



The “PTS” in this airplane’s name stands for “Progressive Trainer System”. Hangar 9 first introduced this concept several years ago in their [P-51 Mustang PTS Basic Trainer](#). Read the Sport Aviator review on this excellent concept and airplane by clicking the blue text. The PTS concept was, and is, to convert a scale airplane into a gentle, basic trainer while still allowing its performance to grow as its pilot’s skills advanced.

The P-51 Mustang PTS excelled as a basic trainer while looking like a fighter. It was powered by an Evolution 45 and was equipped with drooped leading edges, a 3-bladed propeller, speed brakes and flaps. The Droop leading edges converted the Mustang’s [symmetrical airfoil](#) into a [flat-bottomed airfoil](#) outboard of the flaps. This slowed the airplane’s response to aileron input while increasing lift. The Speed Brakes added drag for better airspeed control while the flaps lowered in-flight and approach speeds; making the airplane a gentle performer for the newest pilot.

The fixed, or optional servo controlled, flaps also increased lift for the wing area inboard of the ailerons. The 3-bladed propeller reduced the airplane’s top speed. The combination resulted in an airplane that performed as an excellent basic trainer without having to look like the box it came in. Once the pilot had gained sufficient flying skills, the speed brakes could be removed and then the flaps could be raised. This resulted in a slightly faster, slightly less forgiving airplane but one that was still on the gentle side. In fact, with the brakes removed and the flaps raised, the Mustang PTS performed much like an Advanced Trainer.

Once the pilot had mastered the Advanced Trainer version of the Mustang PTS, the last steps were to remove the drooped wing tips and to install a 2-bladed propeller. Now, the Mustang PTS not only looked like a P-51, it flew like one as well. Level top speed reached well above 100 mph. Tighten a steeply banked turn by pulling too much “up” elevator and the airplane could snap roll on the unwary, and greatly surprised, pilot. Landing, approach and stall speeds reached “scale” levels.

But the unencumbered P-51 was far more maneuverable than its trainer version. Vertical performance improved once the extra drag and weight were removed. While the airplane was more forgiving than most Mustang versions now available, a “first airplane” it was not. Hangar 9 featured the Mustang PTS as “two airplanes in one”. Actually it has proven to be *three* airplanes in one. It is a great Basic Trainer at the start. Remove the speed brakes and raise the flaps and it becomes a great second airplane. Remove the drooped leading edges and it transforms into a high-performance scale airplane. Too bad it didn’t have retractable landing gear. Hmmm, now there is an idea. Maybe it can be converted to one. We will have to look into that possibility!



Photo 3

But, getting back to the PTS concept. Since the Mustang PTS was so successful, Hangar 9 introduced another PTS fighter, the [F-22 Raptor](#). Designed to appeal to the “Post WW II” oriented pilot, the Raptor featured flaps, wing extensions and the now famous drooped leading edges (also wing span extensions here). Instead of speed brakes mounted on the main landing gear, the Raptor featured a fuselage made very wide by including large “air inlet” ducts on each side. Unlike the Mustang’s gear mounted speed brakes, these air ducts can not be removed later.

With all the drag and lift devices attached, the Raptor proved a gentle, forgiving Basic Trainer. Its appearance was very “jet-like” but, as originally equipped, its 3-bladed propeller slowed the airplane’s speed and rate of climb a little too much. Changing to a 2-blade 11 x 5 in. propeller fixed that as detailed in the Sport Aviator [F-22 Raptor Update Article](#). With this one minor change, the Raptor PTS became the excellent Basic Trainer it is today. (Note: the Raptor [RTF](#) now arrives equipped with a 2-blade propeller.



Photo 4



Photo 5

Both the Mustang and Raptor PTS airplanes are powered by the very successful Evolution 45 glow engines. These engines are very user-friendly for the new pilot. They even have mixture limiters that prevent abuse while keeping the powerful engine reliable and trustworthy. But they are glow engines and electric power has become more popular recently. That brings us to the subject of this review: The **E-flite T-34 Mentor 25 PTS**.

Do not confuse the E-flite T-34 RTF with the nearly identical appearing T-34 ARF. The ARF is really a glow-powered airplane with an optional electric power conversion. The ARF does not have flaps or drooped leading edges and can be converted to retractable landing gear.

This T-34 has flaps, fixed gear and is powered by the powerful E-flight 25 outrunner electric motor using a 3-cell Lithium Polymer battery. The **E-flite** uses the same Progressive Training System found on the glow powered PTS airplanes. The leading edges, outboard of the flaps, are

“drooped” to transform that section of the wing into a flat-bottomed airfoil. The inboard wing section relies on the flaps for extra lift and drag.



Photo 6



Photo 7

There are no speed brakes like those on the Mustang. Instead, the T-34 uses a large cowl to add the drag required to keep the airplane's airspeed in the training range. Like the other PTS aircraft, the T-34 is a Ready-To-Fly (RTF) Basic Trainer that will grow with the pilot's abilities. There are few parts in the “kit” as expected with an RTF. The wings and tail surfaces just bolt in place. The power and radio systems are factory installed and connected. Assembly requires about 45 minutes.

EQUIPMENT



Photo 8



Photo 9

Unlike many other electric powered RTF trainers, the T-34 arrives fully flight ready, including a 3-cell, 11.4 Volt Lithium Polymer battery and charger. The battery is the popular E-flight 3200 mAh 15C (EFLB1040). “15C” means that the battery's maximum continuous discharge rate is 15 times the 3.2 Amp capacity (hence “C”) or 48 Amps. The Electronic Speed Controller (ESC) is rated for 40-Amp discharge and has a Battery Eliminator Circuit (BEC) which means the motor battery also powers the on-board radio system.

The included E-flite charger is a balanced charger for 2 or 3 cell packs. Input voltage is 12 Volts and the charger has a socket plug for use in a car or other voltage source such as an auxiliary auto “jump starter”. The charger's output is adjustable from 0.5 to 3 Amps.

Most importantly, this is a “balanced” unit meaning that the charger first senses each cell's voltage, matches all the voltages and then keeps all cells at identical voltages until full charge is reached. Charging is through the battery's balancing plug. Balance charging not only extends battery life while providing additional safety, but also insures that the highest capacity possible is stored in the battery for longer flight times and maximum performance.



Photo 10 Photo 11

The included transmitter is the new Spektrum DX 6i 2.4 Ghz, 6-Channel transmitter. The DX 6i is a true computer transmitter that is user friendly, even for beginners. The programs are complete, factory set and easy to understand and program.

Speaking of programming, a few T-34s have come through with the exponential settings, a programming means of allowing full control surface movement without making the airplane too sensitive around the neutral positions, set incorrectly. The Exponentials were set at negative numbers thereby making the airplane too sensitive around the neutral, center positions and less sensitive at full deflections. This is easy to fix. Just follow the transmitter directions on how to enter the Exponential Function and change the numbers from negative to positive. Keep the same numerical values, just make them positive. See the table at the end of this article for all the proper settings.

The Spektrum AR 6200 is a special, lightweight 2.4 Ghz receiver based on DSM2 technology. It is a full range unit so it can be used in any aircraft and flown within visual range. As do all Spektrum receivers, it features Dual Lock®. This means that the receiver locks on to two unused frequencies of the available 80 and then uses a digital code so the receiver listens only to its own transmitter. This eliminates the need for frequency control and makes the T-34 nearly impossible to “shoot down”.

The transmitter / receiver system also features Model Match®. Even though the transmitter stores trim settings for ten different aircraft, only the aircraft named on the transmitter screen will respond to the transmitter commands. It is impossible to fly the “wrong” airplane, preventing possible damage if different airplanes use different trim settings such as reversed ailerons or throttle.

The included servos are E-flite’s standard size servo, the EFLR 7120. While specs for this servo are not published, they have proven to be more than adequate for the T-34 and have functioned without problems. In fact, they seem almost as precise as sport digital servos. The 7120’s work very well. The fifth servo, added for the flaps, is an “ancient” JR 505 standard servo. More than 10 years old and having served in 5 airplanes totaling about 500 hours airtime, the 505 has proven to be an exceptional sport servo. Except for being converted to ball bearing, this servo has remained untouched for its entire service life.

The motor is the very popular E-flite 25 outrunner motor. This motor pulls the T-34 through all the basic aerobatic maneuvers while providing flight times in the 12 minute range. However, with the supplied [12 x 8 in.](#) propeller and [15C Li-poly battery](#), the motor and the onboard radio system (servos at idle) draw 37.1 Amps at full power. This is perilously close to the Electronic Speed Control’s (ESC) 40 Amp maximum current draw. Since the servos will be drawing extra current while moving in flight, the actual current draw must be close to 38 Amps, maybe a little higher. There is little reserve left in this system.

ASSEMBLING THE T-34 MENTOR



Photo 12

As a true RTF airplane, there is not much to putting this aircraft together. Photo 12 shows, there is not much hardware needed to get the Mentor flying. That means there is not much work needed. The wing is a safe, easy first assembly step so start there.

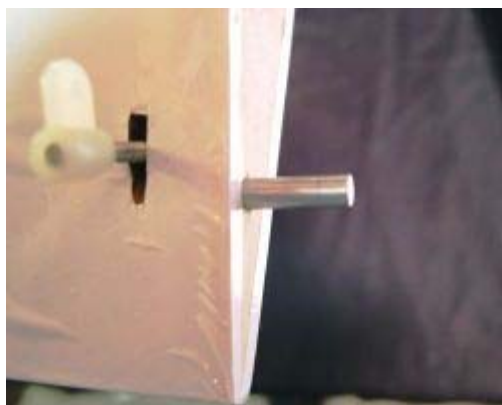


Photo 13 Photo 14

Insert the aluminum anti-rotation pin in the rear hole near the wing's trailing edge. This pin prevents the wing halves from rotating during flight. If fixed flaps are to be used, insert the flap linkage post in the wing slot. This post is not a very tight fit. If you really are going to use fixed flaps, then put a few thick CAA drops into the slot, after the wing is assembled, to hold the post in place.

A better idea is to install retractable flaps as this provides more control flexibility. Since this is basically a \$15 option (for the extra standard duty servo) that requires 10 minutes to do (the operable flap control rod is already included), why wait? However, the choice is yours.



Photo 15

Insert the black aluminum spar (note photo 12) into the socket in one wing half. Pick the same half that has the installed anti-rotation pin. Make sure that both aileron servo wires exit their respective holes in the top of each wing half. Then, slide the two halves together over the spar. The anti-rotation pin should be fully inserted into the corresponding hole and the halves joined tightly.

Lock the assembly together using one of the landing gear nylon straps as shown in photo 15. The holes are already drilled for the two screws. If you want operable flaps, cut the covering over the flap servo mount, install the extra servo and screw in place as shown. The control rod is included. Insert one end into the servo arm and the twin end to the two flap control linkages as shown. Use the included "Y" cord to connect the aileron servo to a single receiver port.

The DX6Ei has "flaperon" capability which would allow individual servo receiver connections. With this system, the ailerons may be individually adjusted to eliminate adverse yaw at very slow airspeeds (the T-34 is capable of flying at some *very* slow speeds) and the ailerons could be lowered as additional flaps during landing. This has not yet been tried as it is part of the future article about the "clean" T-34 with a few upgrades. But it will be!



Photo 16



Photo 17

The last wing assembly step is to install the main landing gear. The gear, wheels are factory attached, slip into the slot in the underside of each wing half. Each is held in place by two landing gear nylon straps (photo 17). Note in photo 16 that the pilot holes are factory drilled; a nice touch that saves a lot of work.

Since everything up front in the fuselage is factory installed, even the cowl, nose gear and spinner (although I suggest opening the spinner and making sure the propeller is tight), start the assembly at the rear.

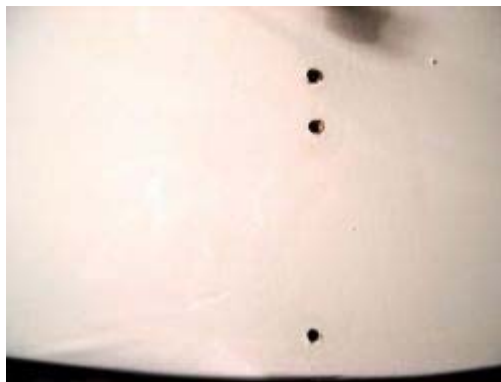


Photo 18



Photo 19

As per most RTF's construction, the entire tail assembly bolts into place. However, unlike most RTF aircraft, the rudder has a hidden control rod that must be installed. Note that there are three

holes in the horizontal stabilizer (photo 18) and three matching holes inside the fuselage slot for the vertical fin (photo 19).



Photo 20

Slide the stabilizer in place (the side with the control horn faces downwards) into the horizontal fuselage slot. Line up the three stabilizer holes with the fuselage holes. Then insert the vertical fin, which has three matching posts, into the fuselage slot and through the stabilizer and fuselage holes. Note that only two of the three posts, the threaded ones, protrude from the fuselage bottom. The other rod, non-threaded, is the rudder control post. Remove the vertical fin slightly, about as far as that in photo 20. Then slip the “wheel collar” that has the long threaded bolt (look closely at photo 12) through the fuselage side slot and onto the rudder post. Hand-tighten in place.



Photo 21 Photo 22

Push the vertical fin into place and bolt from the bottom (photo 21). Connect the factory installed rudder pushrod clevis to the nylon connector on the rudder control rod (the long bolt in the wheel collar). Later, when the rudder servo has been centered, center the rudder and then tighten the rudder control rod screw. Many scale airplanes use this system to control the rudder. For a scale trainer, this is a nice touch as it is usually the rudder control system that is most unsightly on a scale airplane. E-flite did a good job here.



Photo 23

After everything is in place and trouble free, install the tail cone as shown and tighten in place with the two supplied screws. The tail cone hides the rudder linkage while making the tail look "finished".

Not only is the tail cone finished, but so is the airplane. Total building time was about 45 minutes, including taking photos. More surprising, everything lined up perfectly (a very rare happenstance in any airplane), fit extremely well and no modifications were needed. The wing is held in place with twin plywood "pins" up front and two nylon screws in the rear. All three mounting holes were perfectly aligned as was the wing. In fact, it was less than 0.015 inches out (about 1/64 inch) of perfect alignment. Most builders can't do that well and the airplane flew straight and true without requiring rudder trim.

FINAL PREPARATION AND FLYING

Even though the airplane is completely built, I suggest removing the spinner, propeller and cowling. Remove each nose wheel mount and engine mount bolt, *one at a time*, and apply some thread locking compound. Do only one bolt at a time to insure proper alignment. The nose wheel may be slightly smaller than the mount bearings so it may feel loose. This was only true in the earlier models and has been fixed. Do not worry about it as even intentionally hard landings, OK so maybe *only* some were done intentionally, had no effect. Ground steering, despite the loose bearing fit, was perfect and exact.

If you wish, you can check the [Center of Gravity \(CG\)](#) for practice. But, since all the equipment has been factory installed and the tail surfaces are built from sticks, the balance will be just as recommended at 4.75 in. back from the leading edge of the wing at the fuselage. Actually, balance the airplane anyway as that is important for any airplane; even for an RTF. Remember to install the battery and replace the canopy before balancing the airplane. Any aircraft should be balanced as it will be flown except for having an empty fuel tank on a glow-powered aircraft. For consistency's sake, you can balance the T-34 with a discharged battery but I don't think electrons weigh a lot (9.12×10^{-31} kg) so that will not make much difference!

Far more important than the weight of an electron is to laterally balance the T-34 as described in the Sport Aviator article "[Ready To Fly? ... Maybe](#)" in the Flight Tech Section. Few airplanes arrive with good lateral balance. This T-34 was an exception as it was almost perfectly balanced. A poor lateral balance affects an airplane's aerobatic and slow flight; making both more difficult.

Before getting into the Mentor's flight characteristics, here are the all important numbers. Using the supplied 3-cell Li-Poly 15C battery, the T-34 drew 37.1 Amps at 10.5 Volts. The motor produced 380 Watts of power. With a flying weight of 5.1 lb. that works out to 74.5 W per pound. This is somewhat on the low side for a trainer but strangely, the T-34 flew better than these numbers would suggest. High RPM was 7,600 with the stock 12 x 8E in. propeller. Later in the flight tests, we tried a different battery that will be discussed further on.



Photo 24



Photo 25

On the ground or in the air, this airplane has a striking look. The orange over white with black trim color scheme, very much like the full-size T-34, makes it easy for the pilot to see what is happening. In fact, the full-size airplane used these colors so that student pilots could easily see and avoid airborne traffic. Even though the RC pilot is grounded, the colors, designed for airborne visibility, do their jobs keeping the airplane's in-flight orientation easy to decipher.



Photo 26



Photo 27

The T-34's takeoff ground roll is surprisingly short. Ground handling was great and the airplane was easy to keep straight during the short run. Holding just a little "up" elevator during the roll kept the nose wheel light almost immediately. The rudder was instantly effective once the propeller started turning on high. The first ground roll, on grass, was only about 50 feet long.

The airplane held a surprisingly steep climb angle for the first 200 feet. This was very, very good climb performance for a 74 W / lb. airplane. The light weight (5.1 lb.) combined with that extra high-lift wing probably accounted for the performance.



Photo 28 Photo 29

While airspeed is good, this is not a fast airplane with the flaps down and the drooped leading edges attached. Then, it is not designed to be fast in this configuration. Top level airspeed is probably in the 50-mph range while cruise speed is closer to 35 mph. Both are excellent trainer speeds.



Photo 30 Photo 31

The Mentor's aerobatic performance was also surprisingly good. Even with the flaps down, the airplane had no trouble maintaining level inverted flight. It could even climb while inverted and had lots of available "down" elevator even in steep turns. The drooped edges did make outside loops difficult as the airplane would sometimes snap out of top of the inverted loop if too much rudder correction was applied. But hey, this is a trainer, not a "stunter", in this configuration.

Rolls and inside loops were easy and trouble free. The loops were usually 75 feet in diameter. The rolls were more axial and straighter than I would have thought. Stall turns however, required a top speed entry and then only went up about 75 feet when including the quarter-roll. But with flaps down, that was very good vertical performance

While aerobatics are nice, the Mentor is meant, in this configuration, to be a basic trainer. It excels at this job. Slow, level turns require almost no "up" elevator to remain level. The airplane simply refuses to gain significant airspeed if the nose is allowed to drop in the turn. There is no "ballooning" at turn's end as is common with most trainers. Few new student pilots will have trouble learning to make good turns with this airplane.

Even when flying slow and steep turns, the T-34 remains stable, honest and fully controllable. There are no snap roll tendencies even when holding full "up" in the steep turn. In fact, intentionally snap rolling the T-34 only results in an attractive barrel roll. Spins are impossible at any power setting.

Slow flight is where this airplane shines like a supernova on a dark night. Stalls do not happen. Holding full "up" elevator at the stall simply results in a slow sink. The wings stay level and the ailerons continue to work even at this exceedingly slow airspeed. The fully-stalled sink rate is so low that providing even small amounts of power keeps the airplane level.

The Mentor can be forced to fly so slowly, using power and full "up" elevator, that the airplane virtually stops in the air. The airspeed had to be less than 8-10 mph. At 8 mph, the ailerons do stop working and [adverse yaw](#) appears. But the rudder is always very effective in keeping direction constant and the wings level.



Photo 32



Photo 33

The T-34 is one of the best very slow flying, full-sized 40 trainers tested so far. Its excellent slow-flight handling becomes really evident when landing time comes after 10-12 minutes in the air. With flaps deployed, the T-34 drifts down the approach path as if on rails. Keep the power on about 25% and the attitude basically level as the flaps do provide extra drag. Raising the nose at slow airspeeds with the flaps down is not dangerous, the airplane's sink rate merely increases while handling remains steady. If the sink rate becomes too high, just add a little more power. The airplane then stops sinking and resumes flying the approach. This T-34 is a great teacher when it comes to learning about throttle to sink and elevator to airspeed adjustments.

The Mentor handles crosswinds better than a high-wing trainer. Because it is so stable at slow speeds, holding a little wind correction slip is no trouble at all. The landing gear is strong enough for those one-wheel landings. Once one main gear touches down the airplane immediately lowers the other and then lets the nose wheel slowly fall. Because of its low wing, the aircraft handles crosswinds well even when grounded. There is no tendency to lift the upwind wing in a grounded turn. The airplane simply will not tip over from the wind.



Photo 34

When landing with reduced or no flaps, keep the T-34's nose slightly elevated and employ the throttle to manage altitude. Again, the aircraft simply lands itself. You might ask why make the flaps operable during the trainer stages. The answer is the same for this electric-powered airplane as it was for the glow-powered Mustang. In fact, it is more important on this airplane than on the Mustang.

First, raising the flaps extends the gliding distance allowing the instructor a better chance of "making the field" should the engine (motor) quit. The drag is greatly reduced without flaps deployed. Gliding distance and airspeed are increased. Sometimes this makes the difference between making a hard landing on the runway and combing the rough for pieces.

Second, believe it or not, electric-powered airplanes are *more* likely to land without power than are glow-powered ones. Heresy it may be to publish, but true none the less. Why? It has to do with the nature of Li-Poly batteries. These amazing storage devices produce almost full power

right up until they stop producing any. Unlike other battery types that gradually produce less power as they discharge, Li-Poly batteries perform about the same 10 minutes into the flight as they did at takeoff.

It is extremely difficult for the pilot to tell that motor power is about to cease just from the airplane's airborne power response. The result is many "dead stick" landings. Having retractable flaps helps when this happens. The lesson for the pilot is that electric flight times must be just that - timed. Set a countdown timer, or use the one on the 6Xi, for every flight. If your airplane will fly for 12 minutes, set the timer for 9 minutes. Not only will the airframe last much longer this way, but so will the battery. Li-Poly batteries do not like experiencing many deep discharge cycles. In fact, continuing field use is beginning to reveal that Li-Poly batteries should not be discharged below 3 Volts per cell if a long battery life is expected. In this T-34, that means about 10 minutes flying time.

Sport Aviator airplane reviews are not like those in most other publications in at least one important point. Our product tests are not just a few flights around the "patch" then write the report. We fly these things extensively, exploring as much of their flight envelope as possible. This T-34 has over 45 flights on it now. Obviously, to fly that many times we needed more than the one flight battery. In addition to the one that came with the airplane, we also used some 3-cell, 3,820 mAh 25C batteries from another manufacturer that were on hand here

Why bother telling you this? Because we noticed an amazing, at least to this relatively new electric pilot, performance difference with the 25C battery. Even though the top 7,600 rpm remained the same, the airplane's verticals improved. 75-foot verticals became 125 ft. ones. All other flight parameters remained the same. Only the verticals improved.

Could this be because the 25C battery's lower internal resistance allowed it to continue supplying maximum power when it was most needed, in the vertical climb? Maybe, further testing is in order and the results will be published when available.

However, here is the big warning. While the ground RPM remained the same for both batteries, power levels increased with the 25C battery. Instead of drawing 37.1 Amps, the 25C system used 37.8 Amps at 10.7 Volts instead of the 15C's 10.5V. Power increased to 398 Watts from 380W. A 37.8 Amps current draw is much too close to the 40 Amp maximum on the ESC. While no overheating problems were noticed, there is a lot of cooling designed into this airplane, the warning flags are up.

Use only the 15C battery designed for this airplane. The supplied battery is a high-quality unit that provides more than enough power both for training and for those "fun" flights. Using a larger capacity battery is good as that extends flight times but make sure these are still 15C batteries.

SUMMARY

All the PTS trainers are good basic trainers with excellent growth potentials. However, if forced to choose the best training airframe among the PTS airplanes, then the T-34 has a small edge. The P-51 PTS is a great training airplane with top speed ranges from 45 mph to over 100 mph. The F-22 defies even the most ham-handed piloting. But the T-34's slow flight abilities, handling ease in any configuration, functional color scheme, dependable electric power and greatness as a teaching tool for landing gives it the edge, however slight that edge may be.

If you want to start flying right now without having to learn the care and feeding of a glow-powered trainer, buy fuel and then assemble a field kit, get the T-34 Mentor this morning. Sign up an instructor and be in the air this afternoon. It is that easy with this airplane.

TRANSMITTER SETTINGS

As mentioned, some very early transmitters had their exponential program settings reversed. Here are all the DX 6i transmitter control surface program settings for the T-34:

Function	Travel	Expo
Aileron rate 0	90% up/down	+25%
Aileron rate	50% up/down	INH
Elevator rate 0	100% up/down	+15%
Elevator rate 1	55% up/down	INH
Rudder rate 0	100% left/right	+15%
Rudder rate 1	50% left/right	INH

Specifications

Manufacturer: E-flite
Cost: \$500
Radio: Spectrum DX 6i 6-channel
Servos: 4 x E-flite 7120
Engine: E-flite 25 outrunner
Airfoil: Symmetrical with modifications and flaps

Length: 44 in.
Wingspan: 55 in.
Wing Area: 545 sq. in.
Wing Loading: 21.6 oz./sq. ft.
Weight: 5.1 lb.

Special Airframe Features: Symmetrical Wing with drooped leading edges for lift, soft, hard landing proof Propeller, Very Fast Assembly.

Notable Positives

Absolutely great slow flight capabilities
 Extremely fast assembly
 Very good looks
 Light flying weight
 Good basic trainer performance
 Powe4rful E 25 outrunner motor

Notable Negatives

40-Amp ESC too close to the 37.1 Amp motor draw.

Electric Power Specifications

Prop: 12 x 8 Elec.
Max RPM: 7,600
Max Watts: 380
Power Loading: 74.5 W/Lb.
Max Voltage: 10.5V
Motor Current: 37