



## Materials List

### Materials

- nylon (or polyester) canvas skin: about 9 yards x 60" width
- Baltic Birch plywood, 9 ply 1/2" thick: about 1/3 of 5' x 5' sheet
- 1" x 1/8" aluminum angle bar: 16 feet ( 4 pieces 4' each)
- 1" x 1/16" aluminum angle bar: 4 feet
- 2" wide x 1/8" thickness aluminum strip: 4 feet
- 1/4" closed-cell-foam: 2 yards x 5' width
- various bolts, rivets, snaps, straps, buckles, zippers, etc.
- (total cost about \$200)

### Usage:

### Frame:

- Stringers and thwarts are strips of plywood.
- Thwart braces and gunwales are aluminum angle bar

### Skin:

- Deck and bottom liner are lightweight nylon canvas.
- Bottom skin is heavyweight canvas (nylon or polyester)
- Foam layer goes between bottom and liner.
- (the foam layer also serves as a ground pad when using the skin for sleeping while camping out)

### Skirt/Pack cover:

- Spray skirt is lightweight nylon canvas (with 1/4" foam between layers).
- Stretches over the 4' cockpit, opening at one end has 6" splash collar.
- The spray skirt doubles as the pack cover, so it has zippers and shoulder straps attached for that purpose.
- A fanny pack attaches to serve as a waist band, and can stay attached on the skirt-deck in front of the paddler for easy access to its contents (including water bottles on the belt).

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## Building Steps

The operations that went into building my PakYak were:

1. Working out and drawing up the design.
2. Obtaining a sheet of 1/2" 9-ply Baltic Birch plywood (this comes in 5'x5' sheets and it takes about 1/4 of a sheet to make one PakYak).
3. Cutting a piece of the plywood into 1" wide strips (I have access to a big table saw for this). There are also a few 2" wide pieces.
4. Cutting the strips to various lengths (I use a small cut-off saw).
5. Rounding the edges of the strips with a 1/4" radius router bit (I made a jig to do this on my drill press).
6. Drilling (and counter-sinking) bolt holes in the strips.
7. Varnishing all the wood pieces.
8. Obtaining some lengths of 1" aluminum angle bar (L-shaped), most 1/8" thickness, some 1/16" thickness.
9. Cutting the angle bar to various lengths (etc., including rounding some corners).
10. Drilling (and counter-sinking) bolt holes in the angle bars.
11. Obtaining needed bolts and nuts (and pop-rivets).
12. Assembling all the pre-finished members of the frame.
13. Obtaining a sheet of 1/4" cross-linked closed-cell-foam.
14. Obtaining lengths of nylon canvas and strong polyester thread.
15. Obtaining zippers, snaps, straps, buckles, etc.
16. Sewing the skin and spray skirt (mostly simple straight seams, I use my wife's sewing machine).

17. Adding snaps to the skin and gunwales (made of 1" angle bar).
18. Attaching the gunwales to the skin, and unfolding the frame inside the skin.
19. Waterproofing the skin (with Thompson's Water-Seal).
20. Obtaining a Sevylor double-bladed telescoping paddle (breaks down to 2').
21. Obtaining a suitable fanny pack.
22. Adding D-rings to the fanny pack for attachment to the carry harness.
23. Folding it all up and adjusting the harness to fit.
24. Trekking off to the nearest piece of water to try it out!

The above covers all the steps involved in the construction of my latest PakYak prototype. With a few variations, it pretty much applies to my previous model too.

I used 1" wide birch plywood strips for the frame of the previous model, but no angle bar. The gunwales are 1" square tubing. The stringers are 3/4" round tubing instead of plywood strips.

I could use tubing for the stringers in the new one, too, but it costs a lot more than the birch plywood and I wanted to limit my investment until I proved out the design. The aluminum tubing and the Baltic Birch strips weigh virtually the same (ordinary fir plywood is lighter than the birch, but not as strong). But the tubing would only bend under an impact that might break the wood. And the tubing requires very little finish work, compared to the rounding, sanding and varnishing that the plywood needs, so the final cost might just about balance out and give the tubing an edge.

Likewise I might want to use a heavier polyester canvas for the bottom instead of nylon. It costs a bit more, but it won't stretch when wet like the nylon does. I used heavier cordura nylon for skins before, but again I was experimenting with this prototype, and cutting costs, so I tried the lighter and smoother nylon packcloth.

Nylon canvas (both cordura and packcloth) is usually coated with urethane on one side, so it is waterproof enough for upper decks. But the water pressure on the bottom is enough to make it leak a bit. Usually I've glued the foam lining to the bottom skin with contact cement, but (another experiment) this time I didn't, as the design has the foam layer coming up above the water line. So I just waterproofed it with Thompson's Water Seal to keep water from seeping in between the layers. That works, but having the layers glued together is better, as that way a small tear in the outer skin won't result in a water seeping in after all.

Cost of parts adds up to about \$200 (more like \$300 if aluminum tubing is used for the stringers). If I was to build one to sell, I'd ask about \$1000 and figure I was offering a bargain rate for my labor and experience, but worth it to me as an incentive to refine the design and my manufacturing process.

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### Parts Costs

Plywood	\$15 (1/3 sheet)
CC foam	\$40
Aluminum	\$30
Cloth	\$24 - \$60 (depending on grades selected)
Hardware	\$20
Zippers	\$15
Buckles	\$10
Snaps	\$15
Fanny pack	\$15
Paddles	\$15
Shock cords	\$4
Varnish	\$5
Water Seal	\$5
<b>Total:</b>	<b>about \$200</b>

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