RCM presents a pair of primary R/C Trainers for beginners . . . that are superb fun fliers too . . . the P.T. 20 and the P.T. 40.

By Stu Richmond

Remember when you were just learning to fly? If only you had a forgiving model . . . if only things happened a little slower . . . if only the model would have taken a greater pounding . . . if it would have just righted itself . . . these models will!

non-zooming R/C model in a choice of two sizes that a beginner could readily learn to fly . . . and to have a superb fun-fly winner in the hands of a competent flier . . . with lots of fun in-between! The object has been achieved and these are yours to enjoy. This design is dead simple to build, has relatively few parts to cut out and is immensely strong.

steerable gear of your choice selected from many available to RC'ers. The designed purpose of the nose gear is simply to protect the model when landed by a beginning RC'er!

The "break-away" engine mounting plate is a useful safety feature that helps protect your engine. Also, it

The P.T. 40, sweet running Saito .45 4-stroker, all add up to fun in the Florida Sun. The camera "clicker" is RCM's "Flying Lowe" monthly columnist, Don Lowe. He sez, "The P.T. lands too slow" . . . a nice compliment!

R/C Modeler Magazine **urges you**, our reader, to bring this pair of models to the attention of your friends and spectators who are thinking about getting into R/C. And if you want to drift around the sky with your new 4-cycle running leisurely or compete and win in fun-fly contests with climb/glide, limbo, spins, etc., these models can be for you!

The P.T. 20 is ideal for a Saito .30 or smaller 4-cycle engine, as well as .15-.20 2-strokers. The P.T. 40 is ideal for any of the current .40 size 4-stroke engines up through and including the .60 sizes, as well as .25 to .40 2-strokers. The object of this design was to have a non-ballooning,

The P.T. 20 and the P.T. 40 have both been flown with a variety of engines (they're **great** with 4-strokers) . . . they hand launch **very** easily, loop readily, barrel roll well, spin gently to the left, fly inverted, and can be coaxed into **one** outside loop. They'll land at startlingly slow speeds and even handle cross winds well on a paved runway. My two prototypes **do not have** a steerable nose gear . . . but they steer beautifully on take-offs and landings . . . touch and go with ease . . . but for slow speed taxiing **if** you fly from a paved runway you can readily add a

makes changing engines a "snap." My P.T. 20 has had an H.P. .21 4-stroke in it, an Enya .19 2-stroke and is presently flying with a simple, super reliable idling O.S. .15 R/C 2-stroke engine. The P.T. 40 carries a Saito .45 4-stroker that is proving to be my personal favorite engine of all time! It's great on 4-cycle fuel, is happiest on home-brew of 10% castor oil, 20% nitromethane and 70% methanol and the more I run it, the better it gets! But I might try my vintage twin cylinder inline Taplin Twin British Diesel just for fun. The engine mounting plate does have advantages.

So pick the size of P.T. you want to build . . . the four footer (P.T. 20

Don't let the simple lines fool you . . . the P.T. 20 and P.T. 40 are carefully thought out designs specially calculated to fly like no other comparable R/C primary trainers.

The models are designed so that **all the plywood parts** for either the P.T. 40 or P.T. 20 will fit on **one** standard sheet of 6" by 12" plywood. These models have been 100% built with the new space age cyanoacrylate glues . . . Zap, Hot Stuff, etc. All laminating was done with the CA slow-setting glue, like fuselage doublers, maple beam mounts for the engine mounting plate, fuselage triplers, dihedral braces in the center of the wing and to glue the tail together to the fuselage. All other joints were made with the ultra-thin viscosity quick setting CA glue.

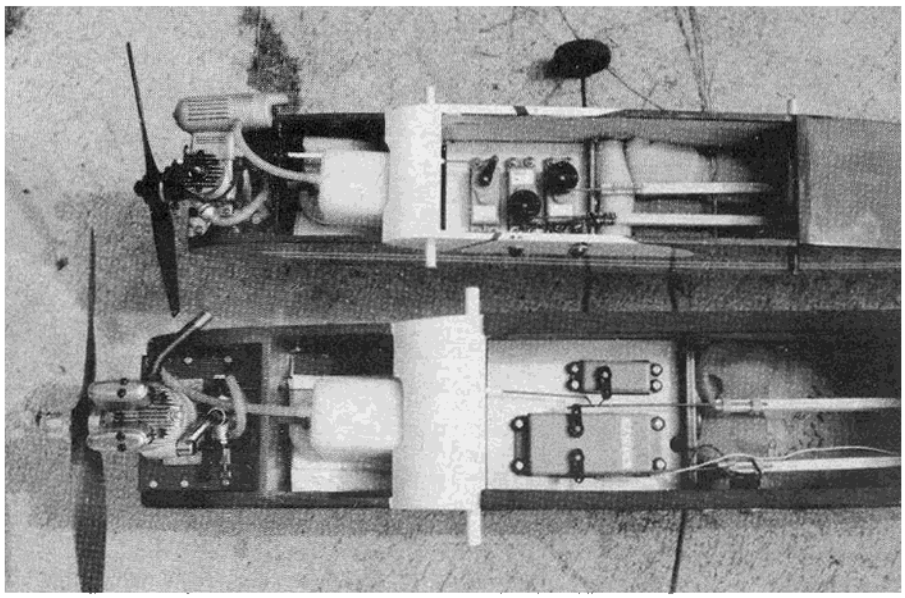
#947), or the five footer (P.T. 40 #948) and send off to RCM for plans.

Now, let's get to the building!

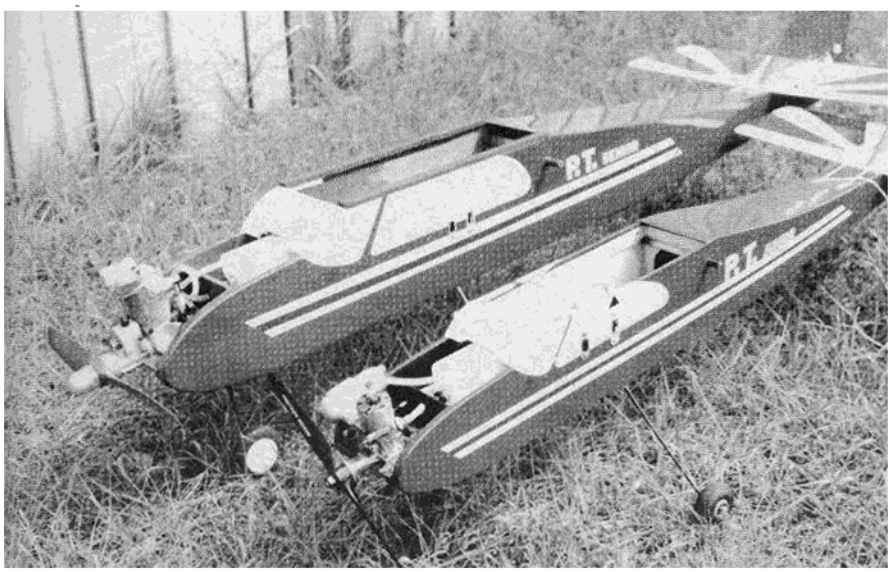
CONSTRUCTION

Both models have been built using firm, fairly hard balsa woods. I urge you to use the sizes specified . . . don't be tempted to "beef" up . . . but it's okay to choose harder wood rather than softer wood. Feel free to take your plans into your local hobby shop and let them help you with the wood selection. **Don't buy wood** that is not straight . . . sight down it with one eye and pick the straightest you can buy. Pay special attention to the pieces for the wing's leading edge and trailing edge. Unwanted warps don't enhance flying!

Place your fuselage side wood under the plans, position carefully and, with carbon paper, trace the basic fuselage side as indicated by the single arrows on the fuselage side view drawing. If you don't use carbon paper, you can



TOP: P.T. 20 with three Kraft servos. BOTTOM: P.T. 40 with out of production Kraft 2-3 "brick" servo/receiver unit and a 3rd servo. Both models roll, loop, spin, fly inverted, and will even outside loop . . . all without ailerons.



Both P.T.'s are engineered for 4-stroke engines, but regular 2-stroke engines, with added weight, work just fine. Do not lengthen the nose in place of adding weight . . . as the aerodynamics will be unbalanced. Absence of compound curves simplifies covering.

use a large pin and pin-prick through the plans into the balsa. Do the same for the fuselage doublers that are indicated by double arrows and the same for the fuselage triplers that are indicated by triple arrows. Pay extra attention to having the wood grain as indicated on the plans. Trace other parts in the same manner and cut out with a razor knife or electric jig saw.

Glue the fuselage doublers to their sides . . . one **left** side and one **right** side. Glue in the maple engine bearers (B) being very careful and meticulous to get them exactly angled as shown on the plans. This down sloping angle at which the engine mounts is called "down thrust" and its purpose is to prevent unwanted "power-on" stalls . . . real airplanes often use it too. Add the triplers which are parts (A) and (C). Bend the wire landing gear parts . . . decide if you really want or need a steerable nose gear (fine for taxiing on pavement runways) and attach to (D) and to (I). Then glue (D), (H), and (L) in place on one of the fuselage sides being careful to keep them square at a 90° angle to the fuselage side.

Put the remaining fuselage side in place and hold it in place with rubber bands while you carefully align the sides . . . the bottom of both sides should fit down perfectly parallel on a flat surface. Glue the second side to (D), (H), and (L). Add parts (M) in place, bevel the rear of the fuselage sides as shown and glue them together. Add all other parts as shown on the plans except the dowels

48" 3 pound and 60" 4½ pound primary trainers designed for the RC'er just learning to fly . . . as well as the sport flier.

through the cabin area that hold the wing's elastic bands . . . the dowels are pre-painted and put in place **after** the fuselage is covered . . . and they are glued to the sides. Cover the windshield area and top and bottom of the fuselage with balsa as specified, with the grain going across, not front to back. Wrap coarse 80 grit sandpaper around a flat piece of wood and lightly sand the fuselage. Round the corners with 220 grit sandpaper used lightly. Apply two coats of fuelproof paint around the front edges as shown in the photo, and inside the gas tank area and engine compartment. Use the same color as your primary fuselage color will be, since you cannot cover inside these areas of the fuselage successfully. Add your wheels, and your fuselage is ready for covering.

Trial-fit your gas tank. If you use a Kraft tank as I did, the lower front lip of the windshield planking will have to be cut away slightly for the tank to slip in place. The front wing dowel holds the rear of the fuel tank in place. The front is held down by the fuel feed line that goes through the hole in bulkhead (D) and then goes to your engine's carburetor . . . simple, huh?

Wing construction is super simple. Cut out a plywood template or pattern from scrap plywood and cut around it to make 25 wing ribs from 3/32" firm balsa. Then cut two more out of the same size wood as the wing's trailing edge — with the thicker edge at the top. These two ribs become your wing tips. Select very hard, straight leading and trailing edge balsa, cut notches in the trailing edge to accept the wing ribs, and pin in place over the plan. Pin the spruce wing spar in place (**do not use balsa** . . . use spruce and if you can't buy it big enough, glue two or three strips together to get up to size) and the leading edge too. Put all but the three center ribs in place. Align carefully and glue. Prop up one wing tip for the correct dihedral angle as shown on the plans and glue and clamp in place the three dihedral braces made from plywood. You'll have to slightly trim the center three or five ribs to accept the plywood dihedral braces. On the bottom only, fill in the flat area between the three center ribs so a flat mating surface is formed where the wing fits to the fuselage. Re-glue all center joints for added security and strength. It is important that the wing's leading edge be the half-round shape shown on the plans. **Under no conditions should the front of the wing be sharp** — it **must** be blunt, although the exact shape is not a **"fly — won't fly"** condition. Sand lightly with 80 grit sandpaper on a block and lightly finish with 200 grit.

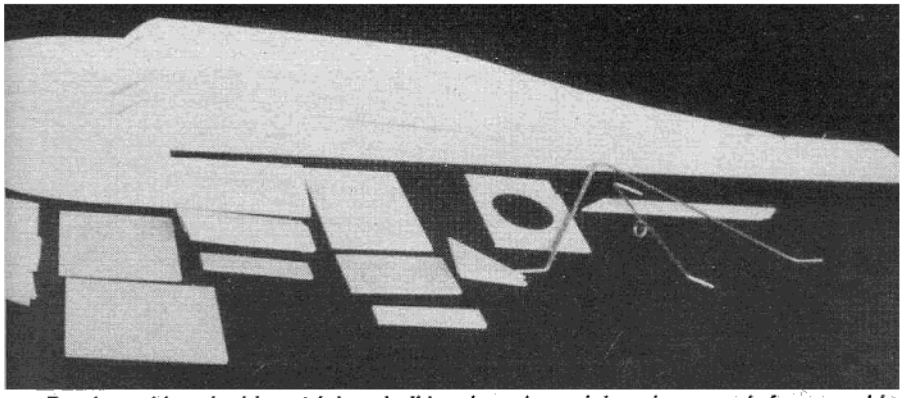
Cut out tail parts as shown, and lightly sand and round all edges except the bottom of the fin where it mates with the stabilizer.

Cover all parts of your P.T. primary trainer to suit your pleasure, but the use of a heat shrink film like Super MonoKote is highly recommended as it is fast, colorful, light and is very easy to use since we have **no compound curves to cover.** The contrast of light and dark colors is easily visible in the air. Plan ahead! Hinge the elevator and rudder into

Designed By Stu Richmond

P.T. 20	P.T. 40
TYPE OF AIRCRAFT	**TYPE AIRCRAFT**
Primary Trainer & Fun Flyer	Primary Trainer & Fun Flyer
WINGSPAN	**WINGSPAN**
48 Inches	60 Inches
WING CHORD	**WING CHORD**
9 Inches	11¼ Inches
TOTAL WING AREA	**TOTAL WING AREA**
435 Sq. In.	678 Sq. In.
WING LOCATION	**WING LOCATION**
High Wing	High Wing
AIRFOIL	**AIRFOIL**
Flat Bottom	Flat Bottom
WING PLANFORM	**WING PLANFORM**
Constant Chord	Constant Chord
DIHEDRAL EACH TIP	**DIHEDRAL EACH TIP**
2-3/16 Inches	2½ Inches
O.A. FUSELAGE LENGTH	**O.A. FUSELAGE LENGTH**
35¾ Inches	45½ Inches
RADIO COMPARTMENT SIZE	**RADIO COMPARTMENT SIZE**
(L) 9" x (W) 3" x (H) 2"	(L) 11" x (W) 3¾" x (H) 2¼"
STABILIZER SPAN	**STABILIZER SPAN**
16 Inches	20 Inches
STABILIZER CHORD (incl. elev.)	**STABILIZER CHORD (incl. elev.)**
5½" (Avg.)	6¾" (Avg.)
STABILIZER AREA	**STABILIZER AREA**
88 Sq. In.	135 Sq. In.
STAB AIRFOIL SECTION	**STAB. AIRFOIL SECTION**
Flat	Flat
STAB LOCATION	**STABILIZER LOCATION**
Top of Fuselage	Top Of Fuselage
VERTICAL FIN HEIGHT	**VERTICAL FIN HEIGHT**
6 Inches	7½ Inches
VERTICAL FIN WIDTH (incl. rud.)	**VERTICAL FIN WIDTH (incl. rud.)**
4½" (Avg.)	6" (Avg.)
REC. ENGINE SIZE	**REC. ENGINE SIZE**
.30 or smaller 4-stroke .15-.20 2-stroke	.40-.60 4-stroke .20-.40 2-stroke
FUEL TANK SIZE	**FUEL TANK SIZE**
4 Oz.	8 Oz.
LANDING GEAR	**LANDING GEAR**
Tricycle	Tricycle
REC. NO. OF CHANNELS	**REC. NO. OF CHANNELS**
3	3
CONTROL FUNCTIONS	**CONTROL FUNCTIONS**
Rud., Elev., Throt.	Rud., Elev., Throt.
BASIC MATERIALS USED IN CONSTRUCTION	**BASIC MATERIALS USED IN CONSTRUCTION**
Fuselage ..... Balsa & Ply	Fuselage ..... Balsa & Ply
Wing ..... Balsa & Ply	Wing ..... Balsa & Ply
Empennage ..... Balsa	Empennage ..... Balsa
Wt. Ready To Fly ..... 48 Oz.	**Wt. Ready To Fly ..... 72 Oz.**
Wing Loading ..... 18.5 Oz./Sq. Ft.	**Wing Loading ..... 15.3 Oz./Sq. Ft.**

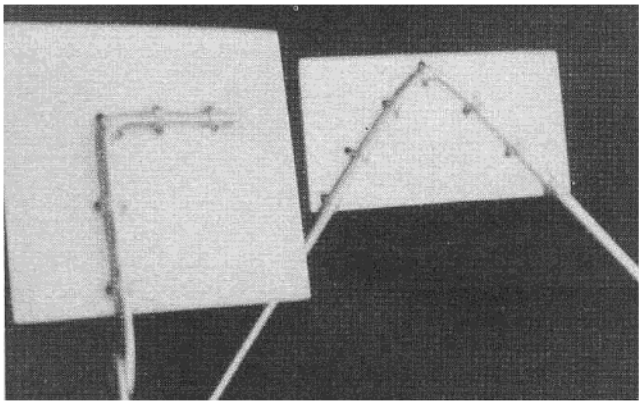
Note: The P.T. 20 has been flown with 8 ounces of weight added and the P.T. 40 has been flown with 16 ounces of weight added . . . at the center of gravity . . . and the only apparent difference is a slight decrease in the rate of climb and a slight increase in landing speeds! The P.T. 40 could easily/safely carry an airborne camera.



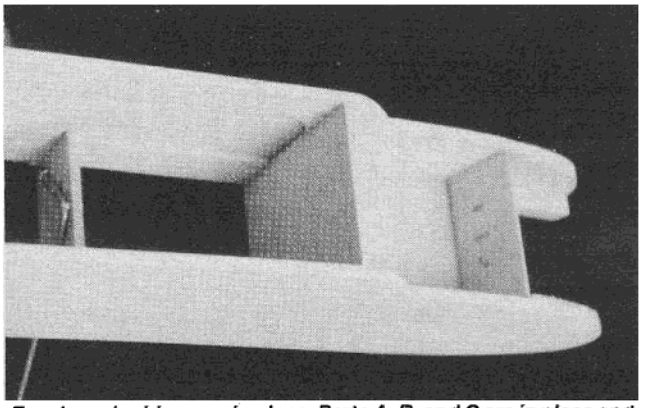
Fuselage sides, doublers, triplers, bulkheads and remaining pieces ready for assembly. Landing gears have also been bent. If you have trouble bending the nose gear's shock absorbing loop, simply omit the loop.

position and cut away small amounts of MonoKote where the tail surfaces join so that balsa wood can be glued to balsa wood. Balsa wood glued to MonoKote provides unsatisfactory strength. Pre-cover the triangular balsa piece that reinforces where the rudder joins the stabilizer, trim it and glue in place with slow drying CA after cutting away the MonoKote where the surfaces mate.

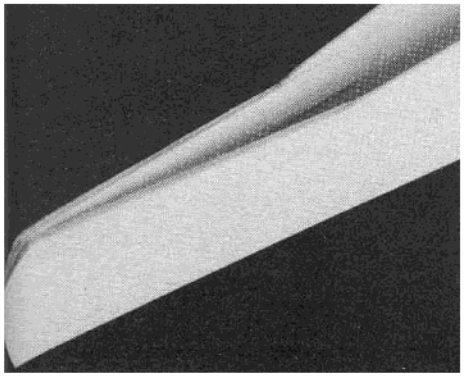
Now you are ready for your radio and engine installation. Cut the engine mounting plate to accept your specific engine, drill all holes and then



Landing gear wires are in place on D and on I. Small holes are drilled on each side of the wire and thin soft wire binds the wires in place, with 5-6-7 strands through each set of holes. Coat with thick CA glue. A steerable nose gear is nice for slow speed taxiing, and could be easily substituted if you wish.

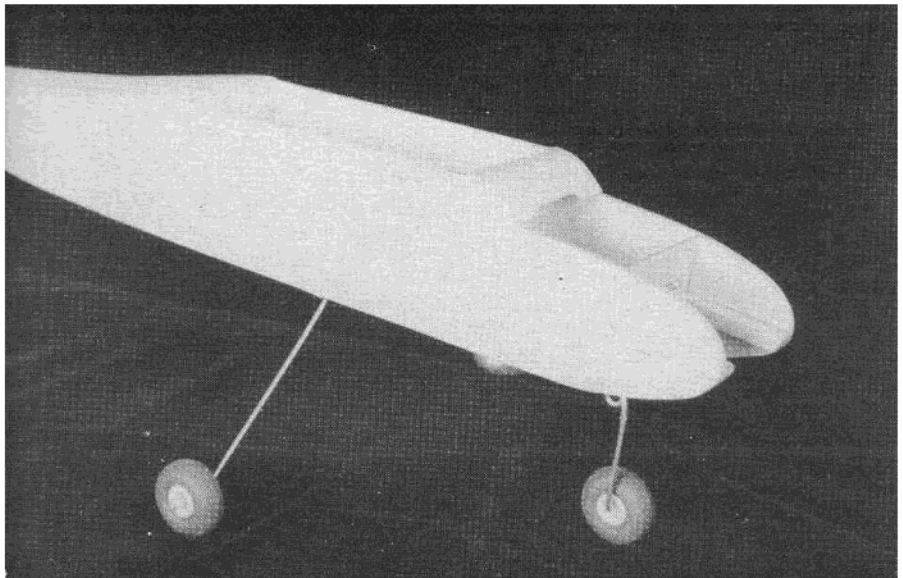


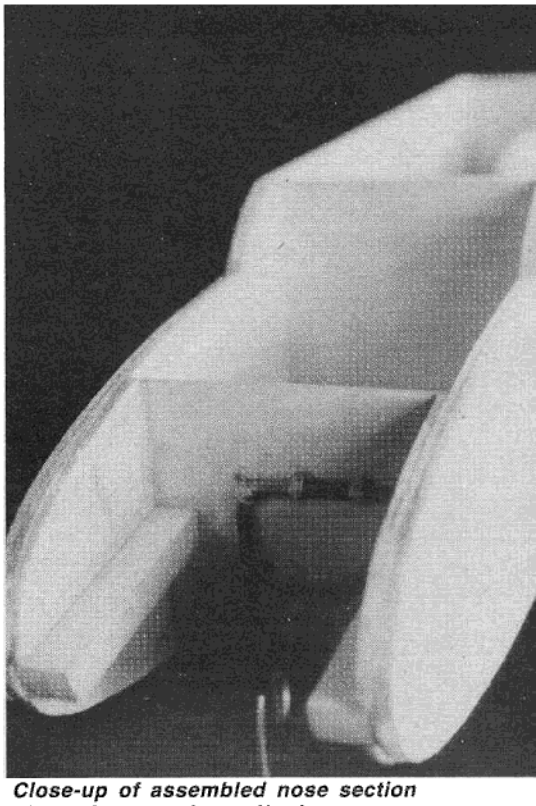
Fuselage doublers are in place. Parts A, B, and C are in place and D, H, and L have been glued to first one side . . . and then to the other side. I and both J's are in place. Both F's are in place and E has been added. This simple assembly is very strong.



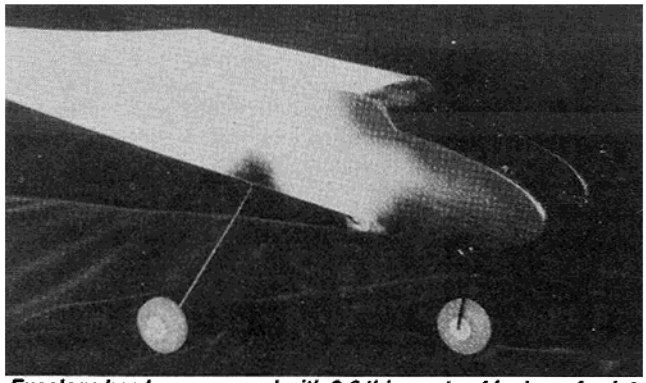
LEFT: Both part M's have been added, the inside rear of both fuselage sides have been beveled as shown on the plans, and glued together at rear.

BELOW: Fuselage is completed. Note the lower forward lip of the cabin's windshield has been slightly "tailored" to accept the fuel tank. Front of tank is held in place by the fuel line passing through the hole in D . . . neat, simple and allows you to readily check your fuel supply! Fuselage has been sanded and all edges have been slightly rounded.

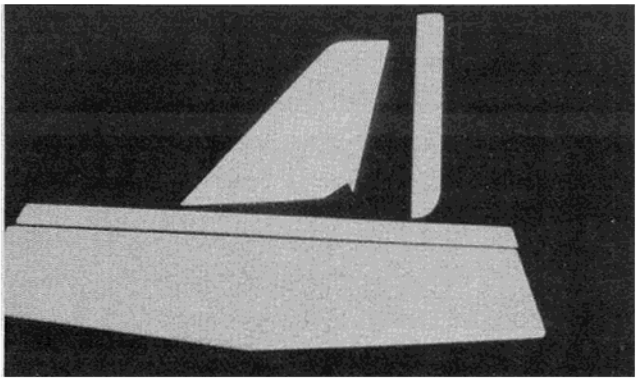




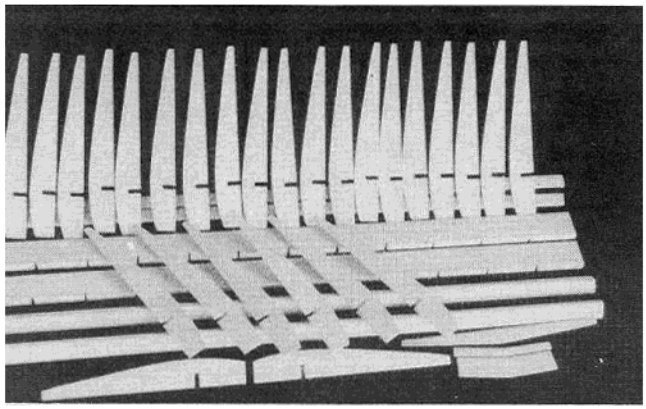
Close-up of assembled nose section shows how maple engine bearers are laminated to the fuselage doublers and are further locked in place by parts A and C which fit above and below.



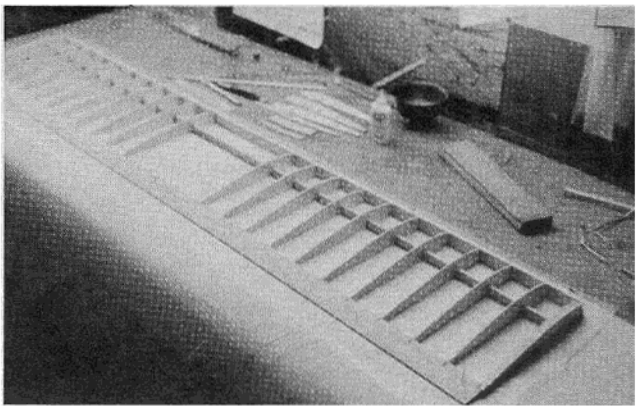
Fuselage has been sprayed with 2-3 thin coats of fuelproof paint in the forward areas to prevent fuel from soaking into the wood. It is now ready for covering.



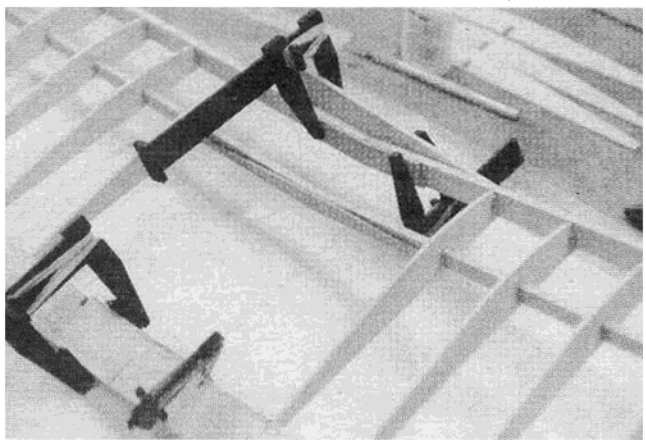
Elevator, rudder, fin and stabilizer have been cut out and all edges except the bottom of the fin have been gently rounded with sandpaper.



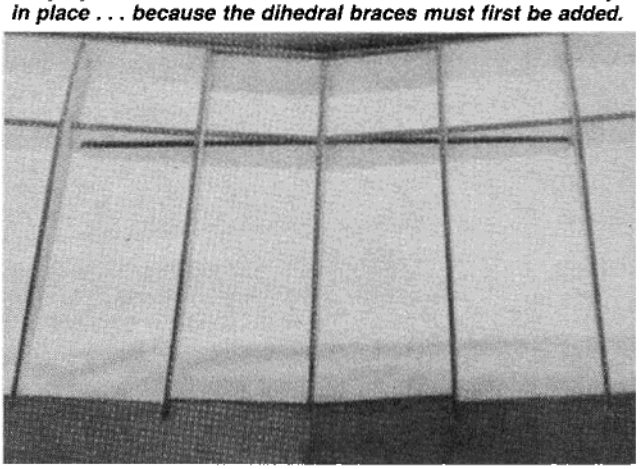
The P.T. 20 and P.T. 40 each have about 80 parts to cut out. Of these, 27 are identical and are cut with the aid of a single template of the wing's rib. The two ribs in the foreground are cut from tapered trailing edge wood . . . and are the wing tips.



The wing is built in two panels . . . the left and the right. The spruce spars, leading edge pieces and trailing edge pieces are not yet joined in the middle. Also the three center ribs are not yet in place . . . because the dihedral braces must first be added.



The dihedral braces, when accurately cut from plywood, establish a total ten degree dihedral angle for the wing. Scrap balsa is shown in front of the leading edge so that the clamps in use will not dent/damage the already shaped leading edge. Slow drying CA glue was used in laminating the three dihedral braces in place. A second gluing was done for added security.



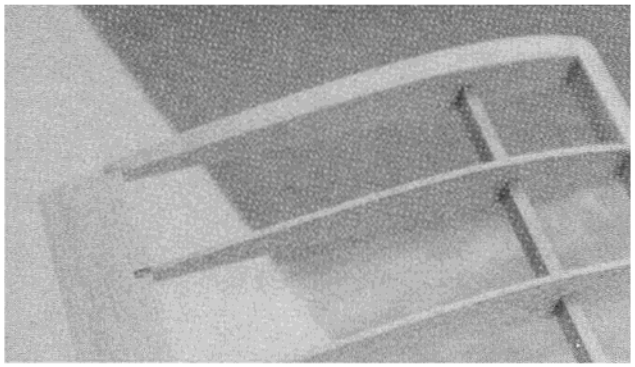
The remaining center ribs have been trimmed to fit in place and are glued. Planking is fitted between the three center ribs with grain running span-wise. This planking provides a flush flat surface where the wing mates to its fuselage.

lightly sand all surfaces and trial fit. If it fits well, coat the engine mounting plate with CA for added strength and fuel resistance. You might want to make a spare plate at this time and carry it in your field box or flying box. Spray the plate with your fuelproof paint like Pactra Poly-U or Rustoleum, allow to dry, and mount your engine with nuts and bolts and largest practical size washers to protect the plywood. Then mount the plate to your fuselage with six woodscrews into pre-drilled holes. Again use washers to spread the stress on the plywood engine mounting plate.

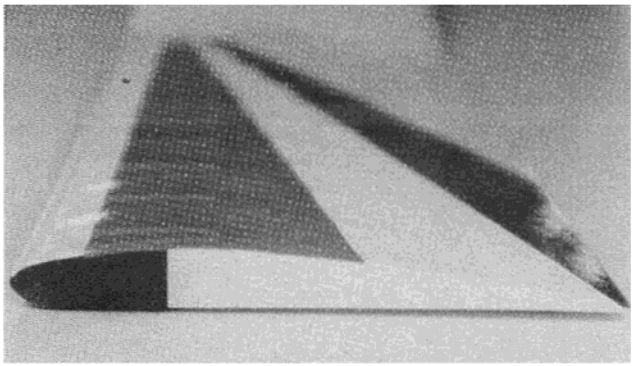
Although these P.T.'s are designed strictly as fine, easy flying models that use only three channels of a radio control system — rudder, elevator, and throttle, it is recommended that you buy at least a four channel radio system. If your set only comes with three servos — fine! At least you'll be able to add another servo if you want to proceed to the Basic Trainer pair of models that now exist only in my mind . . . or some other intermediate model.

I assure you, these models are **excellent** fliers on three channels of control . . . **ailerons are not suggested nor required**. They can initially compound your problems of getting "up" on the learning curve of flying R/C quickly, safely and successfully!

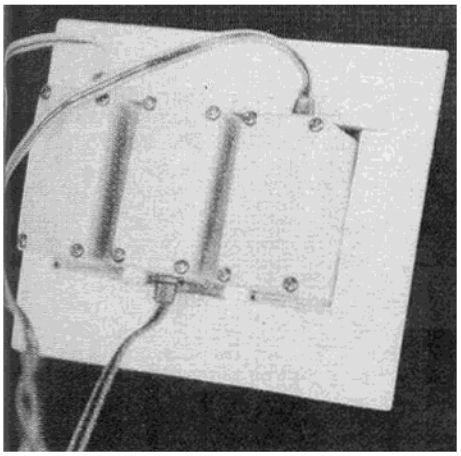
Please discuss the following with your instructor to be . . . and follow his



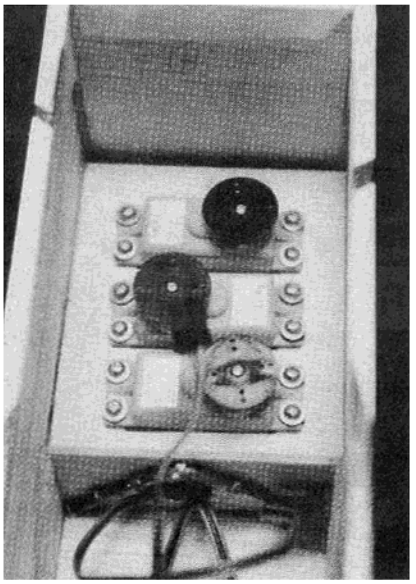
The two tip wing ribs are cut from trailing edge balsa wood and provide strength and grace to the wing tips. IMPORTANT: After your wing is finished, add nails pressed into the tip ribs to carefully balance your wing. Invariably one wing comes up slightly heavy . . . add nails to the light tip. A heavy wing panel causes unwanted turns!



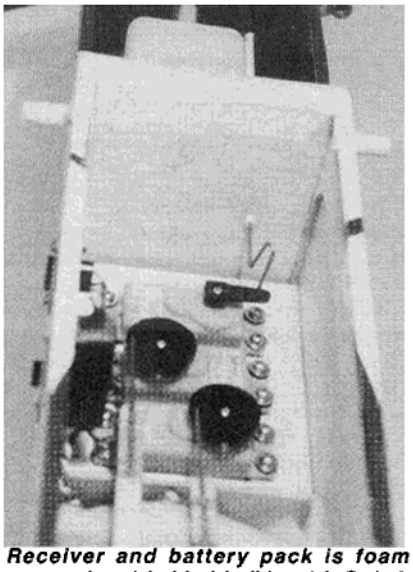
MonoKote covering, or a similar heat shrink covering should be used on these models. When the wing is completed it MUST be intentionally TWISTED and reheated/shrunk to permanently hold the twist . . . so that the rear/trailing edge is higher than the front/leading edge. The text tells why. Even 747 Jumbo jets use this stall preventing trick!



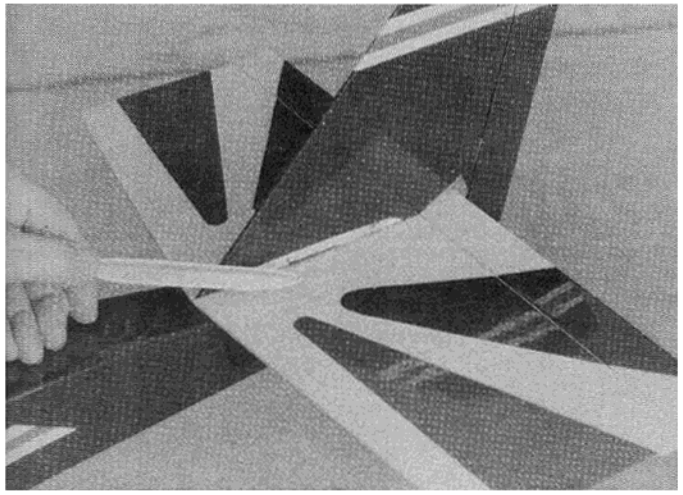
Three servos fit nicely into a plywood tray. The plywood is doubled up so that the mounting screws can bite deeper into wood. The P.T. 20 can easily carry the largest, heaviest servos made. The P.T. 40 has so much cabin volume it can easily carry a small camera or have a bomb bay installed and worked from a fourth servo.



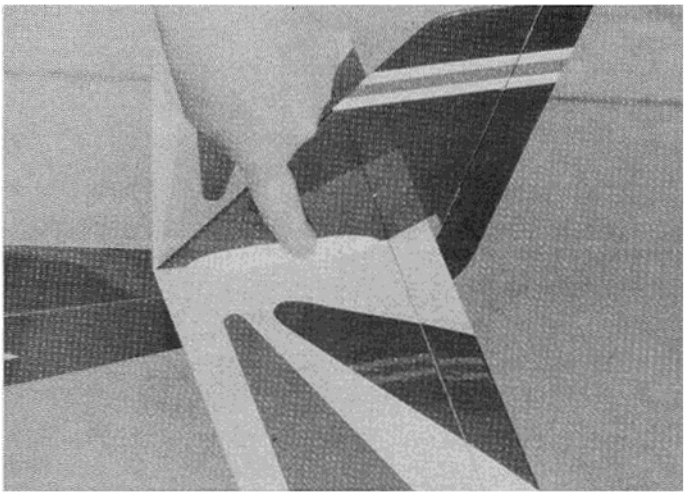
The servo tray glues neatly in place and the servo wires are fed out through the hole in I and to your receiver. Servos shown here are Kraft KPS-25's. The hole patterns are identical for Kraft KPS-22's, KPS-24's, KPS-25's and KPS-26's.



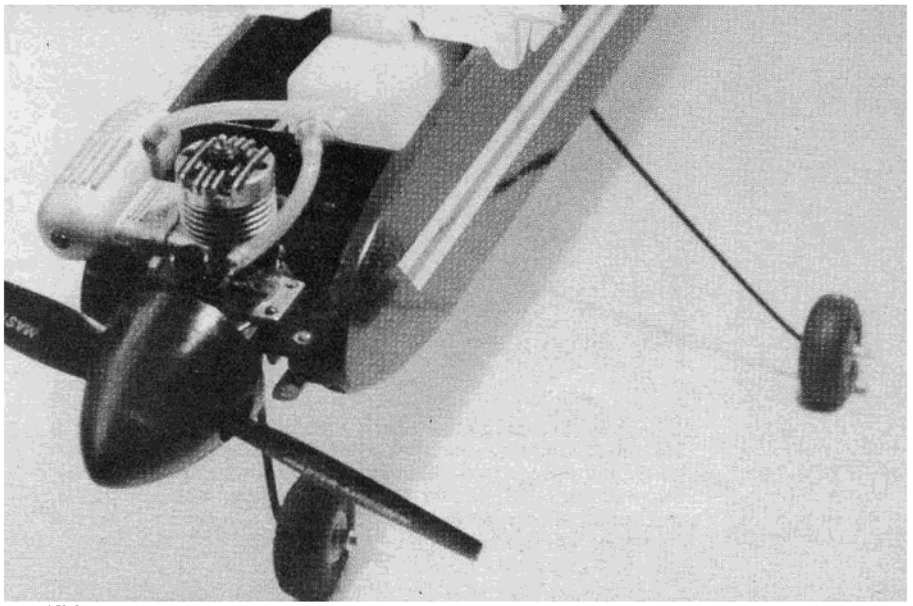
Receiver and battery pack is foam wrapped and behind bulkhead I. Switch and charging jack are mounted opposite the engine's muffler. .047 size wire from throttle servo has a flexing bend in it at the servo arm to prevent servo stall. Pushrods to rudder/elevator travel parallel to the tail.



The covering material is slightly cut away where the bottom of the fin meets the stabilizer. A balsa gusset brace is pre-covered with about 1/16" of overhang left all around. The gusset brace is glued in place with slow CA and the joint's strength is immense. Then the 1/16" overlap is ironed down to complete the job.



Gusset brace is in place to securely join the fin to the stabilizer. A matching gusset brace is on the other side of the fin.



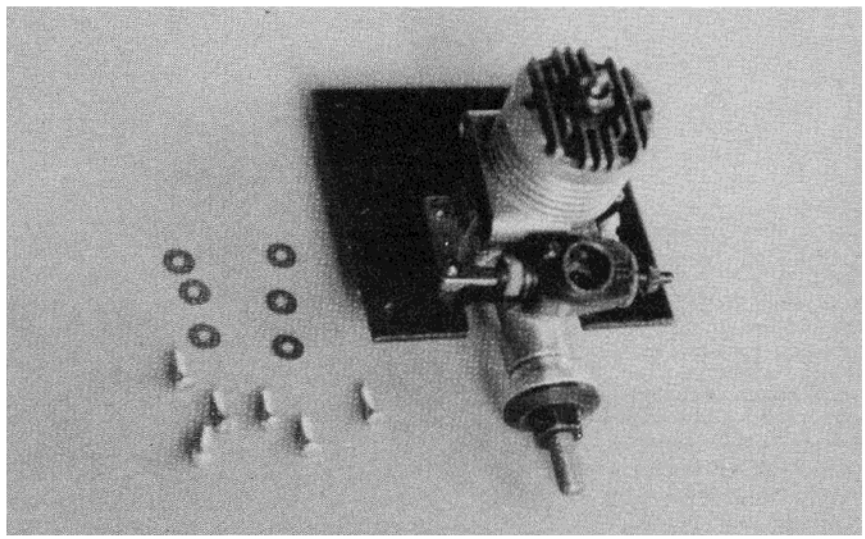
This model carries a 2-cycle engine, and a piece of lead wheel balancing weight can be seen below the closest engine bearer. A second weight is on the other side too for a total of four ounces. The Saito .45 4-stroke engine in the P.T. 40 balances out with no weight added to nose or tail. A spinner with a nylon nose cone provides crash damage and aids electric starter usage. An 8/4 or 9/4 prop is right on the 20. A 10/6 or 11/6 prop is right on the 40.

skillful flying in R/C, in my opinion, is that done by those who race Formula I Pylon models . . . and in this past year's Tangerine International R/C pylon event, all three winners — first, second, third — flew Mode I.

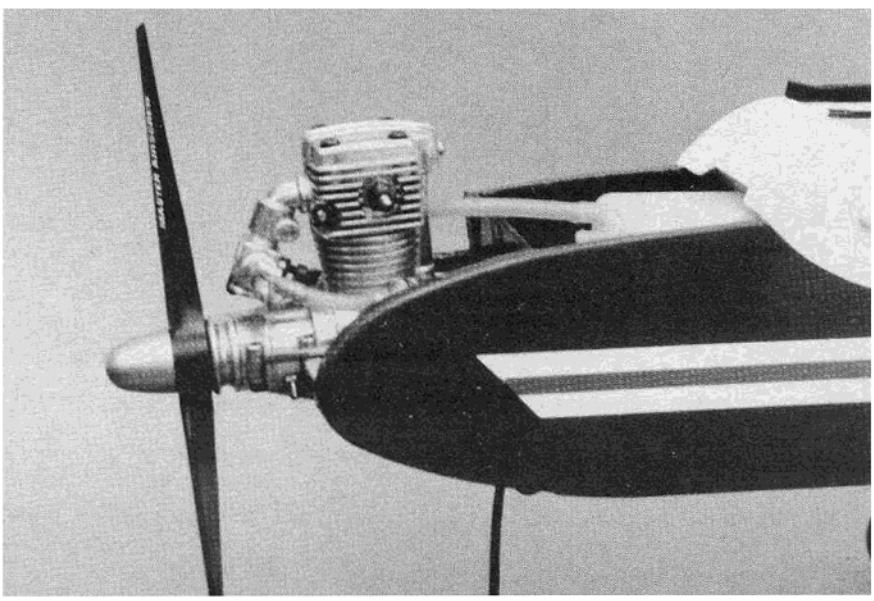
Talk this over with your teacher and fellows at the field, then make your decision and install your radio as the manufacturer's directions specify. The plywood servo mounting plate shown in the photos works just great. The upward bend in the .047 wire going from the throttle servo is there to flex slightly either at extreme high throttle or extreme low speed throttle, so the servo does not bind at either extremity as it drives your carburetor.

To have maximum enjoyment from your P.T., I recommend you select an engine that is known for fine idling qualities since shooting touch and go landings and power landing approaches will require an idle speed probably below 3,000 rpms on an 8/4 or 9/4 prop on the P.T. 20 . . . and also

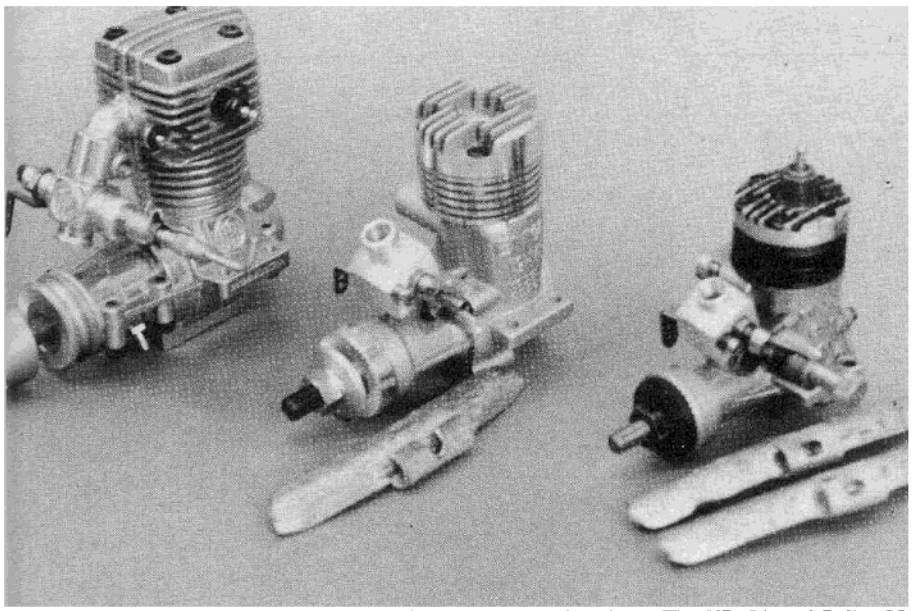
advice! All presently sold radios available in the USA are shipped with the throttle on the left stick and elevator on the right stick. This is an industry standard for the American market. **All** of these sets can be readily changed by your hobby shop seller so that the throttle is on the right stick and elevator is on the left stick. Either way, initially the rudder of the P.T. will be actuated by left and right movement of the transmitter **right hand** control stick. Throttle also on the right stick, with fore and aft travel or movement is called Mode I. Throttle on the left, as all sets are shipped, is called Mode II. Neither mode is necessarily better . . . Mode I allows for the separation of the two primary axis of control, which are the roll axis and the pitch axis. This tends to eliminate unwanted interaction while learning to fly. A good flier will be a good flier on **any** mode of transmitter control. But the most demanding



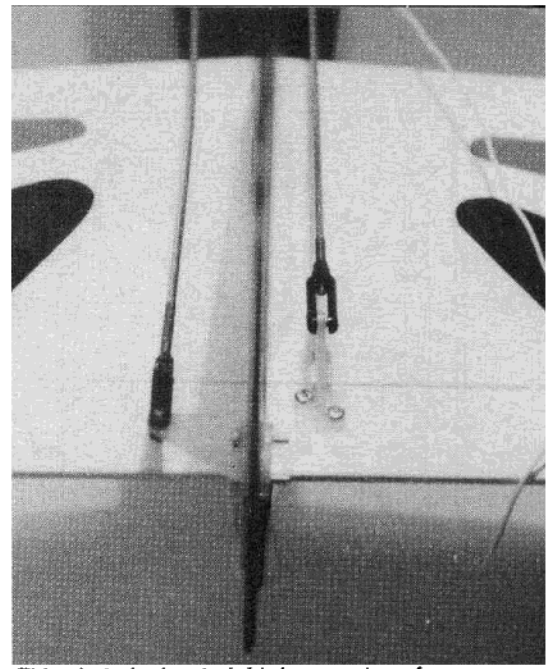
Engine mounts with nuts and bolts to the engine mounting plate. Then the plate mounts to the engine bearers with screws and washers into holes in the engine bearers that are drilled slightly smaller than the screw diameter. This system provides "break-away" engine protection and facilitates changing engines. It is urged that you pick an engine with excellent idle characteristics for maximum pleasure. Text specifies rpms.



The P.T. 20 and P.T. 40 are designed as superb primary trainers to learn to fly R/C . . . to succeed in landings and takeoffs . . . and they are ideal with the new 4-cycle R/C engines. The HP .21 4-cycle engine is shown here in the P.T. 20.



Your P.T. must be properly balanced as shown on the plans. The HP .21 and Saito .30 4-stroke engines may require slight tail weight . . . the Enya .19 required two ounces of nose weight. The O.S. .15 required four ounces of nose weight. Lead wheel balancing weights from tire stores are ideal as they have a cast-in metal tab which makes mounting easy.



This photo looks straight down on top of the P.T.'s tail assembly. The pushrods exit the fuselage in front of the leading edge of the stabilizer and pass directly back to their control horns. The receiver antenna passes inside the fuselage and exits through one of the pushrod exit holes.

below 3,000 rpms on a 10/6 or 11/6 prop used on the P.T. 40. I had to discard a neat 4-cycle engine on my P.T. 20 because it just would not reliably idle below 4,000 to 5,000 rpms . . . every landing was "dead stick." Watch what the fellows at the field use with the best success and buy your engine accordingly for greatest pleasure!

1/4" x 1/4" hard balsa pushrods from the elevator and rudder serovs, with wire (1/16") at the servo end and threaded pushrod at the other end work well. Such pushrods cost the least and are not affected by temperature changes. Glue a 1/4" x 1/4" piece of balsa across the hole in bulkhead (L) **after** the pushrods are installed, and have the piece you're gluing in place, then push up very lightly on the bottom of the two pushrods. You'll put virtually no drag on the two pushrods, but this support will tend to dampen vibration that often occurs in the pushrods (very important) as this vibration does tremendous damage inside your servos. Most radio installation instructions make no mention of this technique of damping vibration — use it and you're the gainer!

Now, probably the most overlooked feature of many R/C models is the **washout** that is specified on the rear wingtips of the P.T. plans. The photo of the wingtip shows graphically what washout is. The trailing, or rear edge of the wing is raised up slightly, per plans. After the wing is covered and trimmed in your choice of colors, have someone rigidly hold the center of the wing while you **gently** twist the wing at the tip and **reheat** the MonoKote covering. When the covering cools, the wing will accept this twist. If not right the first time, simply twist and heat until you meet the specifications on the plans. Do the other wing the same way . . . the trailing edge higher than the leading edge. J-3 Piper Cubs have washout as well as Boeing 747 Jumbo Jets! But I have yet to see an R/C plan for a Piper Cub that specifies or even mentions washout.

So what does washout do on the P.T. 20 and the P.T. 40? It does the same as on the Cub and on the 747 . . . it prevents the wingtip or outer section from stalling abruptly at a relatively high angle of attack . . . like on a take-off or a landing. The center of the wing will stall first and the tips keep lifting to yield a very gentle stall, one in which the nose gently drops from lack of full lift on the wing. As the nose drops, the flying speed is quickly regained while the aircraft proceeds straight ahead. You **must** have the specified washout for stall protection.

Make every effort to search out a willing and capable instructor at your local flying site. Be sure you've already mailed away and received your license to fly from the Academy of Model Aeronautics so all parties are insurance protected. Now get the first flights up and away with your new pride and joy, your very own primary trainer for R/C --- the P.T. I'm confident your instructor will enjoy teaching you to fly with this model and you'll quickly solo successfully and be part of this wonderful R/C hobby. □

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