



INSTALLING THE FUEL TANK AND ENGINE



In Part II of this article series, we covered the best way to build an ARF trainer Fuselage airframe. [“How to Build an ARF Trainer Part II”](#) detailed how to build the very best fuselage airframe possible. In truth, most ARF trainers would fly well if a few steps were left out, as long as the stabilizer and vertical fin were properly set. However, if all the steps were followed, your ARF Trainer would be better than 99% of “First Timer” airplanes brought to the flying field.

This article, “Part III – Engine Choice, Installation and Final Assembly” will follow the same pattern. When selecting and installing the engine, and then completing construction, you will not need to perform every step detailed here for your airplane to fly OK. But if you want the best flying trainer at the field and one that will be problem free and extremely durable, try to follow these instructions as much as possible.

How much you are willing to do so will determine how well your trainer will perform, how easily and quickly you will learn to fly and how long your airplane will last. Remember that all Sport Aviator photos can be enlarged just by clicking on them,



Photo 41

The instructions included with today’s ARF trainers are almost always excellent. The Tower Hobbies Trainer is no exception as photo 41 shows. It is time to move towards the airplane’s nose area. Assembling the fuel tank is the first step. The front of the fuel tank’s “stopper”, which contains the fuel and vent hoses, protrudes from the firewall. Having the engine already installed means using lots of surgical clamps to pull the lines into their proper positions. Assemble and install the fuel tank first if your trainer resembles this setup.

Note: If your trainer has the fuel inlet line and vent (pressure) line easily accessible, use a two line system as shown here. If your trainer's engine is completely cowled in, you will need a third line for filling. Almost all trainers use the two-line system so the third line installation is not detailed here. If you must have one, follow your airplane's instructions about installing one.



Photo 42



Photo 43

Photo 42 shows all the fuel tank parts in the order in which they will be assembled. The first step is to slide two aluminum tubes into the "rubber" stopper from the smaller side. Two of the three holes in the stopper are drilled completely through. One is not. Do not puncture the latter if you are not using a three tube system. After inserting the tubes, slide the smaller metal nut plate over the two tubes. Position the larger metal plate over the tubing and holes from the top. Insert and tighten the screw about 50%. Your assembly should look like photo 43.



Photo 44

TIP: Pick one of the tubes as the fuel inlet tube (usually the shortest one). My preference is to use the tube on the side of the engines fuel inlet (the left in this case). Use a 1/32 in. nail set to slightly "flair" the fuel tank end of the tube. Do not separate the tubing, just make a slight flair. This flair keeps the tank's pickup line from slipping off the fuel inlet tube. Do not bend the interior vent tube at this time. Make sure the stopper is not expanded yet.



Photo 45



Photo 46

Slide the transparent silicone fuel tubing over the pickup weight as shown. Make sure that the tubing is all the way on and slips past the slightly raised area as shown in photo 45. This keeps the weight, sometimes referred to as the "Clunk", firmly attached to the pickup fuel line.

Note the clunk's position inside the tank in photo 46. The idea is to get the clunk to be about 1/8 in. to 1/4 in. above the rear of the fuel tank when the stopper is fully inserted and the tank is held in the vertical position. Even though the clunk has a small slit cut into it (see photo 45), it is remains possible to starve the engine of fuel in a vertical climb if the clunk rests against the tank bottom. While not as critical in a trainer, this precaution is an absolute necessity in a sport aerobatic airplane.



Photo 47



Photo 48

Slide the tank fuel pickup line over the fuel pickup tubing about 3/4 in. (photo 47). Expand photo 47 and note the flair in the tubing that holds the line firmly onto it. Then place the stopper about even with the tank hole and note if the clunk would extend too far into the tank (photo48). It almost will always be too long.



Photo 49

The first remedy is to slide the pickup line all the way up the remaining tubing (photo 49). Try it again. Only this time, install the clunk and slide the entire stopper assembly *into* the tank. If the clunk touches the bottom, remove the stopper and cut the line using a sharp hobby razor knife (photo 49). Repeat this process until the clunk is in the correct position. (Now you know why you didn't bend the vent tube since you will be inserting and removing that stopper too many times.)



Photo 50



Photo 51

Test bend the vent tubing as shown in photo 50. It sometimes helps to put the stopper over the tank's exterior, even with the tank's stopper hole but outside the tank. Bend the tubing until it looks like it will fit inside the tank pointing at the TOP of the fuel tank and nearly touching it. This tubing allows the muffler gases to pressurize the fuel tank, (usually to about 3-4 lb/sq. in.), to insure consistent engine runs. If not set high enough towards the tank top, it will not be possible to completely fill the fuel tank.

Once you have the correct height for the vent tube, keep the height but begin to bend the tubing until it points towards the top front of the fuel tank (photo 51). The correct position is for the tubing to point forward with the tubing top almost resting against the tank's top. The "hole" must be clear.

TIP: If this is the first time you have assembled the fuel tank, you might wonder how to insert the stopper assembly once the vent tube has been bent. Insert the fuel pickup, with the attached clunk, into the tank. Then tilt the stopper at about a 45-degree angle until the vent tube just clears the inlet. Then slide the stopper forward, while gradually decreasing the angle, until the vent tube is entirely inside the tank. It is possible that the pickup tube is too long to allow this. In that case, slide a bit more of the pickup tubing up into the stopper. It will now extend further out from the stopper on the exterior. This operation is harder to explain than it is to do.

Once all the assembly is complete, use a regular #2 Phillips screwdriver to tighten the stopper screw. Tighten it well so that the stopper can not rotate and you can see it swell in the tank neck, firmly sealing it. A small hobby screwdriver will not provide sufficient torque unless you happen to be an XFC contestant or an Olympic weight lifter. *Make sure that the vent tubing is on the top side of the fuel tank.*

Sliding the tank in place in the fuselage can be difficult. The short fuel lines provided in the kit do not help. It is possible to slide two 6-32 ball drivers into each line from the front firewall hole and then guide the lines out through the hole. But few new pilots have these tools. (Hint – go buy one 6-32 plus the 4-40 and 2-56 sizes as soon as you can.)



Photo 51A



Photo 51B

Here's a better idea. Go to the hobby shop and buy a 5 ft. length of the Aerotrend® blue fuel line, standard size, and 5 ft. of the Prather® standard size fuel line. If these brands are not available use the equivalents in your area. Hook the blue line to the fuel inlet and the pink line to the vent tube (photo 51A). Note the flared ends on the two metal tubes to make sure that the lines do not leave their respective tubes during use.

Run the other ends of the 5 ft. fuel lines out through the firewall hole. Gently pull on the lines while pushing the tank into the fuselage from the wing saddle opening. Use the lines to guide the tank stopper into position in the firewall hole. The tank is installed and you didn't need to learn any nasty new words to do it.



Photo 52

One great thing about the Tower Trainer is that all the holes for mounting the engine mount and nose wheel bearing are not only marked, but are drilled and the blind nuts installed (photo 53). This is not bad for such an inexpensive, but well designed and built, basic trainer. Other ARF trainers may not have the holes drilled; only marked.

In that case, drill the holes as marked and of the instructed size (directions *can* help sometimes so read them). Insert the blind nuts from the other side and imbed them into the rear of the firewall using the proper size bolt. Insert several larger washers under the bolt head to insure that the firewall front is not damaged during this process. Fortunately, Tower did this work for us.

CHOOSING AN ENGINE



Photo 53

Photo 52 shows the engine system chosen for this airplane. The O.S. Max .46AX is an amazing engine. While it has more power than this airplane will ever need, outside of a pylon race maybe, the engine's real advantage for a newer pilot is its amazing reliability and ease of running. This engine can reliably idle, once broken in over about 15 flights, at 2,300 rpm (how many times the engine revolves in one minute) or even a bit slower. This makes for easy-to-control landing approaches and even slower landings.

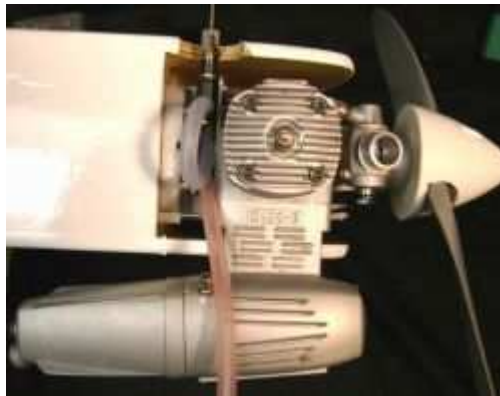


Photo 54

The particular engine used in this airplane has over 150 flights in at least four airplanes. It has gotten to the point that it will idle around 2,100 rpm and yet it tops 12,500 rpm on an APC 11 x 6 in. propeller. Why choose the excess power and not just use a less expensive .40 engine?

That is a good question that deserves a good, if too long, answer. The short answer is that, like many cars that have a choice of engines, your airplane also provides power choices. The Chevrolet Suburban for example, has a base 5.3 Liter engine of 305 hp. That is great (20 mpg on the highway) as long as you are not towing a large load or trying to go very fast. The 6.0 Liter engine is faster and tows more while its gas mileage ratings are around the same as the 5.3 L engine (~17 mpg highway). The big 8.0 Liter engine can tow nearly twice as much but uses so much gas you won't be towing anything very far.

The longer, more accurate answer is this. Having some excess power that a basic trainer really doesn't need allows the pilot to select different propellers based on that day's flying mission. How does this work?

Early instructional flights are best flown at slower airspeeds, both approach and top speed. This provides the pilot time to plan ahead. It may sound strange, but it is very difficult to setup any .46 size engine to reliably idle at less than 2,200 rpm. Most real world engines at the field are set to idle in the 2,400 to 2,600 rpm range.

The two-stroke glow system fights you on these smaller engines. True, the larger glow two-stroke engines like my O.S. Max 1.40RX will idle well at 1,600 rpm. But that is a \$500 competition engine *engineered* for an excellent idle. It also has size (momentum) and high heat retention on its side. Plus, it is running on 20-25% nitromethane fuel which does help idle reliability.

Sport .40 or .46 engines running on 10-15% nitro fuels have none of these advantages. But the .46AX has a little more momentum than a .40 engine and more torque. This means that it will idle at 2,200 rpm with *either* an APC 11 x 6 in. or an 11 x 5 in. propeller. Either propeller idles at the same speed. But the 11 x 5 in. propeller lowers all the airspeeds, especially the critical approach and landing speeds.

The 11 x 5 in. propeller also accelerates faster. Newer pilots may not appreciate, or even recognize, this ability to “spin up” faster. But believe me your instructor does so when saving your airplane from an approach stall at 10 feet high! The lower touchdown airspeed also makes timing the flair easier to manage.

To a sport .40 engine, the 11 x 5 in. propeller is as an 11 x 6 in. is to a .46. A .40's performance falls off markedly when switching to the 11 x 6 in. propeller. In fact, most .40 sport engines do not perform well with the larger size. Their propellers of choice offering the same options are 10 x 6 in. size and a 10 x 5 in. A .40 engine turning the 10 x 6 in. propeller actually flies the approaches and landings *faster* than does the more powerful .46 engine turning an 11 x 5 in. one.

You can switch to a 10 x 5 in. propeller. That works. However, remember that much of an airplane's rate of climb depends on the size of the rotating propeller disc. Without getting too complicated, the larger the disc, at the same rpm, the better the climb rate. Therefore the .46 engine with the 11 x 5 in. propeller provides a superior sustained, not zoom, rate of climb. This is another good feature to have.

Once the pilot has mastered the basic flying techniques, install the 11 x 6 in. propeller and enjoy the higher airspeeds and increased performance. If you want to pylon race your trainer or just want to fly faster, go to a 10 x 7 in. propeller. Climb is sacrificed but the airspeed will increase by 5-10 mph. No matter what you do, basic trainers are drag-limited when it comes to airspeed. They all seem to top out, regardless of engine size, at around 70-80 mph. This is true even when flying with the powerhouse O.S. 55 engine.

Speaking of the .50 and .55 engines, why not use one of these on your trainer? True, it can save you money as this engine is useable on many of your future sport aerobatic airplanes while the .46 may provide less performance on a future Extra 300. But the .55 has one problem in that it extends your learning time when used on a trainer.

What! How can a larger engine make me take longer to learn how to fly? Remember that this is an ARF trainer. Its interior dimensions are fixed. The tank area is set for the 10.5 ounce fuel tank included in the “kit”. Enlarging this area for a bigger fuel tank takes so much work, you might as well build a trainer from a wood kit in the same time (almost).

The .55AX engine burns about 20% more fuel than the .46AX. This shortens your learning time per flight by 20%. Shorter flights mean shorter training time per flight. Shorter training time means more flights to learn the same lessons. Flying more flights usually translates into more flying days to learn the same amount. Considering that learning inhibitions are caused by spreading the learning process over a longer time period, using the bigger engine means that it just will require about 25% more flights to learn to fly.

To compound this problem, the .55AX requires a 12 x 6 in propeller on a trainer. Not only are approach and landing speeds higher, but the larger propeller tends to hit the ground more often during student landings. That is definitely not good for the propeller and probably not for the engine either. However, climb rates are out-of-sight verticals.

In my opinion, select a strong .46 size engine for your “40-sized” trainer. The O.S. Max 46AX is one of the best we have tested so far. That is why it is on this airplane.

INSTALLING THE ENGINE



Photo 55

The Tower Trainer uses the very common “clamp” mount in order to insure that just about any “40-sized” engine will fit. By 40-sized, it is meant that the engine is built on a .40 crankcase. The actual engine displacement (the number of cubic inches the piston covers when producing power) can vary from .40 cu. in. up to .55 cu. in. Of course, the more power volume (displacement) an engine has the more power it produces and the more fuel it uses to produce that power.

The .46-size engine used in this airplane fits easily. First, install the mount onto the firewall. Important – Make sure to put the releasable type of thread locking compound *into* the four firewall nuts. Put the washers on the four bolts, push them through the mount’s bolt holes. Then apply a little more thread locking compound onto the bolts themselves. Assemble the mount to the firewall using a screwdriver. Tighten the bolts as much as possible, but do not damage the bolt heads.



Photo 56



Photo 57

Once the engine mount is in place, locate the nylon nose wheel and related screws. Push the mounting bolts through the bearing as in photo 56. Do not forget to include the spacing washers which provide some extra space for the nose wheel to turn in. Squirt some thread locking compound into the two firewall bolts and onto the bolts themselves (sound familiar?).

Mount the bearing to the firewall but only tighten the screws to about 80%. Then insert the nose wheel into the bearing and into the bearing hole in the engine mount (photo 57). This aligns the two mounting bearings for the nose wheel strut. Make sure it turns freely and then, with the strut still in place, tighten the nylon bearing mounting screws. (Note: Photo 57 shows the engine mount clamp plates in place but they should not be at this point.)



Photo 58



Photo 59

Remove the nose wheel strut after checking it again for ease of rotation. Mount the clamp plates using just two bolts at the rear most points. Just fit the bolts in place as loosely as possible. Raise the plates and slide the engine in place under the clamping plates (photo 58). Then install the two forward screws. The engine is now lightly held in place (photo 59).

Bolt the spinner backplate onto the engine. Measure the distance from the firewall to the rear of the backplate. It is supposed to be 37.5 inches in this airplane but the engine's remote needle valve mount prevents the engine from sliding back far enough (photo 59). It just so happens that the distance from the front of the engine mount ring to the backplate *is* exactly 3.75 in. Maybe the instruction book meant that measurement? But that is not what it says.



Photo 60

In reality, it is OK to have the engine a little further forward than designed, up to about 0.35 inches. The important part is to insure that the backplate and rear of the propeller blades clear the front of the fuselage. The best that could be done in this installation was 4.1 inches from the firewall. The airplane flew fine anyway. The worst that could happen was that the airplane would be very slightly nose heavy and there is nothing wrong in that.



Photo 61

Put a thin card stock behind the engine (photo 61) to prevent the needle valve mount from contacting the engine mount (that shields the plastic from vibration) and slide the engine all the way back as far as it will go. Make sure the rear of both engine mounting lugs are equidistant from the firewall. This makes sure the engine is aligned in the mount so it will have the correct amount of right thrust to compensate for the engine's torque effects. Note – The firewall has this “right thrust” already built into it.

If your engine is narrow, there may be some side-to-side play. Center it as much as possible in the mount by eye. If you really want to be precise, not really required in this case, then read the Sport Aviator article, [“Engines 101 Part 2”](#) in the Pri-Fly section. But that kind of centering precision is only needed on sport aerobatic airplanes, not here.

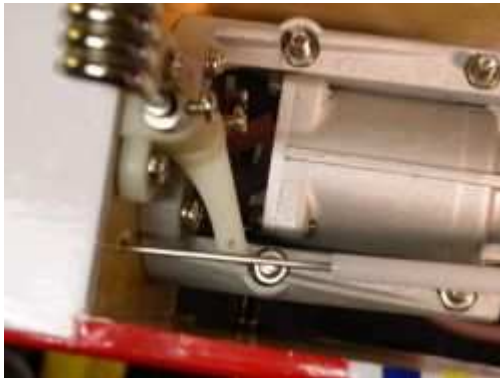


Photo 62



Photo 63

Now is the time to connect the throttle rod. Insert the plastic rod guide through the holes in the front fuselage formers. The easiest way to do this is to first slide the metal control rod through the holes. Then slide the nylon housing over the rod (photo 62). This makes it easy to align the tube through the tight former holes.

You may have to cut a new hole in the formers for the tubing. This airplane's former hole was too low. Use a high-speed rotary tool to do this (photo 63).



Photo 64

Attach a clevis to the threaded rod end as was done for the rear control surfaces. Slide the rod through the guide tube and connect the clevis to the engine's throttle (photo 64).



Photo 65

Position one of the slide connectors onto the throttle servo's control arm as shown in photo 65. You will have to drill out the arm hole to about 3/32 inch. Insert the threaded portion through the arm from the top. Put thread locking compound on it and tighten the nut. Make sure the connector is just free enough to rotate as the arm revolves. Note the washer position.



Photo 66

You may have to bend the rod to get it to pass through the connector (photo 66). A little flex here is not a bad thing and can help cushion the throttle servo against being driven too far. Keep the locking screw loose for now.



Photo 67



Photo 68

Turn on the radio systems. Move the throttle to full and bring the throttle trim to full as well. Slide the throttle control rod through the connector until the engine throttle is full open (photo 67). Tighten the connector's locking screw. Gradually reduce the throttle but leave the trim full up. The engine's throttle barrel should look like photo 68.

Use the transmitter's Travel adjust feature to make sure this happens. Reduce the throttle trim all the way and the throttle slot should be completely closed. The rest of the throttle setup is done at the field and is detailed in Part IV of this series.



Photo 69

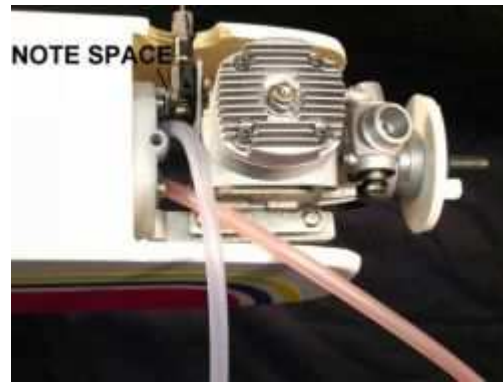


Photo 70

The fuel lines are placed behind the engine and exit via the top of the engine as in photo 69. Make sure there is no crimp or "pinch" and that the lines are clear. Leave the fuel lines about 8-10" too long at this point. Connecting the fuel lines is best left to the end as is mounting the muffler.

Note the clearance space between the engine's high-speed needle valve housing and the engine mount bolt in photo 70. The space was created by the card stock pictured in photo 60. This space is important. First, the "plastic" needle valve housing would be eventually damaged as it vibrated against the bolt head. Second, there have been instances where setting the engine's fuel flow became difficult, if not impossible. Several times the problem was solved once the engine was moved forward to create the space.

Make sure to use a lot of thread locking compound on this bolt. Should it loosen, the only way to get at it to tighten it is to remove the engine. Once the engine's throttle movement, idle settings and thrust vectors are set, the *last thing* you would want to have to do is to *move it!*

INSTALLING THE RECEIVER AND FLIGHT BATTERY



Photo 71 Photo 72

Most basic trainers just leave a space in the fuselage forward of the servos for storing the receiver and flight battery. The Tower Trainer provides a really clever receiver and battery plywood tray. The tray is held in place using four wood screws and is removable.

Position the tray in the fuselage as in photo 71. Use a 6-inch long 1/16 in. drill bit on the slowest speed setting in your high speed rotary tool. Drill the holes as shown in photo 72. Make sure not to exit the fuselage bottom. Just pass through the plate and about 3/8 inch into the hardwood mounting blocks that also serve as spacers to keep the tray about 1/2 in. above the floor.

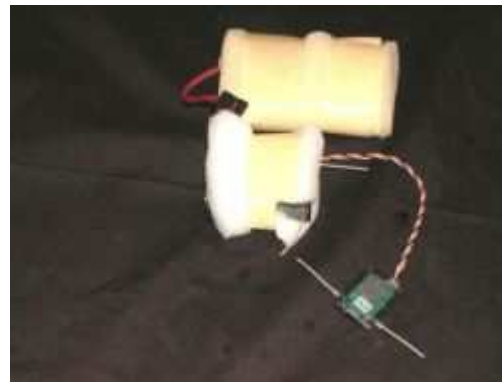


Photo 73 Photo 74

Included with the Tower Trainer ARF are two pieces of soft foam. This is very important. Both the receiver and the flight battery *must* be wrapped in two layers of 1/2 in. soft foam inside glow-powered airplanes. Even electric-powered airplanes should have at least one layer. Do not just Velcro the receiver in place.

Wrap the foam around both parts. If using a Spectrum or JR system, cut out spaces for the side antenna to escape and for the remote antenna's wiring to exit (photo 74). Loosely wrap the foam and then hold in place with masking tape. Do not pull the tape tightly as that could crush the foam, reducing its vibration protection. For the same reason, do not use rubber bands to hold the foam. Just make the foam tight enough so that the parts do not slide out of their foam cocoons.

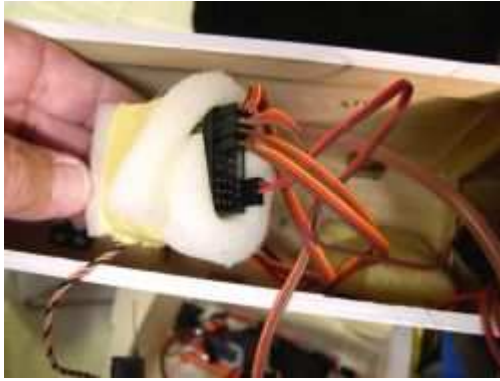


Photo 75



Photo 76

There was not enough foam to cover the receiver completely in two layers. That is usually the case. But since this receiver only contacts the fuselage on the bottom, the twin foam layer is only needed on the bottom (photo 75). Pull the servo wires through the slot in the tray and connect them to the receiver. Work slowly and make sure that the correct servo moves when commanded and that it moves in the correct direction. Use the transmitter's servo reversing feature to correct any problems.

Once everything is connected properly, hold the receiver and flight battery in place on the tray using the supplied Velcro straps. Make sure the doubled foam layer is against the tray (photo 76). Note that the remote receiver has not yet been positioned nor has the battery lead been reinforced in photo 76.

As to the flight battery, it should be a 5-cell (6-volt) battery if you are using a 2.4 Ghz radio system. 2.4 Ghz systems do not like to see voltages lower than 3.8 volts as they could then momentarily lose lock. The 5-cell battery prevents this from happening. Try to get a battery of about 1,700 mAh capacity. Training flights can be long and the higher capacity battery prevents those awful "I ain't got it" moments that can happen late in the day after the sixth long training flight.

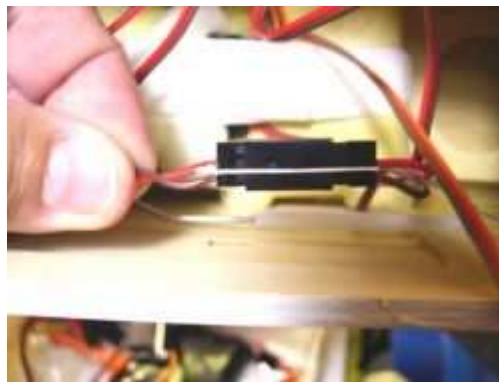


Photo 77

Speaking about the battery – It is a good idea to insure that the connection from the battery to the switch be made secure. If this connection fails, there is nothing that even the World's Best RC pilot could do to save the airplane as all control is lost. After all the interior work is complete, use some heavy thread to secure this connection as shown in photo 77. Do this on all your airplanes, even RTFs. Note that the thread passes between the wires to prevent slippage.



Photo 78



Photo 79

Mounting the switch in the Tower Trainer is simple. Both sides have a place cut out of the plywood to accommodate the switch and exterior plate. Even the mounting bolt holes are pre-drilled. Always pick the side opposite the muffler to mount the switch. Never locate the switch or receiver antenna exit hole on the muffler side.

With this airplane, only the covering must be removed to mount the switch. On some ARFs, a little more work is required. The switch mounts on the interior and projects through to the outside. If you must cut out the fuselage side, (not required here), use the external switch plate as a template. First cut out the space for the slide switch, then position the switch and drill one mounting bolt hole. Secure one bolt then drill the second hole. The end result should look like photo 79.

INSTALLING THE LANDING GEAR



Photo 80



Photo 81

Installing the nose wheel is a good place to start. Notice how the "flat" in the nose gear leg has been pre-made. This is unusual in an ARF but Tower did it. Normally the flat would have to be determined and then created using a metal file. Tower did that work for us. The nose wheel steering arm is being cut in photo 81 per the instructions. Notice the locking screw in the metal nose wheel collar. The idea is to tighten that screw against the flat cut into the nose wheel.



Photo 82

There is a wheel collar that serves as a nose wheel “height adjuster” that is placed onto the nose wheel strut. Click on photo 82 to enlarge it and read the text on the photo. Slide the vertical nose wheel shaft into the nylon bearing, then through the steering arm. Make sure the steering arm locking screw is located over the flat section and faces forward.

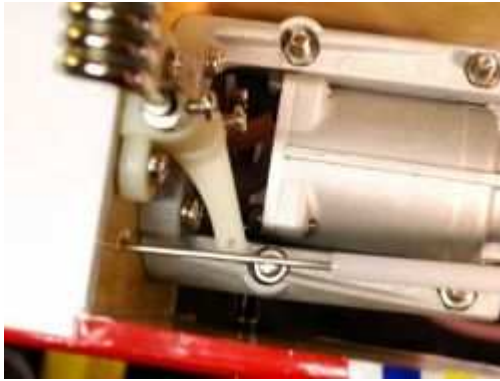


Photo 83



Photo 84

For now, position the strut all the way up into the nylon bearing. Everything should look like photo 83. Then slide the nose wheel steering control rod through the fuselage former holes and into the servo bay (photo 83). The wire should just about pass over the rudder servo's output arm hole on the opposite side from the rudder control rod (photo 84).

Tower provides another servo arm adjustable fitting as was used on the throttle. The instructions say to install this fitting onto the nose wheel steering arm. I prefer to use a “Z” bend here and to install the adjustable fitting on the rudder servo arm. But if you do not have a “Z” pliers to make the bend, this can be a tough proposition.

If you can make the bend, use it on the steering arm. If not, position the adjustable fitting on the steering arm and connect the steering control rod to the rudder servo as you did the elevator connection. Center the rudder servo output arm and then adjust the steering arm to be approximately straight.



Photo 85



Photo 86

The short, straight side of the main landing gear legs slide into two holes in the fuselage bottom (photo 85). However, the bend in the landing gear prevents the legs from being fully inserted into the holes. The result is that horizontal part of the strut that crosses the fuselage will not fully seat into the slot provided (photo 86). This is extremely common in the ARF World. It weakens the gear mounting strength, creates a little extra drag and turbulence over the horizontal stabilizer and just plain looks “ugla-fied”.



Photo 87



Photo 88

Use a small round file or the round metal cutter on a high-speed rotary tool to radius the area just inside each of the holes (photo 87). Remove just enough wood to allow the bend to fully seat into the slot. Position the gear legs and hold them in place using the two nylon straps as in photo 88. This is a much neater and stronger installation for very little extra work.



Photo 89

The wheels are held in place with six wheel collars. Three go inside the wheels and the remaining three lock the wheels in place on the axles. Make sure the wheels rotate freely but have very little side to side slop. Also, make sure that all six locking bolts face to the rear to keep dirt and FOD (Foreign Object Debris) out of the bolt heads. Apply thread locking compound to all the bolts.

Once the wheels are in place, turn the airplane over onto its wheels on a level surface. As a preliminary setup, put the torpedo level on the wing saddle front to rear. The bubble should be just on the rear one degree line. (In case you were never a plumber or tool salesperson, the two *outside* lines on the bubble glass are the one-degree lines.)

The slightly “nose down” position makes for definitive takeoffs, you have to pull “up” elevator to lift off, while reducing those nasty landing bounces. If the nose is slightly raised, the airplane will takeoff too early and want to always bounce on its nose wheel first every time it touches down.

Use the height adjusting collar on the nose gear strut to make this adjustment. If it is not possible to lower the nose enough, then bend the main gear legs slightly downward to increase the fuselage height. Remember to also bend the axles to compensate for the increased gear strut angle so the wheels will lie flat on the surface.

THE FINAL FEW ASSEMBLY STEPS

We are almost done. Just two minor tasks remain. It would probably be a good idea to find some method of mounting the wing onto the fuselage. The airplane flies better with the wing attached. Really it does. In order to keep our flying field, maybe having a muffler would also be great.



Photo 90

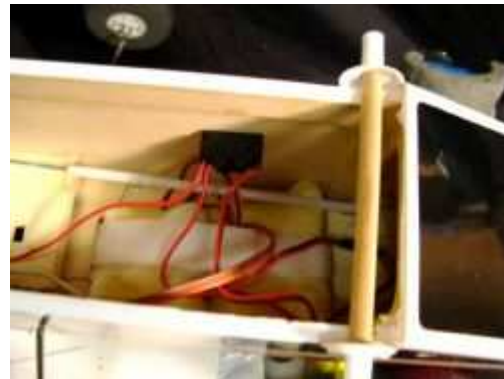


Photo 91

The Tower Trainer uses the very common, for trainers at least, dowel and rubber band wing mounting system. This is a good, if ugly and messy, way to keep the wing firmly attached to the fuselage. Sometimes, the rubber bands even break as designed to protect the fuselage if a wing tip digs in on landing. But most times, since 12 to 14 strong #64 bands are required, the rubber bands remain intact and everything else breaks.

There is a way to convert this airplane to the better looking, more useful, nylon wing bolt mounting system, but that is a big project and probably too much work for a first airplane. If this is a backup airplane or you are a more experienced builder, you can look into this conversion in the Sport Aviator article [“Not Your Stock HobbiStar – Part1”](#) in the Pri-Fly Section.

But this airplane is using the rubber band mounting system. There are two different size wooden dowels. The larger size goes in the fuselage front. Tower includes some neat plastic dowel covers that not only dress up the airplane and help keep the rubber bands locked in place, but also protect the dowels from fuel residue and oil rot.

Hold the dowel firmly with pliers and attach both covers to the dowel (photo 90). Then place it against the fuselage in the wing saddle area to insure you have the correct dowel (photo 91). Then remove one cover.

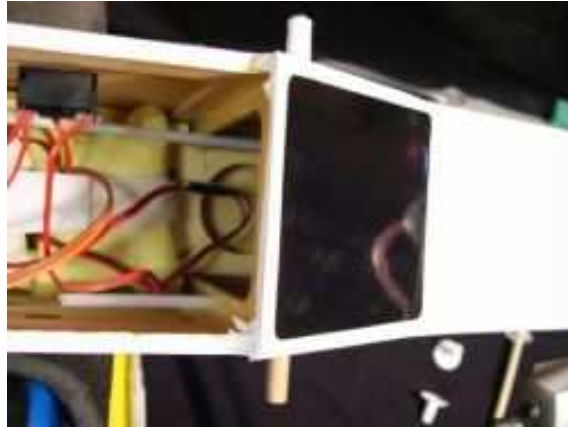


Photo 92

Insert the dowel into one side of the fuselage and out the opposite side. Replace the second cover. While the screws are initially difficult to tighten, they go in easily the second time so pliers are not usually needed during the final assembly. The plastic covers should be firmly against the fuselage sides without a space and without denting the sides.

Attach the rear dowel and covers in the same manner. Put just a small amount of thin CAA on one side where the dowel meets the interior fuselage side. Use very little adhesive on just one side. This keeps the dowel from rotating but still allows removal by manually rotating the dowel to break the adhesive bond.



Photo 93



Photo 94

Glow engine mufflers *a/ways* come loose. Right? And if “permanent” thread locking compound is used to keep them attached, they can never be removed. Right? Not Really. In fact, there is a great way of keeping your muffler right where it belongs until you want to remove it. How?

Use the regular, removable thread locking compound. That is the one that melts at about 200 degrees. Bet you think that it will no longer work just because it crystallizes in the mufflers ~375 degree F heat. If applied correctly, that doesn't happen. Look carefully at photo 93. Note that a *lot* of compound is used and that both the muffler and bolt threads are completely saturated with the stuff. The muffler's threaded bolt holes are completely filled with compound.

Now tighten the muffler bolts very tightly. Let the compound set for at least 48 hours to fully cure. As the muffler heats up and the fully cured compound begins to crystallize, it also expands slightly and hardens in place. But so much compound is there that, once expanded, it locks the bolts in place even though the molecular structure has been damaged by the heat. However, because the compound *has* been weakened by the heat, it remains removable.

I have more than 40 airplanes that use this method currently flying and the mufflers never loosen. Some of these airplanes have had their mufflers attached for more than 500 flights and 30 years.

Yet they remain in place on the next flight as well as they did on the first. (**TIP:** Run your engines dry of fuel after each flying session, then add 10 drops of after-run oil to the carburetor and glow plug hole when you get home, *every time*, and your bearings will last just as long.)

Shorten the fuel lines as needed. Connect the red (hot) fuel line to the muffler pressure tap. Never try to fly without this line connected as the engine will either run lean and be damaged or will stop altogether. Connect the blue (cool) fuel line to the engine fuel intake. The color coding will help you to keep the fuel line connections straight when both are removed for fueling.

Your ARF Basic Trainer is now completely assembled, but not yet setup for flight. Remember, while it may seem daunting, it really isn't. The information provided here is extremely detailed and in many cases, takes longer to read than to do. Total assembly time should not exceed 12-15 hours if this is your second airplane. If it is your first, plan for 15-16 hours assembly.

The information provided is for the "ideal" construction. Follow it completely, without cutting corners, and your new trainer will outlast 90% of the other airplanes at the flying field. But you can cut a few corners and still have an excellent airplane. If you wish to that is.

However, your new airplane still must be preflighted, balanced (including laterally), and trimmed/setup after the first few flights. That will be covered in the final part of this series in a few weeks. If you are ready to fly now, go to the Sport Aviator article "[Ready-To-Fly?...Maybe](#)" for preflight and balance information.

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