Almaguin 500, Almaguin 400

Designs #002 and #003 by Matthew B. Marsh http://www.marsh-design.com

Vessel Description

The Almaguin 400 and 500 are versatile 4- and 5-metre utility runabouts, designed with cottagers, anglers and day trippers in mind. When heavily loaded (415 and 190 kg "official rated" capacities, respectively), they are versatile working boats, capable of hauling heaps of crew and gear on inland lakes and rivers. After offloading the cargo and surplus crew, and opening the throttle, they act more like racing hulls- capable of towing waterskiers and pushing 30-knot speeds in flat water. (Being high-sided, they present too much windage to keep up with real racing hulls in calm water.) They are built in taped-seam plywood, and do not require elaborate jigs or high-precision carpentry.

The design was inspired by Phil Bolger's Diablo, a simple, practical and well-performing boat that has served me well for many years. The Almaguin is designed to offer similar performance and carrying ability to the Diablo, with a drier and more comfortable ride in rough conditions. The construction methods used for this boat will be familiar to anyone who has worked with stitch-and-glue construction or the "tack and tape" models from Bolger's "instant boat" series. Unlike typical stitch-and-glue construction, the panels of these boats are not stitched together with wire; they are tacked to the bulkheads one by one as the hull is assembled. The structural bulkheads form the only building jig required, and remain a part of the finished boat.

The Almaguin hull is of a double-V configuration; it can also be thought of as a deep-V with a shallow-V pad. When lightly loaded at rest, the Almaguins will feel a bit tippy, and will roll 10 degrees or so as people move around and get in and out (they are, however, very hard to roll past this angle). As they are loaded down, the outer chines become immersed, and the roll will diminish. The entry is relatively sharp, there is more freeboard than usual for boats this size, and the motor well presents an effectively full-height transom to a following sea; thus, the Almaguin should be somewhat drier and more comfortable in heavy conditions than a typical aluminum skiff of comparable dimensions.

As the hull accelerates to planing speeds, both the inner 7-degree V and the outer 26.5-degree V will act as planing surfaces; the net effect is performance at low planing speeds that is comparable to what you would get from an ordinary 15-degree deep V hull. There will be a noticeable planing hump as the boat climbs over its bow wave. If the Almaguin is lightly loaded, the water will begin to break away from the inner chine as the hull accelerates. The boat is now running on the relatively narrow 7-degree V, with a considerable improvement in top speed; the outer V now serves as a raceboat style anti-trip chine. In turns, she will bank inward and ride on the outer V.

The Almaguin 400 is just about the largest boat that can be comfortably car-topped (although a trailer is preferable), and it'll fit (barely) in the bed of a full-size pickup with the tailgate down. The Almaguin 500 needs a trailer, but can be towed by virtually any small car. Appropriate engines are 20" shaft outboards from 7 to 30 hp (20 hp if tiller steered) for the Almaguin 400, and 15 to 60 hp (40 hp if tiller steered) for the Almaguin 500, the middle of those ranges being generally ideal.

A first-time builder assembling the boat in his spare time should allow four to eight months for the build; an experienced, motivated builder familiar with taped-seam construction will likely find that she can produce an Almaguin hull in seven to ten working days, possibly less.

Build Instructions

Materials

The 5 m version requires, at a minimum:

- Three sheets 4' x 8' x 12mm (1/2") plywood
- Two sheets 4' x 8' x 9 mm (3/8") plywood
- Five sheets 4' x 8' x 6 mm (1/4") plywood
- 90 metres (98 yards) of 300 gsm (10 oz) fibreglass tape, 4" to 6" wide
- 30 square metres (36 square yards) of 300 gsm (10 oz)10 oz fibreglass cloth
- Epoxy resin and hardener to make 46 L (12 gal) mixed
- 7 litres high-strength filler (eg. colloidal silica)
- Microballoon fairing filler as desired
- Four clear-grained 1" x 2" x 18' for gunwales
- Two clear-grained 1" x 2" x 16' for spray rails
- Additional 1" x 2" stock for cleats and local reinforcement- three or four 8' lengths
- One 2" x 8" x 5' for motor mount
- Minimum 210 L buoyancy foam

The 4 m version requires, at a minimum:

- Two sheets 4' x 8' x 12mm (1/2") plywood
- Two sheets 4' x 8' x 9 mm (3/8") plywood
- Four sheets 4' x 8' x 6 mm (1/4") plywood
- 70 metres (77 yards) of 300 gsm (10 oz) fibreglass tape, 4" to 6" wide
- 17 square metres (20 square yards) of 300 gsm (10 oz) fibreglass cloth
- Epoxy resin and hardener to make 30 L (8 gal) mixed
- 6 litres high-strength filler (eg. colloidal silica)
- Microballoon fairing filler as desired
- Four clear-grained 1" x 2" x 14' for gunwales
- Two clear-grained 1" x 2" x 12' for spray rails
- Additional 1" x 2" stock for cleats and local reinforcement- three or four 8' lengths
- One 2" x 8" x 4' for motor mount
- Minimum 150 L buoyancy foam

Additional glass tape and wood will be required if you want to build a complex interior with consoles, storage bins and such. You can save about 4-8 square metres of cloth and 4-8 L of epoxy if you're omitting the extra layer on the hull bottom and the layer on the inside; this will result in a slightly lighter, but less durable boat. If you're going to beach the boat, drag it up on shore, or carry stuff that might damage bare plywood, it's better to put these extra layers on while you're building it.

Suitable plywood should be solid, free of internal voids, and laminated with a glue that passes the boil test (no bond weakening when a sample is soaked in boiling water for an extended period). All marine structural plywoods are acceptable. In some areas, plywood rated as AB or AC exterior, or MDO sign-painter's plywood, might be of sufficient quality for this boat. If in doubt, try boil-testing a sample of it (if the glue weakens after boiling, it's not boat safe), and check the cut edges for evidence of voids or cracks (both of which are bad). European 125x250 plywood is a bit larger than North American sizes, so builders

using this size may have slightly larger scraps and offcuts at the end (the plans are drawn for 4' x 8' North American sheets).

The gunwales and spray rails should be clear-grained timber of any reasonably durable, locally available species. Since they serve a structural role and must be bent to shape, knots should be avoided. It may be necessary to scarph several pieces together to form suitable clear lengths. The motor mount board can be of ordinary construction-grade lumber, although significant knots should be avoided.

Any epoxy laminating resin formulated for use with wood and fibreglass should be suitable. Polyester and vinylester resins do not adhere well to wood and should not be used for this project. The fibreglass tape and cloth should be of an epoxy-compatible type; some have coatings that are not epoxy-compatible, so check with your supplier.

And, of course, don't forget to budget for lights, cleats, seat cushions, a good bilge pump, fenders and mooring lines, and all those other little bits that get tacked on in the final weeks before launching.

Panel Joining

It will be necessary to join several of the plywood panels end-to-end, as shown on the plans. The usual way of doing this is with a scarph joint, and the plans are drawn to allow for a scarph ratio of 10:1 (8:1 is typically adequate, though). Scarphs can be tricky to cut, and an easier method is to use butt blocks. If you choose to join panels with butt blocks, the blocks should be cut from plywood one size thicker than the panel they are joining. They should be roughly 25 cm wide and should stop 5 to 7 cm from the panel edges, to allow room for seam taping. (For chine panels, a block the full width of the chine panel should be used.) Butt blocks should be glued with epoxy and clamped securely while the epoxy cures, making sure that they're on the inside face of the panels- if you're using this option, it's probably best to trace out your panels first, before making the butt joints. If you have the ability to clamp an entire 4' wide joint flat, it is also possible to directly butt the panels, with fibreglass tape set in epoxy on each side of the joint. This method requires considerable pressure to hold the panel edges flat while the epoxy cures.

Panel Layouts

To copy the dimensions of the bulkheads onto the 12 mm plywood, use a tape measure, a straightedge and a large framing square to locate all the points marked on the plans. You'll probably have to draw a vertical reference line at the edge of each bulkhead from which to copy the measurements. These points can then be joined with a pencil and straightedge. In particular, note the depth of the transom where the motor will be mounted; the dimension given on the plan is suitable for most 20" long-shaft motors, but some ('90s OMCs, for example) might have slightly longer-than-standard shafts. If you already have your motor, measure its shaft and set the depth of the transom cutout so that the anti-ventilation plate will be at the level of the keel.

The curved side, chine and V panel edges are all copied to the plywood in the same way, point by point. Starting at one end of a plywood sheet, mark off the grid positions (300, 600, 900, 1200, etc.). Then, at each grid station, measure from the edge of the sheet and mark the distances shown on the plans. Drive a finishing nail partway into the wood at each marked point, then wrap a long batten (1/2" wood or plastic extrusion works well) along the curve, to the outside of the nails (it probably won't lie perfectly fair, so wiggle it around a bit and hold it with weights so it forms a fair curve). The face of the batten that is touching the nails and pointing towards the panel, then, represents the edge to cut, and can be traced with a pencil. Don't forget the convexity at the bow end of each panel! Make sure to mark the frame positions on the side panels (the frame position marks represent the front face of each bulkhead). After cutting out one panel, you can use it to trace its mate onto the remaining plywood.

The stem is laminated from plywood to a thickness of 24 mm (1”). You only need to mark out one segment of the stem, using the same points-and-batten method described above; the remaining layers can be obtained by tracing after you have cut the first piece (the outermost layers should be solid, the inner ones can be broken up as long as the seams don't line up). The stem's outer edge is not a continuous curve; it is divided into three sections (one where the inner V will meet it, one for the outer V, and one for the sides). Each section should be traced in a separate sweep of the batten, and the short horizontal sections shown on the plans will join them. These discontinuities ensure that the thicker inner V panels will be in line with the thinner panels higher on the stem, so the final bow is a continuous curve. The stem bevels will be cut to a different angle for each panel. The inner edge of the stem (the side pointing into the boat) is not critical- simply make sure it is the correct thickness at the frame position markings (and draw these on the stem) and trace a fair curve. Mark the frame positions (again, representing the forward face of the bulkheads) on the stem.

A circular saw, set to a shallow depth and equipped with a fine-tooth crosscut or plywood blade, works well for cutting most of the parts. Keep the saw kerf to the outside of your marked lines. It may be necessary to use a jigsaw for the sharply curved stem segments and for the limber holes in the bulkheads. The panel edges do not need to be bevelled. If you are planning to cut down the bulkheads later, you can make a short cut on each side at the appropriate height (large enough to fit your saw in once the hull is assembled). Do not cut down the bulkheads, or cut out any lightening or access holes in them, until the hull has been assembled.

Fibreglassing Techniques

Plywood has a tendency to soak up epoxy resin. This can be troublesome if you don't plan for it; for example, the edge grain of a sheet can suck resin out of an epoxy fillet, leaving a dry, stiff mix that is hard to work and doesn't bond well. It's best to wet out joints (and panels) in stages: begin by applying a thin coat of unthickened epoxy, which will soak into the wood over a period of several minutes. Edge grain might need a bit more epoxy after a few minutes. Now, mix and apply the thickened epoxy (blend colloidal silica or another strong filler into the epoxy so that it's about as thick as soft peanut butter), using a shaped piece of wood or plastic, or a flexible spreader, to create a smooth fillet along the joint. Once the fillet begins to 'kick' or gel, press the fibreglass tape onto the wet fillet (lightly, so you don't distort the fillet) and brush on just enough resin to wet out the tape. If air bubbles appear, gently work them out towards the edge. When glassing large areas, you should once again prime the area with epoxy first, and wait several minutes for the wood to soak it up before laying down the cloth. Use only just enough resin to completely saturate the cloth; you'll smooth out the textured surface with fairing compound later. Excess resin just adds weight and wastes money.

Construction

Begin by laminating the stem. The outer layers should be continuous, and the smaller segments used as core layers. The stem must be kept flat while the epoxy cures; placing it on a flat floor and weighting it down should work. Once the epoxy has cured, you will need to cut the stem bevels, as shown on the plans. A bandsaw is ideal for this, but a jigsaw can be used if you are patient and have a steady hand. The stem bevel is different for each panel, so three different angles need to be cut. The transition between bevel angles is at the little horizontal jogs you marked while tracing the stem.

The next step is to glue the 2x8 motor mount board to the inside face of the transom with epoxy. It should stop short of the actual transom edge so that there is room to tape the corner seam. It is important to keep the transom flat while doing this, so that the transom does not warp.

Before progressing any further, it would be wise to add temporary "legs" of scrap lumber to the tops of the intermediate bulkheads, and to provide a level spot on the floor for them to rest. These will support the upside-down boat as you assemble the hull. The temporary legs should extend roughly 40 cm above the tops of the bulkheads, bringing the upside-down hull to a comfortable working height. If you're working alone, you may wish to attach these legs to a sturdy backbone frame; this alleviates the need for an assistant to help hold things in place as you bend the plywood panels.

The hull assembly begins with the joining of the side panels and the transom. The side panels will need to be temporarily supported, and should be lightly tacked to the transom edges with finishing nails. (If you have used butt blocks, make sure they face inward!) Make sure everything is square and symmetrical, then fillet and tape both sides of the transom-to-side-panel joints.

Once those joints have cured, the rest of the bulkheads can be installed. Align the forward face of each bulkhead with the corresponding mark on the side panels, and tack the side panels to the bulkheads with finishing nails. If the panels try to pull away from the bulkheads, you may wish to add temporary 1x2 cleats and wood screws. The boat will now be resting, upside-down, on the temporary legs you attached to the intermediate bulkheads.

The stem can now be fitted, aligning the marks on it with the forward faces of the bulkheads. Tack it lightly in place, for now. Pull the side panels inward and align them with the stem, making sure to keep this assembly symmetrical, and secure the side panels to the stem with screws (the panels will be very springy, and will try to pull away from the stem). You will probably have to wiggle the stem around a bit to get it to line up properly with both bulkheads and with the side panels.

At this point, you should make sure the hull is straight and has no twist. A laser or water level can be used to verify that both corners of the transom, and the tip of the stem, are at the proper heights. Also, measure from each corner of the transom to the tip of the stem; this measurement should be identical on both sides. Now work some epoxy into the joint between panels and stem, and between stem and bulkheads.

The remaining hull panels are simply draped over the bulkheads, and lightly tacked down with finishing nails. It might be necessary to shave a bit off the edges in some spots, depending on how precise your cuts have been. Considerable effort may be required to twist them into position near the bow; make sure they are secured well enough that they will not pop free! The chine pieces will not reach all the way to the bow, and must be secured to the adjacent panels with wire stitches or zip ties at their forward ends. Do not worry about the small gap they leave near the bow- the fibreglass can easily bridge it for now, and it will be filled from the inside later.

Once all the panels are in place, verify once again that the boat is straight, symmetrical and not twisted. Then fillet and tape all of the exterior seams. Use two layers of fibreglass tape on the keel. Each chine (two adjacent joints) requires three strips of tape- one to span each joint out to the big panel, and one to connect the two joints.

The next step is to glass the entire exterior of the hull. This is a messy step, but a necessary one; the exterior glass serves an important structural function, and protects the plywood from abrasion and checking. On the four-metre boat, one layer of 10 oz cloth set in epoxy is sufficient; the five-metre boat should get a second layer of 10 oz cloth over the entire hull bottom (outer chine to outer chine). In both cases, if the boat will see heavy abuse (such as getting dragged up on shore frequently, or being beached on concrete or gravel), one extra layer of cloth on the hull bottom is a good idea, although it adds about 10-15 kg. Omitting the extra layer will result in a perfectly serviceable boat, but one that is somewhat more likely to be damaged by beaching or other abusive service.

Fairing

If you plan to roll the hull only once, you should fair the underside now. Fairing the side panels serves a purely cosmetic function, and is optional. The outer V should be faired to a reasonably smooth surface, but is not critical. The inner V and inner chines, however, are very critical to the boat's performance and must be faired accurately.

A pre-made epoxy fairing compound can be used, or you can mix epoxy with microballoon filler to a smooth, easily spreadable but not saggy consistency. (Don't use car body filler, it won't stick to the hull for very long!) The mixture should be applied to the hull and spread into a thin, smooth layer with a wide, stiff trowel. Once it has cured, it can be sanded, and another, thinner layer of fairing compound can be applied if necessary. This process repeats until you either achieve the finish you desire, or say "enough of this, let's move on".

The critical inner V should be faired smooth, so that there is no evidence of the fibreglass texture. At high speeds, the water must break cleanly away from the inner chine, so it should be faired to a sharp edge. A slight reverse chine (ie, build it up a bit at the sharp edge) is desirable; make sure it's the same on both sides so that the boat will track straight at high speeds.

Interior Structure

The boat should now be flipped right-side-up. It will be too heavy, and the structure still too weak, for one person to do this alone. A couple of fresh pizzas should attract enough friends and neighbours to make the turnover an easy 15-minute job. If you have a trailer, now is a good time to place the boat on it; if you don't have a trailer, the hull should be shored up with timber blocking and soft padding so that it is stable and secure.

Epoxy fillets and tape should be applied to the inside of the chine and keel joints, and to both sides of the bulkhead-to-hull joints, in the same manner as for the outside. Fillets should be smooth, and should extend roughly 20 mm to each side of the joint while being about 10 mm thick in the middle. Don't fillet or tape the bulkhead-to-side-panel joints on bulkheads you plan to cut down. A fairly large fillet, with a couple of layers of tape, will be needed on each side of the stem; also add extra fibreglass to the stem in the area where you will be mounting the bow eye. The keel joint needs to be beefy, especially so in the 5 m version, and three layers of glass tape should be used here.

If you want this to be a long-lived boat, you should glass the inside surface of the hull from outer chine to outer chine with one layer of 10 oz cloth. This should be done in the fuel tank bay and in all areas where people will walk. This will greatly improve abrasion resistance, and reduce the chances of spilled fuel or water soaking into the plywood. It's not structurally necessary, though.

The gunwales and spray rails are made from 1x2 stock. It may be necessary to splice together several pieces to get a suitable clear-grained length. Start at the stern, and use screws from the inside as well as epoxy to secure the spray rails and gunwales. Wrapping the wood with towels or rags, then soaking these with hot water, can help soften the wood enough to force it into the proper curve. The usual gunwale consists of one 1x2 on each side of the plywood; a more traditional look can be had (with a bit more work) using spacer blocks cut from 1x2 stock between the plywood and the inner gunwale.

It is now time to install the motor well. The motor well sides are important structural members (they transfer the engine thrust to the hull) and cannot be omitted. It is possible, but Not A Good Idea, to leave out the motor well. Even a tiller-steered boat should include the motor well; the bulkhead forming the forward face of the well can be cut down slightly to accommodate the tiller, although the boat's power and

load ratings will be decreased if this is done. The motor well sides are filleted and glassed just like the bulkheads. If you plan to fit a drain plug, cut a half-pipe from 4" plastic pipe and glue it to the hull bottom under the motor well, to form a passage for water to get from the interior to the drain plug. (It's perfectly OK to omit the drain plug, and it's likely that you'll never miss having it.) Some small blocks of 1x2 wood, attached to the motor well sides, will be helpful when installing the bottom of the motor well.

The space under the motor well, and to either side of the motor well, should be filled with low density closed-cell foam in order to meet small-craft level flotation requirements. (About fifty litres or so of foam should also be installed somewhere low near the bow.) At least 210 L of foam for the 5 m boat, and 150 L for the 4 m boat, are needed to meet the legal minimum requirements for swamped flotation. Styrofoam is one option; there are also many poured or injected foams that are suitable. Don't use anything that could absorb water.

Once the foam is in place, the motor well bottom and the quarter knees can be glassed in place, along with the aft bench in the 5 m version. The cutout for the 5 m version's fuel tank bay can also be made now; its lower edge should be reinforced with a couple of 1x2s extending well past the cutout. (Should you choose to install a fixed tank and not make the cutout, this bay becomes a closed space, and additional fire protection regulations may apply.) A drainage hole through the transom should be made in each aft corner of the motor well, and these holes should be lined with epoxy to protect the wood.

Interior Layout

Everyone has their own preferences for interior layout. Some might prefer a small centre console, others a large centre console, a side console, tiller steering with lateral bench seats, tiller with longitudinal benches.... the list goes on. Some possibilities are shown on the following page, but this is by no means an exhaustive list. No particular interior layout is specified in the plans; you are free to do whatever you wish, so long as the bulkheads are not completely removed. At least 120 mm of solid bulkhead must remain below whatever you cut out, and the cut edge must be reinforced with a 1x2 on each side, extending well past the cut-down section (as shown on the Details page of the plans). It is OK to cut down the bulkheads in such a way as to leave the top two-thirds of the side panels unsupported; if you do this, the cut-off part makes a nice bench seat to fit that bulkhead. (Start these cuts before assembling the hull, if this is what you plan to do!)

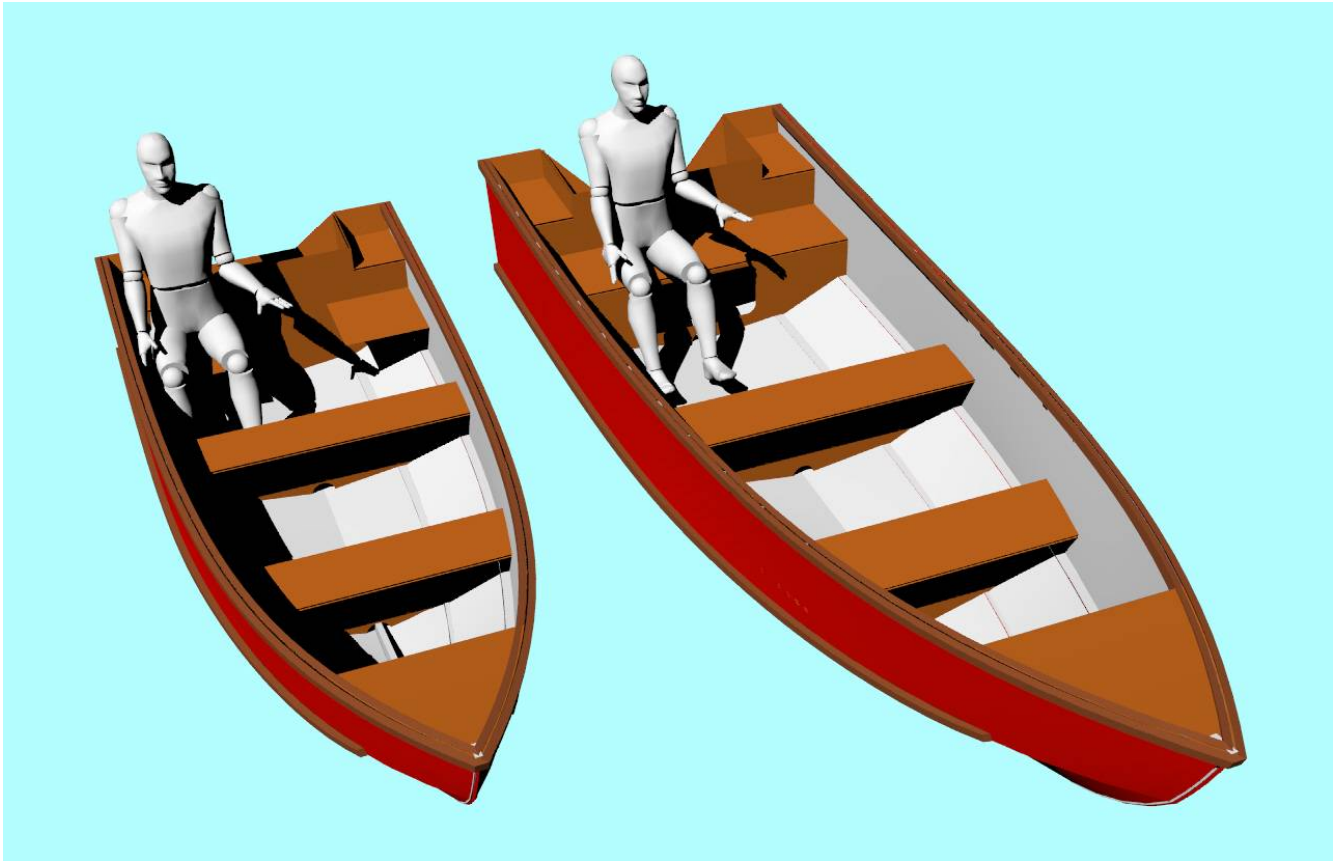
It's best to measure the pieces for your interior from the actual hull, rather than from the plans. Slight deviations from the plans inevitably creep into the finished product, and you'll get better-fitting parts (and a better idea of how your layout will work) if you mock it up in the actual hull. The same fillet-and-tape technique used for the hull and bulkhead joints can be used for the interior, or you can revert to more traditional carpentry if you prefer.

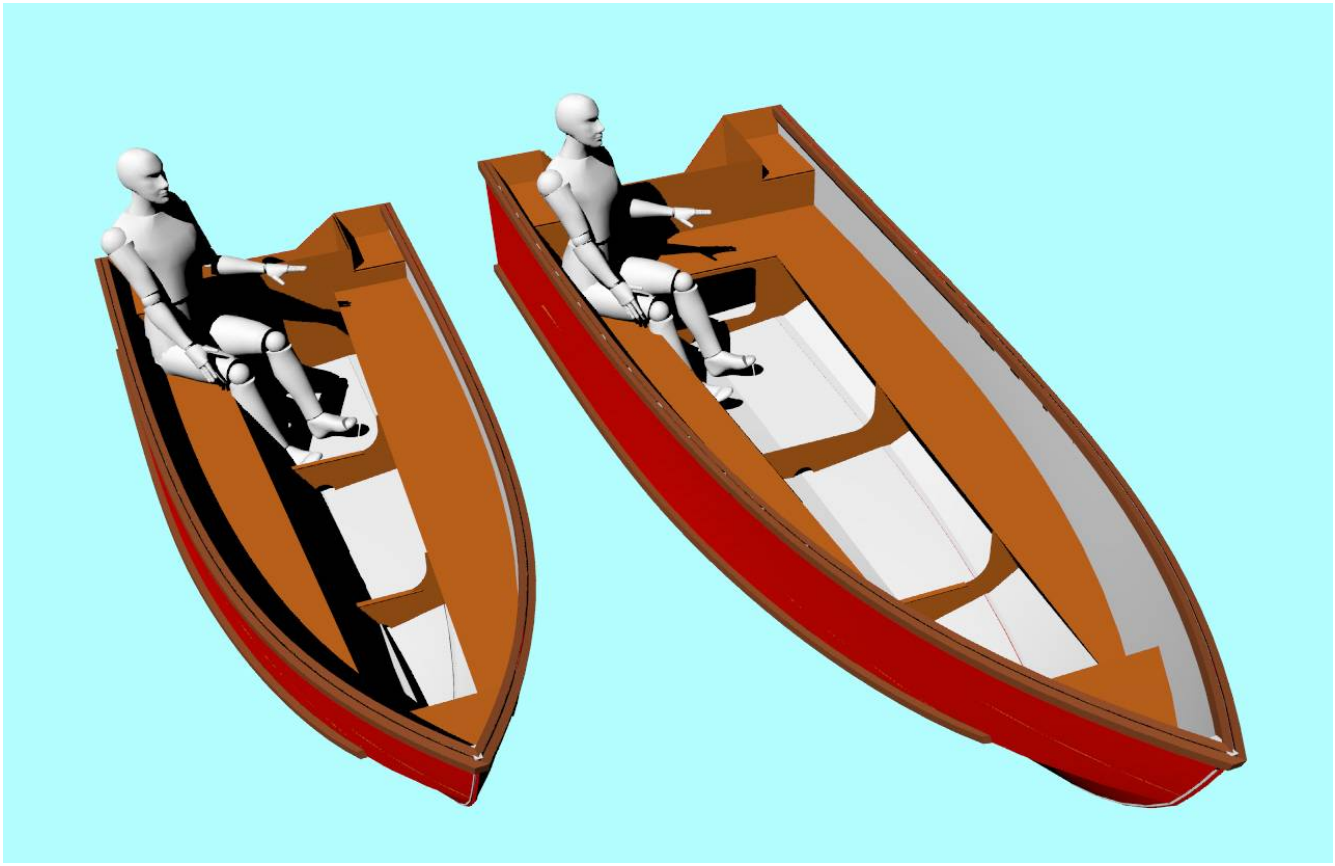
A remote steering station is highly recommended if you will be using larger engines or if you will be frequently single-handing the boat in windy weather. The Almaguins have much more freeboard in the bow than common aluminum utility skiffs do, and they may be hard to dock in a crosswind if the crew and engine weight is all in the stern. Remote steering is a bit more expensive, but it moves the crew weight forward and makes it easier to handle larger engines (remote steering adds about 10 hp to the 400's maximum power rating, and 20 hp to the 500's rating).

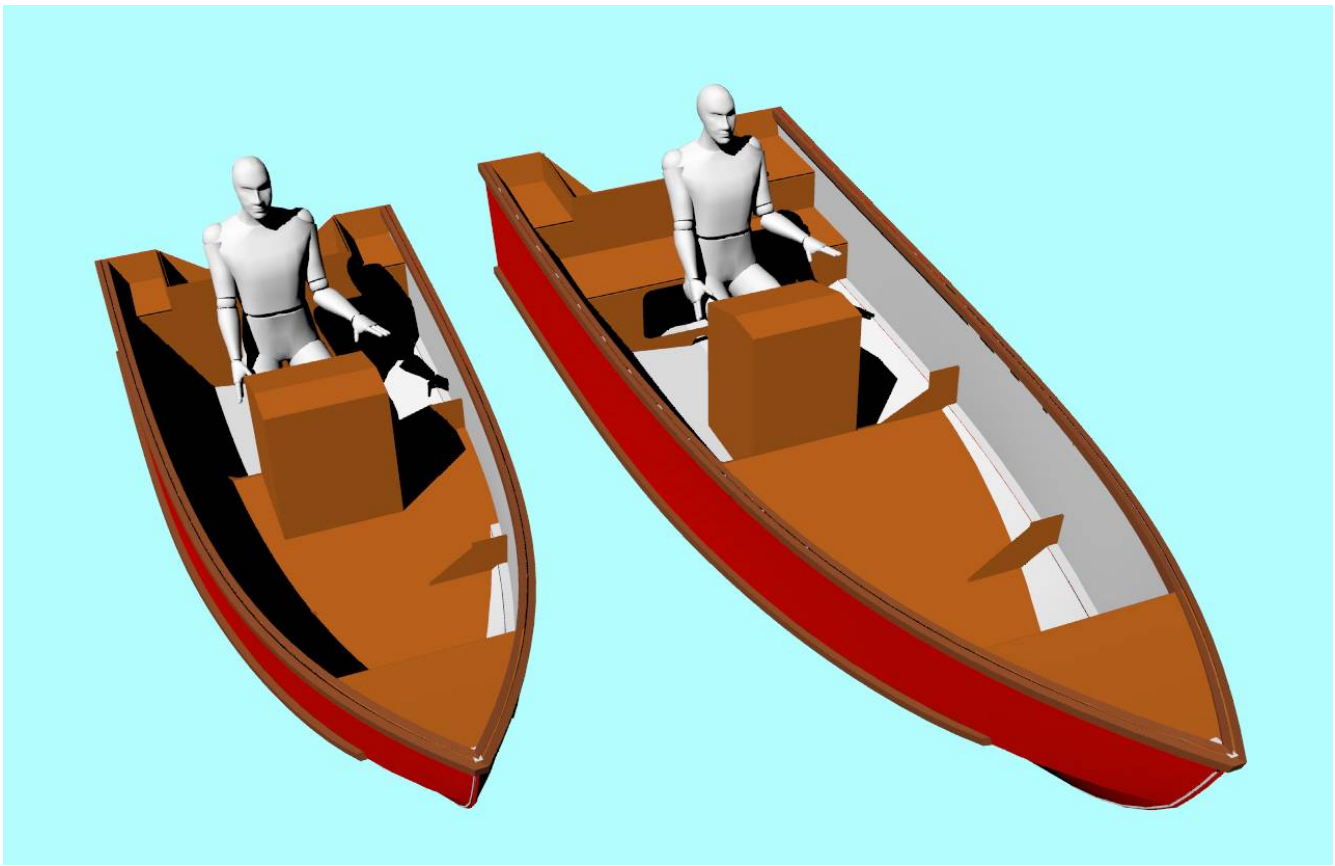
You may decide to fit a foredeck, or you may prefer to put a triangular seat or shelf in the bow. If you put a seat in the bow, it should be sloped aft at a 3 to 5 degree angle so that water drains aft and does not pool on the seat. Remember to put about fifty litres of flotation foam low in the bow. It's even possible to put in a small cabin, if you so desire, but don't make it too high- 30 to 40 cm above the gunwale is as high as a

cabin can be without adding excessive windage. If you're planning long-range cruising in the Almaguin 500, you might consider an aft cabin with a forward steering station. Be creative!

Whatever you decide to do with the layout, it is a good idea to have enough storage space on board for four or five lifejackets, a couple of paddles, fenders, an assortment of ropes, a few bottles of engine oil, sunscreen, etc., the ship's papers and emergency signalling gear, and a 5 kg anchor with a hundred feet or so of anchor rode. Moving such items from the car to the boat at each launching, then back again, gets tedious very quickly.







Finishing

If you haven't yet faired the underside, now is the time to flip the boat upside-down again. (If you already faired it and don't want to flip it again, you'll have to prop it up high enough to reach underneath for painting.) Fairing the inner V and inner chines is critical, even if you don't plan to fair the rest of the hull.

Scrub the outside of the hull clean with acetone or whatever solvent your paint supplier recommends, then prime it with the appropriate primer. Hopefully, by now, you've settled on a paint scheme. If you're going to paint a waterline and boot top, measure the appropriate depths at the transom, and with the boat propped up appropriately, use a laser level or water level to transfer these depths to various points along the hull.

Antifouling paint is not required for a trailer-dwelling boat, although it might be desirable if the boat will spend most of its time sitting at a dock. For the topsides (and the underside of a trailer boat), ordinary exterior house paint will suffice; you are of course free to use shinier, pricier (and longer-lived) yacht paints if you prefer.

Any parts of the interior where people will walk should be given a non-skid finish. Silica sand, sprinkled liberally on the first coat of wet paint, works well. Whatever doesn't adhere can be vacuumed up, and the second coat of paint locks it down nicely.

The boat should be fitted with a bow eye. Drill a slightly oversize hole through the stem in the area you reinforced earlier for this purpose, and use a thin stick or straw to line the hole with epoxy. Then drill it again, to the proper size. (Normally, you'd overdrill to perhaps twice the nominal diameter- here, though, you need to keep the hole relatively small so you don't weaken the stem.) The bow eye will need a beefy metal backing plate, and should be well bedded with 3M 4200, Dolphinite, or another bedding compound.

A pair of stern eyes should be fitted. They are installed in a similar manner to the bow eye, and should be located close to the outer edges of the motor well. These are needed for towing and for tying the boat down to its trailer. Additional cleats, oarlocks and such can be mounted to the gunwales.

A small aluminum or stainless-steel L-angle, affixed to the bottom edge of the spray rail, will greatly improve the rail's damage resistance when it gets tossed against low docks by wind and waves.

Many motors require mounting bolts to be installed through the transom. The holes for these bolts should be drilled oversize, lined with epoxy, and then redrilled, in the same manner as the holes for the bow and stern eyes. The motor mounting bolts should be given large, beefy washers and backing plates. You should set the motor height so that when it is fully trimmed in (closest pin, or hydraulic ram fully retracted) the leading edge of the anti-ventilation plate is level with the keel.

A strong swimmer will be able to roll the Almaguin 400 far enough to climb back aboard over the side. This will be extremely difficult on the 500, or for weaker swimmers. A boarding ladder, or even just a small step and a handle on the transom, is a good idea on both boats.

The final step is to obtain a capacity plate and registration number from the local authorities. As the regulations vary from district to district, and from year to year, it is best to consult with your local Coast Guard or transportation department for the current requirements in your area. A wise builder will do this before starting, or early in the construction process, as there may be specific rules about flotation foam, fire protection, fuel tank ventilation, or other issues that are easier to address during construction than in a finished boat.