THE LOW WING TRAINER

A QUICK 'N SIMPLE WAY TO MAKE A NEAT LOW WING ARF TRAINER

By Jim Feldmann

Why is it that virtually all R/C "trainer" aircraft have the wing on the top? That isn't the case in the world of full-sized aircraft. The Piper Tomahawk and the Beech Skipper were among the last civilian training aircraft manufactured, and both were low wing designs. The Piper Cherokee (low wing) is no more difficult to fly than the Cessna 172 (high wing). And yet when anyone wants to learn to fly R/C, his choice of kits is limited to high winged aircraft.

The Royalair 40T and the nearly identical Hobbico Flightstar and Hobby Shack Right Flyer, are high wing ARF trainer kits, and they all assemble into excellent trainers, but suppose that you just happen to like low wing aircraft. (Or you just want to be different.) Well guess what! The conversion of a high wing trainer to a Low Wing Trainer is easy and inexpensive, and the low wing flies just as well as the high wing.

Actually, the Low Wing Trainer doesn't have the pendulum effect of the fuselage constantly trying to keep the wings level. This is good and bad. It's bad for your first two or three flights while you're fighting to keep the airplane level while you struggle around the field. But it's good from then on because the low wing is much easier to control in the turns. The low wing also has less total side area, so it is less sensitive to crosswinds. When the time comes, the low wing will serve quite well as a basic aerobatic trainer as well.

For the experienced flier, the Low Wing Trainer makes a very enjoyable, low pressure "Sunday Flier."

I have attempted to design this conversion so that it is no more difficult than the basic assembly of the kit itself. The instructions are written for someone with no modeling experience, and the materials list has been kept to a minimum. Nevertheless, I strongly recommend that all beginners find an experienced modeler to help with both assembly and flying. (And to loan you the tools you don't already have.)

CONSTRUCTION

Wing:

Let's start with the wing. The only changes here are to move the aileron servo and pushrods to the top of the wing, and put a simple landing gear mounting plate in the bottom.

LOW WING TRAINER
(A Modified ARF)

Designed By:
Jim Feldmann

TYPE AIRCRAFT
Trainer/Sport

WINGSPAN
62½ Inches

WING CHORD
11½ Inches

TOTAL WING AREA
705 Sq. In.

WING LOCATION
Low Wing

AIRFOIL
Flat Bottom

WING PLANFORM
Constant Chord

DIHEDRAL, EACH TIP
1¾ Inches

OVERALL FUSELAGE LENGTH
45 Inches

RADIO COMPARTMENT SIZE
(L) 11" x (W) 3" x (H) 5"

STABILIZER SPAN
23 Inches

STABILIZER CHORD (incl. elev.)
7 Inches

STABILIZER AREA
160 Sq. In.

STAB AIRFOIL SECTION
Flat

STABILIZER LOCATION
Mid-Fuselage

VERTICAL FIN HEIGHT
8¾ Inches

VERTICAL FIN WIDTH (incl. rud.)
5½ Inches

REC. ENGINE SIZE
.36-.46 2-stroke

FUEL TANK SIZE
10 Oz.

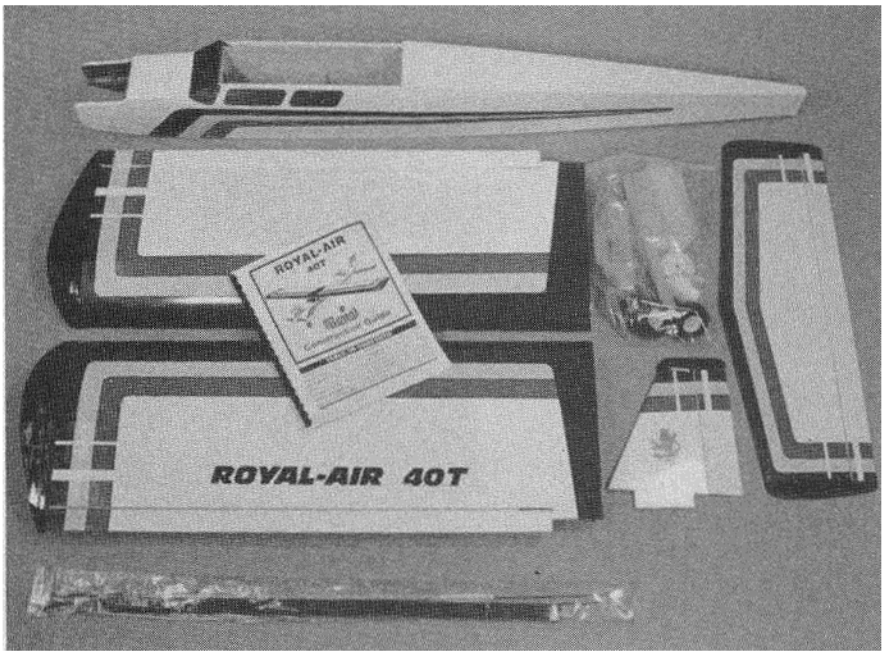
LANDING GEAR
Tricycle

REC. NO. OF CHANNELS
4

CONTROL FUNCTIONS
Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa & Ply
Wing	Balsa & Ply
Empennage	Balsa
Wt. Ready To Fly	96 Ozs. (6 Lbs., 0 Ozs.)
Wing Loading	19.6 Oz./Sq. Ft.



● Cut the aileron horns and their support blocks off the back of the wings. If your kit has a piece of plywood on top of the wing over each aileron horn, use a "Tuf-Grind" to cut through the plywood. If you're careful with the covering while making the cuts, you won't have to patch it later.

● Remove the wire aileron horns from the blocks and reverse the horns side for side. You want the threaded portion of the horn to protrude from the **top** of the wing instead of the bottom. You will need to notch the blocks and wing to allow the horns to move to the front and rear. With the horns reinstalled, glue (thick CA) the support blocks back in place on the back of the wings.

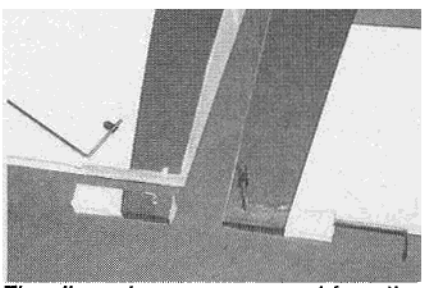
● Now install the ailerons and join the wings in accordance with the kit instructions, but don't cut the servo hole or install the servo mount yet.

● Cut a 2" x 4" hole in the **bottom** of the wing, at the center just behind the spar. Remove the section of the center ribs between the back of the spar and the rear of the 2" x 4" hole.

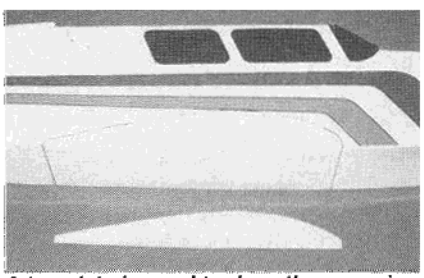
● Make the new gear support ribs from lite ply and glue them in place (epoxy). These ribs should be 3" apart.

● Make the two lite ply gear mount plates and glue them together (thick CA) to make one 1/4" x 2" x 4" gear mount.

● Check the fit of the gear mount in the hole in the wing, and sand the edges of the hole and the top of the gear support ribs as necessary. The gear mount should be flush with the wing surface at its outer edges. When satisfied with the fit, glue (epoxy) the gear mount in place.



The aileron horns are removed from the wing and switched side for side so that the threaded ends protrude from the top of the wing instead of the bottom.



A template is used to draw the new wing saddle on the outside of the fuselage. A new, easy to use template is shown on the plans.

MODIFYING ARF'S

There are a lot of reasons why you might want to modify an ARF aircraft kit.

There are a limited number of types available. If, for instance, you wanted an ARF trainer for use on water, your best bet would be to add floats to a proven land trainer.

Some designs sacrifice performance for simplicity or price. Adding retracts to a sport/pattern ARF would make it fly smoother and perform aerobatics with more precision.

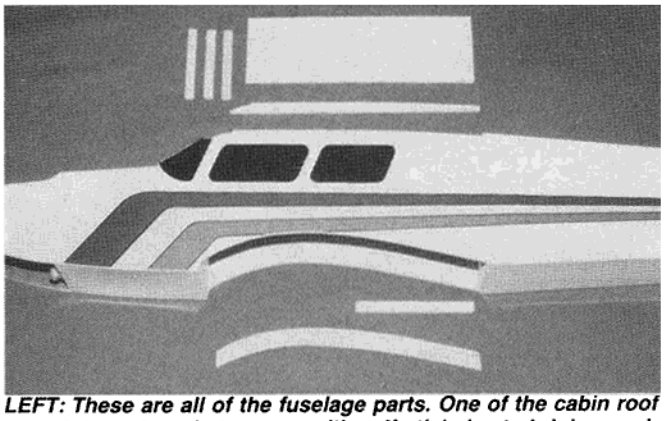
You might not find the style you like. Why should all basic trainers look like Cessna Skyhawks? A Piper Cherokee is just as easy to fly.

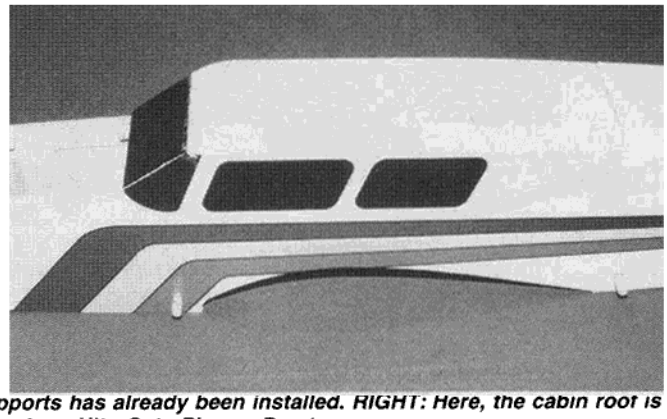
They all look the same. It seems like every P-51 has the same markings; every trainer the same color scheme. Maybe you just want to be a little different.

Modifying things releases your individual creativity, and every modeler will have his own ideas about what changes should be made. We'd like to pass along some of our ideas and some of the basic skills involved in an occasional series of articles on "Modifying ARF's."

The first two articles in the series presented the H20-T (Water Trainer) and Basic Recovering. The Low Wing Trainer is the third, with more to follow, including such subjects as "Adding Retracts," "Bolt-on Wings," "Aftermarket Add-ons and Paint."

If you have a modified ARF which turned out really well, we'd like to hear from you. Send photos and a description to: R/C Modeler, ARF, P.O. Box 487, Sierra Madre, California 91025.

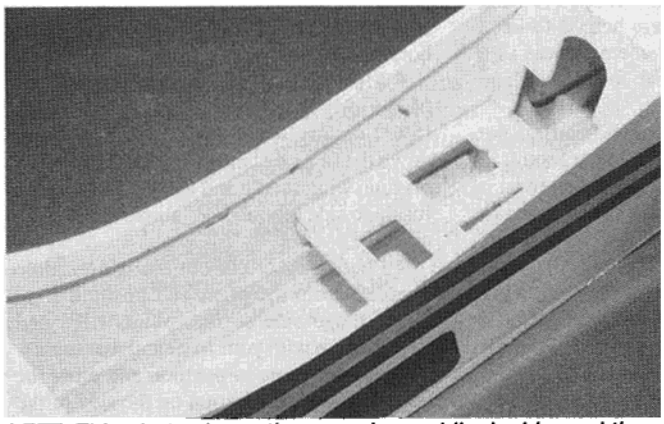


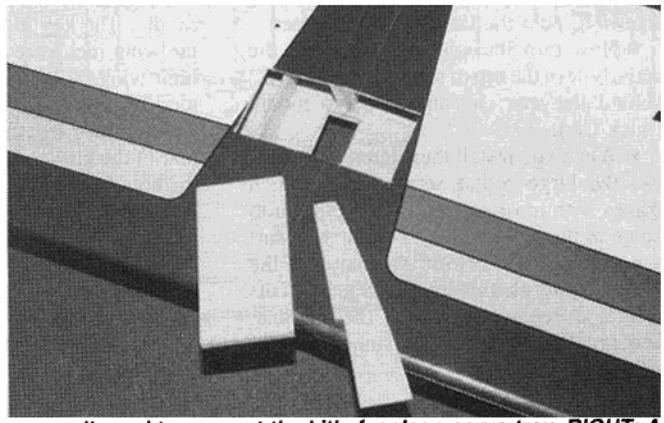


LEFT: These are all of the fuselage parts. One of the cabin roof supports has already been installed. RIGHT: Here, the cabin roof is complete and ready to cover with self-stick, heat shrink covering such as UltraCote Plus or Presto.

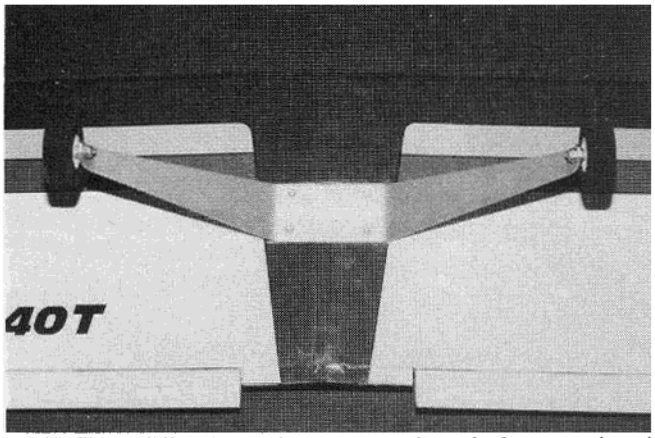
• Cover the gear mount with Presto or UltraCote Plus, overlapping the existing wing surface by at least 1/8'' all around. The heat gun will shrink away any wrinkles.

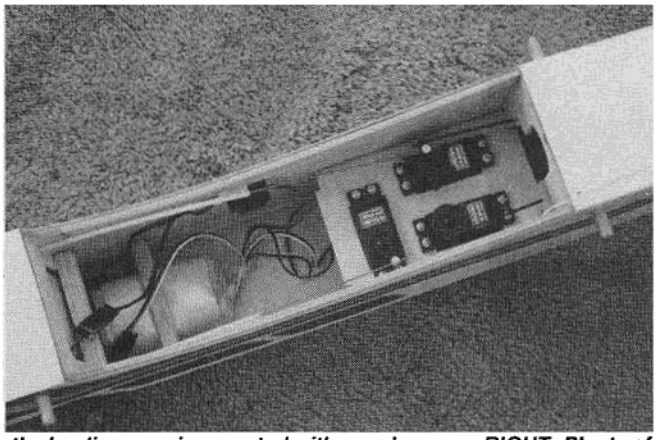
• Drill the four mounting holes in the Hallco landing gear with a 9/64'' drill bit. Center the gear on the gear mount with the straight side facing the **rear** of the wing, and the angled side facing forward, then drill the





LEFT: This photo shows the new wing saddle doubler and the new servo rail used to support the kit's fuselage servo tray. RIGHT: A 2'' x 4'' hole is cut in the bottom of the completed wing, the center ribs are removed, and new plywood landing gear support ribs are added. One is shown installed in this photo. Note the servo cut-out in the top of the wing.





LEFT: The 1/4" lite plywood gear mount drops in, is covered, and then the landing gear is mounted with wood screws. RIGHT: Plenty of room for a neat radio installation. The battery is mounted under the fuel tank.

mounting holes through the gear mount with a 3/32" drill bit. Use the #6 sheet metal screws to hold the landing gear in place.

• Now turn the wing over and cut the servo hole in the **top** of the wing, about 1/2" behind the spar. Install the servo mount (thick CA).

• When you install the aileron pushrods, use the large round servo wheel which comes with most servos. Drill the pushrod holes in the wheel (5/64") about 1" apart and at least 1/4" **behind** the center of the wheel. (See sketch on the plans.) This creates differential throw in the ailerons, and greatly improves the smoothness of aileron response.

Fuselage:

The fuselage mods are even simpler than the wing mods. We're going to cut a new wing saddle out of the bottom of the fuselage and build a roof over the old wing saddle. The key to success here is to keep the wing incidence the same as it was as a high wing. (Use thick CA for all fuselage modifications.)

• Remove the former (bulkhead) at the rear of the kit's main landing gear mount in the bottom of the fuselage. You can twist it out with a pair of pliers, we're not going to use it again.

• With the fuselage right-side-up, measure down 1¾" from the old wing saddle and draw a line on the inside of both fuselage sides, extending 4½" forward from the front of the former at the rear of the wing saddle. Cut two 4½" lengths from one of the 1/4" x 3/8" balsa sticks and glue one to each fuselage side with their top edges on the line. These sticks will serve as mounts for the fuselage servo tray.

• Now, on the outside of the fuselage, and starting with the right side, find the bottom of the fuselage former at the rear of the wing saddle. You can usually see the bottom tab of the former under the covering material where it comes through the side. Otherwise you can push a pin through the bottom of the fuselage from the inside. Make a mark on the fuselage side where the front of the former and the top surface of the bottom sheeting meet.

• Measure the distance from the rear end of the original wing saddle to that mark (5¼" on my Royal 40T). Now measure down the same distance from the front of the original wing saddle and make a mark on the fuselage side (about 1/4" above the bottom on mine).

• Photocopy or cut out the wing saddle template from the plans and position it on the fuselage side so that points "F" and "R" line up with your front and rear marks. Hold the template in position and draw the new wing saddle position on the side of the fuselage.

• Follow the same steps to draw the new wing saddle on the other side of the fuselage.

• Use the 2" "Tuf-Grind" in the Moto-Tool to cut away the fuselage sides below the new wing saddle and remove the fuselage bottom between the front and rear formers. The 1/2" sanding drum is ideal for final shaping of the rough cut wing saddle.

• Make the new wing saddle doublers

THE LOW WING TRAINER BILL OF MATERIALS

1 — ARF trainer kit (Royalair 40T, Hobbico Flightstar 40, Hobby Shack Right Flyer 40, or similar)
1 — Hallco #B106-5 landing gear
2 — 1/4" x 3/8" x 30" balsa sticks
2 — 1/8" x 12" x 12" light (poplar) plywood sheets
4 — #6-3/4" sheet metal screws
1 sq. ft. — Goldberg Ultracote Plus or Black Baron Presto in a color to match the top of the fuselage of the kit you will be using.

Tools List

The following tools will make the cutting and covering tasks involved in this conversion much easier. Most experienced modelers will have these items in their shop, and you might be able to borrow them. If not, don't despair, you **can** cut lite ply with an X-Acto knife.

Heat gun, for shrinking covering
Dremel or Craftsman Moto-Tool
1/2" Drum sander (coarse) to fit Moto-Tool
2" Tuf-Grind cut-off wheel (from House of Balsa) with mandrel
X-Acto knife, with #11 blades

Adhesives

You will need the following adhesives. The instructions indicate which adhesive is best for each operation.

Thin (fast) CA
Thick (medium) CA
5 minute epoxy

Refreshing new look for a true training airplane. (With improved sport flying capabilities as a bonus.)

from lite ply and glue them in place.

- Place the wing in the wing saddle. The airfoils of these flat bottom trainers are all pretty much the same, but there is quite a bit of variation between different kits from the same manufacturer, and even between the two wings in the same kit. The plan template is a good fit for my Royal kit, and should be close for most of the others, but you may have to do some sanding here or there to make the wing fit the saddle properly. If your kit has the plywood pieces on top of the wing over the aileron horns, you'll need to sand a notch for them at the rear of the wing saddle. Try to keep the bottom of the wing parallel to the old wing saddle while making it fit the fuselage. This is a step you may want to ask an experienced modeler to help with. If there are no gaps larger than about 1/16'', foam wing saddle tape will take care of it nicely.
- Once the wing is sitting solidly in the wing saddle, drill 1/4'' holes in the new wing dowel locations (see plans), and glue the dowels in place. While we're at it, we could convert to a ''bolt-on'' wing, but the rubber bands are much more forgiving of rough landings, so I've stayed with them on this one.
- Make and install the 1/4'' x 3/8'' balsa cabin roof supports. Shape them to match the plans template and then carefully glue them in place on top of the old wing saddle. Try to get these pieces flush with the outside of the fuselage to minimize sanding later.
- Cut three 3½'' pieces from the 1/4'' x 3/8'' balsa, and glue them across the front of the cabin behind the windshield. Sand a slight angle on one side of each one so that it fits snugly against the one before it.
- Make the cabin roof from lite ply and glue it in place. It goes behind the cross pieces and on top of the cabin roof supports.
- Put a strip of masking tape over the windshield and side windows next to the new wood to protect the finish and then sand the cabin roof to remove any roughness or irregularities.
- Now cover the roof with Presto or UltraCote Plus. Do the sides (roof supports) first, with about a 1/8'' overlap on the kit covering and the cabin roof, then the roof itself, with an overlap at the front and rear. After the covering is applied, the heat gun will eliminate any wrinkles and improve adhesion.
- Glue the fuselage servo tray to the bottom of the rails which you installed earlier. The servo tray is actually reversed from the way it is installed in the high wing. Check to be sure that you install it with the front hole (throttle) on the same side of the airplane as the throttle lever on the engine.
- It's a good idea to seal the edges of the covering around the new wing saddle with thin CA to prevent fuel residue from attacking the wood.

That's it! Now you can go ahead and finish the airplane in accordance with the kit instructions. Set the control throws and the balance point (C.G.) to match the instructions, but remember that with differential throw in the ailerons, they will move further up than down. Use the kit recommendation for the up travel.

Flying:

The Low Wing Trainer tracks very well on the ground. Take-offs are straight and require only a little up elevator to rotate. In level flight, it's not quite as stable in roll as the high wing, but more stable in yaw. Turns and aerobatics are much smoother and more precise than the high wing. Landings are very controllable, with no ballooning and no bounce, but the high wing is pretty good at landings too. If you are a beginner learning with an experienced instructor, it really comes down to personal preference. If you are already an experienced flier, you will probably like the low wing better. A lot of our local sport fliers like it a lot as a change of pace. Happy Flying! □

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