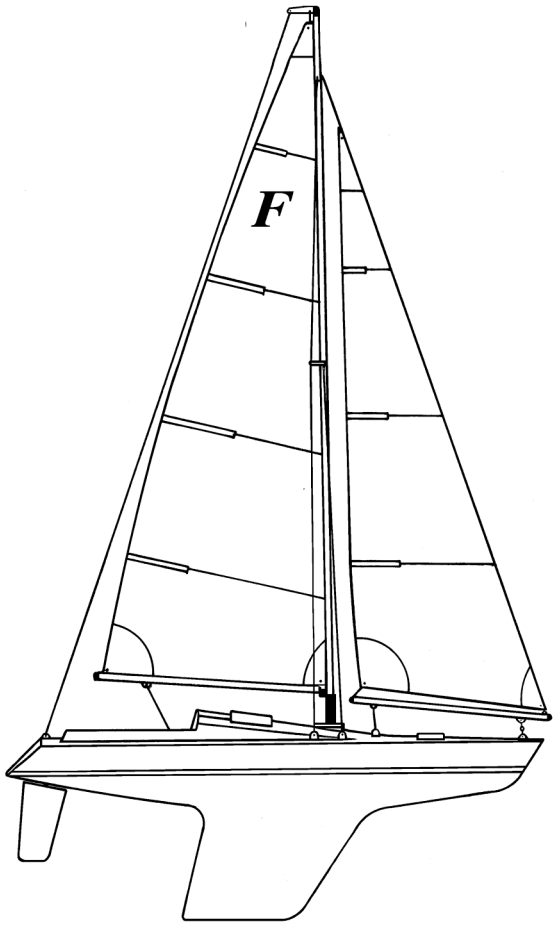
The ‘BAKERSFIELD’ *Fairwind* for RACING

A Construction Guide



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The 'BAKERSFIELD' *FAIRWIND* for RACING

I. INTRODUCTION

The Fairwind 900 is a radio-controlled model sailing yacht produced by the Japanese manufacturer Kyosho. The Fairwind is now recognized as an official One-Design racing class by the American Model Yachting Association (AMYA), and is actively raced by the Bakersfield Model Yacht Club (BMYC). The Fairwind features a one-piece pre-molded ABS plastic hull/deck/keel which makes it very easy to build, and an ideal project for first-time model yachters.

The Fairwind is available in several forms: 1) A complete kit including a Futaba 2-channel radio & sail winch, 2) A complete kit less radio & sail winch, or 3) Individual Hull/Hatch/Rudder components. Experience has shown that the Futaba sail winch (S3802) is somewhat underpowered in heavier wind conditions. The Futaba radio and a better sail winch (the Hitec HS-715 or HS-705) can be purchased separately at less cost, also leaving the builder with a free extra servo. Therefore, the recommended options are either the complete kit less radio & winch, or individual Hull/Hatch/Rudder components.

Purchasing the Hull/Hatch/Rudder as separate components will save about $25.00, but the complete kit (less radio & winch) includes some very useful items that are definitely worth the extra money. However, the complete kit also contains many items which should NEVER be used on a competitive Fairwind such as the aluminum spars, nylon sails, radio board, and inferior rigging materials. Furthermore, it is of utmost importance that a prospective builder wishing to produce a competitive racing Fairwind NOT follow the instructions included with the kit!

Rather, the following guide should be used as a starting point. It is strongly recommended that, whenever possible, prospective builders contact experienced Fairwind sailors and view several completed Fairwinds to become familiar with their construction before purchasing any components or beginning construction.

The following guide is based on the collective experience of numerous BMYC Fairwind builders/skippers. Through trial and error the BMYC Fairwind Fleet has arrived at a formula for what it believes is the 'state of the art' competitive Fairwind. The following instructions will produce a highly competitive Fairwind at the lowest possible cost. Indeed, the top 7 finishers in the 2004 AMYA Fairwind National Championships all sailed Fairwinds constructed essentially utilizing the following construction techniques.

Before beginning, it is important to mention a few basic principles that must be followed to produce a '*fast'* and legal Fairwind:

1. **KEEP WEIGHT TO A MINIMUM AND AS LOW IN THE HULL AS POSSIBLE.**
2. **KEEP IT SIMPLE** (Eliminate unnecessary components, and simplify all controls)
3. **USE CUSTOM PANELED SAILS** (The kit sails are NOT competitive)
4. **FOLLOW THE FAIRWIND CLASS RULES** (www.AMYA.org/fairwind.html)

Also, it is important to note that the Fairwind is molded from ABS plastic. When fastening components to the hull/deck, epoxy is the recommended adhesive. However, epoxy will only adhere to ABS if there is a good 'mechanical connection.' This means that before gluing, the surface of the hull/deck MUST be 'roughed-up' in the area of the joint to give it 'teeth.' This can be easily accomplished with 80-grit sandpaper and a little 'elbow-grease.'

Finally, DO NOT INSTALL THE LEAD SHOT BALLAST UNTIL THE FINAL STEP. This is important for two reasons. First, until your Fairwind is completely assembled, you will not know how much ballast is required to bring it up to the legal minimum of 8 pounds. Second, construction is MUCH easier with a non-ballasted hull.

II. HULL & HATCH COVER

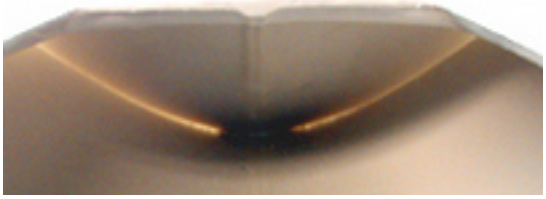
A. Trimming Flash. Where the two sides of the hull/deck assembly are joined, there is a large continuous seam of excess flashing. This must be removed with a SHARP utility or X-acto knife. Trim the seam SLOWLY & CAREFULLY, working your way along the hull and deck. Don't rush the job; one slip can ruin your Fairwind. The forestay and backstay 'tabs' should also be removed at this stage with a coping saw or Dremel tool. After removing the bulk of the flashing with the knife, finish-up with a sanding block to 'fair-in' the seam and smooth over the joints. If you do not intend to paint your Fairwind, you can finish the job with progressively finer sandpaper; ending with 1000-grit wet. Afterward, a good plastic polish with a soft cotton cloth will restore the smooth, shiny finish to the hull and deck

Transom (Photo #1)

Bow (Photo #2)

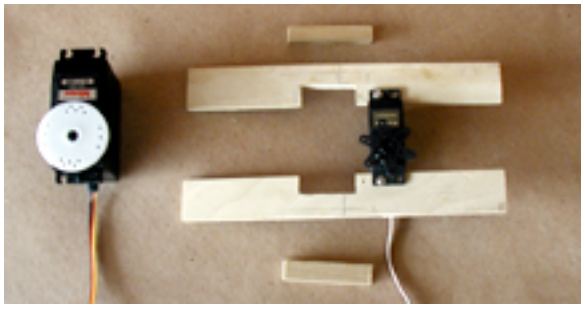
B. Stern Reinforcement. The 'blow-molding' process used to produce the Fairwind generates a few 'thin spots' in the molding. The most troublesome of these is at the transom-hull joint. If you hold the hull up to a light source while looking at the stern from inside the hatch opening, you will notice that the seam between the transom and hull is extremely thin. (See Photo #3). This thin seam should be reinforced by pouring in a small amount of epoxy (1/8 oz.) and standing the hull on end bow-up while the epoxy cures.

Thin area of stern (Photo #3)



C. Servo Mounting Rails. Do NOT use the servo mounting system included with the kit! It is HEAVY, located in the wrong place, and prevents placing the battery down low in the keel. Instead, make two servo support rails 1/4" X 1" X 7-1/4" long from wood or carbon fiber. The two short 'risers' for the Sail Servo are ½" high X 3/8" wide X 2" long. Position the sail servo about ¼" offset to port of the hull centerline with the rudder servo spaced ¼" away from the sail servo. Chamfer the ends of the supports to fit the contour of the hull. (See Photo #4)

Servo Tray Parts (Photo #4)

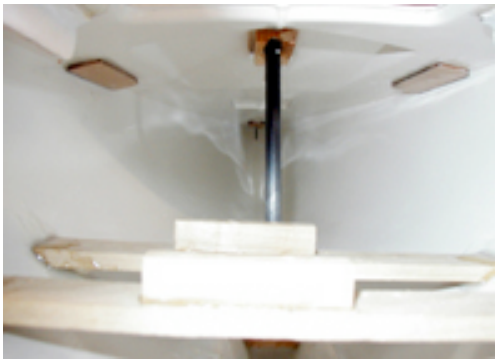


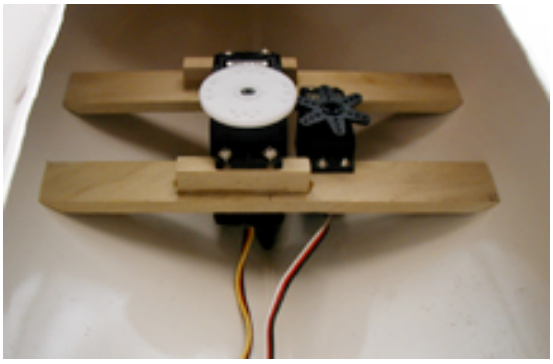
D. <u>Mast Support</u>. Do NOT use the 'hockey-stick' shaped mast support brace included with the kit! It blocks the keel opening; preventing the placement of the battery in the keel. Instead, make a small mast base block and under-deck pad from wood, and epoxy them in place. (See Photo #5) The wooden base block should be contoured to fit the bottom of the hull. If you purchased a 60" long, 8mm diameter carbon fiber tube from 'Hang-Em-High' as a mast (see III. A. below), you will have nearly a foot left over after you cut it down to the class-legal 48." This leftover piece can be cut to length and fitted between the base block and under-deck pad, as a mast support. (Photo #5)

Mast Support Parts (Photo #5)

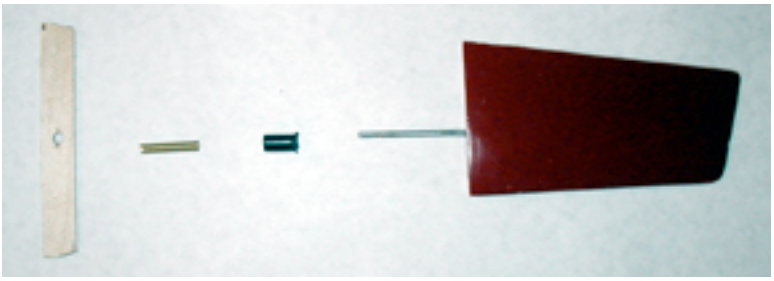
E. <u>Under-Deck Stay Reinforcements</u>. Make two wooden pads to reinforce the under-deck connections of the side stays from 1/8" X ¾" stock. Epoxy these pads in place. (Photo #6)

F. <u>Mounting Rail Installation</u>. Attach the sail and rudder servos to the Radio Mounting Rails using small woodscrews. Place this assembly into the hull with the center of the sail servo located 19-1/2" from the bow. Trim and chamfer the ends of the rails as required to ensure the assembly fits both level and snugly against the sides of the hull. Rough-up the hull surface where the rails will attach and epoxy the rails in place. (See Photo #7) It is a good idea to place a small ¾" square patch of fiberglass cloth into the epoxy at each joint to help spread the load. The sail and rudder servos may be removed after the epoxy cures for interior hull finishing.

(Photo #6) 

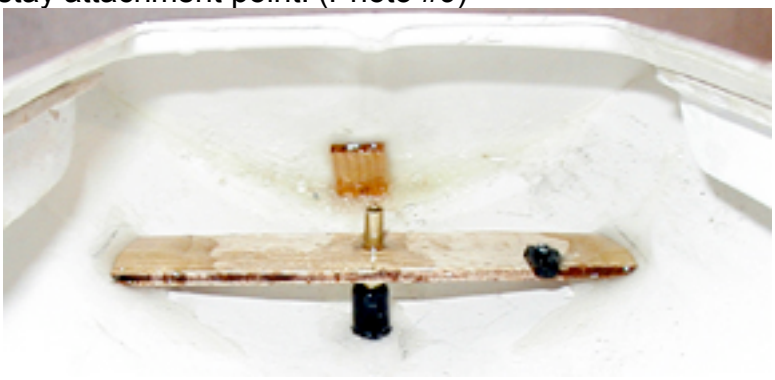
(Photo #7) 

G. <u>Rudder Thwart Installation</u>. Make the rudder thwart from 1/8" X 1" X 4-1/4" wood. Drill a hole through the center of the thwart to accommodate the brass rudder sleeve. (Photo #8)



Rudder Support Parts (Photo #8)

Drill a hole through the bottom of the hull so that the black plastic rudder bearing fits tightly. Next, 'dry-assemble' the rudder assembly and trim/chamfer the wooden rudder thwart until the rudder fits snugly against the hull and exactly vertical (aligned with the keel). Once you are satisfied with the fit (and have roughed-up the hull surface), epoxy the rudder thwart in place adding two ¾" square patches of fiberglass cloth to the joints. (See Photo #9)
It is also a good idea to epoxy a small wooden pad (1/8" X ½" square) to the underside of the transom to reinforce the backstay attachment point. (Photo #9)

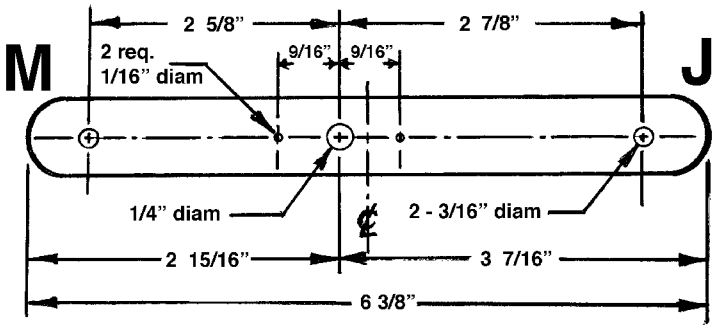


Rudder Support In Place (Photo #9)

H. <u>Hatch Cover Installation</u>. Use the 1/8" plywood from the kit-supplied under-deck supports to fabricate two 'ramps' approximately 3" long. These ramps will taper from about 5/8" wide at one end to about 1/4" wide at the other. These 'ramps' are then epoxied in place under the deck along each side of the cockpit opening with the 1/4" wide ends facing forward. The middle of each ramp should correspond to the location of the winches on the hatch cover.
Install 4-40 threaded rods or 1-1/2" long hex-head cap screws through the kit-supplied plastic winches, along with 4-40 lock nuts and a 1" long aluminum or plastic arms to act as an off-set lock under the deck supports. (Photo #10)
NOTE: The above operation is optional as there are a number of different ways of securing the hatch to the cockpit. However, whatever method is used, eliminate the use of tools.

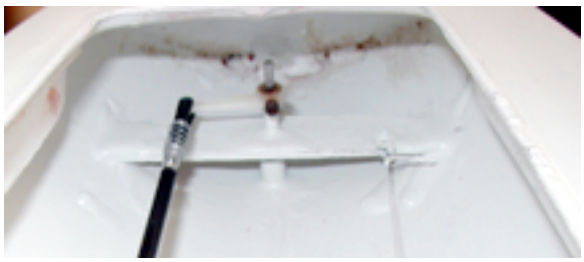
Hatch Fasteners (Photo #10)

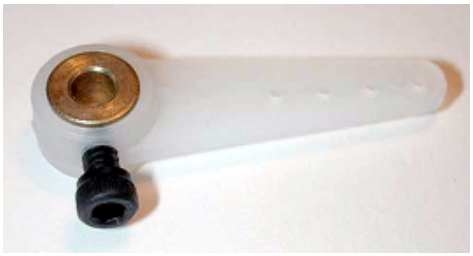
I. <u>Sail Servo Arm</u>. Make a plastic (Plexiglass), aluminum, or carbon fiber sail servo arm 1/8" thick X ¾" wide X 6 3/8" long as shown in Photo #11. Use a countersink to chamfer and de-burr the two 3/16" diameter holes to reduce drag on the sheets.



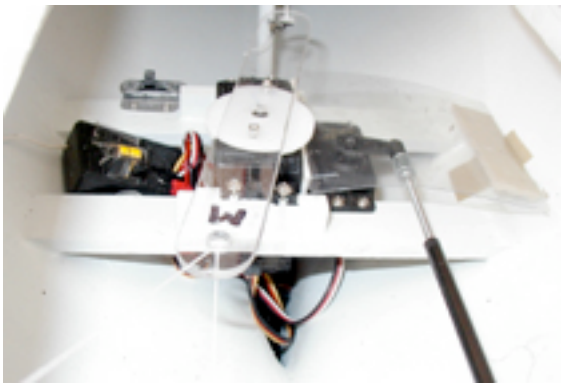
J. <u>Radio Receiver & Switch Installation</u>. Install the sail and rudder servos in the mounting rails. Attach the radio receiver to the side of the sail servo using double-sided foam servo tape. Install the switch in a convenient location where it will not come in contact with water. A waterproof switch mounted on the deck alongside the mast step plate works well. However, DO NOT USE the kit-supplied rubber boot arrangement! The kit-recommended switch location (alongside the hatch) puts it under water when sailing in heavier winds and the rubber boot is subject to cracking which lets water flow into your switch! The receiver antenna should be either taped to the underside of the deck or preferably run through a small hole near the hull-transom seam and run up the backstay.

K. <u>Rudder Arm</u>. Do NOT use the stock white plastic rudder arm! Purchase a nylon steering arm with a brass insert. (See Photo #13)
Do NOT use the kit-provided rudder pushrod; it is not strong enough! A proper pushrod may be fabricated from ¼" square spruce or a small carbon fiber tube. Epoxy 4-40 threaded rods into each end of the pushrod and thread Kwik-Links on each end. (See Photo #12)


Rudder Arm & Connecting Rod (Photo #12)


Rudder Arm with Insert (Photo #13)

L. <u>Final Control Installation & Adjustment</u>. Attach the rudder pushrod to the rudder and servo arms and adjust the threaded Kwik-Links until the rudder is centered when the transmitter stick is centered.
Attach the sail servo arm to the top of the sail servo and check for proper motion. If the sail servo has been modified for 180-degree rotation, the full-in and full-out positions will be as shown in Photos #14 and 15.
Also shown is a simple clear plastic cover sheet attached with Velcro to prevent the sheets from getting tangling in the rudder servo.


Sail Servo Fully Extended (Photo #14)


Sail Servo Contracted (Photo #15)

M. <u>Painting</u>. As already noted, the plain white hull may be polished to a shiny finish with plastic polish without the need for paint. However, a well-done paint scheme will produce a much more aesthetically pleasing model yacht and (if done properly) will not affect

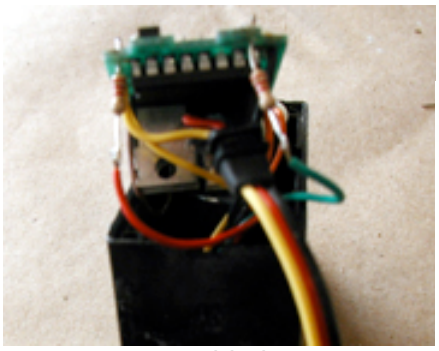
performance. A fast drying acrylic lacquer such as 'Plasti-Kote' available from Pep Boys or any automotive store is recommended. First apply a coat of 'sandable primer' after filling any small holes and imperfections with 'Bondo's Glazing & Spot Putty'. Wet sand with 1000 grit paper. Apply two coats of your finish color and then carefully wet sand with 2000 grit paper. After all is done and thoroughly dry, use a '3M Rubbing Compound' to bring out the luster and shine.

N. <u>A Word On Scale Deck Fittings</u>. The Fairwind kit comes with a large amount of scale model yacht fittings. Most of these should NEVER be installed on a racing Fairwind. The ships wheel, bow and stern pulpits, lifelines, fenders, radio antenna, and smaller cabin-mounted winches will snag sheets (and other Fairwinds)!
However, the cam cleats, cabin rails and main winch drums add an aesthetic touch without adding much weight or danger of snags. The 2004 National Champion Fairwind even had 1/32" thick mahogany deck planking added to the cabin and cockpit sole. The bottom line is simple common sense: an extra 1 to 2 ounces of weight in paint, low-profile fittings, and trim will have no noticeable effect on performance, while "going overboard" and adding every fitting will result in a malfunction-prone boat that is noticeably slower. The best advice is to consider each fitting and determine if it significantly adds to the risk of snagging or adds too much 'windage' (i.e., wind drag) or weight to the boat. If so, don't install it.

III. MODIFYING THE SAIL SERVO TO 180 DEGREES

These are instructions for modifying the HiTec #HS-715BB Sail Servo or the HiTec #HS-705MG Servo to rotate 180 degrees instead of only 90 degrees (actually it rotates closer to 170 degrees). It's simply a matter of adding two (2) resistors to the circuit. For this servo, we remove the circuit board from the back of the servo (Photo #16), de-solder the green and red wires from the circuit board, add a resistor (2.2 K-Ohm, ¼ Watt) to each connection point, re-solder the wires to the resistors (Photo #17) and carefully replace the circuit board back into the servo. No need to remove the gears or potentiometer from the housing. If you don't want to get into the soldering operation, you can simply add a '180 Degree Servo Stretcher' (Photo #18) to the servo leads, available from RobotZone (See APPENDIX).


Removing Circuit Board (#16)


Resistors Added (#17)


Servo Stretcher (#18)

IV. RIGGING

A. Mast. For the lightest and strongest material, the mast should be carbon-fiber tubing (CT 3150 (8mm) X 60“ long) cut to 48” long. The left over piece can be used as the mast support. (See II. - D. above). It is available from Hang-Em-High (Online Store), 1420 Yale Ave., Richmond, VA 23224, Phone/Fax (804) 233-6155.

B. Mast Crane. The kit-supplied aluminum mast crane works well with the 8mm carbon fiber mast. Use a ‘razor saw’ to cut a ¼” deep ‘notch’ in the top of the mast tube. The aluminum mast crane will slide into this notch and fit snugly into the tube where it may be epoxied in place. (Photo #24)

C. Spreaders. They may look nice, but because of the stiffness of the carbon fiber mast, we don’t feel it’s necessary to use spreaders on the Fairwind.

D. Side, Back & Fore Stays. Two (2) side stays are attached to the mast at approximately 40” above the deck with a simple bolt through the mast or use tang fittings (Photo #19) on each side. Another tang fitting may be used on the mast for the jib fore stay. Current rules allow a ‘masthead rig,’ instead of a fractional rug, so the fore stay can be attached near the top of the mast. If the rules change in the future, you can always lower the jib stay tang to meet the rules. All stays are connected to the deck with hooks (so the rig may be removed easily) to a tang (on the transom) and two Through-Deck Eye-Bolt fittings (Photos #20 & #25) aligned perpendicular to the center line of the mast, and one 2” from the bow on the fore deck. To prevent stretching, use 40# nylon-coated stranded stainless steel wire. Use #A3 Sleeves for crimping. Use single-end rigging screws (Photos #21 & #25) for adjustment of the side stays.


Tangs (Photo #19)


Eye-Bolts (Photo #20)

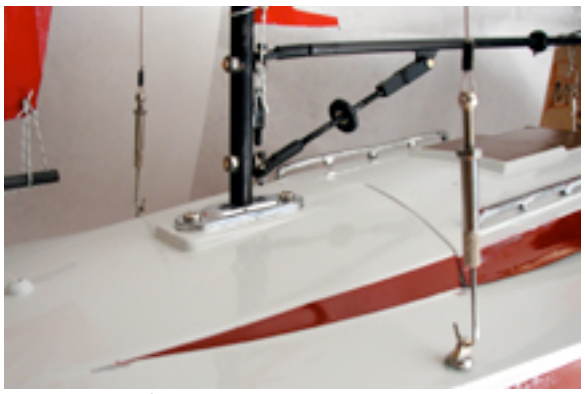

Rigging Screws (Photo #21)


Bowsies (#22)

E. Running Rigging. Do NOT use the kit-supplied bowsies; they will slip and not hold your adjustments. Instead purchase quality bowsies. (See Photo #22) Use short sections of Dacron or Dyneema cord for adjustments of back stay, jib stay and jib halyard.


Back Stay Connection (#23)

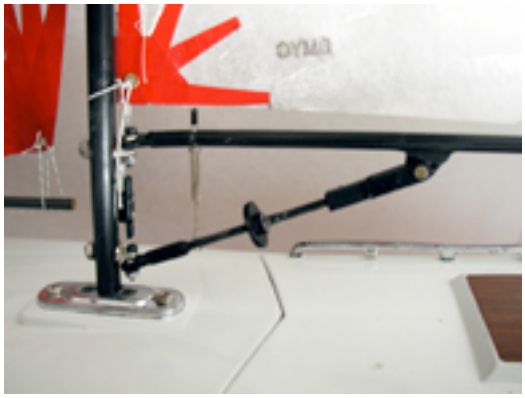

Top of Mast (#24)


Side Stay Connections (#25)

F. <u>Boom Vang</u>. The vang may be fabricated from a 4-40 turnbuckle with right and left hand threads, a 4-40 Safety Lock Quick Link (Photo #29) and a 2mm X 4-40 HD Ball Link (Photo #28). A small thumb wheel is glued to the turnbuckle to aid in hand adjustments. The main boom is attached to another 2mm X 4-40 HD Ball Link. The two Ball Links are then attached with the 2mm threaded bolts to two (2) Through-Deck Eye Bolt fittings (Photo #20) spaced on the mast 1-3/8" apart such that the centerline of the boom is 2" above the deck. Attach the vang to the main boom using a small screw eye or a small piece of 1/16" thick aluminum or carbon fiber sheet, bonded into a small pre-cut slot along the bottom of the boom. (Photos #26 & #27)

Note: If you prefer, the 8mm carbon fiber mast fits nicely into the kit-supplied black plastic mast base sleeve. This allows use of the kit-supplied vang and gooseneck assemblies. However, the kit-supplied vang assembly should be rigged with a non-stretch material such as stranded stainless steel wire rather than the braided nylon line.

Boom Vang Assembled (#26)



Boom Vang Installed (#27)

Ball Link (#28)

Kwik Link (#29)

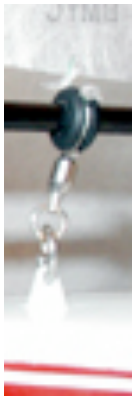
G. <u>Main & Jib Booms.</u> These are also available from Hang-Em-High (CT1570 (4mm) X 29.5" long) or go to your nearest archery shop and buy a couple of carbon fiber arrow shafts. Sometimes you can find damaged ones that the store is throwing away. You can't beat "FREE". Be sure to follow the Class Rules and cut them to the right lengths.

H. <u>Main Boom Attachments</u>. This is a matter of personal taste. Some skippers prefer to use small rubber grommets that slide along the boom for adjusting the main's outhaul and the main sheet. Glue a small brass tube with collar into the end of the cf boom to reinforce and prevent the boom from splitting on the end. Then drill a 1/16" hole vertically through the end of the boom for the outhaul. Attach a cord from the main's outhaul through the boom to the sliding rubber grommet. You will have plenty of instant adjustment whenever needed. (Photo #30)

I. <u>Jib Boom Attachments</u>. Use the same techniques on the jib boom. A standard cf arrow shaft has a metal tip, which is used for the front end. Drill two horizontal cross-holes for the jib stay and the jib halyard as far forward as possible. Reinforce the other end with a brass insert and drill a vertical hole near the end for the jib's outhaul. For the jib swivel, use a ball-bearing sst. fishing swivel (Photo #31A) with a hook to the eye-bolt on the deck and attach the other end to a rubber grommet with a Dacron cord. Use rubber grommets for adjustment of outhaul, the jib sheet adjustment as well as the location of the jib swivel. (Photo #31) **Note:** *The entire rig (with sails installed) may be unhooked and removed for traveling if necessary. If you do this, store your rig in a flat box, well protected from creasing, dirt or other damage to the sails*.

Main Boom Attachments (Photo #30)

Jib Boom Attachments (Photo #31)



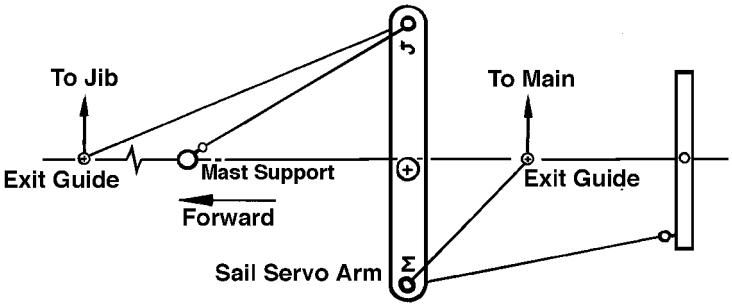
Swivel (#31A)

J. <u>Sheet Adjustments</u>. The most common way to adjust sheets is to use a bowsie linked at the end of the main or jib sheet with a wire clip attached to a small Screw-Eye on the boom. Here is another way, which eliminates both the bowsie and the screw-eye. Use another sliding rubber grommet tied with a small cord fed through 3 vertical holes in the boom with the other end tied to a small brass sleeve, or something that won't go through the hole in the boom. Connect the main sheet with wire clip to the last loop under the boom. This gives ample adjustment quickly…and won't slip. (Photo #32)

Sheet Attachment to Boom (Photo #32)

K. <u>Sheet Arrangement.</u> Below (Figure #33) is the standard method of using a double throw winch arm in the Fairwind. We recommend you obtain a strong very light weight line for the sheets such as DYNEEMA white 04mm rigging line available from GBMY (See APPENDIX).

<u>NOTE:</u> Many local Bakersfield sailors prefer that the Sheet Exit Guide for the mainsheet be located in the middle of the Hatch Cover, rather than the kit location as shown in Photo #30. Moving the boom connection farther out on the main boom provides less stress on the sail servo when close-hauled and makes for a better sheeting arrangement.



Sheeting Arrangement #33

L. <u>Adding Ballast</u>. Once you have finished building your Fairwind, assemble it completely as if you were actually going to sail it; including ALL rigging, radio equipment, and batteries. Place the completed boat on an accurate digital scale. Subtract the weight of your completed Fairwind from 8 pounds; this difference is how much ballast must be added to the keel. Obtain some No. 4 or 8 Hard Lead Shot from a local gun shop and some 30-minute epoxy. Remember to allow for the weight of the epoxy in calculating the ballast.

In order to keep the ballast weight down low and as far forward as possible, place the hull in a cradle with the bow tipped DOWN AT AN ANGLE OF 30 DEGREES. Pour the pre-measured lead shot into the keel and shake until the top surface of the shot is flat (at a 30 degree forward angle). Mix the epoxy and pour it over the lead shot. Work the epoxy down into the lead by repeatedly squeezing (gently) the keel from the outside and shaking the hull slightly. When the epoxy starts to cure, the keel will begin feeling warm. At this point, place the hull into a sink, swimming pool, or other large container of water to keep it cool. (The heat generated by a large volume of curing epoxy can easily distort the ABS plastic hull.)

Here is approximately what your Fairwind should now weigh and what you need to add:

Hull & Hatch Cover with everything installed, plus add a set of 4 AA batteries……	3 lbs. 8 oz.
Rigging & Sails……	4 oz.
Ballast to add (Mixed with epoxy)..……	4 lbs. 4 oz.
TOTAL MINIMUM WEIGHT……..….....	8 lbs. 0 oz.

V. SAILS

Sails are your ENGINE. Sail shape is by far the most important factor in determining the speed potential of a Fairwind. The Fairwind kit sails are made from single panels of nylon ripstop. These sails have extremely poor shape, and the nylon fabric is far too heavy for a model yacht the size of a Fairwind. If you are interested at all in racing, and maybe winning a few races, then you need a good suit of custom-made multi-paneled sails made from a lighter fabric. There are a number of excellent sailmakers throughout the world. However, the top seven competitors in the 2004 Fairwind National Championships all used sails from Chuck Black of San Diego. Interestingly, Chuck's custom sails for the Fairwind cost LESS than a replacement set of stock kit sails! (See APPENDIX)

VI. TUNING

This construction guide does not cover the art of tuning a model yacht for racing. However, the proper setup and tuning of a racing Fairwind are critical in achieving maximum speed potential. There are several good sources for this information on the internet. Check out: The Fairwind Website (www.fairwind900.home.comcast.net); The Model Yachting Resource Center (http://www.myrc.org/); AMYA (http://www.amya.org/); RC Sailing (http://groups.msn.com/RCSailing/); and The Windpower Discussion Site (http://center-of-effort.com/windpower/index.php).

VII. CONCLUSION

Hopefully, this guide has been helpful to you in constructing your 'Racing Fairwind.' The methods and materials described in this guide have been 'tried and tested' in the real world in Bakersfield, CA and found to produce a championship quality Fairwind. But, it is rare for a model yacht to be a winner 'right off the workbench.' Remember that one of the most important attributes of a competitive model yacht is 'reliability.' There is always a 'shakedown' period where a newly constructed model yacht will exhibit its weaknesses and defects. During this period, components may have to be adjusted, altered or even replaced, rigging redone, or methods rethought. True performance will only be achieved when a desired sail setting and rudder position can be repeatedly reproduced, at will, WITHOUT MALFUNCTION. This is why SIMPLICITY is so important; the simpler your rigging, sheeting and controls are, the more reliable (and fast) your Fairwind will be!
Don't forget the three basic rules for winning races, (1) Practice, (2) Practice and (3) Practice. Just having a fast boat is not the only thing needed to be a champion.

So have fun and win some races.

VIII. APPENDIX

RESOURCE GUIDE
This is not a complete list of everything needed to build the "Bakersfield" Fairwind. Additional items, such as spray paint, epoxy, wood laminate, screws, nuts and other items are also necessary.
(Of course, prices are not guaranteed and subject to change without notice)

ITEM DESCRIPTION	Photo #	Vendor	Part #	Price
OPTION I – COMPLETE KIT:				
FAIRWIND, Complete Kit (w/o radio & servos)		B&F	KYO-40610	$179.99
OPTION II – INDIVIDUAL COMPONENTS:				
HULL & HATCH COVER	(Photos #1, 2 & 10)	B&F	KYO-FW1	99.99
RUDDER ASSEMBLY	(Photo #8)	B&F	KYO-FW22	9.99
RUDDER W/SHAFT ONLY		B&F	KYO-FW8	3.99
PLASTIC RIGGING PARTS – SET 'A'	(Photo #10)	B&F	KYO-FW16	9.49
PLASTIC RIGGING PARTS – SET 'B'		B&F	KYO-FW17B	3.49
RADIOS & SERVOS:				
FUTABA 2DR ATTACK 2-Channel AM Radio (Includes radio, receiver, S3003 Futaba Rudder servo and HiTec HS-765HB Sail Servo)		B&F	FUT/HRC-2	104.99
HiTec HS-765HB Sail Servo		B&F	HRC33765	49.99
SERVO STRETCHER – 180 DEG.	(PHOTO #18)	RZ	667730	14.95

HARDWARE & MATERIALS:

WATERPROOF SWITCH (Photos #14 & #15)	GBMY	451		8.00
RUDDER ARM with brass insert (Photo #13)	GBMY	388		1.90
4-40 THREADED ROD X 12" long (Photo #12)	Local		~	.50
4-40 SNAP CONNECTORS (Photo #12)	Local		~	1.00
TANGS, SST. (10 PER PACK) (Photo #19)	GBMY	199		4.76
THROUGH-DECK EYE-BOLTS (Photo #20)	GBMY	145		2.28
RIGGING SCREWS, SINGLE ENDED (Photo #21)	GBMY	131		5.17
BOWSIES, SAILSETC (10 Pack) (Photo #22)	GBMY	199		4.76
4-40 TURNBUCKLE R/L hand threads	Local		~	2.00
4-40 Ball Link X 2mm bolt & nut (Photo #28)	Local		~	2.00
4-40 KWIK-LINK with safety lock (Photo #29)	GBMY	399		1.90
RUBBER GROMMETS 4mm tube (#30, #31 & #32)	Local		~	.20
SHEETS - DYNEEMA white 04mm line	GBMY	310		5.48
RIGGING - "Sevalon" #40WNA Nylon sst. & sleeves	Local		~	4.00
MAST - PULTRUDED CARBON FIBER 8mm X 60"	H-E-H	CT3150		9.25
BOOMS - PULTRUDED CF TUBE 4mm X 29.5"	H-E-H	CT1570		3.30
BLACK SAILS Fairwind "Test 505" fabric	BLACK			65.00

We estimate the total cost to build the "Bakersfield" Fairwind from scratch using OPTION II. - INDIVIDUAL COMPONENTS, listed above, plus the above hardware and materials, plus miscellaneous parts to be in the neighborhood of $380.00.

Vendor Codes Listed above:

B&F = B & F Hobby Shop: http://www.bnfhoby.com/
RZ = ROBOT ZONE:
http://www.robotzone.com/customer/product.php?productid=183&cat=0&page=1
GBMY = GREAT BASIN MODEL YACHTING: http://gbmy.com/
H-E-H = HANG-EM-HIGH: http://ecom.citystar.com/hang-em-high/ushop/index.cgi
BLACK = BLACK SAILS: (E-Mail) rcmdlboat@aol.com

MAJOR CONTRIBUTORS TO THIS MANUAL

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Third Place 2004 Fairwind National Championship Regatta
Third Place 2003 Fairwind Region 6 Championship Regatta

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First Place 2005 Fairwind National Championship Regatta
First Place 2004 Fairwind National Championship Regatta
First Place 2003 Fairwind Region 6 Championship Regatta

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Third Place 2005 Fairwind national Championship Regatta
Fifth Place 2004 Fairwind National Championship Regatta

Plus we incorporated many Bakersfield Model Yacht Club member's suggestions from trials, tribulations, practice and actual racing their Fairwinds.