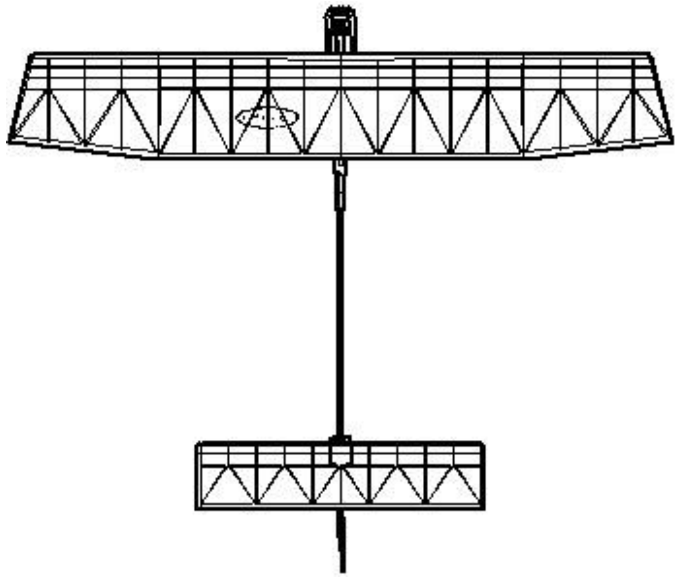

Joulebox

Mark III

Construction Manual

Kit No. CBMD-006

CB Model Designs

www.cbmodeldesigns.com

Congratulations on your decision to purchase this kit! Every effort has gone into making the Joulebox one of the lightest high-performance E-36 designs available. This class of free flight model offers clean and easy operating fun for competition or great sport flying.

Adhesive and general assembly process recommendations

Cyanoacrylate adhesive (CA in this instruction) should be used with discretion and caution. Assembly of the more delicate structures is best achieved with aliphatic resin carpenters glue or cellulose cement (Duco, Testors, Ambroid, etc.). Use of these types of adhesive offer the best chance for any minor adjustment during assembly, and minimizes the chance of adhering the structure to the plan or building board by thin glue wicking through pin holes in the parchment paper covering the plan. Proceed carefully and take your time with the assembly process. The Joulebox can easily be constructed and made ready to fly in one week of evening work sessions. Please read these instructions thoroughly in conjunction with study of the kit drawing and supplement sheets before starting construction. These written instructions assume the builder has the basic knowledge and skills to construct a model of this type, and the instructions will be brief and cover highlights of the process only. A comprehensive construction photo documentation PDF file is available as a free download from our website www.cbmodeldesigns.com within the Joulebox product page; please refer to the photo documentation for more detailed insight into a prescribed building sequence if the written instructions are not sufficient for you. As always, you may refer any questions to me (Clint Brooks) through my website email as needed.

Keep this in mind as you proceed-LIGHT WEIGHT WINS. If you plan to fly in contests, be very sensitive to changes or material additions that add weight. This airframe has been flight tested and if built as described will yield light results and top performance.

Wing Assembly

Review the laser part number sheets before starting to understand the part arrangements and numbers. Mark any items that look like they would be confusing to sort due to similar size and shape. Start wing construction by adding the 1/16 x 1/8 inch (1.6 X 3.2 MM) lower edge spar caps on the AFT SIDE of the WS-1 & -2 spar sections. There is another 1/16 x 3/32-inch (1.6 X 2.4 MM) spar cap on the UPPER EDGE of the spars, but this is not installed until all the ribs are in place and the dihedral set. You will have to notch the ribs by hand after the assembly is complete to install these spar caps.

Assemble the WLE-1& -4, WLE-2 & -3 leading edge assemblies next. On the inboard end of the center panel leading edge assemblies, install the 1/8 inch (3.2 MM) thick scrap balsa filler with taper at this time. This is important to reinforce the wing for the shock load imparted by the wing platform during D/T landings and prevent cracking of the leading edge in this area.

Assemble the basic wing sections on the drawing. Washout is built into the tip panels using the two washout shims provided in the 3/16 (4.8 MM) thick laser part sheet. Location for these is shown in phantom line on the drawing. You will need to shim about 1/32 inch (.8 MM) under the end of the WS-2 spar to bring this into flush condition with the tip rib WT-1 with the washout shim in place. Do not install the diagonal ribs W-1A & W-2A common to the dihedral breaks until the ribs W-0 and W-T's are installed when the dihedral is set. After that, install the W-1A ribs into place with each wing panel section held flat on the building board surface. Install the W-2A rib with the tip panel on the board with the washout shim back in place to ensure this condition is represented when gluing the rib in. Install all ribs and the upper cap before installing the 1/16 x 1/8 turbulator spars ahead of the main spar.

The turbulator spars are scarf spliced at ribs W-0 & W-T. You can install the spars into the notches dry with overlap on the dihedral rib, and then slice through both at the same time using a new sharp razor. The ends of the spars should overlap in the rib slot. If you did not glue in the spars yet you can still move them from side to side to adjust the location of the splice. Or you can make diagonal cuts at one end of the strip stock and fit it into place against the other side which is already cut diagonally to match, and fine tune the location for the joint. Working from one side of the wing to the other allows you to fit each joint with the final trim of a spar occurring at the tip rib. Always install the spars with each panel held against the building board, the tip panels with the washout shim in place to ensure the wing tip washout is maintained in the assembly.

Wing sanding and shaping
Sand the wing leading and training edges to shape and blend into the wing rib profiles. A sanding block template is provided with this instruction-make a tool 1-1 ½ inches wide (25.4 ~38 MM) and contact cement 100 grit sandpaper to the contoured area. Use of this tool offers the best result for contour sanding-use sparingly and lightly. The tip panel taper deviates the basic contour of the block, but you can still fit areas of the block contour to match the airfoil sections and achieve a smoothly faired contour in the ribs and spar tops-be observant for best fit to the area being sanded. Seal the wing structure with two coats of thinned nitrate dope after fine sanding prior to covering if using Esaki tissue (covering contact areas).

Horizontal stabilizer assembly
The horizontal stab is assembled in the same manner as the wing. Sand and shape the finished frame to the airfoil section using the sanding block template provided for best results. Seal the finish sanded framework with two coats of thinned nitrate dope prior to covering if using Esaki tissue. Install the D/T post DPT-1 after covering with a small dab of cellulose cement to keep it from being lifted out of the slot in use.

Vertical stabilizer assembly
Assemble the fin from the three laser parts-cellulose cement is best for this as it sands easily and leaves no raised seam that could affect flight trim. Lightly sand joints flush. Sand the leading edge to a full radius, the rest of the fin remains flat and the trailing edge left square. Seal with two coats of 50% thinned nitrate or wipe-on polyurethane, sanded between coats to seal the wood grain from moisture.

Motor mount assembly
Glue the MM-2 and MM-3 motor mount frames together. Align these together using .047 diameter wire through the three hole locations the #1-72 machine screws will thread into later, then glue. Note the countersink on the forward face of the MM-2 frame for seating the centering ball and do not install backwards.

After making this assembly, use one of the #1-72 machine screws to thread the three holes used for installing MM-1. This should be a tight fit on the screws to help retain them from loosening in use from vibration.

The motor mount is designed to swivel on top of a centering ball that maintains the centerline orientation of the assembly stack and allows spherical adjustment of the motor angle using the three #1-72 machine screws. If you do not desire this in your model, simply attach the MM-1 frame directly to the MM2/MM-3 subassembly using the machine screws. You can add hard shims in the normal manner by loosening the mounting screws and packing the shims to suit your thrust angle requirements. If you use the swivel mount, cement the plastic centering ball into the countersink on the front of the MM-2 frame to retain it during installation of the MM-1 frame.

Fuselage assembly
Build the fuselage pod by assembling the FP-1 cap with the two FP-2 sides. Also assemble the upper motor mount filler FP-4 from the five pieces on part sheet F-01and set aside. Tip: you can shave a little weight by beveling the upper inside edge of the FP-2 sides, above the carbon tube contact line, for the full length of the fuselage pod.

You can install the carbon tube at this time if you wish, and finish the front end of the pod by installing the motor mount using the hole in MM-3 to locate and adding the FP-3 and FP-4 fillers. I suggest 5-minute epoxy to install the motor mount assembly to the carbon tube and front end of the pod. Attach the pod to the carbon tube using thin CA allowed to wick along the contact line the tube makes with the three box sides. Use the glue sparingly-it does not require heavy glue lines to install this item.

Install the stab platform details SP-1 and SP-3 using CA. These need to be positioned at ninety degrees to the sides of the fuselage pod. I build directly over the kit drawing with the fuselage pod and carbon tube blocked into place over the side or top view to get the stab platform pieces installed per plan location. I have also built the tube assembly complete with the fin and stab platform details and then installed the fuselage pod at ninety degrees relative to the stab platform or fin. Either way works-make sure everything is square to the fuselage pod for alignment.

Assemble the two pylon side skins directly on the plan. Install the plywood timer mounting frame TMF-1 on the outside surface of the left side skin after the pylon is assembled to allow sanding of the pylon side, etc. Finish the inside surface of the pylon skins and upper/lower caps with two thin coats of dope or polyurethane prior to final assembly of the pylon sides together.

Install the wing hold down dowels into the slots in the PC-2 cap prior to installing the aft end pylon sheeting and servo mounting frame.

Cut a small strip of 1/32 (.8 MM) plywood from the scrap margin on the laser part sheet and glue two small pieces of this over each servo mounting screw hole on SM-1. Then pilot drill through these at the hole locations using a .047 diameter drill or sharpened wire. Thread the holes using a servo mounting screw before installing SM-1 into the pylon assembly.

Install the PRC-1, -2 and SM-1 details into the aft end of the pylon assembly using the tab locations, then install the D/T trip wire and associated fillers.

Install the wing mount platform WM-1 after scoring and cracking for fit to the wing underside dihedral. Install the aft wing mount WM-2 and this completes the basic pylon assembly. Seal the outside surfaces and fuselage slot area with two coats of thinned dope or polyurethane.

Power train assembly (Starlink-Flitetech component kit)
Start this step by installing the battery Deans plug assembly (red plastic male pin connector with a BLACK and RED wire) onto the two power input wires (BLACK and RED) for the Electronic Speed Controller (ESC). If you are not familiar, these are the two wires on either edge of the ESC with the 3-wire connecting terminal block for the timer in the middle. The other end of the ESC has three separate wires coming out of it that are to be connected to the motor.

The ESC battery wires are sufficiently long to reach the lipo connector plug-you shouldn't have to add any extra wire. For soldering, use of at least a 40-watt iron is recommended. From the Deans Micro Connector package slip a red and black segment of heat shrink tubing onto the ESC battery lead wires and move up and away from the solder joint area. Assemble the connector pin set as noted on the Deans package and install this assembly into a soldering vise or small clamp to hold it steady for the soldering steps. On the tinned end of the bare wires I like to flatten them using the smooth area of needle nose pliers-this gives it some alignment to the flat side of the Deans pin until the solder melts when joining. Solder tin the connector block pin accepting each wire, on the outboard side. Position the tinned end of the ESC connector wire on the outboard side of the pin and heat it until the solder flows between the two parts and remove the iron heat. This connection must be strong and well joined for maximum current flow-give it a light pull test to make sure you have a good solder joint. Repeat for the remaining joint in the same manner, then cover the solder joints with the heat shrink tubing and shrink in place.

You need to modify your lipo connector to utilize the mating half of the Deans connector, if your lipo is equipped with the standard male JST connector (red plastic). This is easy and safe to do provided you work only one lipo wire at a time, and insulate the solder joint prior to working the second wire. If the ESC motor wire ends are still unfinished when you start this make sure you insulate the ends from each other as during the final step of the lipo modification the ESC will become energized and these wires could short out the ESC and lipo if they touch together.

Start by cutting <u>ONE</u> of the wires close to the JST connector to minimize loss of wire length. Strip about 1/8 inch (3.2 MM) from the end of this wire and tin it with solder. Slip the color coordinating segment of heat shrink tube from the Deans plug set and move it back from the solder joint area. Leaving the Deans plug connected to the ESC side plug for polarity reference, solder the lipo wire onto the Deans terminal matching the color of the wire being attached from the ESC side. Slide the heat shrink tubing over the solder joint and shrink in place. THEN go back and cut the remaining wire end free from the JST connector and repeat the steps to finish the plug installation. If you cross wire polarity the lipo will quickly heat up and start to expand-this is dangerous and will result in a fire if left unchecked. Be very certain about polarity when assembling the Deans plug.

Most likely you will need to have a matching Deans connector on your field charger. You can modify the harness for the charger as done for the lipo, this time cutting off the female red plastic JST connector and soldering in a Deans Micro connector block with polarity matching the lipo. Take caution to ensure no shorting is possible on the charger harness opposite ends if installing the wiring using the lipo connection for polarity reference. Be careful to match polarity in all system connections, including the charger.

On the motor connection ends of the ESC wiring, install the female portion of the 2MM connector plugs. If desired, you can save some weight by trimming excess length from the ESC wires-do not cut or alter the wires from the motor in any manner. The female pins are best installed by tinning the connector on the wire receptacle hole first with the plug held in a soldering vise or otherwise secured for hands free support during soldering. Heat this tinned area until it softens and install the tinned end of the ESC wire into the molten solder, then let harden. Install black heat shrink tubing over the plug and wire junction up to the working end of the connector and shrink in place.

On the motor lead wires, install the male sides of the connector plugs in the same manner described above. Install the heat shrink tubing such that when assembled with the female plug there is no bare metal exposed at the joint between them. I set the end of the tubing approximately .06 behind the working end of the male connector and then shrink the tube around the wire and body joint area and leave a cuff of un-shrunken tube that overlaps the joint when connected to the female side which is shrunk all the way to the end of the connector.

The motor wires are joined to the ESC with the center wire leads connected, and the outer wires determine polarity and motor turn direction. When testing the system, you reverse the outer wires to change the motor rotation direction-the center wire stays the same. Be sure to use bits of colored heat shrink to identify the left and right connections between both halves of the connector pins to allow re-orientation if you unplug for servicing, etc.

The Starlink-Flitetech timer instructions are included in your kit package. Review these for operation and installation requirements. For reference-the black wire on the servo is the negative polarity wire and should be connected to the timer on the side indicating negative polarity on the circuit board adjacent to the connector pins. The black wire on the ESC connector is also negative polarity and should be installed to match the orientation of the servo connector below it. If you are using the Texas Timers eMax timer the same conditions apply.

Bench test your system at this point. Leave the propeller off the motor to prevent problems. Attach a 2S lipo battery and follow the instructions to activate the timer for servo operation and timer function. Validate the motor is turning counterclockwise (viewed from the front of the motor). If not, reverse the two motor wire leads as noted above to change polarity.
Validate all power train functions and remove the battery and motor (note wire orientations on motor connections for marking with colored heat shrink tube sections).

Install the motor to MM-1 using the three #1 x 1/8 (3.2 MM) long sheet metal screws provided. Then install the motor to the fuselage using the #1-72 machine screws into the motor mount subassembly already installed. Lightly tighten the three machine screws until the motor mount becomes rigid against the centering ball-see the flight trimming instruction for suggested thrust angles to start. Provided the three screws remain tensioned against MM-1 the mounting remains rigid. Loosening and tightening the screws a little allows quick thrust angle adjustments during flight trimming sessions in the field. Once thrust trim is established you can add hard balsa or basswood shims in the remaining gap to lock in the setting, or use the method of applying little portions of plastic body filler (Bondo, etc.) to create a molded in place hard shim. If you are experimenting with different motors and props, it's advised to leave the shims out until you arrive at your best setup. Note: overtightening these screws until the plywood mount MM-1 bends is not providing any angular change or further securing of the motor. You do not need to tighten any more than what stops the motor from any movement. When you bend the mount, you have only removed possibility of further adjustment, particularly if the bent area is in contact with any point against MM-2

Install the servo in the pylon. Position the ESC inside the pylon from the upper side using the oval shaped cutout in PC-2, pushing the motor wires down and out through the mouse hole in the front of the pylon (cutout in PC-3). For the Starlink timer, the ESC will be roughly horizontal above and forward to allow clearance. If the eMax timer is installed the ESC is aligned approximately with the front edge of the pylon to allow clearance for the vertically oriented connector pins and associated wiring (eMax 90-degree connector pin version).

Install a piece of the pile side Velcro against the inside surface of the pylon left hand side to attach the lipo. The hole in this area is for finger access after the lipo is installed to help break it free from the Velcro to remove. The lipo installs with the wiring facing aft with the ESC connector over the upper side of the battery-the balance port wiring and plug is folded down against the end of the lipo and tucked into the pylon cavity when installing. As you insert the lipo, tuck the wires up under the top of the pylon-there is cavity space to accommodate the wiring and connector-there should be no wiring projecting outside the pylon opening if installed as described.

Install the timer plywood mounting plate TMP-1 on the Starlink timer and then connect the servo and ESC connector plugs to the timer connector pins and install the timer to the pylon using the (4) # 0 x 1/8 (3.2 MM) screws provided. Note-if using the eMax timer this mounts directly to the surface of TMF-1 frame at the pilot hole locations using the same screws. Install the pylon onto the fuselage pod at the dimension shown for the front edge. Re-connect the motor to the ESC wires and push any excess length back into the pylon to minimize fouling with the folding prop blades.

Dethermalizer lanyard installation

Now that the servo is installed you can finish the D/T setup for the stabilizer. Form a loop in one end of the heavy thread D/T line provided and tie off around a piece of wire or screwdriver shaft about 3/16-inch (4.8 MM) diameter-but make the loop long enough to slip over the D/T post on the stab. Slip the loop off the tool and wick thin CA onto the loop and knot to harden this shape and prevent collapse and twisting. On the free end of the thread, harden about one inch (25 MM) with thin CA to provide a wire-like stiffness for threading through the tube fairlead and the boom pass through hole at the aft stab platform location. Slip the 1/16-inch (1.6 MM) diameter aluminum stop tube onto the thread in front of the furthest aft guide tube to be ready for final set when adjusting the pop-up angle on the stab.

Install the stabilizer with the lanyard formed loop placed over the post prior to installing the hold down bands. With the stab pulled down in flying position, establish the location of the lanyard forward loop, using the round tool as a mandrel. Tie off and apply thin CA to secure the knot and harden the thread loop. Tie-on two dental bands to this loop for attachment to the D/T trip wire-check for firm tension to keep the stab trailing edge down hard against the SP-3 pad on top of the boom. Release the tripwire and allow the stab to drift up to an approximate 45-degree angle and with the alum stop tube set adjacent to the lanyard hole in the tail boom, crimp firmly to secure it to the thread and hold the stab angle.
Pull the lanyard forward and apply a small drop of thin CA to secure the crimped tube to the thread.

Flight trimming-glide phase

With the model assembled install your battery pack and check for the center of gravity location-this should be at about 60-70% of the wing chord at center. Make initial hand glides without any stab tilt to establish the CG and straight glide path, then add a 1/32 inch (.8 MM) thick shim on the right side of the stab platform to provide tilt on the stab for a right-hand glide circle. This model should be set up for right hand glide, and right-hand power pattern. Set the stabilizer bottom surface to be parallel with the tail boom tube to start using the adjustment screw in the stabilizer.

Flight trimming-power phase

It is suggested the motor thrust angle be set with about 3 degrees left thrust and no down thrust to start.

There are two ways to power trim a model of this type. If this is your first power model and you are using the Starlink timer you have some low power codes to use for initial flights. This may be useful to you for observing some basic characteristics without the high energy run stress. The following describes some steps to take for this type of approach. The other approach is to begin power trimming at full power but very short motor runs and short D/T to give the model a chance to survive if things go awry.

It is highly recommended that RDT (Radio D/T) functionality be included on a model like this as it will save a lot of time and grief during the trimming phases. Typically, you can disable the motor on the first RDT button push and then release the D/T by continuing to hold down the transmitter button. Do this at the first sign of a problem as there can be a slight delay that can prove disastrous at low altitude or high speed. Note: the eMax timer will automatically D/T one second after a motor RDT is activated.

For the conservative low power approach-early flights are suggested using one-minute flight times on the timer function (Starlink timer). First flight should be 40% power for a 10 second run duration. Perform a slow count to 7 before releasing the model to minimize the motor run time in case of problems. Launch with a gentle push off in level condition-the model should begin a shallow climb to the right which may steepen as it comes around into the wind on the first turn. If it seems safe let the model run the full 10 seconds under power and start watching how it transitions to glide when the motor shutoff occurs. Any tendency to spiral dive to the right under power should be corrected with small left thrust angle adjustments Proceed to 70% and 100% power profiles using the one-minute flight time to validate thrust angle settings once the 40% power pattern results in a uniform upward climbing circle. Note-higher power should result in higher launch angles to manage the burst of energy. If you launch level as done for lower power, you may find the model will be in a spiral dive to the ground. This is one of the reasons most prefer to go directly to high power trim to start as not much is learned from the lower power trimming effort that translates for high power attempts.

At full power it will likely be thrust adjustments to the left that have the most effect on the climb pattern. You want the model to head up very steeply in the few moments after launch and remain in a tight vertical spiral climb. If the model levels off in a right turn before assuming a climb spiral keep adding in little amounts of left thrust and down thrust to correct for this. Another technique to help obtain a steep spiral climb is adding wing skew. In this case, positioning the left wing tip slightly aft of the right tip will impart some additional right wing wash-in affect with a tendency to lift the right wing under power. Add wing skew in small increments to assess the effectiveness of it over many attempts. Once the trim pattern is satisfactory, key the wing to the pylon sides for repeatability of the setting. On mine I have as much as 1/8-inch (3.2 MM) offset to the left, as witnessed at the front of the pylon centerline relative to the center dihedral joint. Keep the trailing edge of the wing centered on the pylon. You may have to increase stab tilt slightly after the power pattern is set to get the model to circle properly with wing skew added. It might look funny tilted but if it works it's perfect-you did the right thing! Try to obtain a 30-50-foot (9-15m) diameter right glide circle to keep the model in the lift area after glide transition. Also, reducing decalage will improve the ability of the model to remain on course in a steep climbing turn. If the model wants to flatten out into a turn it has too much decalage and is going into a looping flight path. Reducing decalage (lowering the stab TE) will help the model track-play with this feature to understand the effects of decalage and obtain the optimal climb pattern.

If you want to skip the low power assessment, perform full power checks using the 5 second motor run time and a one second D/T. Count down to three before releasing the model at full power to give it a chance on the initial flight attempts. Fly the 5 second/one second D/T profile until the model climbs safely. Then start adding D/T time to observe the transition and fine tune the glide for sink and turn radius.

Any changes due to crash damage, re-setting of surface warps, etc. should return to the 5 sec/one second D/T pattern to confirm behavior before flying full duration again.

Note on ESC's that are provided in the Deluxe kit with the Starlink-Flitetech component option: these are pre-programmed for the motor brake function to be 'ON' and other presets by myself, as a courtesy to you. I include a record of the pre-sets made in the ESC packaging. The ESC can be re-programmed by yourself anytime. There are ESC programming cards available to adjust the settings on the ESC-but you have to obtain the card associated to the particular brand and amperage rating of ESC being used in order to change the ESC settings. These cards are generally inexpensive items available on-line through hobby distributors specializing in electric R/C products and market the ESC brands used in the Deluxe kit.

General Flying Tips

Learn all you can about the performance potential of your model by experimenting with launch techniques. You want every millisecond you can get in the air under power in competition, so learn how to hold the model for launch and manipulate the timer button for the fastest release time.

Observe the effects of launching into the wind versus downwind. Determine which technique will provide the highest climb under calm and breezy conditions.

Take time to trim the model for a spiraling climb in launch without any looping tendencies. Seek consistent, maximum altitude potential in the power trim setup. I have found the model to launch best if the nose is held up to about 45-60 degrees to the horizon I also find it helpful to bank the model to the right as if in a shallow turn. You will figure out the bank angle that works best with experience. I offer a very slight push at the angles described and allow the model to pull off under its own power.

Minor washout in the fin will always result in strong turning tendencies during the launch-if this persists in spite of all normal remedies carefully inspect the fin for warps-especially the tip-it take very little washout to prevent a good power pattern. Fin tab adjustment is sensitive and caution is in order. I would suggest a balsa tab wedge be used instead of bending for tab setting as these can be tuned with sanding and stay the same over time if you find rudder tabbing is required.

Always check the wing for trailing edge warps before flying-any bowing creates wash-in or wash-out effects that can cause your model to roll during the launch and crash.

For E-36 competition the real challenge comes with the five second motor run. Being able to judge conditions for hitting lifting air under a minimum launch height situation is where you should spend most of the time learning to use this model effectively.

Between flights and upon retrieval after one, unplug the battery pack to conserve energy. In competition, a fresh charge is used on each official flight so trim your models with this characteristic in place for consistency. Having at least two lipo's is desirable in competition to allow charging one while flying the other.

Good luck with your new Joulebox; enjoy the clean and easy flying this type of model brings to the free flight sport.