The World Models AT-6 Texan EP ARF

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by Frank Granelli

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The World Models, marketed through Airborne Models (airborne-models.com [1]) in the United States, has become well known for their complete line of Park Pilot-sized electric powered WW II fighters. A few of them are pictured below.

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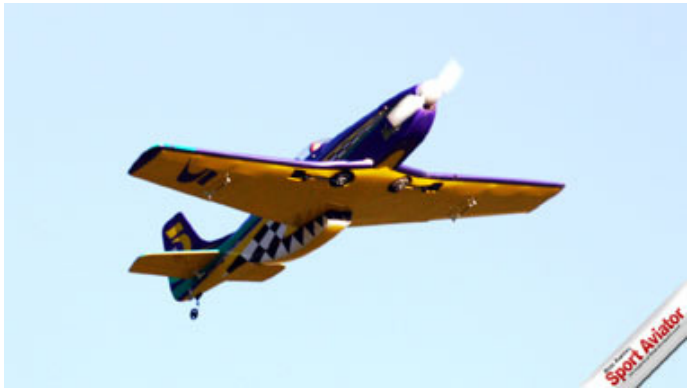
- 

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Many of these mini-warbirds (usually in the mid-40” wingspan size range) feature retractable landing gear and have complete rudder, aileron, throttle and elevator control. All use the powerful for its size KM0283010 outrunner motor that draws around 17 Amps with the supplied folding propeller (more on that later).

The World Models AT-6 Texan meets all the aircraft requirements of the Academy of Model Aeronautics’ (AMA) Park Pilot Program. The aircraft weighs less than 2 pounds (the Program’s upper weight limit) and has a level top speed under 60 mph (the Program’s upper speed limit). For complete Park Pilot aircraft details, visit ParkPilot.org [2].

The AMA Park Pilot Program offers non-AMA members the opportunity to become AMA members at a much reduced cost. Park Pilot membership includes a great magazine “Park Pilot”, $500,000 personal liability insurance, $2.5 million liability insurance for the flying field owner (see insurance details) [3] and membership in the world’s largest sport aviation association – the AMA. For complete information and details about Park Pilot membership, just click here [4].

The North American AT-6 Texan, known as the SNJ in U.S. naval service or the Harvard overseas, served as the Advanced Trainer aircraft for future fighter pilots in many air forces from late 1937 until the mid-1950’s. The South African Air Force used them until 1995! Over 17,000 were built by several countries and more than 350 are still flying today.

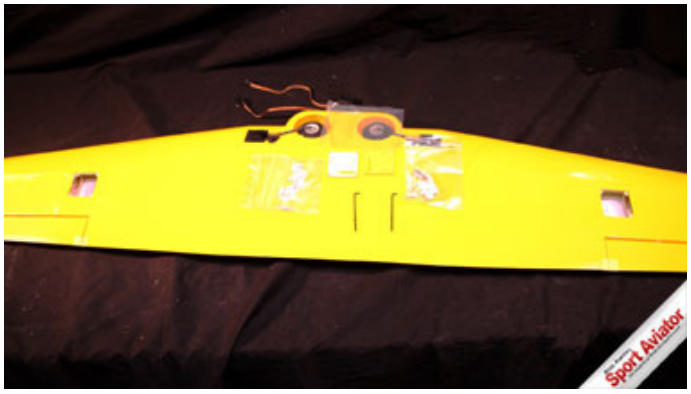
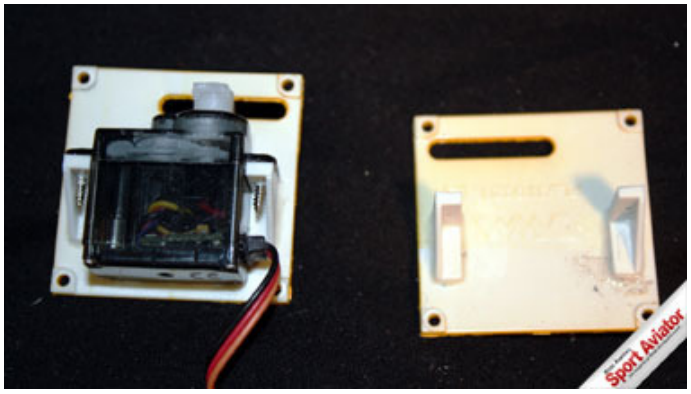
While the full-size Texan was designed as an Advanced Trainer, this airplane is not meant for that role. It is meant as a highly aerobatic warbird. For the newer RC pilot, this is designed as a good third airplane. For the more experienced RC

pilot, this is an exciting and truly capable mini-warbird that can be flown most anywhere.

The World Models AT-6 arrives from Airborne Models in their usual well-decorated, sturdy, twin-walled box inside an even stronger shipping box. Shipping damage is highly unlikely if not impossible. This Almost Ready to Fly (ARF)) airplane features a pre-mounted one-piece wing, factory installed landing gear, fully painted and almost mounted cowl, two pilots, and pre-hinged control surfaces. There is not a lot of assembly required to get airborne except to glue on the tail surfaces, install the radio gear and bolt on the motor.

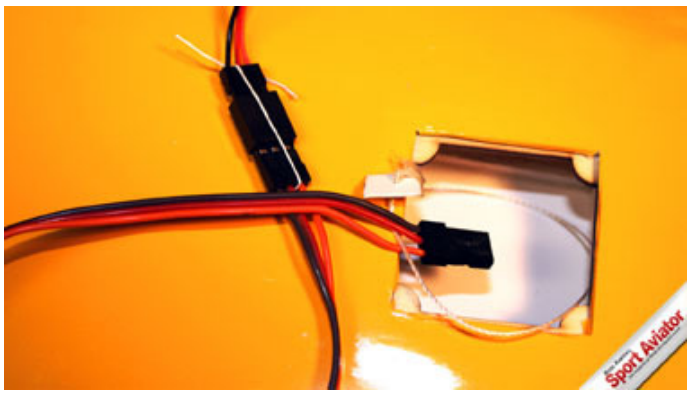
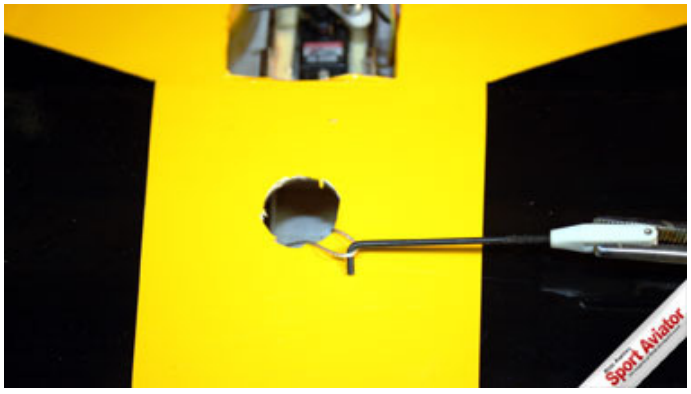
The airplane is constructed of plywood and balsa. It is covered with LighTex; a light, strong durable covering designed just for these smaller airplanes. Many of the LighTex colors feature built-in panel lines.

Assembly:

- 
- 

Let’s start with the wing since it is almost fully assembled. The wing features twin aileron servos. Having twin aileron servos allows the use of flaperons, if desired with computer transmitters. It also allows the pilot to trim out any adverse yaw using the differential setting and this airplane has more than a little adverse yaw at slow airspeeds. If using a 4-channel transmitter, both servos work off of a “Y” cord connector which means the ailerons work but the two trimming functions are lost.

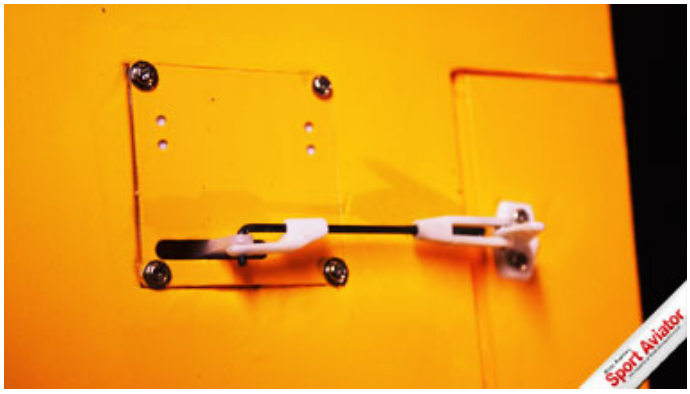
As the photo on the right shows, the ailerons are mounted to the two plastic hatch covers using the servo mounts. Select the mount, there are two sizes, that allows the servo output arm to be centered in the slot. Glue the mounts in place using thin CAA. Mount the servos.

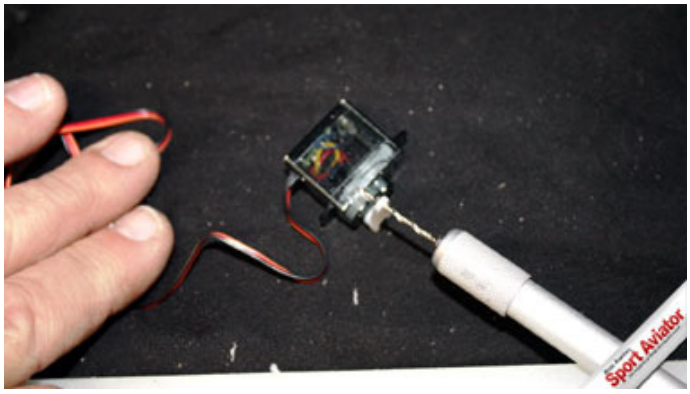
- 
- 

Attach a 12-in. extension to the aileron servo. Tie it as shown in the photo to insure that it does not work loose. There is a string mounted inside the wing designed to pull the servo wire through the wing and out the center hole. Insert the small plastic square into the connector wire as shown; click on the photo to enlarge it.

Cut out the covering over the top center hole. I used one of the pre-made aileron connecting rods to lift the string out of the wing. Be careful here. Before you pull the first servo wire through the wing, make sure to hold onto the other end of the string in the opposite aileron servo bay. If you do not, it could pull away from its tacked-on position inside the other bay. There is only one piece of string with its ends in each servo bay.

Hold the end and pull the string with the connector attached through the wing and out. Screw the servo cover/servo assembly in place. Do the same to the second aileron servo. Then, install the ailerons onto the wing using thin CAA. For complete details on how this is done, read the Sport Aviator article "Installing Mylar Hinges" [6] [5] in the Flight-Tech Section.

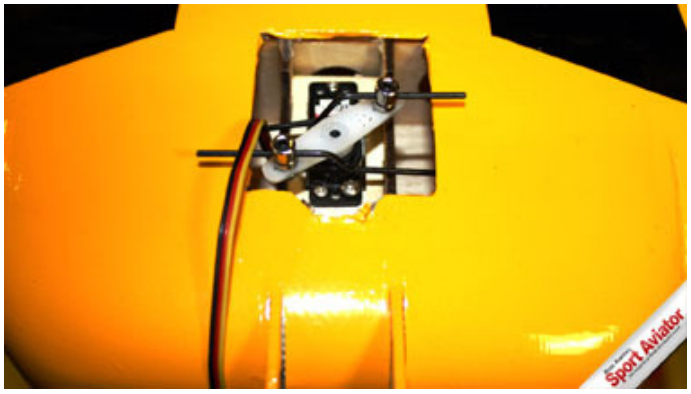
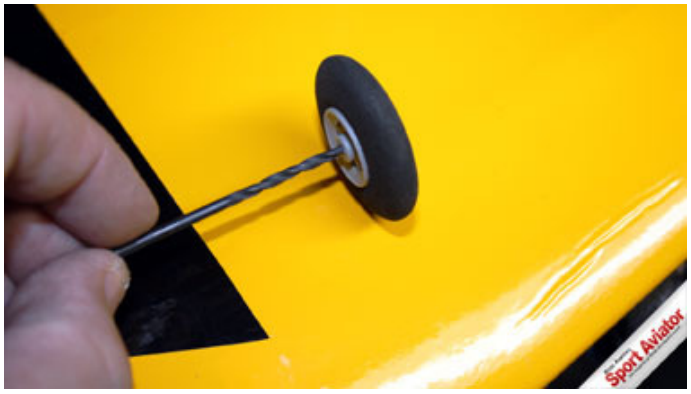
- 

- 

The aileron connecting rods are pre-formed. The manufacturer makes installing the control horns, one of the most difficult installations for a newer builder, very easy to do. The mounting bolt holes are already marked in the underside of the aileron. Just make the hole larger with a pin or 1/16-in. drill bit and then insert the bolts. This is a big help.

Screw on a clevis to the threaded end and slide the bent end through the outermost servo output arm hole. You will have to enlarge the hole using a 1/16 in. drill bit as shown. Center the aileron and the servo, adjust the control rod length to fit and then attach the locking connector as shown. Repeat for the other side. Verify that the ailerons move in the correct direction.

You may have to enlarge the wheels' axle holes slightly as shown. Do it by hand as power drilling can drive the bit off center. The plastic is easy to enlarge by hand. The review airplane needed just a slight hole cleanup with a drill bit just a few hundredths larger than the axle.

- 
- 

Using the supplied adjustable servo connectors makes it easier to adjust the retractable landing gear. The retractable gear requires a servo with at least 22 in. oz. of torque for proper operation. This airplane uses the HiTec HB-65BB servo.

Test fit the wing to the fuselage. Everything to mount the wing is already factory installed. Everything fit perfectly on this airplane. Put the wing aside for now.

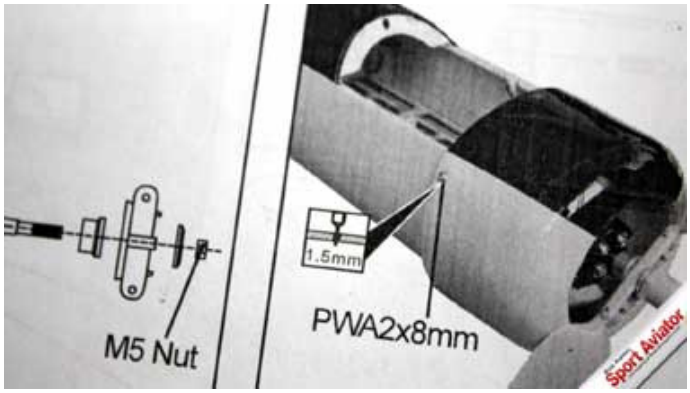
Each builder has their own assembly order. I prefer to install the motor, Electronic Speed Control (ESC) and the cowl first before the tail assembly. It is easier to rotate and position the fuselage during the front end installation without worrying about the tail getting in the way or being damaged. But that is a personal preference. However, since I am writing this review, we'll install the motor first!

The Motor is The World Models 28/30 Outrunner (KM0283010). This 12,000 rpm max., 1015 Kv, 180 W motor provides 10-14 minute flights on a simple 3-cell, 2200 mAh Lithium Polymer (Li-Po) battery. The ESC is The World Models 25 Amp number KC2025A02A and can handle up to 4 cell Li-Poly batteries. Note – the motor can only use 3-cell batteries (11.4 Volt) as it is limited to 12 Volts.

The Texan includes a composite motor mount which bolts directly to the firewall. The motor mounts inside it as shown. Make sure the motor wires exit the bottom of the mount when it is attached to the firewall. Use thread locking compound sparingly on the bolts that attach the motor to the mount. Use the normal amount of locking compound when bolting the mount to the firewall.

The motor requires a 3mm propeller adaptor (HW2340100) to mount the folding propeller. About that folding propeller that comes with every one of the World Models. It looks silly on a warbird; especially on a warbird with a big radial engine cowling behind it like the AT-6 (or the Zero or P-47). I would love to get rid of it and replace it with an APC 11 x 5E in. propeller.

But I can't replace it. Know why? Because it outperforms every propeller I have tried on these airplanes. On each of the 6 The World Models warbirds I have built and flown, it performs the best. Even worse (for replacing it) the propeller blades move easily out of the way when landing gear up on grass. It just is the best operating propeller for these airplanes. Maybe it wouldn't be so silly looking if I painted it black?

- 

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The directions are good and pictorial but you will have to “translate” all the International symbols. The photos help a lot (photo on the left). The cowl mounting blocks are already attached to the fuselage and covered. The mounting holes are pre-drilled in the cowling. All that is needed is to mount the propeller as shown in the photo on the right, position the cowl so that it clears the propeller arc and then hand drill the holes. Remove the propeller, connect the ESC to the motor and then mount the cowl using the supplied screws.

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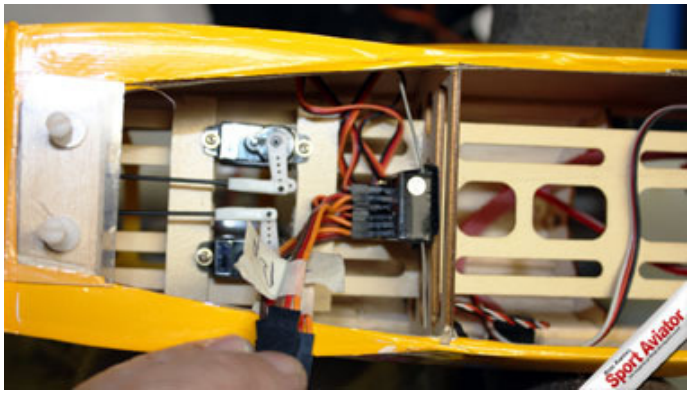
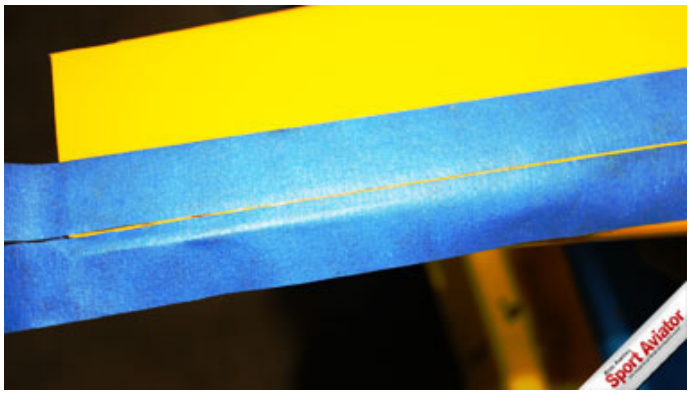
- 

Mount the ESC on the underside of the battery tray using a wire wrap tie. Mount the receiver as shown and test fit the battery on the tray. Use the included hook and loop fastener to test hold the battery in place on the tray. Mount the rudder and elevator servos, here E-flite S-75 servos, as shown. Do not install the control rods yet.

- 

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Now is the time to install the stabilizer and the vertical fin. Do not yet attach the elevator or the rudder. Put two pieces of low-tack masking tape onto the fuselage slot for the stabilizer. Place them so that the very thin space between them (about 1/64 inch) is centered in the slot. Then use a very sharp hobby razor knife to cut along the slot. Remove the tape and fold back the covering as shown. This covering will later be affixed onto the stabilizer making a professional installation.

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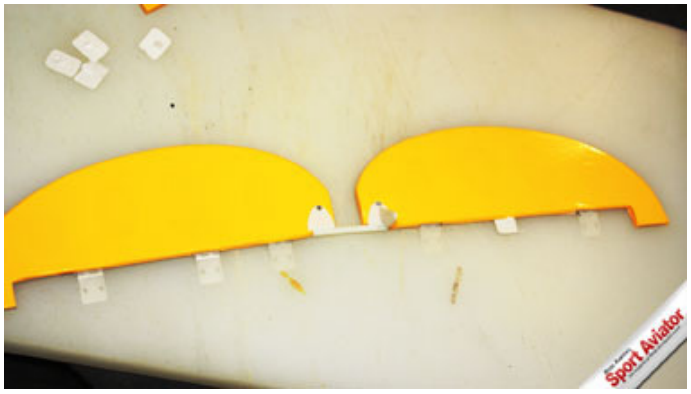
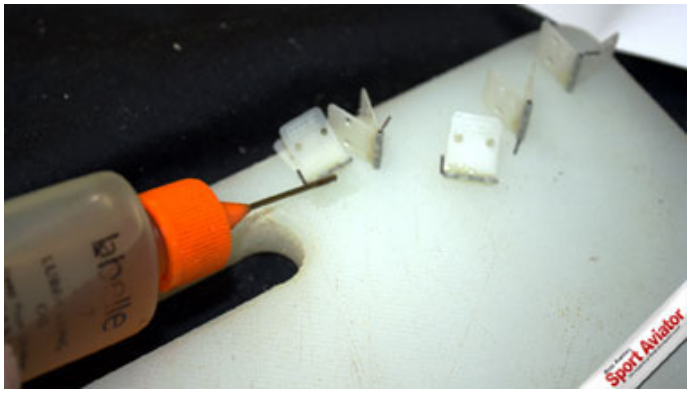
Install the wing, level the airplane using squares as shown or by your favorite method and install the stabilizer. Use a level and make sure the stabilizer is exactly parallel to the wing. This is vital as a misaligned stabilizer will ruin the airplane's performance by causing a roll with every elevator control input.

The photo (above left) shows the test installation using an appliance level and a small weight to bring the stabilizer into alignment. Once the stabilizer is aligned with the plane of the wing and the tips are equidistant from the forward centerline of the fuselage, either use thin CAA to hold it in place or remove it, apply 5-minute epoxy and re-install and align it again.

Once the stabilizer is in place, use a model covering heat gun to attach the covering that had been folded out of the way back onto the stabilizer for a truly finished look. If possible, do the same when installing the vertical fin.

- 
- 

All The World Models share one common problem. The hinges are fine for every other control surface but too rigid, once installed, for proper elevator control. What happens is that the elevator half attached to the control rod works fine. But the other half, joined by a plastic joiner, is not able to move the same amount because the hinges are too stiff. The result is the same as if the stabilizer was misaligned to the wing.

The answer is simple. Either on the elevator half without the control rod or on both halves, use thin, pin hinges as shown. These hinges are available in any hobby shop. Apply light plastic safe oil to the center pin (photo on the right) and then epoxy the hinges in place making sure the removable hinge pin is inside either the elevator or stabilizer to make sure it does not come loose.

Now both elevator halves move the same amount and the airplane performs like a champion. Install the vertical fin making sure it is 90-degrees to the stabilizer with 5-minute epoxy or thin CAA. Unfortunately, the covering had been factory removed on this airplane so the same covering fillet could not be made over the vertical fin.

Once the vertical fin is installed, attach the rudder using the Mylar Hinge method mentioned in the Sport Aviator article "Installing Mylar Hinges" [6] [5] using thin CAA. Using the holes already marked in the elevator and rudder, install the control horns as was done on the rudder.

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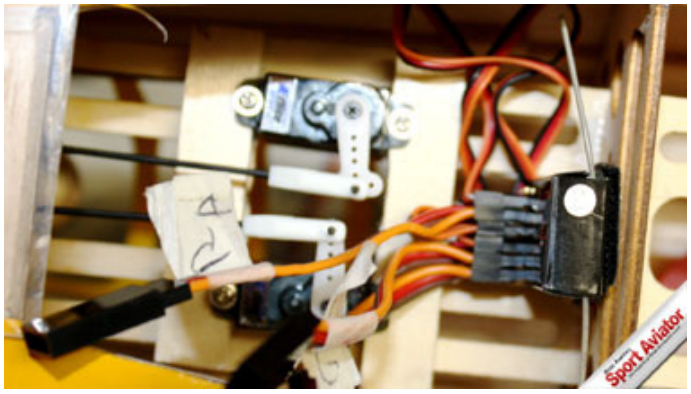
- 

Slide the pre-bent control rods through the nylon tubing from inside the wing saddle as shown in the photo on the left. The shorter control rod is for the elevator. Cut a small slot where the control pushrod exits the fuselage to allow the rod through the covering to the outside world.

Once the rods are installed, place a servo into the fuselage mounting plate. Note if your servo's control arm is on the same level as the pushrod. In this airplane, the pushrod exit was more than 1/8 inch higher than the control arm. Rather than bend the control that much in such a short length, I installed two strips of 1/2 inch x 1/8 inch spruce "spacers". This raised the servo control arm upwards to the same level as both pushrods.

Mount the receiver in the location shown. Since this airplane flies on 2.4 GHz, getting the antenna outside was not an issue. If you are using 72 MHz then route the antenna out a hole in the side of the fuselage back to the vertical fin.

The manufacturer supplies two very light foam pilots. Both are well decorated and weigh less than a gram. Use a sanding board to file the bottom flat as the foam seam has a slight bulge. Then epoxy the pilots in place using 5-minute epoxy. Once the epoxy cures, then install the canopy using the supplied screws through the factory drilled canopy holes.

OK, the airplane is finished but there are two very important tasks to perform now. All The World Models mini-warbirds are designed as aerobatic performers and they are extremely maneuverable. This maneuverability stems from a precise balance of Center of Gravity (CG) location, control movements and flying surface positioning. In short, properly balancing these aircraft is more vital than usual with most models.

The pre-formed tail wheel assembly bolts onto the fuselage using the pre-marked holes. The steering uses a small metal clip bolted through the rudder capturing an extension from the tail wheel. This is simple and very common.

Important Notes: The CG location is specified as being 3 inches behind the leading edge at the wing-fuselage juncture. This is NOT the proper start point for newer pilots. For your first flights, move the CG forward to the 2 7/8 inch mark. You might have to put some nose weight in this airplane to achieve this CG but it is very important. This airplane required 2 1/2

oz. of nose weight mounted in the lower front cowling.

Miss setting the CG properly and your first flight most likely will be very exciting and very, very short. But you must also closely follow the control movement settings for the elevator.

Never, Nicht Immer, Jamais, No jamás, Not Ever, Ever exceed the designed elevator movement of 10 mm in each direction. In fact, use the 10 mm movement just for takeoffs and landings. The airplane is best flown using a low rate of 8 mm in flight.

While the instructions say that 6 mm is the limit for aileron movement, a start setting of 10 mm is good and provides better rolls. But adverse yaw does increase at the 10 mm setting when flying at very slow airspeeds so program the transmitter's differential setting to about 20% to start. As with most aircraft, get all the rudder movement you can but use about 50 % exponential on the rudder.

Building the airplane required about 6 hours. Properly setting the retract servo's movements required about 30 minutes. If you fly from a paved runway, the retracts are ideal. But if you have only a grass runway, you may have second thoughts about using the retractable gear.

For future flights, I am considering removing the landing gear and retract servo to save weight. I will cover the wheel openings with LighTex to match the wing covering. The wheels are just too small to land on even short grass without flipping over.

However, takeoffs from short grass are possible with the retractable landing gear. If you prefer not to hand-launch, then leave the wheels in place and retract them after takeoff.

Once the CG and control surface movements are set and the controls are in the neutral position, charge the 2200 mAh, 3-cell Li-Poly battery and head for the field.

Flying:

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The AT-6 Texan has always been an attractive airplane. While it has lots of wing area, the trailing edge sweeps forward to meet the swept leading edge. This gives the airplane a racy look that hides its Advanced Trainer mission. To help slow the roll rate, the outer wing panels still have plenty of lifting area. The constant cord center section provides extra wing area for more lift.

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The World Models' AT-6 Texan is a nice looking airplane from all angles. The decal package has more decal choices than there is space on this airplane to apply them. The decals help the airplane come alive in flight as well.

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Like all its mini-warbird cousins, the Texan fairly jumped off the ground after a short run on pavement. While my runway is grass, many of the following flight pictures were taken by Michael Ramsey, Editor of Model Aviation, during a visit to AMA's Muncie HQ. Thanks Michael for the assist.

Grass takeoffs also use almost no ground run or, they flip over. The grass must be short; less than 1 inch high. All airplanes of this size range are better hand-launched than Rise of Ground (ROG) when flying from grass runways. Landing “wheels up” is a necessity on grass. The folding propeller is a true asset on grass landings.

If the CG was set at the 2 7/8 inch mark and the elevator movement limited to 10 mm up, takeoffs are gentle, with an excellent climb rate. The airplane has a generous climb rate and reaches 300 feet in just a few seconds. The climbout is stable and requires just a touch of right rudder to counter the motor’s torque.

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With the gear up, the AT-6 looks striking when airborne. The World Models did a great job on this airplane. Fly-bys are impressive and easy to handle. If you click on above right photo and look closely, you will note that the airplane is flying in a crossed control condition. The ailerons are opposite the rudder input and some “up” is inputted. This “skid” as it is known, is being flown to get one of those ubiquitous “wing down” fly-by photos so popular in modeling press pictures.

I point this out to show that, when properly setup, this airplane will gladly suffer such abuse from its pilot. I was surprised at the airplane’s willingness to fly this skid using so little elevator input. Most airplane need more “up” as the skid usually produces a strong pitch downwards.

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Due to its symmetrical airfoil, the Texan flies just about as well inverted as upright. The wing does have some dihedral, really polyhedral as the center section is flat to match the full-size aircraft, making some rudder input necessary for inverted loops and climbing maneuvers.

The above left photo is just one of those classic “Texan Shots” you always see in the movies. The unique triangle tail, the large clear canopy and the polyhedral wing are classic. For a radial engined airplane, the Texan looks more streamlined when airborne than the airplane actually flies.

That big cowl does slow the airplane in down lines and keeps the airspeed to a manageable 50-60 mph at full throttle.

Climbs are excellent and loops can top 150 feet in diameter. The Texan can hold a 30-degree climb angle seemingly forever. Snap rolls are very quick but predictable. Stall turns do not require the pilot to hold opposite aileron but do require inputting the rudder slightly before the airplane stops it’s upward movement. Adding about 20% throttle during the stall turn helps as well.

Rolls are just right around 3 per 5 seconds with 10 mm of aileron movement up and 8 mm down (the differential setting). The rolls are more axial than I would have expected and require very little “down” elevator input during the inverted phase. Slow rolls can extend up to 200 feet in length. Knife edge flight is limited so pitch the nose up a few degrees before starting the point or slow roll. The airplane does pitch to the belly in knife edge but this can be easily trimmed out. The “walking” in knife edge was much less than expected.

With the CG set as directed and elevator movement limited to 10 mm, slow flight is very easy to manage and averages around 20 mph. Deep stalls, full “up” elevator held throughout and after the stall break, result in one or two oscillations but then the airplane snaps off to one side. Aileron inputs have significant adverse yaw at very slow airspeeds (below 20 mph) so coordinate with the rudder during the final landing approach.

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The landing approach is easy to manage using just about 30% throttle. Lower the wheels if flying from pavement or keep them up when landing on a grass runway. Because of its 32 oz. flying weight, the Texan has a high sink rate without power so keep the throttle in. The sink rate increases if the airspeed is allowed to drop too much below 20 mph or so.

Remember that throttle controls altitude and elevator controls airspeed during the approach and the Texan will land like a pussycat. Forget that maxim and the Texan will either land short or snap out of the approach if the pilot tries to stretch the glide using elevator. This is true of most scale airplanes and the very aerobatic Texan is not an exception.

Enlarge the above left photo and note the amount of “up” elevator being used. The Texan is fully into its landing flair and almost ready to touch down. It is moving about 15 mph with almost no wind (very rare in Muncie). The airplane is using almost no “up” elevator even in the flair. You can see for yourself that more than 10 mm elevator movement is never required so stick to that limit.

The World Models AT-6 Texan is a true performer and offers the more experienced pilot a great looking, highly aerobatic, high-performance scale airplane in a small, fly anywhere package. It is more than affordable at only $120 for the ARF kit, outrunner motor and installed retractable landing gear. If you have flown a few airplanes and want to try the smaller side of exciting warbird flying, this is a great airplane for you.

For more information go to: airborne-models.com [7]

Notable Positives

- Excellent aerobatic abilities
- Extremely fast assembly
- Very good looks
- Powerful motor
- Much pre-fabrication
- Folding propeller for grass landing

Notable Negatives

- Center of Gravity (CG) and elevator throw sensitive

Aircraft Specifications

- **Manufacturer:** The World Models
- **Cost:** $120.00
- **Motor:** 28/10 outrunner
- **Airfoil:** Symmetrical
- **Special Airframe Features:** One-piece wing; installed retractable landing gear; included motor, nicely painted cowl
- **Length:** 31.5 in.
- **Wingspan:** 44 in.
- **Wing Area:** 295 sq. in.
- **Wing Loading:** 15.6 oz./sq. ft.
- **Weight (as tested):** 32 oz.

Electric Power Specifications

- **Propeller:** Folding 10 x 6 in.
- **Maximum Watts:** 205 Watts
- **Maximum Voltage:** 12.5 Volts
- **Motor Run Time:** 12 - 15 minutes
- **Maximum RPMs:** 7,700 RPMs
- **Power Loading:** 102 Watts / lb.
- **Motor Current:** 18.1 Amps

Additional Equipment used in Test:

- **Radio:** Spektrum 6Xi
- **Servos:** 4 x JR 527

Excerpt: The AT-6 Texan has always been a great first scale warbird. The World Models now offers the smaller electric pilot a chance at real warbird performance and maneuverability in a fast, easy to assemble ARF model. Even the retractable landing gear is pre-mounted. Bring a picnic lunch and join us in the park for some warbird fun.

Links:

1. http://airborne-models.com
2. http://www.theparkpilot.org
3. http://www.modelaircraft.org/parkflyer/pp-faq.aspx
4. http://www.modelaircraft.org/parkflyer.aspx
5. http://masportaviator.com/2004/01/06/installing-my lar-hinges-in-arf-trainers

6. http://masportaviator.com/2004/01/06/installing-my lar-hinges-in-arf-trainers
7. http://airborne-models.com/html/productdetails.asp ?ProductID=140

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