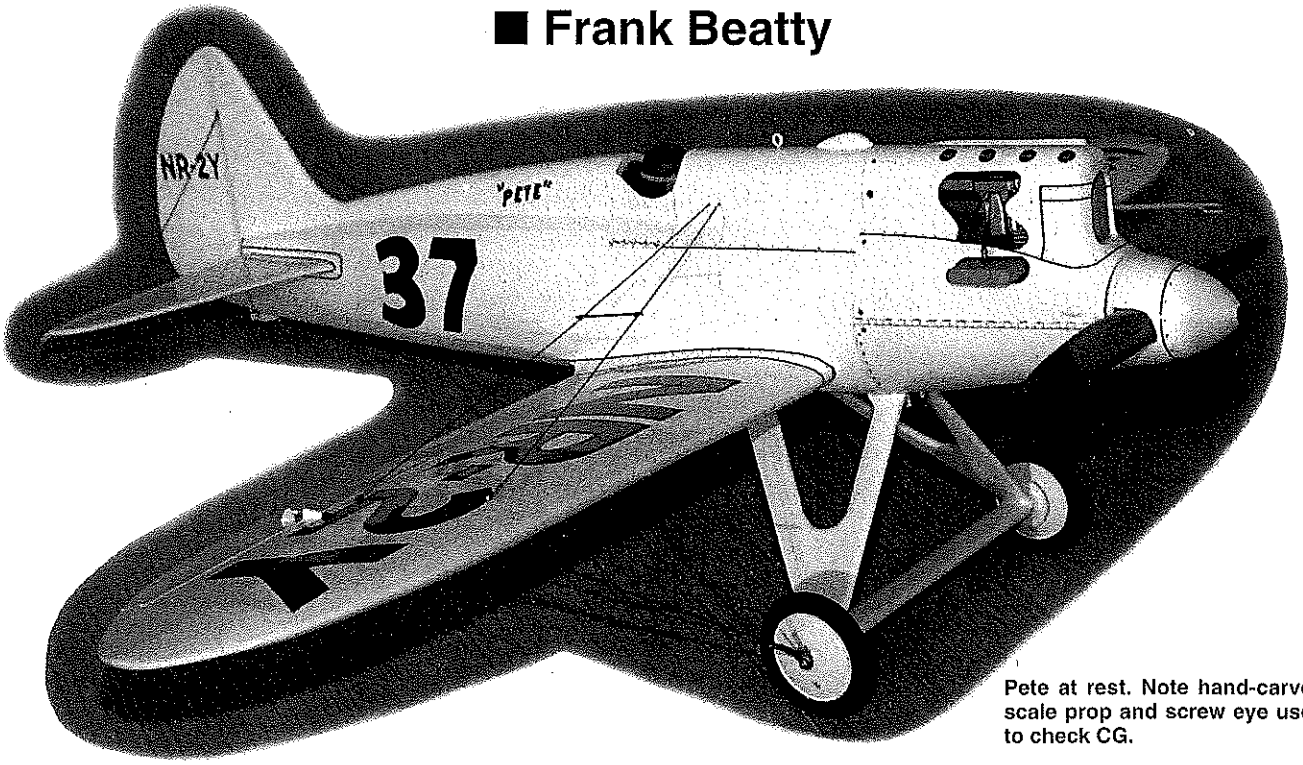
#881

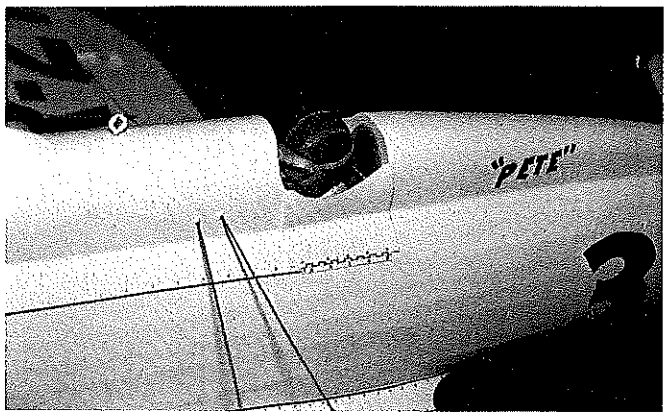
HOWARD PETE

■ Frank Beatty

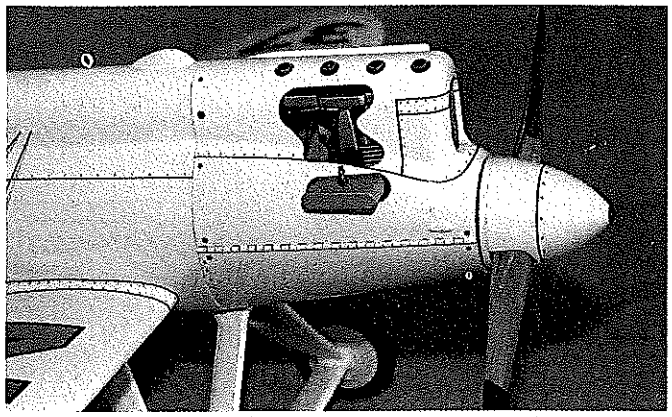


Pete at rest. Note hand-carved scale prop and screw eye used to check CG.

Benny Howard's 1930s racer for CL Scale competition



Tips gleaned from Don Typond's *How to Paint Pilot Figures* tape (Robin's View Productions) added realistic detail.



Dummy manifold in largest cutout "helps hide an otherwise unsightly hole." Stacks protrude slightly above openings.

Full-scale aircraft engineers are faced with challenging design and performance requirements that often can be resolved only by compromise or tradeoff.

The same holds true for model designers. t will make a big difference in how the nodel will be designed and built, for nstance, if it is to be a weekend sport model ır an all-out competition machine.

The Pete was intended to be a competition nachine that would participate in a future Nationals. In order to enhance its true scale ıppearance, the control system leadout wires hould be enclosed in the wing.

It was recognized that the sharply curved illet at the wing-to-fuselage joint would :omplicate locating the bellcrank. Space imitations and clearances dictated the use of ı 2½-inch short-span bellcrank, even though his might induce somewhat sensitive fore- ınd-aft pitch-axis flight qualities.

As design work progressed, it was noted hat the bellcrank mounting plate must also ;erve as the rear undercarriage strut- nounting plate. This raised concerns that a ıard landing might buckle that plate and ender the control system inoperable. (That ear has proved groundless.)

Finally, it seemed that the wing center ;ection should be built as a separate unit in ›rder to facilitate the bellcrank and rear ındercarriage strut installations.

An alternate approach for a weekend sport nodel would be to locate a 3- or 3½-inch ong-span bellcrank on top of the engine nounts between bulkheads 6 and 9. The 'uselage and wing center section could then ›e built as one unit, and the fears about the ındercarriage strut location would also be :liminated. Of course, revised cutouts for 'erouting the throttle and elevator pushrod inkages would be required. Tradeoffs, ınyone?

CONSTRUCTION

Though the Pete is not an especially difficult model to build, the construction sequence is important.

The tail surfaces, wing center section, and wing outer panels are built first, so that :onstruction will not be delayed when those ›arts are needed.

Stabilizer and Elevators: Thin, scalelike, strong fabric-covered tail surface structures :an be achieved by building them around an internal 1/64 plywood core.

Cut 1/64 plywood cores for the stabilizer and elevators. Cement the spars and balsa ribs to these cores. Soak four 1/16 x 1/4 balsa strips in ammonia and bind them around these structures' outlines. When dry, these strips can be cemented to those structures.

Install the elevator horn and Robart hinges. Build up epoxy around those hardware items at the plywood cutouts. These joints are quite strong and will need no other reinforcement.

Drill the stabilizer spar and use cyanoacrylate (CyA) glue to attach 1/16 brass tubing into these holes for rigging wire locators.

FOR PETE'S SAKE

The 1997 Nationals Control Line Sport Scale event was drawing to a close when it was announced that static and flightline judges had offered to review scoresheets with each contestant in order to improve future scores. That review left me determined to make changes in my documentation format to eliminate inconsistencies that were costing static points.

The strategy that eventually evolved was to start with an excellent, respected three-view and to build on that. All photos and color documentation had to agree 100% with the three-views and with each other. Outlines, details, and markings of the proposed model must be drawn and built to within pencil-line-width accuracy of the material in the documentation package.

A concerted effort would be made to minimize nonscale cowling openings or visible hardware items. And the subject must have a configuration that would ensure good flying and ground handling.

My last few models had been biplanes, so for a change of pace I began looking at the wire-braced monoplane racers of the 1930s. Benny Howard's Pete kept bobbing to the surface.

The Pete was the third airplane and the first pure racer that Benny Howard designed and built. Howard entered as many events as he could—seven in all—and pocketed more than $7,000 in prize money by winning five first places and two third places. He had placed third in the prestigious Thompson Trophy Race, although his Pete had been pitted against larger and far-more-powerful machines.

This underdog element was not lost on the fans in the grandstands, or on the press, who quickly clasped Howard and his Pete to their hearts and made them the darlings of the meet.

Howard's winnings would finance two new racers, and ultimately a Thompson Trophy Race winner, but that's another story.

Model builders also took the Pete to their hearts. Its sleek good looks and sensible configuration could not be denied. We have seen models of the Pete in every format, from small display models to giant Radio Control models.

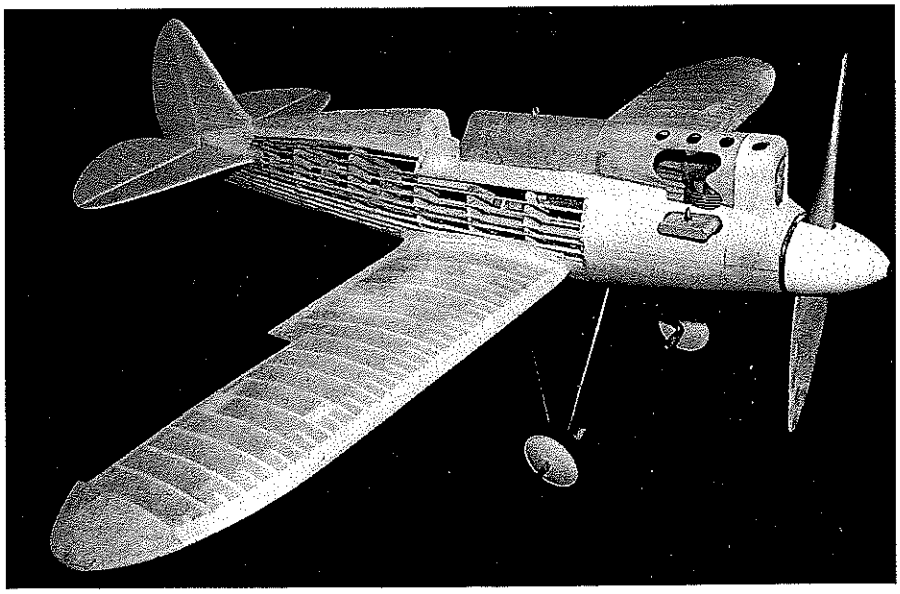
I can remember doing a 10-cent solid display model of the Pete. I can also remember my Cleveland ½-inch-scale model that was displayed for years in my grandmother's living room. How can I ever forget the good times I had flying a Sterling Pete CL model? Nor can I forget a somewhat larger fine-flying superdetailed CL Pete that I saw perform at a Midwestern contest in the mid-1950s. I can recall making a mental note that someday I must do a nice Pete like that.

Paul Matt's superb three-views were used to prepare construction drawings. Color-and-marking details were taken directly from those three-views and a cover painting by R. A. Benjamin (*Model Builder*, September 1988).

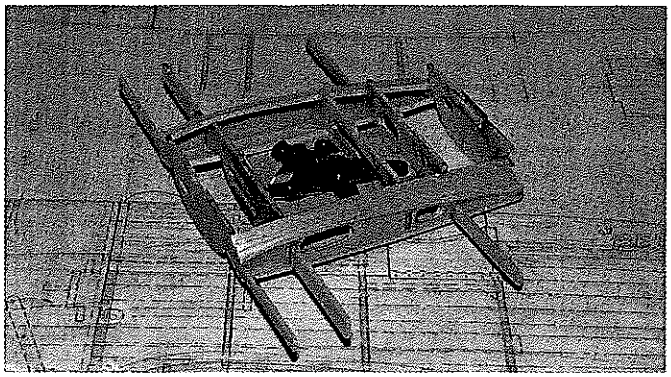
Photos and a three-view of the Wright-Gypsy four-cylinder engine were useful in detailing the carburetor and manifold—so prominent in a large cowling opening.

Various photos gleaned from countless articles about the Pete helped detail and finish the model authentically.

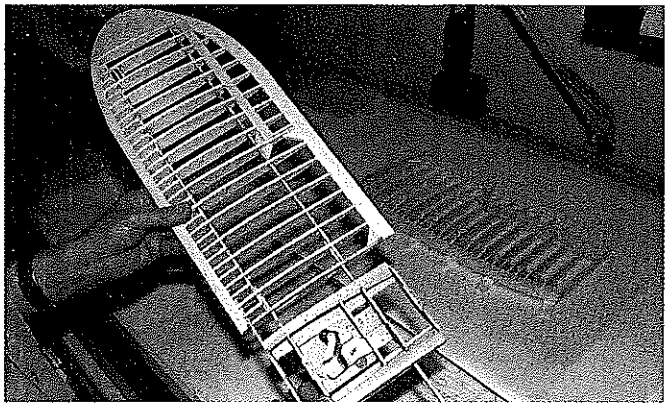
Surely these research efforts and revised documentation format must have contributed to Pete's top static score of 93.7 at the 1998 Nationals. ✈



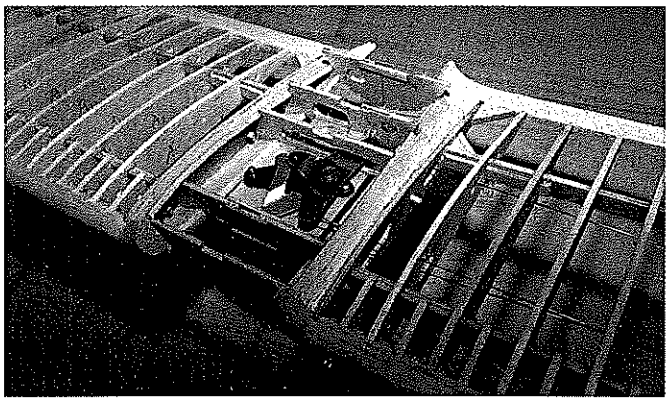
Ready for fuselage covering. Author prefers realism and sturdiness of small basswood stringers, which do not sag after covering and finish have been applied.



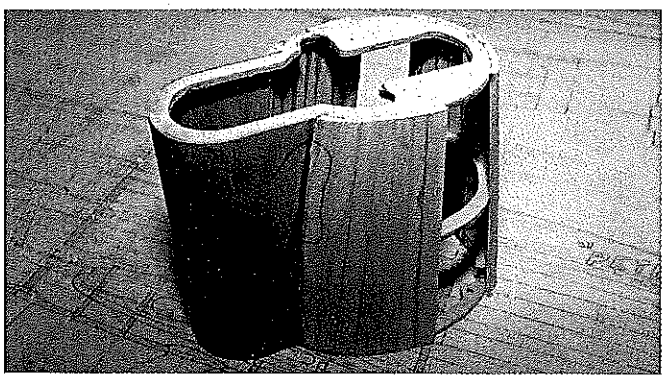
Wing center section with Brodak three-wire bellcrank temporarily installed for photo purposes.



Starboard wing panel is test-fitted to center section.



Three panels joined, fairing blocks installed, bellcrank and leadout wires in place. Note wing root curve.



Upper cowl is 1/32 plywood. Lower section is 3/32 basswood planked over plywood bulkheads—lighter than balsa.

Cover the surfaces using Sig Stix-it, Sig Koverall, and Sig clear dope, and set aside.

Fin/Rudder: These are built in the same manner as the stabilizer and elevators. Fitting and shaping the rudder cone fairings must wait until they can be faired into the rear fuselage.

Wing Center Section: Make up the bellcrank mounting plate. Bolt the bellcrank to the plate, check for freedom of movement, and remove the bellcrank from the plate.

The center section will be built upside down on a building board. Pin a 1/8 x 1/2 x 7 wood strip to the board. This is a guide that will help to align the center section bulkheads.

Fit bulkheads 6A, 7A, and 8 onto the bellcrank mounting plate. Epoxy the parts together, and before they set up, quickly pin the parts to the building board, using the wood strip and bulkhead cutouts to ensure alignment. Epoxy plywood ribs H and bulkheads 5 and 9A to this assembly.

Plank the exposed curved wing root fillets with 1/8 balsa strips. When dry, lift the assembly from the board and plank the fillets' top surface with 1/8 balsa strips.

CyA 1/4 x 1 plywood rectangles to bulkheads 6A and 9A to form boxlike receptacles. These will mate with tabs on bulkheads 6 and 9 when the wing is assembled to the fuselage. This system will square the wing to the fuselage, set the dihedral angle, and set the incidence angle accurately.

The rear landing gear struts will be bound to the bellcrank mounting plate later; this is a key structural element.

Wing Outer Panels: Cut out all ribs, false ribs, spars, and leading and trailing edges. Block up and pin the aileron spar and leading and trailing edges to the building board. Slip all ribs into slots. Thread 1/8 basswood spars through the ribs. Fit false ribs into position. CyA all joints.

Lift the assemblies from the board. Fit 3/4 balsa tips to wings. Fit sheet balsa fillers for mounting aileron horn details. Box in spars at rigging wire locations with basswood blocks. Add wing tip weight. Shape and sand the wing panels to final shape.

Test-fit the center section to each of the outer panels.

Mark matching cutouts at port wing root A and H ribs and remove that material as required for leadout wire passageway. Use an extension drill bit to pierce holes in ribs for leadout wires in port outer wing panel. Install tubing for leadout wire guides in wingtip.

Cut ailerons separate from the wing panels.

Drill spars and CyA 1/16 diameter brass tubing into these holes for rigging wire locators.

Set these assemblies aside for now.

Fuselage: Obtain a piece of 3/4 diameter Reynolds aluminum tubing 26 inches long. Make up a plug assembly (see drawing detail) and CyA it into one end of the tubing. This plug end will slip into a cutout in bulkhead 13 at the narrow tail end of the fuselage.

Carefully align and CyA a 1/8 x 3/16 basswood strip onto the bottom side of the tubing. This will keep bulkheads from rotating out of alignment when they are being threaded onto the tube. Carefully mark all bulkhead locations on this tube assembly. This will be the key tool used in building a straight, round, stringered fuselage. I am indebted to Robert Underwood's article describing this technique (*Model Airplane News*, March 1996).

Cut out all bulkheads. Make up and bind the forward landing gear strut and axle assembly to bulkhead 4A. Thread all bulkheads onto the tubing. Carefully align the bulkheads and CyA the top and three or so stringers on each side into place.

Before proceeding, use the wing center section to make sure that the tabs on the fuselage formers mate with corresponding cutouts in the wing center section bulkheads.

Epoxy engine mounts and gussets with 1/8 dowel locking pegs, fuel tank, 1 1/4 diameter plastic golf tube, and tailskid assembly into position. Use of the plastic golf tube allows us to avoid making nonscale openings in the cowling by providing a passage through the fuselage where cooling air can exit out the cockpit opening.

Install all remaining stringers above the fuselage centerline.

Study the plans and drill and temporarily fit two 1/16 diameter brass tubing rigging wire locators into position between bulkheads 6 and 7.

Cut out 1/32 plywood cowling, soak in ammonia, snap and tape into position on top of the fuselage. When dry, mark and drill holes for rigging wire locators. CyA cowling and tubing in place.

Make up head rest fairing block and cement to fuselage. Add 1/8 balsa filler strips at base of cowling and headrest.

Bolt the engine to the engine mounts. Make up and install the intermediate throttle crank.

Temporarily tape the wing center section to the fuselage in order to bend up and fit the 5/64 diameter music wire rear landing gear strut to correct shape and to mate with main gear and axle.

Make up the linkage to the throttle crank. Set the center section, rear landing gear strut, and throttle linkage aside for now.

Cowling: Three plywood formers and four plywood stringers are assembled and trued. Cover the upper structure with a 1/32 plywood cowling similar to the procedure used on the fuselage. Plank the lower cowling with 3/32 x 1/4 basswood strips. The nose block is three layers of 1/2 basswood, hollowed as shown on the drawings.

Cowlings made of hardwoods are just a smidgen more difficult to build and just a little heavier than if built of balsa. However, these hardwoods take paints beautifully and ding resistance is high. And any openings can have thin, crisp, scalelike edges that hold up in use.

The cowling break is at the model's firewall, and it slides forward for removal. It is aligned and held in position with four 1/8 dowel guide pins at the firewall and two blind mounting bolts hidden behind the spinner.

Cover the cowling with 1/2-ounce fiberglass and set aside.

Wing Assembly: The wing will be assembled upside down on a building board. Use a one-inch-thick block of wood to raise the center section above the building board surface. Slip the outer wing panels onto the center section and block the tips up approximately 1/8 inch. Epoxy all joints.

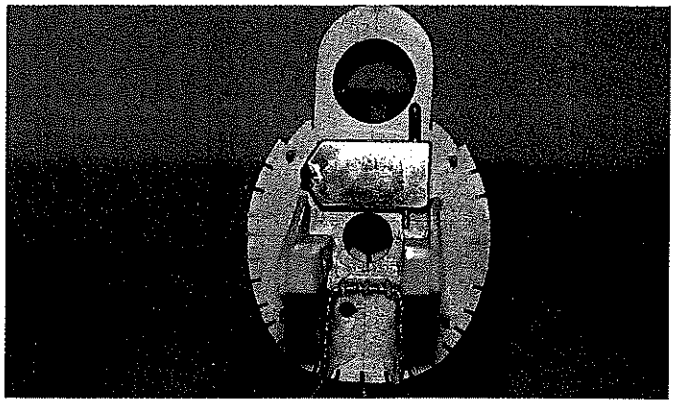
When dry, lift the assembly from the board. Fit and carve balsa leading and trailing edge center section root fairing blocks to shape. Leave them long enough to extend into the fuselage past the planking line, so the fuselage planking can be trimmed to butt against those root fillets.

Bind and epoxy the rear undercarriage struts to the mounting plate.

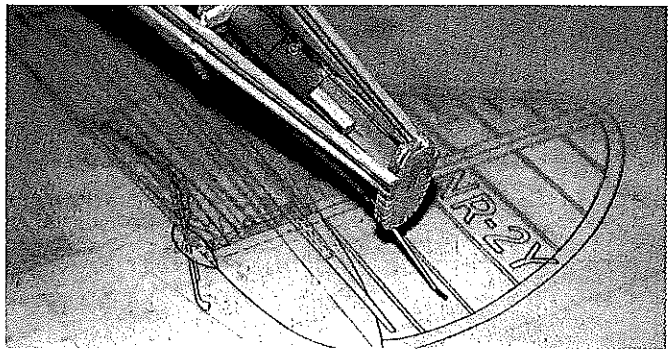
Thread leadout wires through the wing and then bolt the bellcrank (with throttle linkage) to the mounting plate. Bend up leadout loop ends now or cover those sharp ends with tape to prevent injuries.

Give the entire wing assembly a good final sanding. Use Sig Stix-It and Sig Koverall to cover the wing. Brush on two coats of clear dope and set the assembly aside.

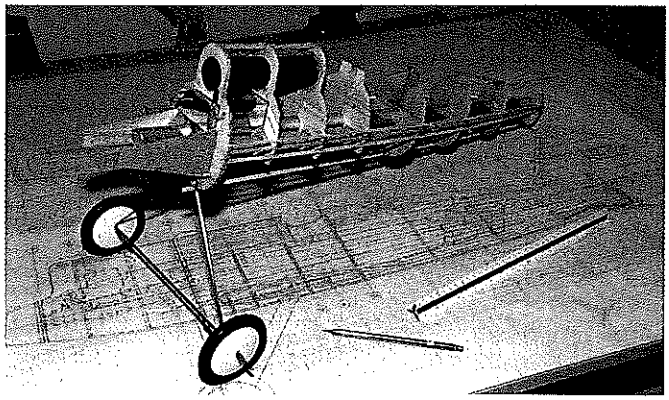
Assembly: An unsightly nonscale cowling opening for glow plug access was avoided by using a remote glow plug connector. Install its



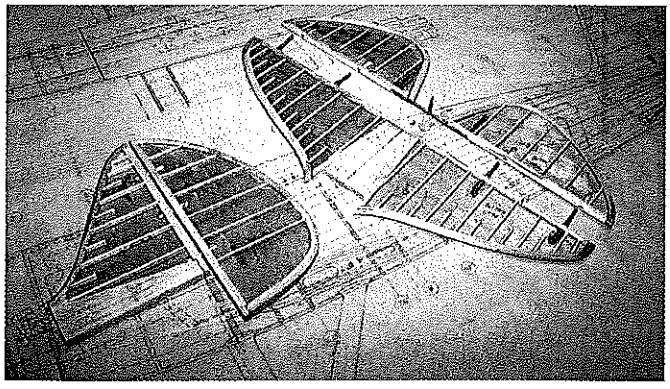
Front view shows stringer notches and cooling air duct opening. Four 1/8 dowel pins are used to align the cowl.



Aluminum tubing guide passes through holes in bulkheads and ensures that fuselage will be in alignment.



Bulkheads, engine mount, main landing gear struts, some stringers have been installed. Note cooling air duct.



Tail surfaces have 1/64 plywood cores with balsa ribs. Strong, light, realistic for fabric-covered structures.

HOWARD PETE

Type: CL Scale

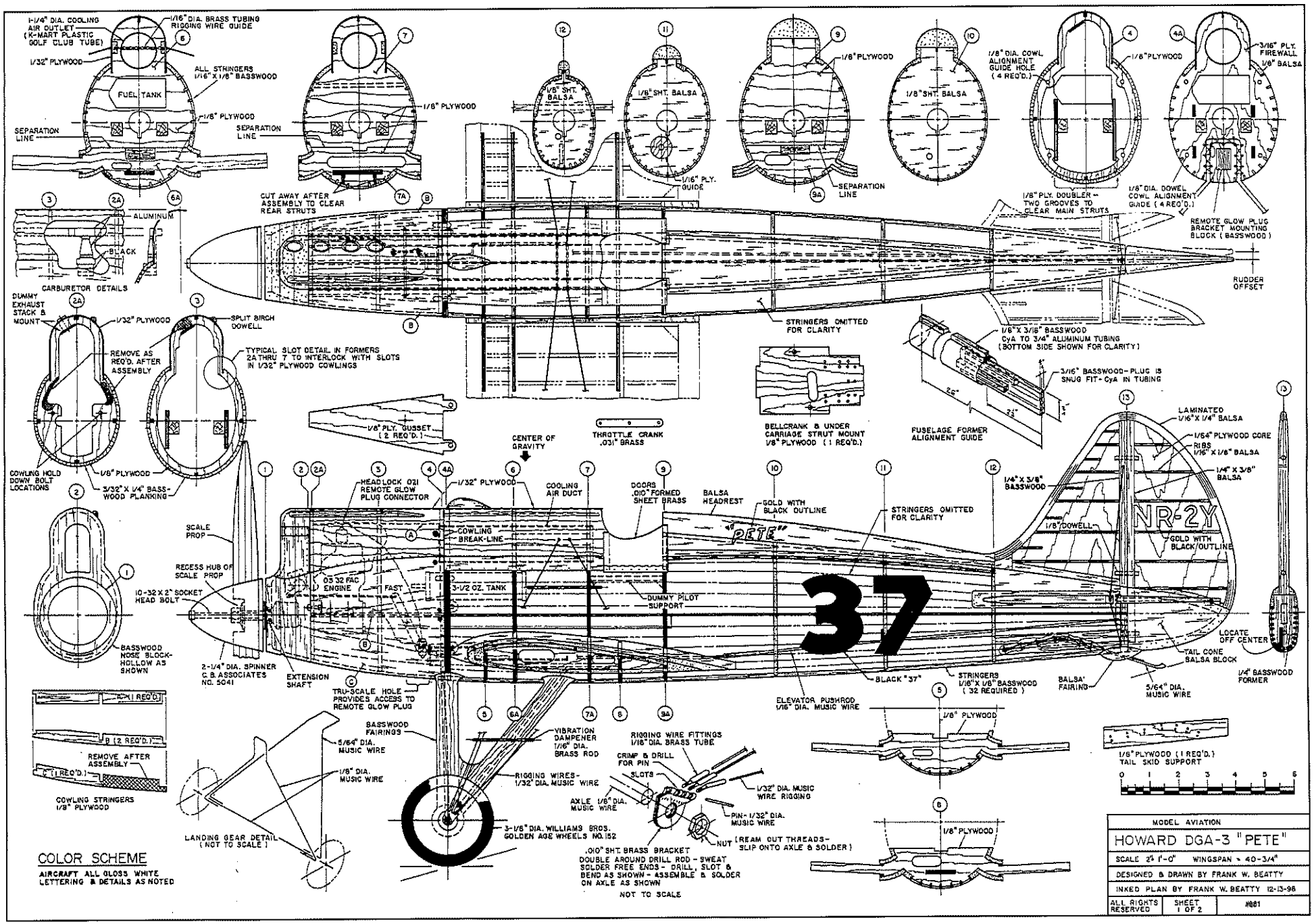
Wingspan: 40 3/4 inches

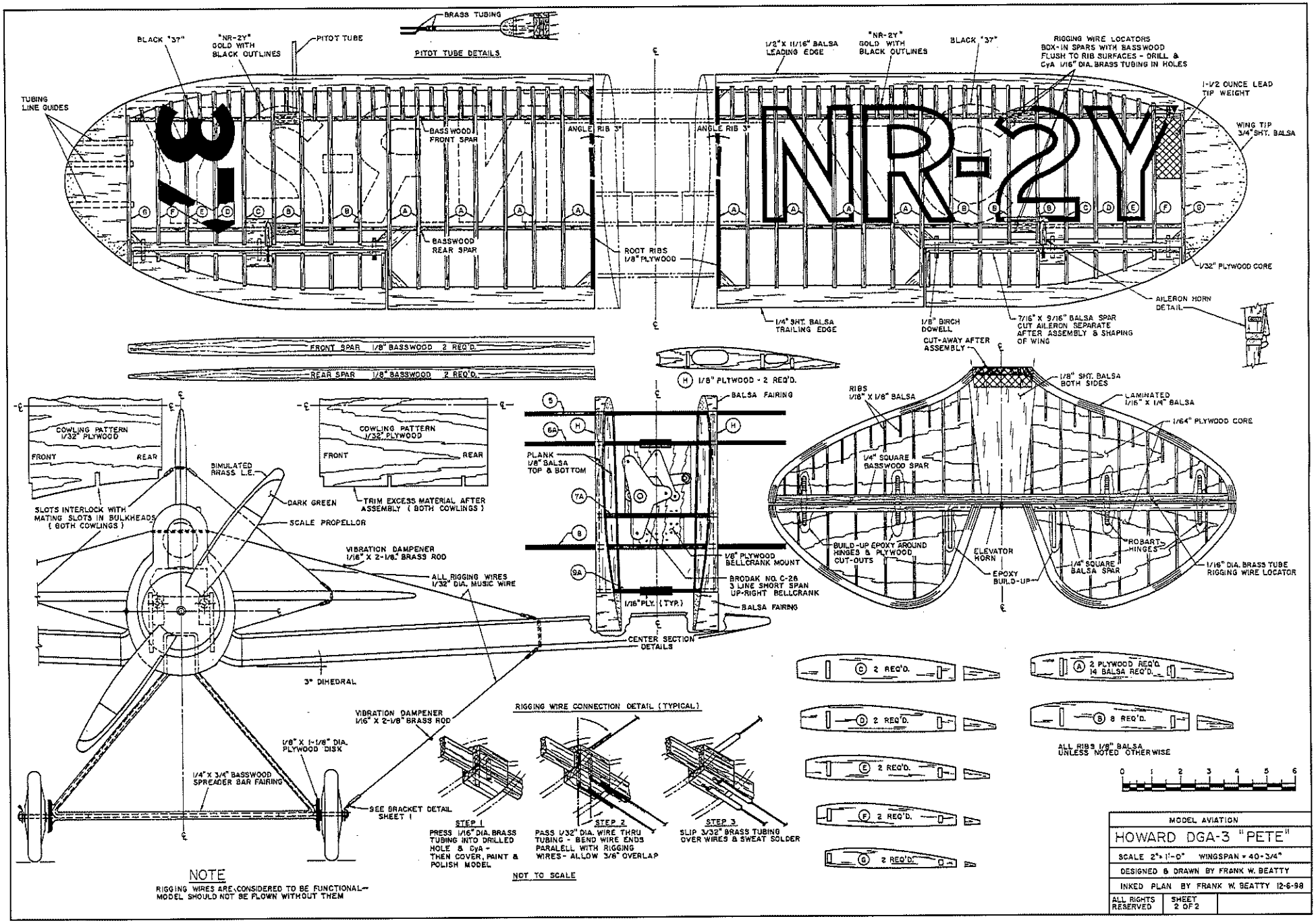
Engine: O.S. .32

Flying weight: 65 ounces (approx.)

Construction: Built-up

Covering/finish: Sig Koverall and Sig dope


1-1/4" DIA. COOLING AIR OUTLET (K-MART PLASTIC GOLF CLUB TUBE)
1/16" DIA. BRASS TUBING RIGGING WIRE GUIDE
1/32" PLYWOOD
ALL STRINGERS 1/16" X 1/8" BASSWOOD
FUEL TANK
1/8" PLYWOOD
SEPARATION LINE
1/8" PLYWOOD
SEPARATION LINE
1/8" SHT. BALSA
1/8" SHT. BALSA
1/16" PLY. GUIDE
1/8" PLYWOOD
SEPARATION LINE
1/8" SHT. BALSA
1/8" DIA. COWL ALIGNMENT GUIDE HOLE (4 REQ'D.)
1/8" PLYWOOD
3/16" PLY. FIREWALL
1/8" BALSA
ALUMINUM
BLACK
CARBURETOR DETAILS
CUT AWAY AFTER ASSEMBLY TO CLEAR REAR STRUTS
1/8" PLY. DOUBLER - TWO GROOVES TO CLEAR MAIN STRUTS
1/8" DIA. DOWEL COWL ALIGNMENT GUIDE (4 REQ'D.)
REMOTE GLOW PLUG BRACKET MOUNTING BLOCK (BASSWOOD)
RUDDER OFFSET
DUMMY EXHAUST STACK & MOUNT
1/32" PLYWOOD
SPLIT BIRCH DOWELL
REMOVE AS REQ'D. AFTER ASSEMBLY
TYPICAL SLOT DETAIL IN FORMERS 2A THRU 7 TO INTERLOCK WITH SLOTS IN 1/32" PLYWOOD COWLINGS
STRINGERS OMITTED FOR CLARITY
1/8" X 3/16" BASSWOOD CyA TO 3/4" ALUMINUM TUBING (BOTTOM SIDE SHOWN FOR CLARITY)
3/16" BASSWOOD - PLUG IS SNUG FIT - CyA IN TUBING
1/8" PLY. GUSSET (2 REQ'D.)
CENTER OF GRAVITY
THROTTLE CRANK .031" BRASS
BELLCRANK & UNDER CARRIAGE STRUT MOUNT 1/8" PLYWOOD (1 REQ'D.)
FUSELAGE FORMER ALIGNMENT GUIDE
LAMINATED 1/16" X 1/4" BALSA
1/64" PLYWOOD CORE
RIBS 1/16" X 1/8" BALSA
1/4" X 3/8" BALSA
COWLING HOLD DOWN BOLT LOCATIONS
1/8" PLYWOOD
3/32" X 1/4" BASSWOOD PLANKING
HEADLOCK 021 REMOTE GLOW PLUG CONNECTOR
1/32" PLYWOOD
COOLING AIR DUCT
DOORS .010" FORMED SHEET BRASS
BALSA HEADREST
GOLD WITH BLACK OUTLINE
1/4" X 3/8" BASSWOOD
SCALE PROP
COWLING BREAK-LINE
"PETE"
1/8" DOWELL
NR-2Y
GOLD WITH BLACK OUTLINE
RECESS HUB OF SCALE PROP
10-32 X 2" SOCKET HEAD BOLT
OS 32 FAC I ENGINE
FAST
3-1/2 OZ. TANK
DUMMY PILOT SUPPORT
37
LOCATE OFF CENTER
TAIL CONE BALSA BLOCK
1/4" BASSWOOD FORMER
BASSWOOD NOSE BLOCK - HOLLOW AS SHOWN
2-1/4" DIA. SPINNER C.B. ASSOCIATES NO. 5041
EXTENSION SHAFT
TRU-SCALE HOLE PROVIDES ACCESS TO REMOTE GLOW PLUG
BLACK "37"
STRINGERS 1/16" X 1/8" BASSWOOD (32 REQUIRED)
BALSA FAIRING
5/64" DIA. MUSIC WIRE
ELEVATOR PUSHROD 1/16" DIA. MUSIC WIRE
1/8" PLYWOOD
1/8" PLYWOOD (1 REQ'D.) TAIL SKID SUPPORT
0 1 2 3 4 5 6
A (1 REQ'D.)
B (2 REQ'D.)
C (1 REQ'D.)
REMOVE AFTER ASSEMBLY
COWLING STRINGERS 1/8" PLYWOOD
BASSWOOD FAIRINGS
5/64" DIA. MUSIC WIRE
1/8" DIA. MUSIC WIRE
VIBRATION DAMPENER 1/16" DIA. BRASS ROD
RIGGING WIRE FITTINGS 1/16" DIA. BRASS TUBE
CRIMP & DRILL FOR PIN
SLOTS
RIGGING WIRES - 1/32" DIA. MUSIC WIRE
1/32" DIA. MUSIC WIRE RIGGING
AXLE 1/8" DIA. MUSIC WIRE
PIN - 1/32" DIA. MUSIC WIRE
NUT (REAM OUT THREADS - SLIP ONTO AXLE & SOLDER)
3-1/8" DIA. WILLIAMS BROS. GOLDEN AGE WHEELS NO. 152
.010" SHT. BRASS BRACKET DOUBLE AROUND DRILL ROD - SWEAT SOLDER FREE ENDS - DRILL, SLOT & BEND AS SHOWN - ASSEMBLE & SOLDER ON AXLE AS SHOWN
NOT TO SCALE
LANDING GEAR DETAIL (NOT TO SCALE)
COLOR SCHEME
AIRCRAFT ALL GLOSS WHITE
LETTERING & DETAILS AS NOTED
MODEL AVIATION
HOWARD DGA-3 "PETE"
SCALE 2" 1'-0" WINGSPAN = 40-3/4"
DESIGNED & DRAWN BY FRANK W. BEATTY
INKED PLAN BY FRANK W. BEATTY 12-13-98
ALL RIGHTS RESERVED
SHEET 1 OF 2
#881



mounting block and bracket to the firewall (bulkhead 4A). Access to the remote glow plug is through a scale hole in the bottom of the cowling.

Attach the wing to the fuselage. Tabs at bulkhead separation lines should mate with receptacles on wing center section bulkheads. These should automatically align wing in all axes, but double-check alignments before epoxying the wing into place.

Cement and dowel-pin the fin to the stabilizer, then mount this assembly to the fuselage.

Install all elevator pushrods and throttle linkages and check for freedom of movement.

Fit ⅛ x ¼ sheet balsa fairings all the way around each wing root at the fuselage. Then the remainder of the stringers can be added. Fit, shape, and cement fairing blocks at the fin-to-stabilizer joint.

Sand the entire fuselage well and cover using Stix-It, Koverall, and two coats of Sig Dope.

Install fairings on undercarriage axle and struts. I prefer to use basswood for such fairings because it resists compression or fatigue-type distortions if the model has a hard landing. Cover all struts with ½-ounce fiberglass.

Finish: At this point my model, assembled with engine, wheels, and all hardware items installed, weighed approximately 51 ounces. It hung nose-down about 5° when suspended from its designated Center of Gravity (CG) location. It was reasonable to assume that the completed model would weigh in at the mid-60s and require little or no ballast to balance properly. All seemed to be going well.

But then a fatal error was made.

At this time I scrapped my 40-year-old hobby type compressor and bought a new 1½-horsepower compressor. At the same time, I switched brands of dope.

The new sealers and dopes were thinned and applied in the manner I was accustomed to. I had not realized that the new paints were thicker and required a great deal more thinner, or that fewer coats would be required. While my little old compressor would have balked, the new compressor dutifully laid this heavy stuff on.

Suddenly I was aware that I now had a very heavy model that had gone decidedly tailheavy. Several courses of action, including stripping the paint off, were contemplated; but with the summer contest season dreadfully near, I decided to go ahead and finish the model.

The finishing process for this model should include a number of coats of sanding sealer, followed by coats of white dope with wet-or-dry sanding after every coat or so. When satisfied with the white, we can dress up the model with decorative markings.

Mask off racing and registration numbers on the wings and fuselage sides and spray black. Cover up all 37s on the wings and fuselage. Mask around the registration numbers on the wing top and bottom surfaces with ⅛ tape. Spray the remaining enclosed areas gold.

Prepare a pane of glass with a coating of very soapy water. When dry, the pane is sprayed gold. The Pete and NR-2Y lettering (for rudder) are cut out and lifted from the glass. These are applied to the model using thinner as a bonding agent. They are protected with a clear dope overspray. (See description of this technique in my "Hot Canary" article, March 1996 *Model Aviation*.)

Talcum powder is rubbed lightly over that gold Pete and NR-27 lettering. Then use a black Top-Flite® Panel-Line Pen to draw the black pinstriping around that lettering. Protect with a clear dope overspray.

I had little previous success with any sort of ink applications on doped surfaces, but this procedure made it almost like writing on note paper after talcum was applied. For this little trick I am indebted to information gleaned from one of Windy Urtnowski's videotapes.

Various panel lines are applied using the talcum and panel-line pen technique. Simulated rivets or screw heads are applied with a Pilot® Silver Marker. Protect all with a clear dope overspray.

Finally, several coats of Sig clear dope are sprayed over the entire model. The whole is hand-rubbed with compound and polished.

Final Assembly: Study the drawings carefully and install the rigging wires on the

wings and tail. Details of the brackets at the axles and sweated tubing fittings at each rigging wire junction should be self-explanatory.

There was fear that the axle bracket fittings would fail on the first landing. Instead, all four original-design fittings on the top of the wing failed on the first flight. That system was replaced by the sweat tubing hardware shown. This rigging setup is holding up nicely. The rigging is considered to be functional and the model should not be flown without it.

The cockpit doors are formed from .010 sheet brass. The doors are attached with miniature pins. The hinge line is drawn with a panel line pin and protected with clear dope.

Finish the model by adding remaining details, such as the vibration dampeners, exhaust stacks, and dummy carburetor and manifold.

Contest rules require us to install a dummy pilot if he is visible in flight. Mine was painted using advice gleaned from Don Typond's fabulous videotape *How to Paint Pilot Figures*—it looks great. That videotape should be in any serious Scale builder's library.

A true-scale carved propeller adds wonders to the model's appearance. My prop was made from four 7/32 basswood laminations. Carve, stain, paint, varnish, and bolt to your model. You will be pleased with the results.

Flying: There is no question that excess weight is bad and is to be avoided. But lately I have come around to thinking that there is also a down side to lightly loaded models.

For one thing, they get bounced around by the wind. This is especially true when doing taxi operations. Such operations on the upwind side of the circle or when coming into the wind can be troublesome.

I have come to realize that heavier models do enjoy some advantages:

Truly overweight models can be flown successfully if they are balanced properly and have ample power. Such models are very unforgiving of pilot errors, however, so pilot errors are a no-no.

If built as originally intended, with a ready-to-fly weight of 60-65 ounces, the Pete will be a dream machine in all aspects of flying and ground-handling operations.

So how do we fly a 90-ounce Pete (mine)?

Be sure that the model is balanced properly. The nose should hang down approximately five degrees when suspended from the CG location.

Fly the model on shorter-than-normal lines—say, 52 feet long.

The O.S. .32 provides ample power, and the Pete flies quite fast and smooth. Takeoffs and level flight are routine matters. High flight operations, especially those attempted in any significant amount of wind, will definitely put the model at risk

of stalling out, with disastrous consequences.

Power-on landings are accomplished by maintaining sufficient power and speed to fly the airplane all the way to the ground. Gradually reduce power and altitude until the model has touched down and is rolling on its main gear, then reduce power a bit more and use a bit of elevator to set the tail on the ground.

The trick is to maintain enough speed to avoid stalling the model on the landing approach, yet be going slowly enough to avoid ballooning back into the air on the upwind side of the landing approach or taxi run.

But why am I telling all of this to you? Your Pete is not going to weigh more than 65 ounces—is it?

During the learning process of flying an overweight clipped-wing racer, some really hard landings were made. The model cartwheeled once at a Midwest contest when its wheels dug into a circle's soft dirt surfaces. Much to my surprise, no compression, fatigue, or stress cracks have shown up on any part of the model's surface.

So listen up! Build light or fly right. ✈

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