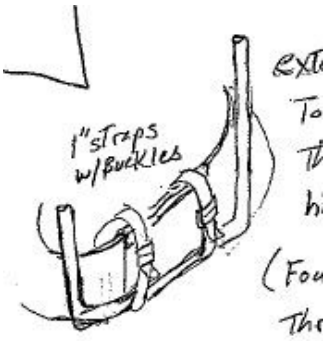
Chair-E-it Construction – Part 3 Hip Belt/Fanny Pack

Designed by Al Geist

Part 3 covers making the padded hip belt – fanny pack combination. Before we get into the construction of the hip belt, here is a little background on the design so you don't have to repeat my failures. The hip belt is the most important part of a backpack. It is critical to both comfort as well as weight transfer. I tried out several different ideas and went through five hip belt prototypes before settling on the one described in this article. The final design is a combination of the best features if each of the previous prototypes and is actually simpler and easier to build. Prototype 1 proved out that the lightweight belt material idea would work, but it's complicated attachment method, patterned after the Luxury-lite backpack was a lot of trouble. Prototype 2 was a test to see how a commercial backpack hip belt could be attached to Chair-e-it. I have a large 6000 cu.in. backpack with a removable hip belt. I took this hip belt (which I didn't want to damage or modify in any way so I could put it back after this test) and ran two short 1" straps with buckles around the belt and around the bottom tube just inside of the bottom shoulder strap mounts (see drawing from my notebook). Surprisingly, this attachment worked great. The bottom tube rode directly below the belt, pulled straight down, and did not press against my back. Prototype 3 copied the shape of the commercial belt using the lightweight belt material but added two slots 1" from the bottom of the belt for the attachment straps to go through. The idea was to raise the tube so that the padding of the hip belt would be between the tube and my back. This idea worked poorly. Yes the tube rested on the padding of the belt as it was supposed to. What I had not considered is that the tube being behind the belt exerted a torque on the belt, pulling the top of the belt out and pushing in on the bottom of the belt. This caused the belt to be uncomfortable to wear with the 35 lb loads I tested each prototype with. Moreover, the straps squeaked in the slots with each step. Prototype 3 was abandoned after 12 miles of tests. Prototype 4 went back to having the tube pull straight down under the belt and added a 3/8" aluminum channel across the top of the belt under the straps to prevent the 1" straps from sinking down into the foam after many miles at 35-40 lb load. This sinking was observed in prototype 2 and 3. Water bottle and snack pockets were designed and tested with prototype 4.



Early hip belt prototypes

Prototype 4 worked well and held up to over 200 miles of hiking including a couple Philmont shakedowns. Prototype 5 improved on prototype 4 by eliminating the aluminum channel, creating belt loops to hold the pocket belt more securely, and eliminating having to keep track of the two attachment straps when Chair-e-it was in fanny pack mode. In prototype 4, unclipping the two buckles on the attachment straps released the frame from the fanny pack, but if someone moved the frame while you were out on a side hike, you wouldn't want to get back and find one of your attachment straps missing. Prototype 5 sewed the attachment strap loops directly to the hip belt. The upholstery thread goes through the strap, through the tape, through the foam, through the tape on the other side, through the strap on the far side, and back again. Tests showed that this eliminated all sinking, and by leaving a 1¼" gap in the seams, two belt loops were created with no additional weight or effort.

Materials: Roll of Scotch Extreme tape or Scotch transparent Duct tape (Home Depot)
6" x 32+" closed cell foam cut from old blue foam sleeping pad
6 feet of 1½" polypropylene (or nylon) strap
5 feet of 1" polypropylene (or nylon) strap for pocket belt
Buckles and adjusters: (2) 1½" adjustment sliders, (1) single adjust 1½"strap buckle, (1) 1" buckle for pocket belt. (2) 1" adjustment sliders for attachment straps
Piece of ripstop nylon to make modular pockets for belt. Amount depends on how many and how large you want to make your pockets. I purchased a couple yards in blue to match the foam, but in retrospect would have chosen a darker color so that it would not show the dirt as easily.

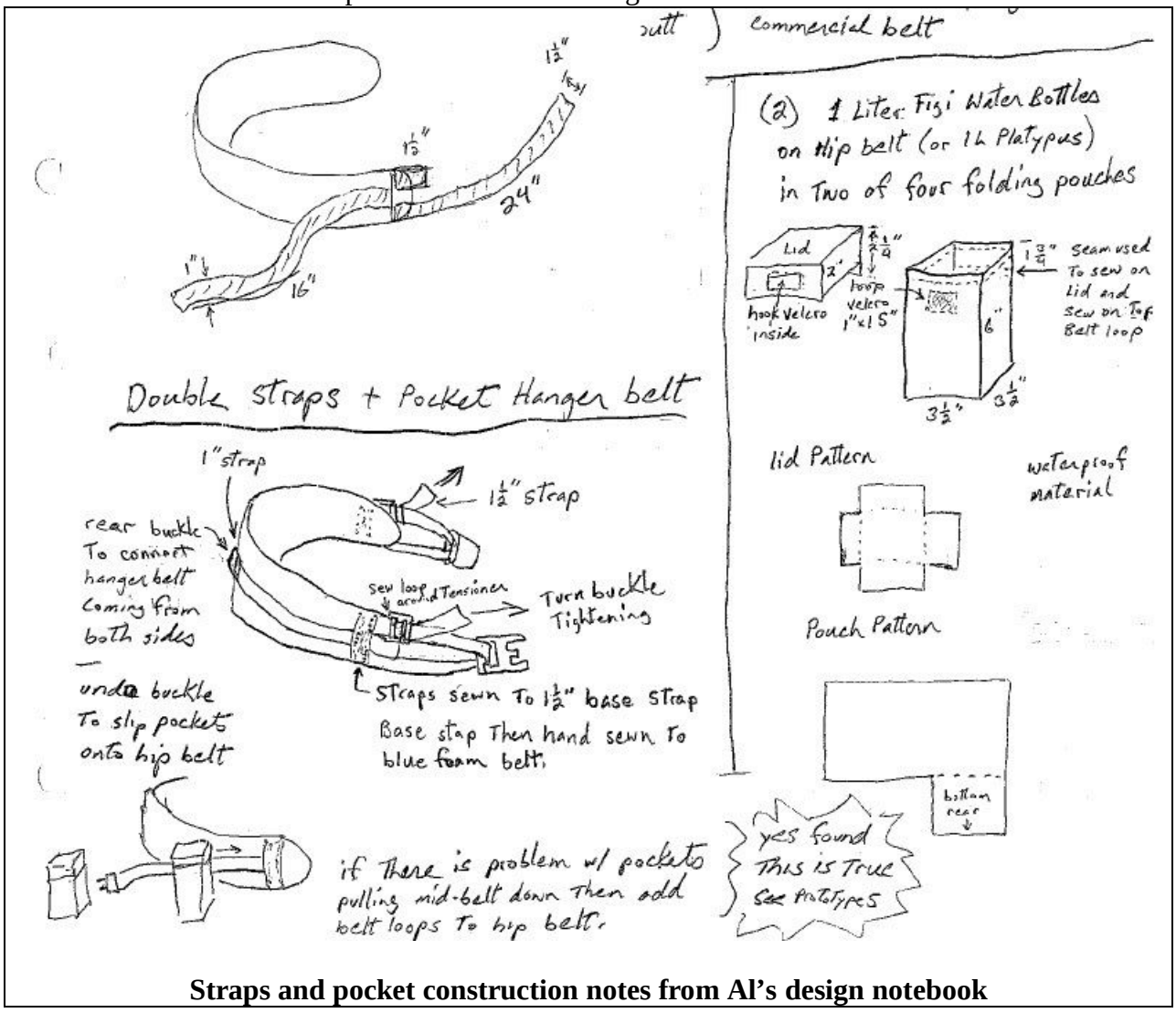
Strap Material. In researching backpack and hip belt straps, I found that polypropylene straps were recommended over nylon straps. The reason given is that polypropylene straps do not absorb as much sweat (or water if rained on), and are much more resistant to UV damage from the sun's rays. The price of both were about the same so I ordered polypropylene straps off the web and used them throughout the Chair-e-it construction. I used 1" wide strap in the shoulder straps, and a mixture of 1½" wide and 1" wide in the hip belt construction described in Part 3.

Belt Material. I came up with the following idea to minimize the weight and cost of the belt. For padding I used an old closed cell blue sleeping pad I had in my closet. Instead of sewing a belt and slipping in the padding, I covered the outside of the foam with Scotch "Extreme Application Packaging Tape" running long-ways along the belt. The tape added almost no weight. The foam provided the padding and the tape provided the tensile strength to the hip belt. The tape rated at 130 lbs/in prevented stretch no matter how tight the belt was tightened, and easily carried the load of the backpack. The straps on the hip belt were sewn right through the reinforcing fibers in the tape, which transferred the tensile loads to the tape. The belt material worked great and was cheap and easy to make. The hip belt was especially comfortable because the shape of the foam can be custom cut to fit your body.

Step 1. Cutting out foam and covering with reinforced tape. The photo below shows the shape used for the Chair-e-it hip belt. I mimicked shape of the commercial hip belt I was used to. The belt shown is 6" at its widest point tapering to 4½" before rounding off the ends. It is 28" long with the waist straps sewn to the rounded ends. You should adjust dimensions and customize the shape to maximize the comfort for your body. For example, I had another long distance hiker try on the hip belt and he said for his hip bones he would want the padded shape to be about 30" long, but have the waist straps still sewn on at 28".

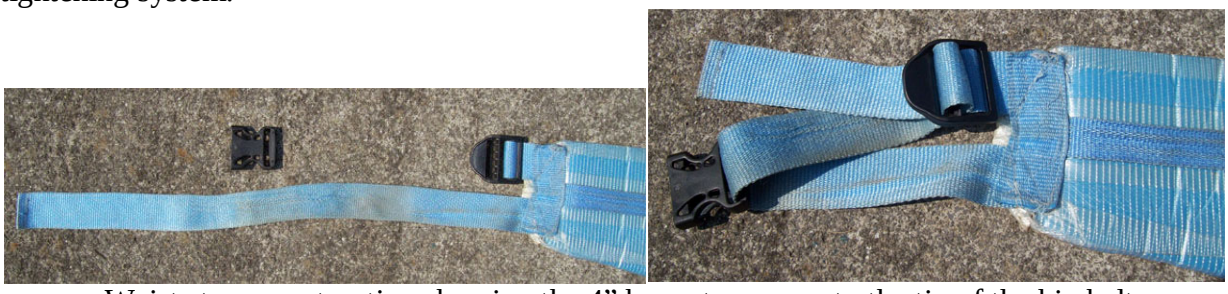
In the photo you can see how the Scotch Extreme tape is laid down lengthwise from one tip to the other. It was actually extended about 2" beyond each end and lapped over to the other side. This formed an extra thick layer of reinforcing on both sides of the rounded ends where the waist strap sewing seams go. The first strips of tape are folded over the top and bottom edges of the belt as shown to the right.

Step 2. Sewing the waist straps to the hip belt. The following page from Al's notebook gives the dimensions of the waist straps which are mirror images of each other on both sides.



Straps and pocket construction notes from Al's design notebook

I sewed all the straps to the base strap first, then had an upholstery shop sew the 4" long, 1½" wide base strap through the tape and foam on the rounded part of the belt (left photo). Right photo shows the waist straps laced up to provide an Osprey-like double belt "pull forward" 2:1 leverage tightening system.



Waist strap construction showing the 4" base strap sewn to the tip of the hip belt.

Picture of the outside of hip belt showing all the straps

Picture of inside of the hip belt showing how the attachment straps run all the way around the belt and the sewing seams go through the strap on both sides. The straps are shown extending 9” below belt on the inside of the belt.

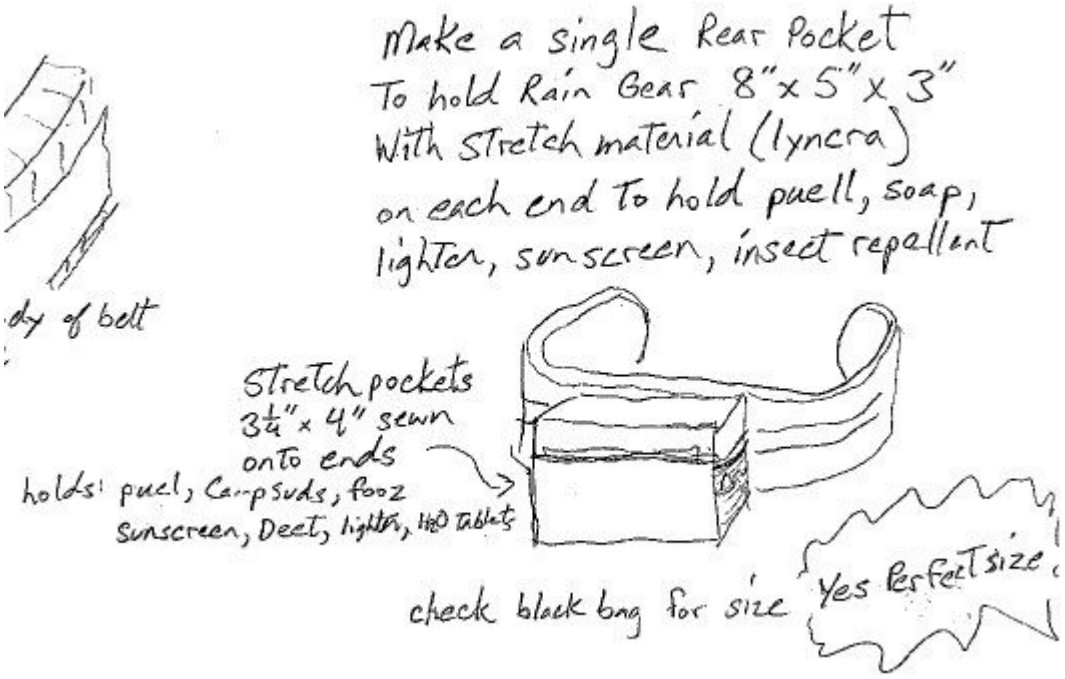
Step 3. Sew attachment straps to hip belt. I wrapped an extra layer of reinforcing tape around the belt under where the attachment straps were going to be sewn. I got the same upholstery shop to sew the attachment straps on. Looking at the close-up photo, note how the two rectangular sewing seams form a 1¼” gap between them that forms belt loops for the pocket belt to slip under. This prevents the pocket belt from slipping down when its pockets are laden with several liters of water. The straps are 7” apart measured from outside edge to outside edge.

On the outside bottom of each attachment strap I sewed a loop holding a 1” slide adjuster. I used these rather than a buckle because they take up less space vertically allowing me to have larger rectangles sewing through the belt and hence better distribution of the backpack load across the surface of the hip belt. I had discovered in prototype 4 that it was not necessary or even desirable to remove the hip belt from the frame when converting to chair and cot modes. In these modes the hip belt fits nicely under the seat and holds the water bottles, snacks, and Purell right out at your finger tips.

The attachment strap goes over the top of the belt and then back down on the inside, extending 9" below the belt as seen in the picture of the inside of the hip belt above. This end of the strap is looped around the bottom tube of the frame and back through the slider so that the tube rides just below the hip belt. I kept a ¼" gap between the tube and the bottom of the hip belt. This allowed the hip belt to rock slightly back and forth as I walked without transferring that rocking to the pack frame, increasing the comfort of Chair-e-it in backpack mode.

You can also see in the photos how well the hip belt held up at Philmont.

Step 4. Building pockets for the fanny pack. Here are my notes for the back pocket of the fanny pack that holds my rain gear (and a couple moist wipes in case I needed TP on a side hike). The attachment loops are 5" apart on the back pocket. This allows them to fit on the pocket belt between the two belt loops. A late addition to prototype 5 was the stretch pockets on either side of the back pocket. At Philmont these stretch pockets turned out to be incredibly handy. I highly recommend that you put such pockets on your own Chair-e-it. The stretch pockets are easy to reach into while you are walking. I kept small 0.5oz containers of Purell, sunscreen, and Camp Suds in one side and Deet, water purification tablets, and a lighter in the other side.



The dimensions of the four side pockets and the shape of the pattern are given on the notebook page shown earlier in this article. The Chair-e-it description article shows pictures of these pockets folded up as well as holding liter water bottles. Here are a few photographs of different views of one of these pockets, which should help clarify how they are made.

Different views of one of the four side pockets on Chair-e-it

Front and back views of the side pocket full and folded up into its own cap

Fanny pack mode during 3D archery at Apache Springs camp shows all the pockets in use