MODEL AVIATION'S Sport Aviator
The e-zine for the new model pilot

Selecting Your First RTF Trainer
by Frank Granelli

With radio, engine, fuel systems already installed, this RTF trainer could be built in 20 minutes. Spending longer on construction will yield a model that may last 1,000 flights with no problem.

THINGS ARE CERTAINLY different today for the aspiring model pilot. Gone, and surely not greatly lamented, are the days when a new modeler had to spend several months building a trainer from a wood kit. He or she usually made a few mistakes along the way; sometimes the kit directions were not very clear or helpful. Sometimes the instructor spotted these mistakes, such as poorly or incorrectly mounted control horns, before the first flight.

However, other problems, such as using the wrong adhesive to join the wing spars and the parts that strengthen the wing's center joint, were undetectable and often fatal to the model when flown. Even minor damage then often meant weeks of downtime while repairs were made. A total loss could mean missing a whole flying season.

We should all be properly grateful to those pioneers of yesterday for their talent, patience, and perseverance. Without them, none of us would have the reliable radios, great engines, and ready-built aircraft we enjoy today.

Today's new model pilot has a wide choice of ARF and RTF basic trainers. Last month I wrote about the differences between RTF and ARF aircraft and how best to choose between them.

This month I will explore assembling an RTF basic trainer. Along the way, I might have a suggestion or two about how to improve the aircraft's function and durability without much experience or building skills. Next month I'll build a complete ARF trainer—the Hobbico HobbiStar 60 Mk III—and include improvements and performance enhancements.

Shown is a typical RTF "kit" as it comes out of the box: the Hangar 9 Alpha 60. Where there are differences, I'll use additional aircraft for illustration. All of the RTF basic and advanced trainers available are finely engineered systems. Their production quality is outstanding and the costs seem magically low.

But the "real world" requires some compromises, such as wings that cannot be fully assembled and fuselages without attached rear surfaces because of shipping restrictions. There is also the need to make every assembly step as simple as possible so that even the newest modeler will

have little difficulty assembling a good, flyable aircraft. The cost of this simplicity can sometimes be a loss of durability.

In theory, there are five major steps to construct an RTF trainer: assemble the wing, bolt on the tail feathers, connect the rear control rods, bolt the main landing gear in place, and mount the spinner/propeller assembly. Total building time could be less than 20 minutes!

The Hangar 9 Arrow RTF advanced trainer was completely assembled in 17 minutes. You can read more about this aircraft on *MA's* Sport Aviator Web site: www.masportaviator.com.

What you get after 20 minutes of assembly is a model that usually lasts for an even shorter period once airborne. Why? RTF trainers remain complex aircraft with many subsystems that require checking before flight. There have been durability problems past the 50-flight mark that are best addressed before final assembly.

Wing Assembly: I like to start on the wing since it is the biggest and the easiest part to finish. It makes me feel as though I have accomplished a whole lot in a short time. All RTF trainers use metal spars to align the wing halves and to ensure a strong wing center-section. There is usually a smaller rear metal pin to further align the wing halves. If the wing has a plastic center rib, as the Hobbico NexSTAR does, the rear pin is omitted.

The Hangar 9 Alpha-series RTFs use light aluminum tube spars and a rear alignment pin to join the wing halves.

Hobbico RTFs use screws to lock wing halves in place.

Slide the metal spar into place and attach the second wing half. Each center wing rib is coated to make it fuelproof. Sometimes this coating flows into the spar and rear pin holes. Tolerances of the spar-to-rib hole are tight to ensure a stiff wing. The smallest amount of coating inside the hole

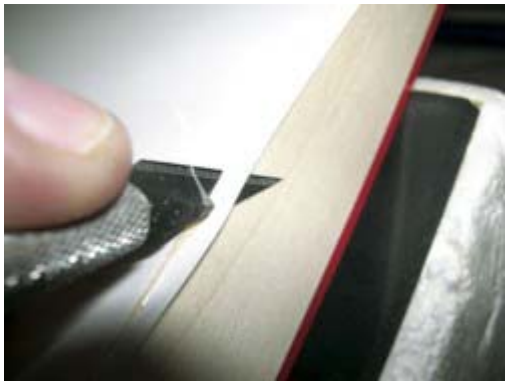
can prevent the spar from sliding in.

If that happens, use a fine, medium-size, round file—a rat-tail file—to gently remove only the coating. Never enlarge the hole itself.

Hobbico wing halves usually screw in place, as on the Avistar 40 advanced trainer. Hangar 9 wings are secured using clear tape. Either method is good for approximately 200 flights; after that, the constant flexing, sudden pullouts, and "difficult" landings take their toll, and the wing spar begins to wear its wing rib mounting holes, allowing the wing to get sloppy. Both methods allow perfect wing alignment, so that is not a problem.

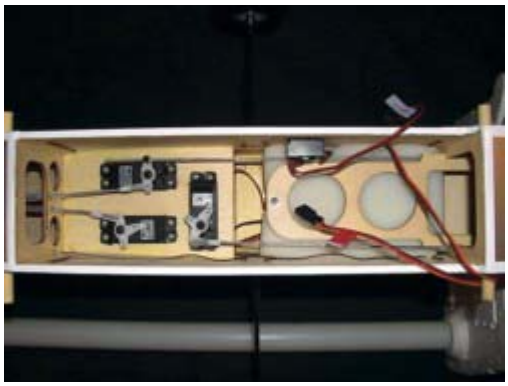
Use an extra-sharp hobby knife to remove only the covering that overlaps the wing center-section. Lightly block-sand the wing halves. Brush a thin film of 30-minute epoxy onto one wing's center rib. Assemble the wings as in the directions, hold them together with masking tape, make sure the LEs and TEs are aligned, and allow to dry.

This RTF wing will never loosen and will stay true throughout the most strenuous maneuvers. Hold off on connecting the aileron control rods for now.



Raise covering away from center rib using sharp #11 blade to cut away overlap that prevents a strong adhesive joint.

Reinforcing the Fuselage: Notice how nice the servos look in one of the photos, all in place and with everything connected. It is good to have an installed fuel tank as well, and the engine is comfortable nesting in its preinstalled mount. It seems a shame to disturb all of that nice work, but I am going to do just that.



Servos in place after reinforcing mounts. Author has had three servo screws strip mounts without using reinforcement.

Experience has shown that some problems develop past the 100- to 200-flight mark that can be prevented at this point. You may consider 200 flights too many to worry about, but it represents only 10-20 weekends of five flights a day. That is less than one season.

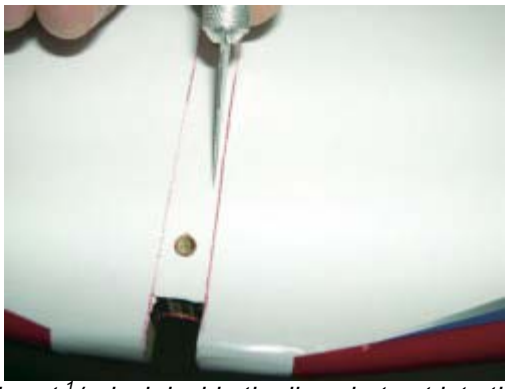
The servos are mounted on a thin plywood plate using small screws, which sometimes loosen after many flights. It is a good idea to center each servo's control arm—the part to which the control rod connects—and then remove the center screw and control arm and the four servo-mounting screws. Remove the servos, but leave them connected to the receiver.

Large 1/2 x 1/2 spruce was used for photo purposes. Thinner 1/8 x 1/2 strips are lighter and easiest to install. Reinforce aileron mount as well.

Hobby shops sell 1/8 x 1/2 spruce rails that are roughly 36 inches long. Cut two rails approximately 1/4-inch shorter than the inside width of the fuselage. Glue the two rails with thick cyanoacrylate onto the bottom side of the servo tray.

Move the servos and wires out of the way, insert one rail through one of the two rear servo holes, and rotate it widthwise. Apply the adhesive and hold in place. It is best to position each rail slightly outside the plywood tray's servo hole so that the servo fits back into place easily.

Hangar 9's Alpha 60 employs two bolts to mount the fin and stabilizer and two more to bolt the assembly to the fuselage.



Using a sharp blade, gently cut $^{1}/_{16}$ inch inside the lines but not into the wood. Remove covering before gluing in place.

After installing the large rails, cut two smaller rails for the throttle-servo mount and install them. In the end, the bottom of your servo tray should look like the one shown. Drill through the existing servo mounting holes with a 1/16-inch-diameter drill bit, and then replace the servos and all connections. Make sure the servos are centered and all control surfaces are in their original positions. Do the same for the wing's aileron servo because it gets the most stress.

All RTF aircraft feature bolt-on tail feathers. Hangar 9 trainers mount the vertical fin to the horizontal stabilizer using two bolts. Two additional bolts mount this assembly onto the fuselage, as shown. Hobbico RTFs use two long threaded rods mounted inside the vertical fin that pass through the stabilizer and are bolted to the fuselage bottom, as is also shown.

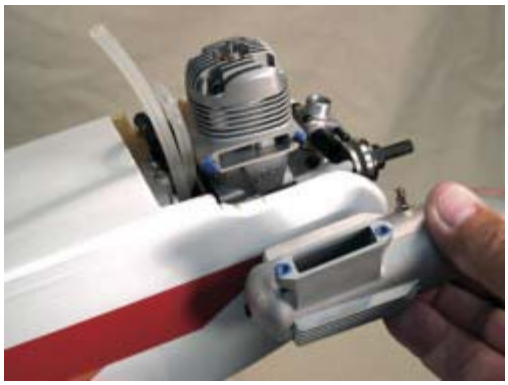
Both systems provide perfect alignment but wear in time. Eventually the wood around the bolt holes distorts, enlarging the holes and allowing the stabilizer to rotate in position.

The solution is to epoxy the stabilizer in place using the stock mounting system for alignment. Install the fin and stabilizer in place. You may find it easier to accomplish this using a 00 Phillips screwdriver to align the fuselage and stabilizer bolt holes first. After everything is in place, draw a line with a fine-point felt-tip marker onto the stabilizer's top and bottom where it meets the fuselage sides.

Disassemble the stabilizer and fin, and cut away the covering 1/16 inch inside the lines on the top and bottom of the stabilizer. Use a sharp #11 blade, but be careful not to cut into the wood. Apply 30-minute epoxy to the fuselage plates that mount the stabilizer. Not much adhesive is needed since the only intention is to reinforce the stock mounting system. Install the vertical fin and stabilizer and let dry.

I have never experienced a loose vertical fin, but you can epoxy it in place if you wish. Remember to remove any covering from the fin's bottom as you did on the wing center-sections. Connect the elevator and rudder control rods. Be sure to use the silicone "keepers" to lock each clevis closed.

Finishing the Front End: All RTF aircraft are delivered with a loose, or uninstalled, propeller and spinner for safety purposes. Bolts might loosen during climate changes that occur during shipping, and that can be a safety hazard. If the propeller is uninstalled, leave it off for now. If it is installed, remove it by reversing the installation instructions.



Apply removable thread-locking compound to muffler holes and bolts. Do not use permanent type; that will prevent removal.

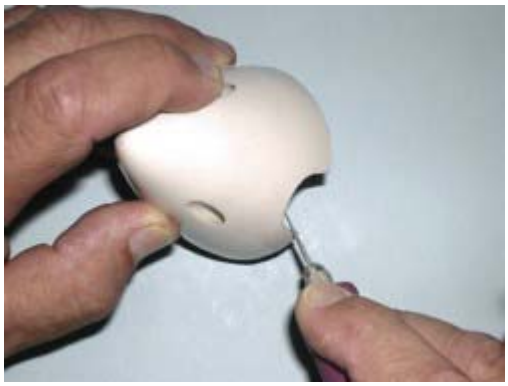
Remove the muffler. This is necessary because none of the RTFs use thread-locking compound, so the mufflers loosen in the first few flights.

While the muffler is off, tighten whatever bolts hold the engine and engine mount in place. Do not remove the engine itself, especially if a clamp mount is used. Realigning the thrust angle can be difficult in such a mount. Just make sure the bolts are tight.

Also while the muffler is off, check the throttle movement. With the throttle stick at high, positioned away from you, and with the throttle trim on high, the throttle barrel should be just fully open. If not, adjust the clevis by turning it until the barrel is fully opened.

Leave the trim on high and lower the throttle stick all the way. The barrel should close until there is roughly a 1/16-inch opening. Lower the throttle trim lever all the way, and the barrel should just close completely. This small preflight check is easier to perform now because clevis adjustment is easiest without the muffler.

Apply the removable type of thread-locking compound to the muffler holes and the mounting bolts. Coating just one side is seldom enough. With both covered, your muffler will be yours to keep forever. This beats combing the fields looking for it after every 20 flights. Install the muffler.



Remove excess plastic flashing from spinner cone to make sure cone mounts firmly against spinner backplate on all sides.

Install the propeller using the correct-size box wrench. Today's powerful engines can start backward, putting extra stress on the prop nut's firmness. The small four-way tool that was popular years ago may not provide sufficient torque.

All RTF spinners use small screws to mount the spinner cone to the backplate. Make sure the

spinner cone rests fully into the backplate's groove before tightening these screws. The screws themselves are not powerful enough to "pull" the spinner cone into place if there is a misalignment. Tighten the screws firmly, but do not apply excessive force; they are just going into fragile plastic threads. Use a small hobby screwdriver for this task.

It may be necessary to remove excess flashing from the spinner cutouts surrounding the propeller. Use a sharp #11 blade in a hobby knife to remove minute pieces one at a time. Recheck after each cut.

If there is more than a 1/64-inch difference, preventing the spinner's mounting properly, chances are that the propeller is in the incorrect position on the backplate. Check this before cutting the spinners.

Ensure that the nose wheel is pointed straight when the rudder is centered. If it is not, adjust it using the servo setscrew located inside the fuselage on the rudder-servo control arm. Retighten the setscrew once the nose wheel is straight.

Attach the main landing gear using the supplied bolts. Test-roll the fuselage to make sure it goes straight. Make any steering adjustments required using the nose-wheel steering adjuster that I mentioned previously.

The Alpha 60 can use nylon bolts or rubber bands for wing installation. Wing holes and nuts are factory installed.

Mounting the Wing: All RTFs I know of—except for the Alpha 60 and the NexSTAR—use rubber bands to mount the wing. The NexSTAR uses a single, shock-mounted, rear nylon bolt and a plastic front pin. The Alpha 60 offers the choice of rubber bands or the traditional double rear nylon bolts threaded into preinstalled metal blind nuts. Two wooden dowels hold down the front end.

If your aircraft uses rubber bands, carefully measure the fuselage width at the front and the rear of the wing. Make a pinhole—at the midpoint between the two sides—in the fuselage, just ahead of and behind the wing.

When mounting the wing, align the center wing joint with the two pinholes. This centers the wing and helps keep the trim constant from one flying session to the next. This process is not required using wing bolts because trim and wing position remain constant with this system.

If you are assembling the NexSTAR, make sure to attach the speed-control flaps with the six screws provided. Although they look ungainly, these slotted flaps make airspeed control during takeoff and landing much easier for the new pilot. Hangar 9 trainers use three-blade propellers for the same purpose.

Additional modifications can be made to RTFs, but they are more to enhance performance than to increase durability. Items such as stronger nose gear, sealed control-surface gaps, wheel pants, and reinforced firewalls offer performance advantages, but they also start to take the "R" out of RTF. Since these modifications, and others, are also useful on ARFs, I'll cover them next month.

This NexSTAR had left rudder once assembled. Unclip clevis (insert) and screw it outward until rudder is straight. Remember to reinstall silicone lock tubing.

Preflight Checks: The most important actions any new pilot can take to ensure successful first flights are the preflight checks. All RTF manufacturers cover these in their manuals, but two actions are critical.

Charge the transmitter and receiver batteries. Center the transmitter trim tabs for the three control surfaces. Turn on both radio systems and examine the control surfaces. Every one must be in the neutral, center position.

If a surface is not centered, such as left rudder or down-elevator, leave the radio system turned on and adjust the clevis that connects to the control horn until that surface is in the neutral, center position.

No aircraft will fly straight unless all control surfaces, especially the rudder, are centered. It is easiest to learn on an airplane that flies straight and goes where it is pointed. RTFs are so well designed that it is nearly impossible to misalign the wing halves during assembly. Therefore, if a great deal of aileron trim is required to fly straight, it usually means the rudder is off-center.

The last crucial step is to check the aircraft's longitudinal CG. Does the completely assembled airplane balance front to back exactly at the point that the instructions require?

Most RTFs do balance perfectly. If yours does not, a few stick-on lead weights, available at the hobby shop, might be required. A photo shows the Arrow having its CG checked using the Great Planes stand that is designed for this purpose. Never fly a new model without checking and adjusting its CG.

The last check is to make sure all screws, such as the servo control-arm screw, the nose-

wheel steering-arm locking screw, and any other fasteners not checked during assembly, are firmly tightened.

Hangar 9 Arrow on Great Planes C.G. Machine. Stand allows positioning test weights and immediately checking effects. CG is correct when nose points downward roughly 10°.

Next month I will build and modify the HobbiStar 60 Mk III ARF trainer. If you want more extensive photo details about checking an RTF trainer than it is possible to cover here, read "Ready to Fly? Well ... Maybe" on Sport Aviator at http://www.masportaviator.com/ah.asp?CatID=2&ID=23. ***MA***