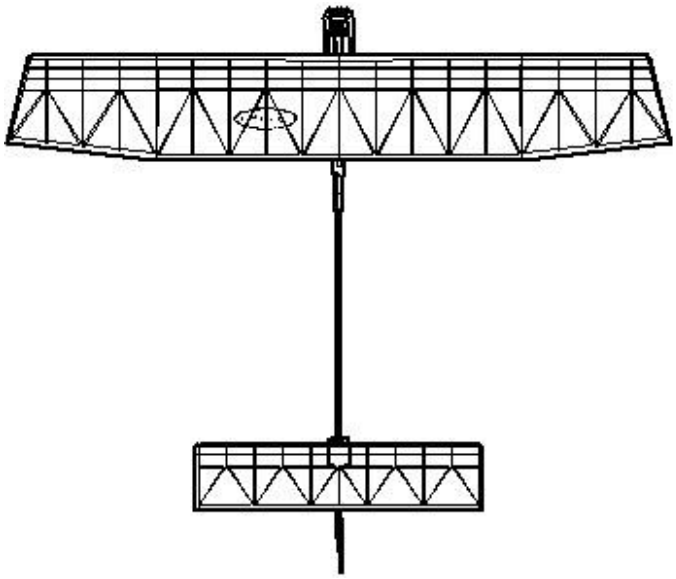

Joulebox 190

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 190 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 190 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 190 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 sparkling performance.

Wing Assembly

Review the laser part number sheet 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 lower edge spar caps on the AFT SIDE of the WS-1 & -2 spar sections. There is another 1/16 x 1/8 spar cap on the UPPER EDGE of the center panel WS-1 spars, but this is not installed until all the ribs are in place and the dihedral set. You will have to notch some of the W-1 ribs by hand after the assembly is complete to install this spar cap-do not omit.

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 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 dethermalized configuration 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 thick laser part sheet. Location for these is shown in phantom line on the drawing. You will need to shim about 1/32 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 this 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. Very lightly block sand the upper contour to offer some fairing of the rib contours to each other to smooth the contours under the covering material. Finish the wing structure with two coats of thinned nitrate dope before covering with Esaki tissue (provided) or Polyspan type covering.

Horizontal stabilizer assembly
The horizontal stab is assembled in the same manner as the wing. Provide small pilot holes in the filler that the small D/T band nails will be installed in after covering. Sand and shape the finished frame to the airfoil section, coat with two coats of thinned nitrate dope prior to covering with tissue or Polyspan. Install the D/T band nails after covering with a small dab of thin CA adhesive to keep them from being lifted out of the holes in use.

Finish with tissue covering with two coats of 50% thinned nitrate dope to minimize weight. Be sure to install the 4" long wash-in wedge on the right wing trailing edge lower surface near the outboard dihedral break after covering. This improves trim for the power phase climb and should not be omitted unless you prefer to warp the wash-in into the panel itself.

Vertical stabilizer assembly
Assemble the fin from the three laser parts. Lightly sand joints flush. Round 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 #0-80 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 #0-80 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 #0-80 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.

Leave MM-1 off until you have sealed the fuselage assembly with dope or polyurethane, added color, etc. Do this for the MM-1 frame before installing the motor itself and set aside for the final assembly steps.

Fuselage assembly

Build the fuselage pod by making two subassemblies; one made from one F-2 side and one of the F-1 caps. Make the other assembly opposite of this so you can assemble the two 'L' shaped assemblies together to form the box. Take care to assemble the caps to the sides 90 degrees to each other. Do the same when making the final box assembly.

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. I suggest 5-minute epoxy to install the motor mount assembly to the carbon tube and front end of the pod. Install the 6MM diameter by one inch long filler in the front end of the carbon tube using epoxy to help take up the minor mismatch on the inside diameter of the carbon tube boom prior to installing the motor mount assembly. Attach the pod to the carbon tube using thin CA allowed to wick along the contact line the tube makes with the four 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 on the inside surface of the left side skin. Use a sharpened piece of wire to transfer the attach screw hole locations into the balsa side through the plywood frame. 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 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 and associated underside fillers. Install the aft wing mount WM-2 and this completes the basic pylon assembly. Fine sand and seal the outside surfaces and fuselage slot area with two coats of thinned dope or polyurethane. DO NOT glue the pylon onto the fuselage pod at this time.

Power train and timer installation

Start this step by installing the battery JST plug assembly (red plastic female 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 connecting terminal for the timer in the middle. The other end of the ESC has three black wires coming out of it that are to be connected to the outrunner motor. Strip the JST plug wires at the ends and tin with rosin core electrical solder. Cut lengths (3/4") of the heat shrink tubing and slide over each wire, out of the way during the soldering step. Then overlap or butt the wire ends (RED to RED, BLACK to BLACK) and solder together by heating the tinned areas and allowing to set. 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 joint. Then cover the bare joints with the heat shrink tubing and shrink in place.

On the motor connection ends of the ESC, install the female portion of the 2MM connector plugs. These are best installed by tinning the connector on the receptacle hole first for the wire with the plug held in an alligator clip or otherwise secured for hands free holding during soldering. Heat this tinned area until it softens and install the bare end of the ESC wire into the molten solder, then let harden. Install heat shrink tubing over the plug up to the joint edge of the male 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.

The motor wires are connected 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.

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.

Bench test your system at this point. Leave the propeller off the motor to prevent problems. Attach your LiPo battery and follow the instructions to activate the timer for servo operation and timer function. Validate the motor shaft 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).

Install the motor to MM-1 using the three #1 x 1/8 long sheet metal screws provided. Then install the motor to the fuselage using the #0-80 machine screws and washers into the motor mount subassembly already installed. Tighten the three machine screws until the motor mount becomes rigid against the centering ball. Adjust the screw tension until there is a uniform gap between MM-1 and MM-2 as a starting point for flight trimming. Provided the three screws remain tensioned against MM-1 the mounting remains rigid. Loosening and tightening the screws a little each time allows quick thrust angle adjustments during flight trimming sessions in the field.

Install the folding prop at this point to validate the prop tips will clear the front edges of the pylon when folding in flight or on motor startup if folded back at launch. Mark the front edge location of the pylon on the fuselage pod for this location as reference; the pylon cannot be installed any further forward than this mark without risk of being damaged by the prop on startup if the blades are folded aft.

Install the servo on the pylon. Position the ESC inside the pylon, with the JST plug being pulled out of the small cutout on the right side of the pylon. Install the outside plywood cover plate on the timer and then connect the servo and ESC connector plugs to the timer connector pins and install the timer to the pylon using the screws provided with it. Temporarily install the pylon onto the fuselage pod and retain with small tabs of masking tape across the bottom to hold against the pod. Re-connect the motor to the ESC. Push the wires down against the top of the fuselage pod and let the ESC seek a best fit inside the pylon, making sure there is enough battery connector wire length coming out of the pylon side to allow some adjustment forward and aft of the battery pack during flight trimming. I use 3/8" diameter light pull dental bands over the front end of the fuselage pod to keep the motor lead wires in place against the top of the fuselage pod. This prevents any prop tip fouling on motor startup if the blades are folded aft.

Dethermalizer 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" diameter Slip the loop off the tool and wick thin CA onto the loop and knot to harden this shape and prevent collapse. Trim off the excess at the knot and install two of the dental bands provided onto this loop. On the free end of the thread, harden about one inch of this with thin CA to provide a wire-like stiffness for threading through the tube fairleads and through the boom at the aft stab platform location. Install one of the 1/16 diameter aluminum stop tubes onto the thread against the rubber band loop end (leave loose on the thread) and feed the remaining thread aft through the fairleads and down through the stab platform hole and out the bottom of the hole in the boom.

Install the stabilizer using the other two dental bands supplied, with the D/T thread placed on top of this when in position. Hook the bands onto the D/T trip wire and position the tripwire end under the servo arm to lock. Slide the second 1/16 diameter aluminum tube onto the loose end of the thread, and then pull taut to tension the rubber bands on tripwire arm. When satisfied with the amount of stretch tension provided, slide the stop tube up against the bottom of the tail boom and crimp the tube to the thread using needle nose pliers. Loosen the band tension and pull the stop tube away from the tail boom and apply a drop of thin CA to the bottom edge of the crimped tube to further secure to the thread and prevent slippage.

With the forward end of the D/T line removed from the tripwire, allow the stabilizer to angle up at a 45 degree angle. Slide the forward stop tube against the front of the first fairlead and crimp the tube to the line to hold this location and provide the stab pop-up position.

Flight trimming-glide phase

With the model assembled and pylon taped in place at the suggested start dimension location mark, install your battery pack and check for the center of gravity location-this should be at about 60-70% of the wing chord. It is suggested the Velcro tape be left off the pylon side until trim flights are made and final CG location is confirmed. Once installed, the tape is very difficult to remove if required, and it should be installed only where needed to minimize weight. Use masking tape to secure the battery pack for early CG adjustments. Move the pack forward or aft until the model appears to balance slightly nose down at this point. Make initial hand glides without any stab tilt

to establish the CG and straight glide path, then add a 1/32 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.

Adjust the pylon location if need be in the event the battery weight shift is not enough to obtain a smooth and steady glide path. Don't final bond the pylon in place until some power flights are undertaken to observe the glide pattern at a higher point and make additional CG adjustments.

Flight trimming-power phase

It is suggested the motor thrust angle be set to a neutral position (no side or up/down thrust angles) to start.

Early flights under power are suggested using one minute flight times on the timer function. First flight should be 40% power for 10 seconds. Perform a count to 7 before releasing the model to minimize the motor run time in case of problems. The launch should be 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. Provided this does not become so steep as to result in power stalling it is okay for now. If it seems close to stalling it is probably best to adjust in a slight amount of down thrust and repeat the launch. 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. Proceed to 70% and 100% power profiles using the one minute flight time to validate thrust angle settings. You may find very little or none right thrust is required, and likely some left thrust to keep the climb circle from getting too steep or too tight to the right as the power and airspeed comes up in the launch.

As there is motor braking functionality in the ESC the motor slows down over a few milliseconds as opposed to a hard cutoff. This allows the model some ability to drop the nose up climb attitude and position to a glide mode with virtually no loss of altitude-if the center of gravity is in the right place. If it is too far aft, the model will stall at the end of the motor run and enter a series of recovery stalls until it stabilizes or contacts the ground. Keep moving the battery forward if this is happening until all the stalling tendency is eliminated at the top of the climb and motor shutoff. The model should very gently transition into a right hand glide circle and begin the hunt for lift. Once these basic characteristics are established glue the pylon to the fuselage pod for continued service.

After the transition glide is established, be watchful of the glide speed. You want to trim the model for a minimum sink rate which is a slow glide speed. Add some thin card stock or balsa shim under the stab trailing edge to slow the model down to just above stall speed in the glide and this should be about right for maximum performance in glide mode. You know you are in the sweet spot when the model glides with a very slight tendency to nose up when encountering minor turbulence-it gives the appearance of wanting to 'sniff' or climb slightly with the slightest buffeting of lifting air.

Now make a permanent reference mark on the pylon side where the battery pack should be placed each time. Cut the Velcro tape (pile side) to a little longer length than the battery and apply to the pylon to allow the battery to be attached using the hook side of the Velcro tape applied to the battery.

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.

For E-36 competition the real challenge comes with the five second motor run with two minute max time. 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 and maximize power for the remaining flights to go.

Good luck with your new Joulebox 190; enjoy the clean and easy flying this type of model brings to the free flight sport.