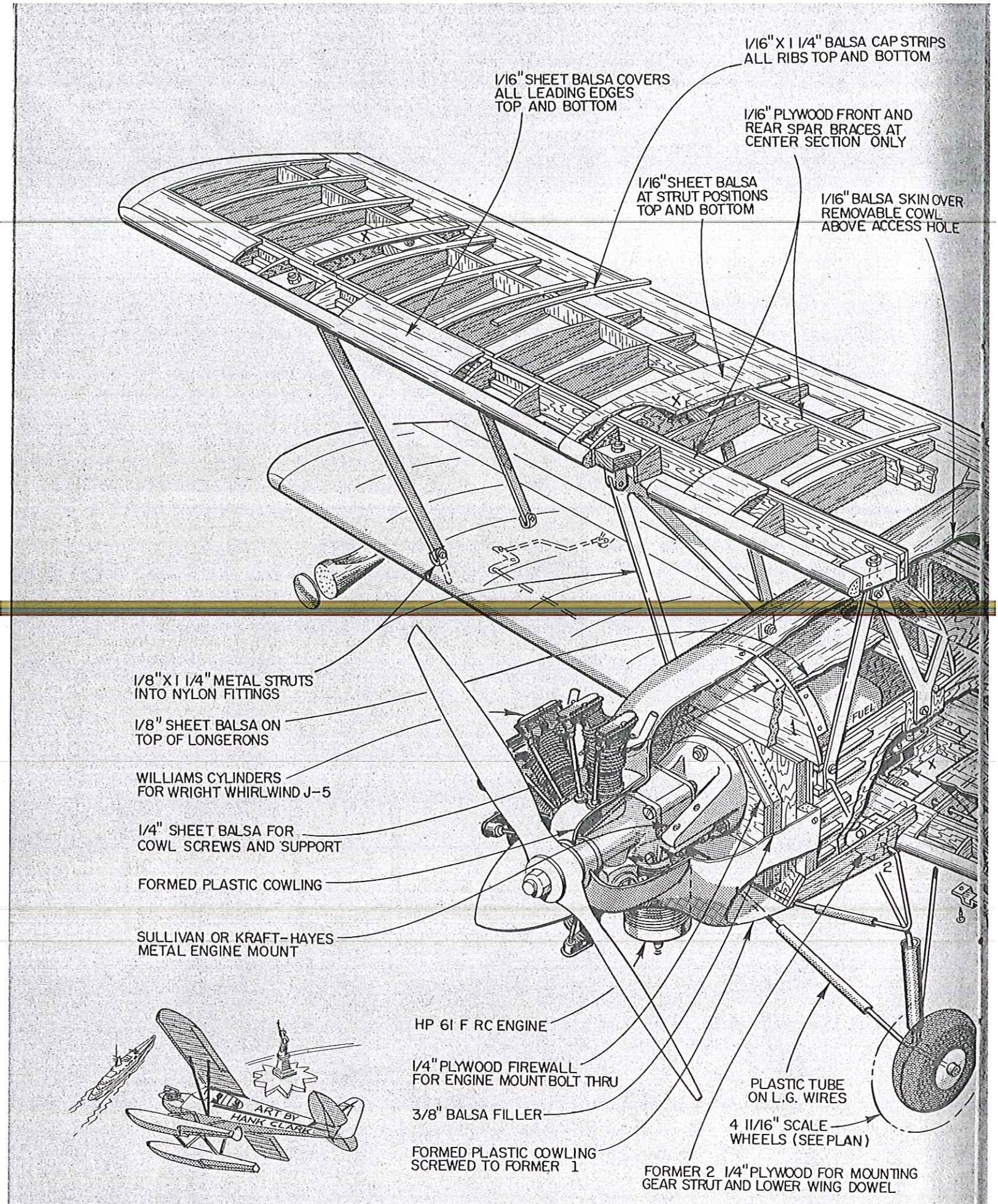
OVER 50 years ago, in 1927, the Pitcairn Aviation Company started manufacturing the Pitcairn Mailwing Biplane. Specifications established for this single-seater listed a payload of 500 pounds, a wing spread of 33 feet, a maximum speed of 131 mph, a landing speed of 45 mph, and a wing loading of 10 pounds per square foot. Designed for use as an airmail carrier, this airplane was equipped with radio and landing lights for night flying off rough dirt fields. Its performance was enhanced by the Wright Whirlwind J5 air-cooled radial engine, which at that time had become famous because of Charles Lindbergh's "Spirit of St. Louis."

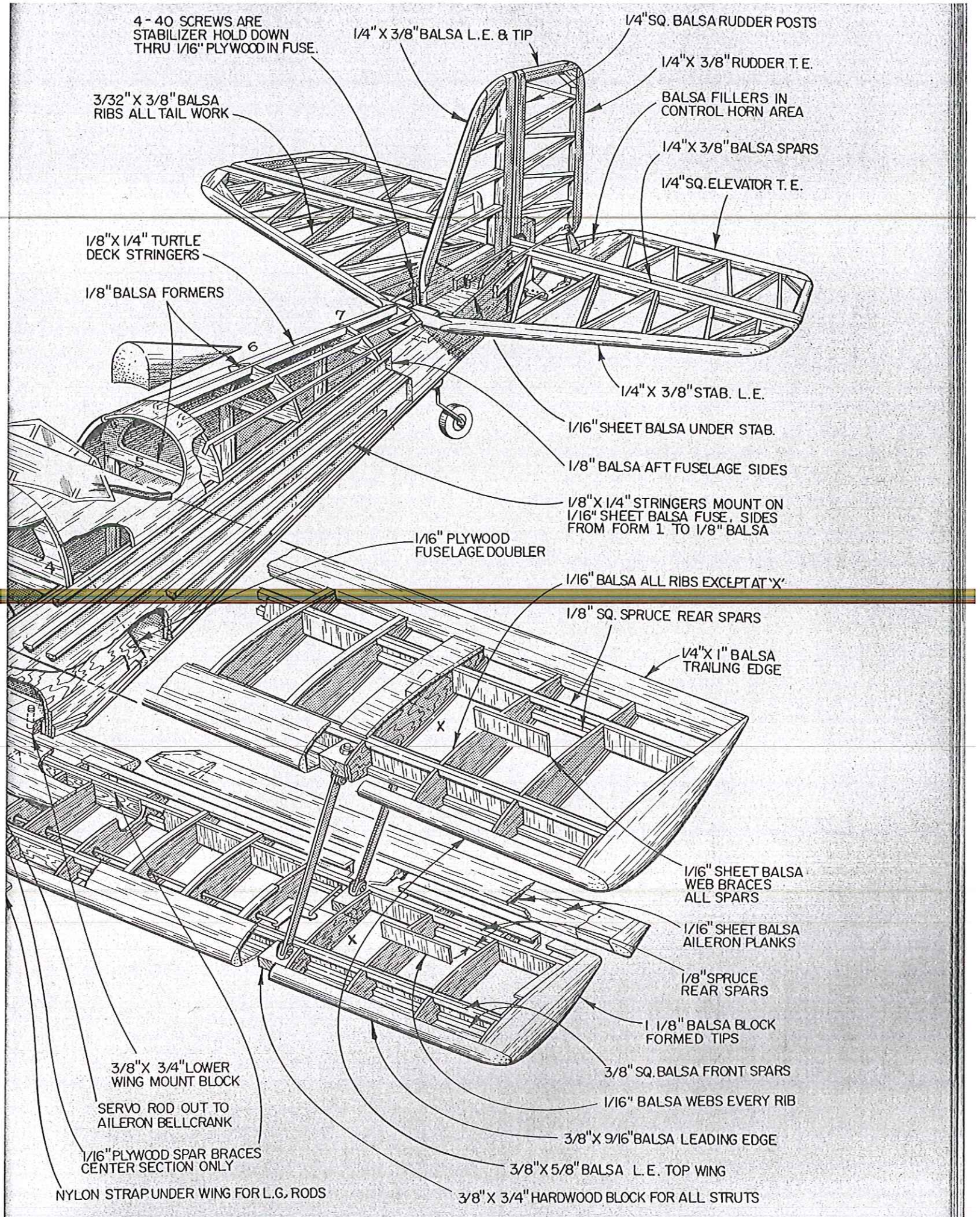
Recognition of this high-performance biplane is well deserved for more than its excellent maneuverability, range, and speed. It helped to start the airlines. Not long ago, Eastern Air Lines modernized their Mailwing No. 21 for flight and display to advertise their early entrance into the field of aviation transportation. Little wonder that this Pitcairn Mailwing hangs

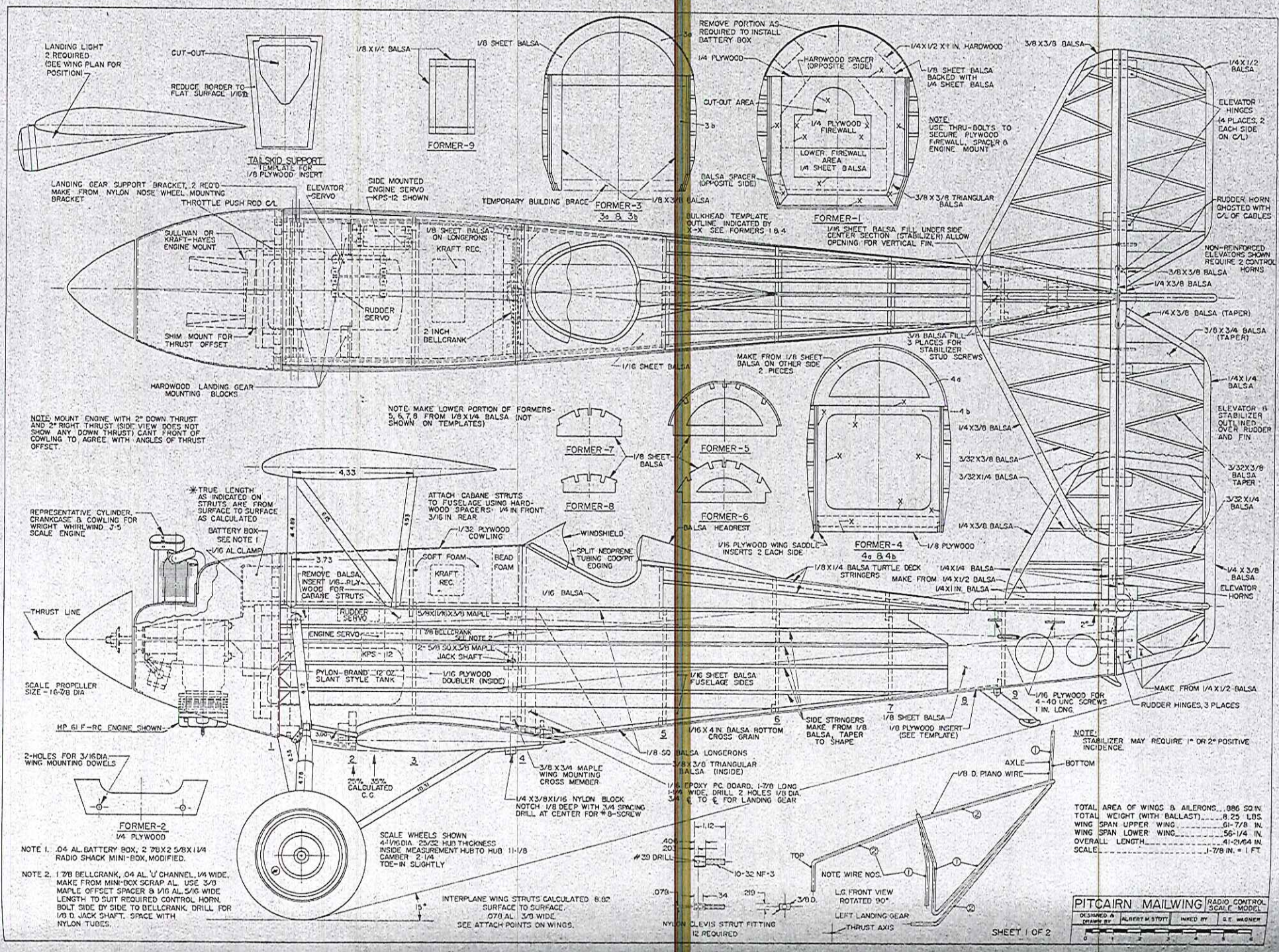
Posed in front of a modern tower, the author's Mailwing gives a feeling of the grace and efficiency that made its full-scale ancestor one of *the* great biplanes that finally yielded to the early passenger-carrying "airliners."

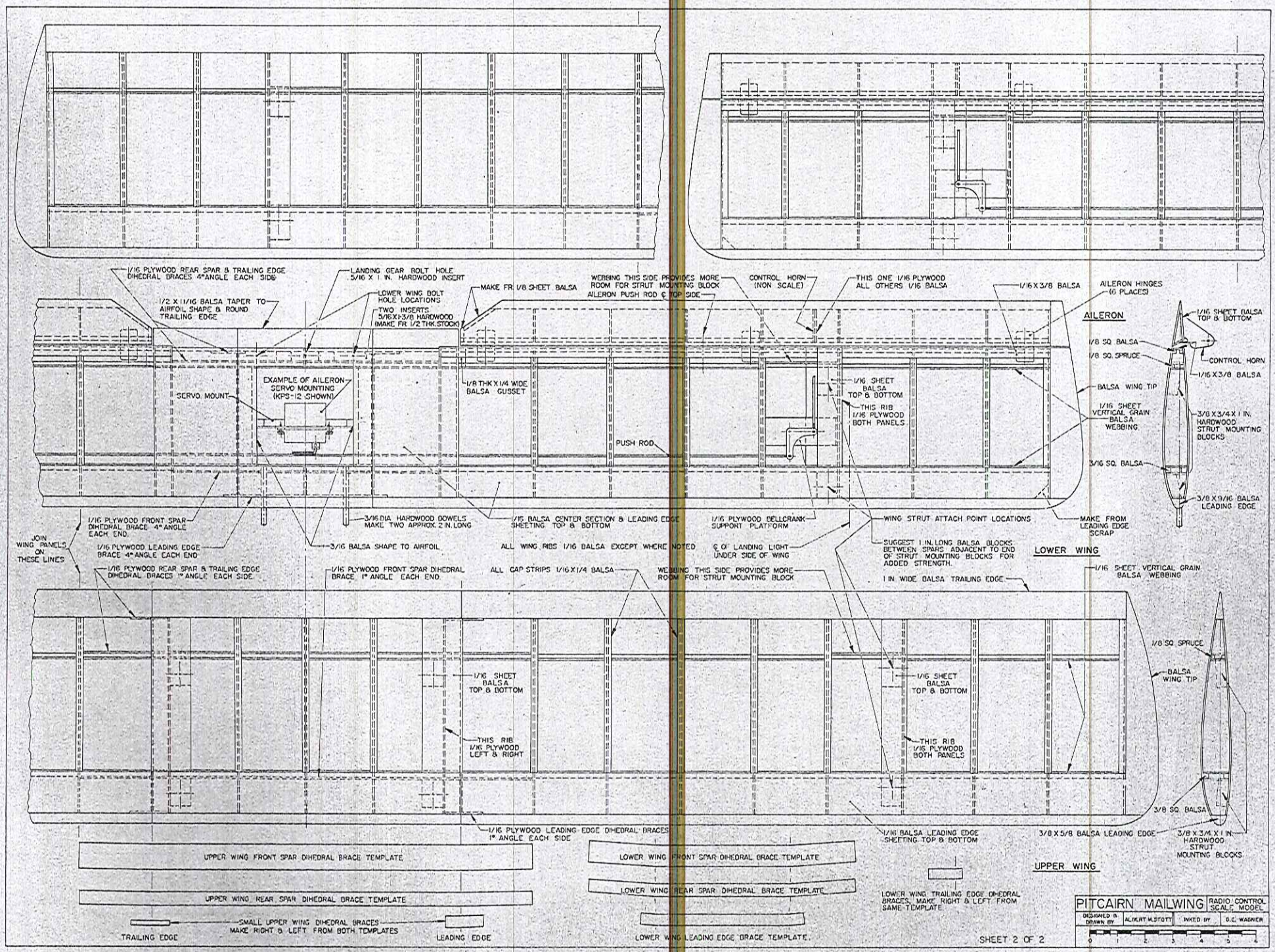


Picture this black-and-yellow gem on your local flight line. The inverted engine—and do note the air intake-like appearance of the Slim-Line muffler—allows a remarkably realistic J-5 Whirlwind, made from Williams Brothers cylinders in 2 in. equals 1 ft. scale. Flown by the club test pilot, the Mailwing was found capable of a rolling circle on its first flight. The 1-7/8-in. scale allows ship to fit in car trunk.

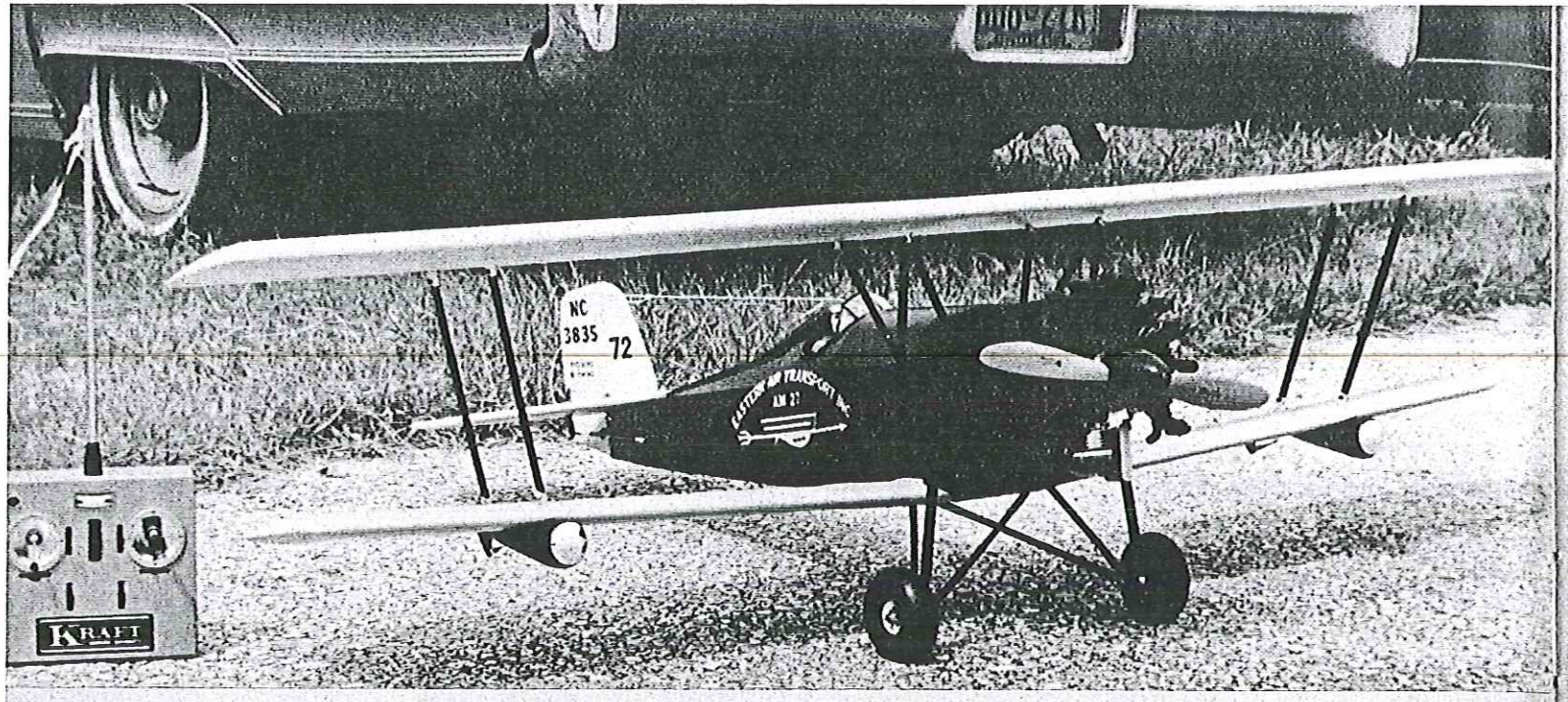

1/16" X 1 1/4" BALSA CAP STRIPS ALL RIBS TOP AND BOTTOM
1/16" SHEET BALSA COVERS ALL LEADING EDGES TOP AND BOTTOM
1/16" PLYWOOD FRONT AND REAR SPAR BRACES AT CENTER SECTION ONLY
1/16" SHEET BALSA AT STRUT POSITIONS TOP AND BOTTOM
1/16" BALSA SKIN OVER REMOVABLE COWL ABOVE ACCESS HOLE
1/8" X 1 1/4" METAL STRUTS INTO NYLON FITTINGS
1/8" SHEET BALSA ON TOP OF LONGERONS
WILLIAMS CYLINDERS FOR WRIGHT WHIRLWIND J-5
1/4" SHEET BALSA FOR COWL SCREWS AND SUPPORT
FORMED PLASTIC COWLING
SULLIVAN OR KRAFT-HAYES METAL ENGINE MOUNT
HP 61 F RC ENGINE
1/4" PLYWOOD FIREWALL FOR ENGINE MOUNT BOLT THRU
3/8" BALSA FILLER
FORMED PLASTIC COWLING SCREWED TO FORMER 1
PLASTIC TUBE ON L.G. WIRES
4 11/16" SCALE WHEELS (SEE PLAN)
FORMER 2 1/4" PLYWOOD FOR MOUNTING GEAR STRUT AND LOWER WING DOWEL
FUEL
ART BY HANK CLARK


4-40 SCREWS ARE STABILIZER HOLD DOWN THRU 1/16" PLYWOOD IN FUSE.
1/4" X 3/8" BALSA L.E. & TIP
1/4" SQ. BALSA RUDDER POSTS
1/4" X 3/8" RUDDER T.E.
BALSA FILLERS IN CONTROL HORN AREA
3/32" X 3/8" BALSA RIBS ALL TAIL WORK
1/4" X 3/8" BALSA SPARS
1/4" SQ. ELEVATOR T.E.
1/8" X 1/4" TURTLE DECK STRINGERS
1/8" BALSA FORMERS
1/4" X 3/8" STAB. L.E.
1/16" SHEET BALSA UNDER STAB.
1/8" BALSA AFT FUSELAGE SIDES
1/8" X 1/4" STRINGERS MOUNT ON 1/16" SHEET BALSA FUSE. SIDES FROM FORM 1 TO 1/8" BALSA
1/16" PLYWOOD FUSELAGE DOUBLER
1/16" BALSA ALL RIBS EXCEPT AT 'X'
1/8" SQ. SPRUCE REAR SPARS
1/4" X 1" BALSA TRAILING EDGE
1/16" SHEET BALSA WEB BRACES ALL SPARS
1/16" SHEET BALSA AILERON PLANKS
1/8" SPRUCE REAR SPARS
1 1/8" BALSA BLOCK FORMED TIPS
3/8" SQ. BALSA FRONT SPARS
1/16" BALSA WEBS EVERY RIB
3/8" X 9/16" BALSA LEADING EDGE
3/8" X 5/8" BALSA L.E. TOP WING
3/8" X 3/4" HARDWOOD BLOCK FOR ALL STRUTS
3/8" X 3/4" LOWER WING MOUNT BLOCK
SERVO ROD OUT TO AILERON BELLCRANK
1/16" PLYWOOD SPAR BRACES CENTER SECTION ONLY
NYLON STRAP UNDER WING FOR L.G. RODS


LANDING LIGHT 2 REQUIRED (SEE WING PLAN FOR POSITION)
CUT-OUT
REDUCE BORDER TO FLAT SURFACE 1/16th
TAIL SKID SUPPORT TEMPLATE FOR 1/8 PLYWOOD INSERT
1/8 X 1/4 BALSA
1/8 SHEET BALSA
FORMER-9
REMOVE PORTION AS REQUIRED TO INSTALL BATTERY BOX
1/4 PLYWOOD
HARDWOOD SPACER (OPPOSITE SIDE)
1/4 X 1/2 X 1 IN. HARDWOOD
1/8 SHEET BALSA BACKED WITH 1/4 SHEET BALSA
CUT-OUT AREA
1/4 PLYWOOD FIREWALL
LOWER FIREWALL AREA 1/4 SHEET BALSA
NOTE: USE THRU-BOLTS TO SECURE PLYWOOD FIREWALL, SPACER & ENGINE MOUNT
BALSA SPACER (OPPOSITE SIDE)
3/8 X 3/8 TRIANGULAR BALSA
FORMER-1
3/8 X 3/8 BALSA
1/4 X 1/2 BALSA
ELEVATOR HINGES (4 PLACES, 2 EACH SIDE ON C/L)
LANDING GEAR SUPPORT BRACKET, 2 REQ'D MAKE FROM NYLON NOSE WHEEL MOUNTING BRACKET
THROTTLE PUSH ROD C/L
ELEVATOR SERVO
SIDE MOUNTED ENGINE SERVO KPS-12 SHOWN
TEMPORARY BUILDING BRACE
FORMER-3 3a & 3b
1/8 X 3/8 BALSA
BULKHEAD TEMPLATE OUTLINE INDICATED BY X-X SEE FORMERS 1 & 4
1/16 SHEET BALSA FILL UNDER SIDE CENTER SECTION (STABILIZER) ALLOW OPENING FOR VERTICAL FIN.
RUDDER HORN GHOSTED WITH C/L OF CABLES
NON-REINFORCED ELEVATORS SHOWN REQUIRE 2 CONTROL HORNS
SULLIVAN OR KRAFT-HAYES ENGINE MOUNT
1/8 SHEET BALSA ON LONGERONS
KRAFT REC.
RUDDER SERVO
2 INCH BELLCRANK
SHIM MOUNT FOR THRUST OFFSET
1/16 SHEET BALSA
HARDWOOD LANDING GEAR MOUNTING BLOCKS
3/8 X 3/8 BALSA
1/4 X 3/8 BALSA
1/4 X 3/8 BALSA (TAPER)
3/8 X 3/4 BALSA (TAPER)
3/8 BALSA FILL 3 PLACES FOR STABILIZER STUD SCREWS
MAKE FROM 1/8 SHEET BALSA ON OTHER SIDE 2 PIECES
1/4 X 1/4 BALSA
ELEVATOR & STABILIZER OUTLINED OVER RUDDER AND FIN
NOTE: MOUNT ENGINE WITH 2° DOWN THRUST AND 2° RIGHT THRUST (SIDE VIEW DOES NOT SHOW ANY DOWN THRUST) CANT FRONT OF COWLING TO AGREE WITH ANGLES OF THRUST OFFSET.
NOTE: MAKE LOWER PORTION OF FORMERS- 5, 6, 7, 8 FROM 1/8 X 1/4 BALSA (NOT SHOWN ON TEMPLATES)
FORMER-7
1/8 SHEET BALSA
FORMER-8
FORMER-5
FORMER-6
BALSA HEADREST
FORMER-4 4a & 4b
1/8 PLYWOOD
1/16 PLYWOOD WING SADDLE INSERTS 2 EACH SIDE
4.33
TRUE LENGTH AS INDICATED ON STRUTS ARE FROM SURFACE TO SURFACE AS CALCULATED
ATTACH CABANE STRUTS TO FUSELAGE USING HARDWOOD SPACERS 1/4 IN. FRONT 3/16 IN. REAR
REPRESENTATIVE CYLINDER, CRANKCASE & COWLING FOR WRIGHT WHIRLWIND J-5 SCALE ENGINE
BATTERY BOX SEE NOTE 1
1/16 AL. CLAMP
1/32 PLYWOOD COWLING
WINDSHIELD
SPLIT NEOPRENE TUBING COCKPIT EDGING
SOFT FOAM
BEAD FOAM
KRAFT REC.
REMOVE BALSA INSERT 1/16 PLYWOOD FOR CABANE STRUTS
3.73
1/8 X 1/4 BALSA TURTLE DECK STRINGERS
1/4 X 1/4 BALSA
MAKE FROM 1/4 X 1/2 BALSA
1/4 X 1 IN. BALSA
1/4 X 3/8 BALSA ELEVATOR HORNS
THRUST LINE
RUDDER SERVO
5/8 X 1 1/16 X 3/8 MAPLE
1/16 BALSA
ENGINE SERVO
1/8 BELLCRANK SEE NOTE 2
12-5/8 SQ X 3/8 MAPLE JACK SHAFT
KPS-12
PYLON-BRAND 12 OZ. SLANT STYLE TANK
1/16 PLYWOOD DOUBLER (INSIDE)
1/16 SHEET BALSA FUSELAGE SIDES
SCALE PROPELLER SIZE - 16-7/8 DIA
HP 61 F-RC ENGINE SHOWN
1/16 X 4 IN. BALSA BOTTOM CROSS GRAIN
SIDE STRINGERS MAKE FROM 1/8 BALSA, TAPER TO SHAPE
1/8 SHEET BALSA
1/8 PLYWOOD INSERT (SEE TEMPLATE)
1/16 PLYWOOD FOR 4-40 UNC SCREWS 1 IN. LONG
MAKE FROM 1/4 X 1/2 BALSA
RUDDER HINGES, 3 PLACES
2-HOLES FOR 3/16 DIA WING MOUNTING DOWELS
FORMER-2 1/4 PLYWOOD
25% 35% CALCULATED C.G.
1/8 SQ BALSA LONGERONS
3/8 X 3/8 TRIANGULAR BALSA (INSIDE)
3/8 X 3/4 MAPLE WING MOUNTING CROSS MEMBER
1/8 EPOXY P.C. BOARD, 1-7/8 LONG 1-1/4 WIDE, DRILL 2 HOLES 1/8 DIA. 3/4 ℄ TO ℄ FOR LANDING GEAR
1/4 X 3/8 X 1/16 NYLON BLOCK NOTCH 1/8 DEEP WITH 3/4 SPACING DRILL AT CENTER FOR #8-SCREW
NOTE: STABILIZER MAY REQUIRE 1° OR 2° POSITIVE INCIDENCE.
AXLE
BOTTOM
1/8 D. PIANO WIRE
NOTE 1. .04 AL. BATTERY BOX, 2 7/8 X 2 5/8 X 1 1/4 RADIO SHACK MINI-BOX, MODIFIED.
NOTE 2. 1 7/8 BELLCRANK, .04 AL. 'U' CHANNEL, 1/4 WIDE, MAKE FROM MINI-BOX SCRAP AL. USE 3/8 MAPLE OFFSET SPACER & 1/16 AL. 5/16 WIDE LENGTH TO SUIT REQUIRED CONTROL HORN, BOLT SIDE BY SIDE TO BELLCRANK, DRILL FOR 1/8 D. JACK SHAFT. SPACE WITH NYLON TUBES.
SCALE WHEELS SHOWN 4-1/16 DIA. 25/32 HUB THICKNESS INSIDE MEASUREMENT HUB TO HUB 11-1/8 CAMBER 2-1/4 TOE-IN SLIGHTLY
INTERPLANE WING STRUTS CALCULATED 8.62 SURFACE TO SURFACE. .078 AL. 3/8 WIDE. SEE ATTACH POINTS ON WINGS.
#39 DRILL
10-32 NF-3
NYLON CLEVIS STRUT FITTING 12 REQUIRED
LEFT LANDING GEAR
THRUST AXIS
TOP
NOTE WIRE NOS.
L.G. FRONT VIEW ROTATED 90°
TOTAL AREA OF WINGS & AILERONS 086 SQ IN
TOTAL WEIGHT (WITH BALLAST) 8.25 LBS.
WING SPAN UPPER WING 61-7/8 IN.
WING SPAN LOWER WING 56-1/4 IN.
OVERALL LENGTH 41-21/64 IN.
SCALE 1-7/8 IN. = 1 FT.
PITCAIRN MAILWING
RADIO CONTROL SCALE MODEL
DESIGNED & DRAWN BY ALBERT M. STOTT
INKED BY G.E. WAGNER
SHEET 1 OF 2



FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 112



With its flying propeller installed, the Mailwing awaits its first test hop. The builder is urged to observe the offset and downthrust angles of the motor mounting (see Fig. 1). Wings are covered with yellow Coverite, fuselage in black. The 12-oz. sq. Sullivan tank fits within a quart-size milk container which is positioned to hold the tank.

To facilitate the calculation of the shim's compound angle and the amount of maximum thickness removal, the following formulas were derived:

A = compound angle of shim in degrees on a new axis y' at θ degrees
B = vertical thrust angle in degrees, down or up
C = side thrust angle in degrees, right or left
θ = slant angle of new axis y' in degrees
D = diameter of shim or approximate diameter of engine mount base in inches
t_{max} = maximum shim thickness removed at edge on new axis y' in inches
Z = thrust axis

$$\tan\theta = \frac{\tan C}{\tan B}$$

$$\tan A = \frac{\tan B}{\tan\theta} = \sec\theta \tan B$$

$$t_{max} = D \tan A$$

Thrust angles B & C not shown on sketch for simplicity

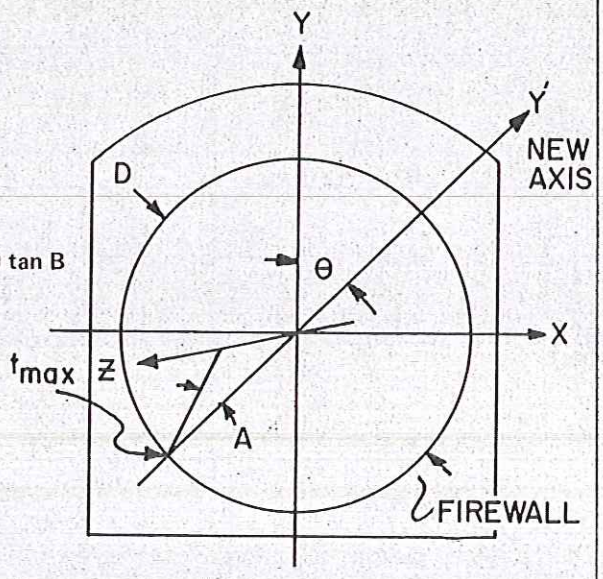


Diagram illustrates shim layout on firewall for problem example using down- and right-thrust correction. Calculations using the derived formulas are very easily accomplished with the help of Natural Trigonometric Tables or a calculator. The example problem is further simplified because the thrust correction angles were assumed to be equal.

When the angles B and C are equal:

$$\tan\theta = \frac{\tan C}{\tan B} = 1, \text{ and } \theta = 45 \text{ degree slant angle of y' axis}$$

then $\tan A = \sec\theta \tan B = 1.414 \tan B$

when B and C = 2 degrees, tan A = .0494, A = 2 degrees 50' compound angle

then for D = 3.0" $t_{max} = D \tan A = 3 \times .0494$

= .148" max. thickness removed.

from the ceiling of the new National Air and Space Museum at Smithsonian in Washington, D.C. In other areas, visitors to the Shannon Airport Museum at Fredericksburg, Virginia, and to the Tallmantz Museum on the West coast, have been able to view Pitcairn Mailwings on display.

The Mailwing evolved from an earlier Pitcairn biplane, called Fleet Wing II. (One should not confuse this aircraft with the "Fleet" biplane.) Fleet Wing II biplanes were powered by OX 5 water-cooled engines housed in cowlings resembling those fitted on Waco and Travel Air biplanes. If one should choose to build an authentic looking Fleet Wing II model, plans of the Mailwing could be altered easily by eliminating the air-cooled engine, substituting the extended OX 5 type engine cowling, adding another seat, utilizing a simpler landing gear, and discarding the landing lights from the Mailwing plans.

Very important to the flying qualities of the Mailwing was the airfoil which evolved from the combination of the desirable features of two previously used undercambered airfoils. One of these airfoils was of German origin and the other was of U.S. military heritage. Tests run in the N.A.C.A. wind tunnel, at Langley Field, Virginia, proved the wisdom of the hybrid airfoil chosen. Demonstration flights made with a Pitcairn Mailwing at very low flying speeds drew many favorable comments from observing pilots.

The single-seat Mailwing was designated as the PA-5. However, a companion biplane in a three-place version was known as the Pitcairn Sport Mailwing. The color scheme used to paint the Pitcairn Mailwings was black on the fuselage, sometimes including the fin and rudder, and the remainder of the aircraft painted yellow. A bluish tint noted on some photographs is due to reflections.

James Triggs' drawings of this airplane

were published in the January 1959 *American Modeler* and the Fall 1960 *Air Progress*. Although Triggs did an excellent overall job on the Mailwing, he omitted the front, short landing gear bracing struts that attached between the lower longerons and the Oleo struts. A previously published small U-control scale model of the Mailwing was also an excellent model designed from Triggs' drawings, but likewise omitted the same struts. This mistake was pointed out to me by the Chief Engineer of the Mailwing design office. A color photograph of the Mailwing at Shannon Airport in Virginia graced the cover of the May 1968, *American Aircraft Modeler*. This picture shows the missing struts and the color scheme of the subject aircraft.

The designers at Pitcairn wanted to make their landing gear rear strut braces attach at the same points on the lower longerons that served also to attach the front spar of the lower wing. To do so, they notched the leading edges next to the fuselage sides at an angle corresponding to the angle of the struts to provide access and clearance. It is possible that metal fairing plates were intended to be used to cover these notches. However, the PA-5 at the Shannon Air Museum has open notches.

The author utilized an unnotched one-piece lower wing on this Sport Scale model, because of the strength advantage of the sheet-covered middle section of the leading edge of this wing. The aileron horns of the author's ship were installed under the ailerons and the hinges were attached at the top edges to provide long, adjustable moment arms. The true position of these horns are at the top at the locations noted on the drawing. Another feature noticed on this PA-5 was that the front corner of the cowling, just to the rear of the engine, was radiused with a concave instead of a convex radius. It is believed that this radius provided more clearance when the engine manifolds were installed.

Still another feature noted was the use of flat area, forward-facing gusset plates in the weldments of the landing gear strut/axle junctions. Drag from these plates must have been quite large. Only a great desire for strength would cause one to use this construction! Those dirt landing fields must really have been rough! The Oleo struts were very soft in order to attenuate the transmission of large vibrational shock loads. Surprisingly, pilots who fly this PA-5 for exhibition prefer to land on grass rather than on paved runways. The landing gear is tuned better to the grass surface than to the smooth runways, and the pilots find that the build-up of rocking or sway on the paved runways can easily cause ground looping.

One interesting fact concerned the rigging of the wings. Wash-out was set into the upper wing tips, as has been on many models, but this was considered in that day to be a company secret. Another innovation related to the ailerons, which were located only on the lower wing and were differential operating. Unlike differential ailerons used in models, the action was unique. The down moving aileron did not continue to move downward, but instead returned toward neutral after a short angular movement while the up moving aileron continued to move upward toward its maximum control position. Undoubtedly, this was a good way of eliminating unwanted drag and yaw. Stability qualities of this aircraft were further assisted by the trimmable stabilizer, which adjusted over the range of 2° positive to 2° negative. While in the design stage, an attempt was made to offset the engine torque by means of a side-cambered rudder fin, but this idea was discarded.

Landing lights twinkle in this majestic climb-out—the lens are made from a pair of L'eggs panty hose containers. The real Pitcairn may be seen at the National Air & Space Museum. Below: Skimming along the concrete runway, the Mailwing feels for the ground and a smooth landing.

Referring to the sport scale model drawings of the Pitcairn Mailwing PA-5, a modeler will realize that a fair amount of model building experience would be required to build it. Having that experience, the builder can readily work from the plans. Therefore, lengthy detailed construction directions have not been included in this article, except in special cases. Basically, the construction methods detailed in the drawings, and the general design parameters incorporated, have been proven on previous models, thereby assuring the strength and flyability of this model, without increasing the tail areas or the moment arms. However, Shannon Air Museum personnel informed the author that models PA-6, PA-7, PA-8 incorporated longer fuselages to improve ground handling. Had this information been available prior to this model design, it would have been worth considering for incorporation with appropriate model designation change! Such a model would have been several inches longer; most of the increase would have been in the length behind the cockpit and a little in front of the wing. All of which would be advantageous to a scale model.

In case anyone wonders why a scale of 1⅞ inch = 1 foot was used for this scale model, the answer is simple. The design was made using an original factory print having a scale ¾ inch = 1 foot. Simple multiplication by 2½ produced the scale used. Calculations for a model built to this scale indicated that a very acceptable wing area of almost 900 sq. in. would be obtained. A scale of 2 inches = 1 foot did not seem more desirable, because the up-

Continued on page 92

For Openers/Winter

continued from page 4

cloaks. Not even clock-watchers. But we see some whose hearts can be saddened. Like TV's Dangerfield, they "don't get no respect."

We see irony. The power center of the AMA is not even in Washington. Under the by-laws, the membership elects district vice presidents, who also are Council members. Almost all are from far away states. The caliber of these people testifies to the judgment of the members who elected them—they are capable. As a group they meet four times a year and deal, to the best of their abilities, with matters before them. (Their qualifications as businessmen and in private life are impeccable.)

But we don't defend them, for the perfect is not to be expected by anyone of any human being. And, perhaps, they feel no defense by F.O. is needed, or welcome. Perhaps they make mistakes—we cannot say. Perhaps, their timing of things is not always brilliant. But they are not devious, not calculating, not political—they are modelers, serving voluntarily. To know them is to believe that what they decide is motivated only by what they feel is best for all. Sometimes this means that the Executive Director is a minority in a Council meeting in which, even if it happens that he is right, it is the Council that is in charge. There is no governmental agency-type Secretary in Washington that can be "Big Brother" to us all.

For what F.O. is about to say, he could receive a pink slip. It is simply this. Recent actions have taken place. They are done with. While some of us may drop by the wayside for awhile, we will go on growing. But, Council, do hear the message from those members who call out to proceed with caution when you lay out new programs, with their added expenses, even if they are things we members think the AMA should do.

Most members are above all this, and the dues increase is less than the cost of their next week's fuel. (Many buy one other magazine for almost as much as AMA asks for a magazine, insurance, and other benefits.) But others among us ask, "Should we go on?" In response here to the few people who have addressed the editor, let us keep our cool. Dues increases, however necessary, brew negative reactions—nobody willingly accepts higher prices. But we can't let "experts" confuse us. We individual members can make our own assessments.

And, finally, to you patient readers who may say, "Fine for you—AMA pays your salary," we answer simply, "We should hope so!" We can do as well in other ways, but like an old warhorse, F.O. likes the sniff of the battlefield—the challenge to improve the magazine, and to see it firmly on its way as a membership tool, par excellance, to help AMA grow and prosper.

That "right to know" in the way that the words were used in this discussion, is a parody of the Supreme Court decision's meaning. Should everyone's correspondence with AMA headquarters be plastered on a billboard? In the present instance, any publication's demand that AMA print a letter of critique, logically is based upon imagined need to shed light on some secretive wrong doing. AMA has been asked to account for paper clips, sugar cubes, etc., broken down as to AMA use and Model Aviation use. This is true and not a joke. Do they think this is Watergate? Where is Deep Throat? Will Judge Jaworski appear in our doorway? Enough already!

Speaking of rights, do almost 50,000 people who wanted and paid for Model Aviation in 1978 have any? Can one or two "critics" seriously think so many people, the great majority of Open members, can be denied what they prefer?

To those troubled by all this, F.O. offers these words by the late President, Jack Kennedy.

"The great enemy of truth is very often not the lie—deliberate, contrived and dishonest, but the myth—persistent, persuasive and unrealistic. Too often we hold fast to the cliches of our fore-bearers. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought."

Greatest Show/Howard

continued from page 13

tions booth there for several years and it draws lots of interest from the spectators. The AMA was represented by president Johnny Clemens; Larry Bolich, special events director; and Earl Witt, secretary-treasurer. The AMA is always very responsive to this type of public exposure.

One could go on and on about the fun and fellowship the fliers enjoy at this show, but the photos show much more than words can tell. If you can see a Flying Circus in your future, make plans to participate. Enjoy your hobby even more.

Pitcairn/Stott

continued from page 23

per wing span would have been 66 inches. An increase of over 4 inches of the upper wing span would have made assembled model airplane too large to be placed on the back seat of an automobile.

Every scale model designer and builder must decide how detailed his scale model should be. It is a decision that involves consideration of the available material, time, money, shop equipment, desired usage, and ability. Now that Sport Scale or Stand-Off Scale is gaining in popularity over true scale, the choice has broadened. The author's decisions were largely a compromise based on a desire to fun fly even in moderately windy weather, and possibly to enter a contest not requiring exact scale. Although the model deviates from scale in the selection of airfoil and the slightly larger engine scale, the plans show the true outline, except as previously noted.

For a realistic appearance, a slightly over-size 2 inch = 1 foot Williams Wright Whirlwind J5 was installed in a way to largely conceal the inverted 60 engine. Further streamlining and camouflaging of the engine were accomplished by a fiberglass cowling to provide as much space around the engine as possible for the muffler, and to permit the installation of the battery pack under the cowling, if desired, to help establish the correct C.G. location without resorting to excess dead weight for balance.

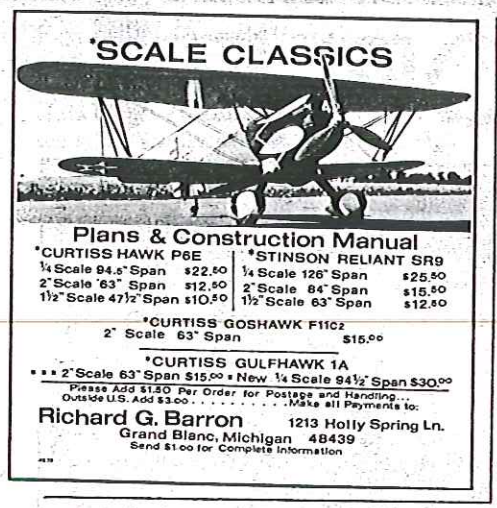
It is common practice to remove scale-like engines on routine test flights, and if necessary to substitute an equivalent weight to prevent a shift of C.G. For this reason, the fiberglass cowl and engine crankcase were formed as separate molded parts.

The crankcase form was made of hard balsa previously used for packing or crating because of its weight. This balsa was cut into discs and laminated before shaping to size. During machining, it was observed that the form tended to turn out of round even in a lathe. This was due to the end grain not cutting the same as the other grain directions. Care had to be taken to bring the form back to round by hand work. Finally, the form was fitted with a ½-in. diameter wood-holding dowel centrally located to extend axially out of the back. This dowel can be supported easily by a vise while applying the fiberglass. No attempt was made to provide draft or taper on the form diameters since it was believed that the fiberglass crankcase would have to be cut from the form anyway. Then there was a pleasant surprise. When the easy-does-it method was completed, the fiberglass crankcase was removed in one piece without damage to either the crankcase or the form. The method of removal is as follows:

1) Remove the thumb tacks which held the Saran Wrap and glass cloth in place while being coated with Hobbypoxy II, and during the placement of a balloon to cover the lay-up.

2) Trim fiberglass at the rear outer diameter to assure that no fiberglass locks around the back corner of the form. Then, rough out the front open hole of the fiberglass cowl, removing any excess that was not cut away to extract thumb tacks. These operations are easier when the fiberglass has cured two or three hours, but has not completely hardened.

3) Insert an artist's flexible palette knife from the rear of the form under the fiberglass and Saran Wrap. (The Japanese artist paint mixing knife used by the



author had a 3-in. flexible blade that tapered in thickness from .014 inch at the tip to .028 inch at the handle. Also, the sides of the knife were slightly tapered and the tip was bent upward an almost imperceptible amount.) Slide the knife axially along the surface and work 360° around form—the same way cooks remove cakes from layer-cake pans. This will free the fiberglass from the form. Some slight temporary stretching may occur and the Saran Wrap may be displaced partially. Repeat this process until the fiberglass crankcase can be pulled from the form. The author has omitted the basic details of the easy-does-it method because this has been published by Hobbypoxy, and in other detailed published articles.

The following comments will assist in decision making or to emphasize certain important details. Three layers of glass cloth with good coatings of Hobbypoxy II will make a light crankcase, but five layers of glass cloth starting with medium weight and finishing with light weight glass cloth would be better. Smoother and thinner coatings of epoxy can be applied when the epoxy is kept warm during application by means of a small hair dryer. Bubbles can be excluded by careful application under these warm conditions, but do not worry about bubbles—since any that mar the surface can be opened and filled later so as not to show when painted.

Care should be taken to prevent round-off of the flats on the crankcase provided for the mounting of the engine cylinders. This can be accomplished by taping a layer of foam rubber over the deflated balloon to press evenly, completely around the section having the flats, while the epoxy hardens. Do not use rubber bands to retain the foam rubber, because they will localize the pressure too much and permanently indent the fiberglass. Masking tape works well to hold the foam rubber in place.

The engine cowling form was made using layers of scrap plastic foam with shaped ¼" balsa sheets laminated front and back to serve as templates, and to prevent distortion or rounding of the front and back corners while under pressure. A holding dowel was built into this form. After the form was shaped to size, the author used U.S. Gypsum Top Coat mixed with water to fill the pores of the plastic foam and to blend the shape of the form. When almost dry and hard, the form was completely sanded. Top Coat is not easily sanded when very rough and fully hardened, but it is possible to sand more easily when a very slight amount of moisture still remains just prior to final hardening. Top Coat can do a better job at less expense when compared to the use of a filler coating made with Tite Bond cement. (Commercially, Top Coat is used on prepared wall surfaces to cover nail indentations and joints.) It is the finish coat and can be made very smooth. Used on the plastic foam surface, this strong coating insulates and protects the plastic foam from damage when hot air is used to soften and smooth the epoxy. The coating need not be very thick, and thinner applications are preferred to reduce the number of coatings that have to be applied to take care of shrinkage that can occur in thick sections. Waxing of this form is not recommended; since Saran Wrap can be applied easily and shrunk very neatly on the form After the fiberglass work was completed, the flexible palette knife was used as previously explained to help remove the cowling without damage to either the cowling or the form.

The author tried without success locally procure balloons large enough for the easy-does-it method of making this engine cowling, but even the Jumbo-size and 16 in. diameter balloons procured were not quite big enough for this cowling. Therefore, a more than usual amount of sanding was necessary for a smooth finish. One word of caution when attempting to use the easy-does-it method. Secure the glass cloth well with thumb tacks, in areas to be cut away, to prevent shifting due to balloon breakage or slippage. Balloons that are a little too small may go onto the form, but slip back off again—especially, when your back is turned! In so doing, the position of the loose fiberglass cloth will be shifted. Following the rule of the thumb that the balloon be at least twice as big as the form usually helps to prevent trouble, but the sloping shape of the engine cowling encouraged slippage of the balloons.

One glance at the landing gear may tend to make the potential builder have second thoughts. The author confesses that item did delay the start of the project. Happily, the landing gear came out right the first time, with very little extra effort, using only four single pieces of ⅛" diameter piano wire for the finished product. Since the landing gear has 12 strut members, each wire simulates several struts.

In order to conserve building time and piano wire, the author played around with coat hanger wire to develop one side of the gear. Even though he had calculated the angles of the bends and the lengths of the struts, he paid the most attention to the lengths and bent the wire to fit the mounting or attach points. When the soft pattern wires were correctly shaped, pieces of piano wire were bent exactly the same way. Having completed one side, the opposite side of the gear was bent from the soft wire by reversing the bends as required. Then, pieces of piano wire were bent to duplicate that side. A small vise, a marking or Kodak negative pencil (author's preference), and a pair of abrasive cut-off discs—mounted on an arbor in the chuck of a Dremel tool—were all of the tools used to work the piano wire.

When the coat hanger wire was initially straightened, the first strut length was marked on the wire with allowance for that bend. Having made the bend, the next strut length was marked on the wire with allowance for that bend. This process was repeated until all the bends were made and adjusted to meet the attach points. The same procedure was used with the piano wire, using the soft wire pattern as a visual guide.

During the design of this landing gear, it was noted that torsional restraint could be utilized to strengthen the gear, rather than relying on resistance to bending alone. This was done by use of a grooved maple landing gear block (Top Flite) firmly affixed with screws and epoxy to the back of the bottom edge of the plywood firewall. Also, by using two other separate pieces of short lengths of grooved maple blocks, attached points were provided immediately in front of the leading edge of the bottom wing on the front side of the plywood bulkhead number 2. To use these mounting or attach points, the piano wire which started at the axle was bent at an angle up toward the middle of the firewall mounting block, bent to lay in the groove in the reverse direction and exit from the same side, then turned up slightly into an inverted "V" and bent into the side of the fuselage at bulkhead number 2. Straps and screws hold the torsional portion in the groove after the wire end is plugged into the side of the fuselage.

A hard wood separator block (not shown on the drawing) was attached to the landing gear block to prevent shift of the torsional sections toward the middle by slipping in the groove under the holding straps. The second piece of wire was formed to attach rearward of the cowling, near the top longeron of the fuselage, and bent downward to include the Oleo strut; then, bent under the axle and back under the lower wing to attach near the center of the bottom of the fuselage to the rear of the trailing edge. The left and right upper ends attach through individual Nylon brackets cut from a single C.G. Nylon nose-gear bracket and bolted to the back of the plywood firewall. These ends are held by wheel collars.

The rearward ends are bent at right angles and inserted into holes drilled in a

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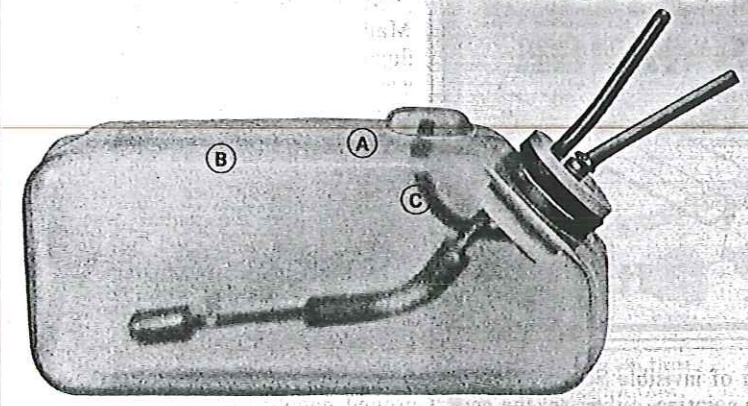

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rectangular piece of Epoxy printed circuit board which is attached to the bottom center area of the lower wing mounting block. A notched Nylon strap bolted under and through the lower wing constrains the ends of the wire in the holes of the Epoxy mounting plate. Attachment of the wire looped under the axle to the axle itself is a matter of personal preference. The author, preferring not to use binding wire and solder, made a pair of aluminum parts. Nylon or other materials could be used instead.

At this point, when one counts the number of bends in the wires, he will find that number equal to, or little more than, wire gears that affix to the back of the firewall, due to the number of bends required to prevent displacement on the firewall. This gear is of stronger construction than many others made of this size wire. On each side, a tripod of struts attaches to the top of the Oleo strut, and the Oleo strut together with the two lower struts likewise forms a tripod attaching at the wheel hub.

Application of dope can be expedited by using 3-in. cubes of Polyurethane instead of a brush. Use a small aluminum pan or margarine container to hold the dope. Soak about ¼ inch of dope into one side of the cube and apply to the covering. A slight pressure will feed dope from the inside pores of the cube reducing the drag of the stroke. However, for the first coat on silk the cube should be held off an instant to encourage a slight dryness, and then lightly touched to the silk so as not to apply too much dope and cause runs. Since weight, especially in the tail, has a detrimental effect on the flying quality, apply only the minimum amount of dope—in particular, the heavier color dope.

Experience indicated that 2° right and 2° down thrust would be a good first approximation of the angles needed for straight and level flight. Offsets of the base of the engine mount of about 5/32 inch can be used to bring the propeller shaft to the center of the cowling for better appearance; however, it should be borne in mind that this also offsets the engine thrust line and will decrease the thrust correction angles required. These angles, and offsets if desired, together with a 2° positive setting of the stabilizer, should be set for the first test flight. Under these conditions, takeoff and flight should be accomplished with less panic and greater safety. Hopefully, the trim adjustments will be within the limits of the trim available at the transmitter.

Any thought that the engine mount could be machined for thrust correction was discarded when it was found that .148 inch would have to be removed, measured at a point on one edge on a slanted 45° axis from the vertical of a 3-in. diameter engine mount base. Therefore, a large wedge-shaped aluminum shim in the form of an annulus (ring or washer) was made and drilled to provide mounting holes as required for the engine mount installation. (Fig. A. provides a scientific, accurate way, of determining the specs for making such an aluminum wedge.)

It is suggested that 3/16" thick aluminum sheet stock be used for machining this circular wedge shim. Machine your shim, scribe and position your axis; then drill mounting holes. This type of shim will produce the firmest engine mount support.

Wing strut and landing gear strut angles and lengths can be calculated similarly using compound angle formulas. Simplest way to visualize the problem is to draw a pyramid with one corner edge perpendicular to a rectangular base, and with the longest edge representing the strut in question. The perpendicular distance between the attach points or bends and the coordinates of the base can be obtained from the original drawings in accordance with the scale. Projected angles can be measured directly from the drawings; they are unaffected by the scale. Formulas for this type of calculation are listed in "Mechanics Vest Pocket Reference Book." A full explanation of compound angles is contained in "Practical Shop Mathematics" Vol. No. 2, by J. H. Wolfe and E. R. Phelps, McGraw-Hill.

After having prepared a description of a good method to use for applying dope, especially to silk, the winter arrived and the odor of dope would have been offensive, so Coverite was applied. One word of

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caution, the black color of the Coverite used tended to bleed into the yellow Coverite insignia trim. Glaskote, later used to seal the lettering, would have prevented color bleeding if it had been painted on the contact surface prior to trimming.

In the final installation and assembly, methods were devised for retaining the fuel tank, installing a muffler, and providing a good looking landing light lens.

First, it was found that the square 12-ounce Sullivan fuel tank fits nicely into the quart size cardboard milk carton. Then, it was a simple matter to cut, position and hold the container in place at bulkhead #2 with flat pieces of "apple taffy sticks." It is important to make this installation removable for access to the servos. Another good way is to make the engine bulkhead removable from the firewall complete with the engine and fuel tank.

Secondly, the Slim Line Muffler is fine for the engine installation, but it should be modified to install at right angles. Beside looking much better, the muffler can remain on the engine during assembly or removal of the cowling. Viewed from one side, the modified muffler appears in a position that imitates an air inlet for the dummy engine.

Thirdly, a very realistic looking lens for the landing lights can be made in about five minutes. Simply acquire a pair of plastic egg containers from your wife or girl friend who has purchased two pair of L'eggs panty hose. Use the largest end of each egg and scribe the required diameter circle inside by spinning a small compass. Using a pair of scissors, cut without cracking to the inscribed circle. Attach lenses to the landing lights with Pliobond cement. For the record, the landing lights were black.

To dress up the 1" piano wire landing gear, it was decided to use the large size straight plastic soda straws. Short pieces of black neoprene tubing (Sullivan) were split and snapped around the wire to concentrically space the ends of the split plastic soda straws. To conceal the split in the straws, two concentric straws were used with splits oriented 180° apart on each wire. The outside split can be covered with a length of invisible Scotch tape before or after painting. Likewise, the ends can be retained by a wrap of the same tape. Tests proved that the tape could be doped. In fact, the dope will stay on the tape with a little loss of gloss; whereas, the dope may tend to flake off the smooth plastic straws when flexed. Sanding the straws lightly to roughen the surface helps. In flight, the straws do not fly off.

Since the Oleo struts are larger, it was decided to use cut off plastic barrel sections of black felt pens. These sections of pens were split lengthwise by means of an Xacto saw and snapped over the piano wire. Concentric spacing was accomplished by a build-up of split neoprene tubing. Axial shift of these pieces of pens was prevented by "Goo" cement. (A rubber-like modeler's cement the author also applies to prevent wheel colars from coming off, etc.)

In preparation for flying, the landing lights, scale engine and cowl were removed. A pair of 3½-in. diameter wheels and a 13-5½ propeller were installed. Then the model was balanced with 12 ounces of lead (two 6 ounce sinkers) on the engine mount. This moved the C.G. forward to about the 30% location. In general, everything was done to compensate for unwanted torque effects and to assure that the model would not fly tail heavy.

Now for the happiest and most rewarding part: the test flights of the prototype. Frank Stanton, a friend and fellow club member, agreed to serve as test pilot at our club field at Johnsville N.A.D.C. Warminster, PA. The first check flight was a complete success. Indications were that less ballast could have been used, but the only trim adjustments required were 50% left rudder trim and 100% up elevator trim by means of the transmitter trim adjustments. The airplane flew so well, even without trim changes to the surfaces, that the second flight became a stunt flight. Would you believe Frank flew a large portion of a rolling circle? Barring a low sun position, Frank probably would have gone all the way around! Allowing for the fact that the model was being flown by a very capable flier, observers noted the excellent manner the Pitcairn Mailwing responded in flight. After the test flights Frank's comments were, "It's a good flying airplane! It's a piece of cake to fly!"

At the next flying session, the Pitcairn Mailwing was flown all dressed-up for in-flight pictures. This time the ballast weight was reduced to about 8 ounces. Two flights were flown to shoot takeoff, fly-by, and landing pictures. It was not surprising that this model did not roll fast, because the ailerons are only on the lower wing and no differential was utilized. Aileron turns were good, but turns made only using rudder resulted in loss of altitude, which is not unusual.

Indications are that smooth grass flying fields would be preferable to hard surface runways, in agreement with the ground handling of the original airplane. Even when flown with landing lights, scale engine and cowl, the configuration tends to protect them from damage should a ground loop occur. One propeller survived two ground loops on hard runways.

One final note, the author has recently purchased "Giant Round Balloons" made in Mexico and distributed through World Toy House. These balloons look very promising for use when making large engine cowls by the easy-does-it method. Of course, modelers should not overlook the possibility of obtaining suitable balloons from Hobbypoxy, the people who originated the method.

RC Aerobatics/Van Putte

continued from page 28

does not guarantee a Novice pattern trophy, but there are enough good fliers around who do have them to make it very difficult for even a great flier to win with a sport airplane.

There are several ways to proceed in alleviating the situation and all of them have their pitfalls. It will probably take a grass roots movement to have much of an effect on pattern flying since major changes in the rules are very infrequent unless there is a widespread demonstration of the need and desire to change them. Contest Directors will have to make decisions to offer competition in line with proposed rule changes and see how they work out. The National Society of Radio Controlled Aerobatics (NSRCA) can be a strong factor in proposed rule changes. The NSRCA district vice presidents should be given feedback on proposed changes so that the issues can be aired in the K Factor, monthly newsletter of the NSRCA. If you aren't already an NSRCA member, send $10 for 1979 dues to Mrs. Sally Brown, Secretary Treasurer; 8534 Huddleston Drive, Cincinnati, OH 45236.

One thing which has been tried by Contest Directors in contests around the country has been the introduction of a special Novice class for beginners in pattern competition. Many large contests have had a