

# Open Source Bike Trailer / Jogger Build and Assembly Instructions

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## Introduction

Before the trailer can be completed, you will need to purchase everything included in the Bill of Materials, which is the next section. Ordering information is included. The websites and vendors given are NOT the only option, and you can order from somewhere else. You will just need to make sure that what you are buying is the same dimension and material. For example, in the case of buying the stock aluminum tubing, you can purchase machine finished aluminum or anodized aluminum. Machine finished aluminum will be shinier, but can be painted. Anodized aluminum is more expensive, but is a matte finish.

You will need to refer to the package of engineering drawings that are included at the end of this manual. The drawings include important information such as cut lengths, locations of holes, assembly drawings, and stock dimensions. The instructions AND drawings are meant to be used together with the drawings containing important dimensions and the instructions containing recommended steps and procedures. Pay attention to where the instructions direct you to the drawings, but do not build a part by referring strictly to the drawing. It is recommended that you study the drawings before beginning to build the trailer.

A List of Tools Required is also provided. The effort and time required to build the trailer will be greatly reduced if you locate these tools before beginning. **An industrial sewing machine is required for sewing the cloth used in the seat. We recommend you find a professional upholstery or sewing firm to either make the seat for you or to use their machinery. This will add somewhat to the cost, but can save you a lot of time if you are not experienced at sewing.**

## Bill of Materials

<b>Product:</b> * = frame, ** = seat	<b>#</b>	<b>Price per unit</b>	<b>Total Price</b>	<b>Supplier Website</b>	<b>Item #</b>	<b>Special Notes</b>
*HDPE Plastic for footrest 12"x24"x1/4"	1	\$13.22	\$13.22	www.amazon.com	B00K2QT13O	Seaboard High Density Polyethylene Sheet, Matte Finish, 1/4" Thick, 12" Length x 24" Width, Black. Could also purchase from mcmaster.com white/opaque for \$12.94, item number 8619K462
**2 inch wide sew on velcro	1	\$23.51	\$23.51	www.amazon.com	B0057562QO	Can also be obtained directly from an upholstery shop by the foot instead of all 15' which isn't necessary
**1 1/2 inch ladder locks/tension locks (10 pack)	1	\$7.95	\$7.95	www.amazon.com	B003TOU4UU	Can also be obtained directly from an upholstery shop by the foot instead of all 10 pieces which isn't necessary
**1 1/2 inch triglyde slides (10 pack)	1	\$5.79	\$5.79	www.amazon.com	B00RWLFJWO	Can also be obtained directly from an upholstery shop by the foot instead of all 10 pieces which isn't necessary
**1 1/2 inch wide Heavy Nylon webbing (10 Yard Roll)	1	\$8.99	\$8.99	www.amazon.com	B008585UMW	Can also be obtained directly from an upholstery shop by the foot instead of all 10 yards which isn't necessary
*Burley Steel Hitch	1	\$25.00	\$25.00	www.burley.com/shop/rep lacement-parts/	960116	Depending on your bike, you may want the Burley Classic Hitch, Item #: 960001
*Burley Axle Assembly, compatible with: 07 D'Lite 07-09 Encore 04-08 Bee, etc	1	\$22.00	\$22.00	www.burley.com/shop/rep lacement-parts/	950016	
*Burley Tow Bar Assembly compatible with: 04-15 D'Lite 04-15 Encore 08-15 Honeybee, etc	1	\$44.00	\$44.00	www.burley.com/shop/rep lacement-parts/	250229	
*Burley 20" Alloy Wheel 2009-2014	2	\$68/wh eel	\$136.0 0	www.burley.com/shop/rep lacement-parts/	160029	



<b>Product:</b> * = frame, ** = seat	<b>#</b>	<b>Price per unit</b>	<b>Total Price</b>	<b>Supplier Website</b>	<b>Item #</b>	<b>Special Notes</b>
*Solvit HoundAbout II Aluminum Pet Stroller Conversion Kit, Medium	1	\$55.99	\$55.99	www.chewy.com	68808	Kit contains the front wheel assembly, the handlebar, and a single parking brake assembly
*Square Aluminum tubing with Radius corners, 1" x 1" x 1/16" wall, satin anodized finish***	24 ft.	\$1.34/ft	\$32.16	www.eagle-aluminum.com	E-9215-EA	Order in four 8 ft. sections and four 4 ft. sections. Please note that these ordering instructions are for ordering from eagle-aluminum. If you want to purchase normal, machine finished aluminum (that is shiny) then you could easily find another vendor for a cheaper price.
*Square Aluminum tubing with Radius corners, 1" x 1" x 1/8" wall, machine finish***	12 ft.	\$2.50	\$30.00	www.eagle-aluminum.com	AR-1474	Order in three 4 ft. sections. Please note that these ordering instructions are for ordering from eagle-aluminum. If you want to purchase anodized aluminum, that is not shiny) then there will be an additional \$100 fee from eagle-aluminum for this size of bar to be anodized.
**Car seat buckle, supporting 1 1/2" straps	1	\$12.97	\$12.97	www.ebay.com	111876058263	Can purchase any car seat buckle that supports 1 1/2" straps
*1"x14-20 Gauge Black LDPE Square Tubing Plug,	20	\$0.32	\$6.43	www.fastenal.com	11131240	For plugging the tubes once the BTJ is complete. Can also order from McMaster-Carr: \$12.29 per pack of 100 , Product Number: 9565K51.
* 1/4 in.-28 tpi x 3 in. Zinc-Plated Grade-5 Cap Screw	4	\$0.45	\$1.80	www.fastenal.com	13015	
*1/4"-20 x 2-1/2" Grade 5 Zinc Finish Hex Cap Screw	6	\$0.34	\$2.01	www.fastenal.com	13013	
*1/4"-20 x 1-3/4" Grade 5 Zinc Finish Hex Cap Screw	5	\$0.22	\$1.12	www.fastenal.com	13010	
*1/4"-20 x 2-3/4" Grade 5 Zinc Finish Hex Cap Screw	2	\$0.40	\$0.81	www.fastenal.com	13014	

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*1/4"-20 x 2" Grade 5 Zinc Finish Hex Cap Screw	2	\$0.35	\$0.69	www.fastenal.com	13011	
*5 in. Zinc-Plated Flat Corner Brace (IMPORTANT: 12 GAUGE)	4	\$1.57	\$6.28	www.homedepot.com	164091	
*1/4"-20 x 1-1/2" Grade 5 Zinc Plated Hex Cap Screw, pack of 50	1 pack of 50	\$8.62	\$8.62	www.mcmaster.com	92865A546	Fully threaded bolts. You will need approximately 40 of the 50 to put together the trailer.
*Locking Pins with Wire Retainer	4	\$2.16	\$8.64	www.mcmaster.com	98416A211	These pins can also be purchased at <a href="http://burley.com/shop/replacement-parts/">burley.com/shop/replacement-parts/</a> part number : 4118800 for \$5 each, but they are much easier to use.
*6061 Aluminum Bar Stock - 3"x 12"x 1/16" thick	1	\$2.56	\$2.56	www.mcmaster.com	8975K295	This will be for making the 2 brackets for holding the handlebar - you need about 8 inches from the 12" stock piece. <a href="http://www.mcmaster.com/#8975k295/=11dp9qm">http://www.mcmaster.com/#8975k295/=11dp9qm</a>
L-Bracket Zinc-Plated Steel	4	\$1.99	\$7.96	www.mcmaster.com	1558A21	
*4"Corner-Reinforcing Brackets, zinc plated steel	4	\$3.68	\$14.72	www.mcmaster.com	1088A33	Triangular Corner braces for the frame
*Aluminum tube for mounting front wheel, 1"x2"x24" long, 1/8" thick walls	1	\$17.80	\$17.80	www.mcmaster.com	6546K39	1"x2" x 24" long, 1/8" thick walls
*Quick-Release Button Connectors for Telescoping Tubing, zinc-plated	10 pack	\$6.94	\$6.94	www.mcmaster.com	94282A130	Spring pins for the handlebar locking mechanism

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*6061 Aluminum Rectangle Tube, 2-1/2" x 1-1/2" x 6" x 1/8" thick wall	1	\$8.68	\$8.68	www.mcmaster.com	6546K59	For the Hitch Sleeve
*Pack of 100 Thin Nylon-Lock Nuts, High Strength Grade 8 Steel, 1/4"-20 Thread Size, 7/16" Wide, 13/64" High	1	\$6.70	\$6.70	www.mcmaster.com	94945A205	Be sure to purchase the Nylon-insert Locknuts or the nuts on the trailer will loosen significantly faster during use. The low profile nuts also facilitate folding the trailer.
*6061 Aluminum Flat Bar 1/8" X 2-1/2" x 24"	1	\$5.24	\$5.24	www.mcmaster.com	8975K532	For making the folding diagonal brackets and braces for front wheel.
*Zinc-Plated Steel washer, for 1/4" bolts	2 Packs of 50	\$3.30/pack	\$6.60	www.mcmaster.com	91090A107	
* 1/4" Aluminum Unthreaded Spacer	4	\$1.90	\$7.60	www.mcmaster.com	92511A087	
* 3/8" Aluminum Unthreaded Spacer	2	\$1.87	\$3.74	www.mcmaster.com	92510A774	
*Single Button—Straight Leg	10	\$5.10	\$5.10	www.mcmaster.com	94282A110	Only 2 are needed for the handlebar, so there may be cheaper options available.
**Backpack Straps	1	\$15.00	\$15.00	www.REI.com	844668	Find and use whichever backpack straps you feel is suitable for your rider. We purchased a medium.
**1000D waterproof Cordura	2 yards	\$12.49	\$24.98	www.rockywoods.com/Fabrics-Kits/1000D-Cordura-Nylon/1000-Denier-Coated-Cordura-Nylon-Fabric	CTD1000	57-60" width fabric. Can also be obtained on ebay, amazon, etsy, for variable prices.
*Stroller Parking Brake (for the second back wheel)	1	\$10.99	\$10.99	www.solvitproducts.com	69903	The front wheel assembly comes with the first parking brake, but a second brake is needed to prevent the trailer from spinning while only one brake is engaged.
**Line 20 snaps (10 per pack)	3	\$5.99	\$17.97	www.tandyleather.com	1261-02	There's probably a better place to purchase these than mcmaster.com

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**Snap Setter	1	\$9.64	\$9.64	www.walmart.com	218349	Called the easy to-do-series line 24 snap fasteners. Can also purchase from other websites such as amazon and tandyleather.
		<b>Total Price</b>	\$626.20			

**\*NOTE:** Many of the parts on this Bill of Materials can be purchased from different vendors and will still work. The vendors listed here are the vendors that the design team used when building the original model and should be a safe option for purchasing materials. However, you may be able to find comparable materials at local hardware stores or closer vendors that can have reduced costs for materials or shipping. As long as the dimensions of the purchased materials match those on the Bill of Materials, you should be successful in building your trailer.

**\*\*\*NOTE:** The original trailer was made with anodized tubing because it looks a little more professional. However, it can also cost significantly more. Using bar stock with a machined finish will also work, but it is shinier than the anodized tubing. You can always spray paint the aluminum to a desired color to eliminate the shiny aluminum finish.

## General Skills Required

While this bike trailer/jogging stroller is designed to be able to be built by most people, there are some general skills one must have in order to successfully build and assemble the trailer. If you do not have these skills, you will need to learn them or ask someone to help you who has the required expertise.

1. Be able to read basic engineering drawings.
  - a. All of the required dimensions of parts, locations of holes, etc. are found on engineering drawings. Being able to understand how drawings are formatted is an important skill and is very simple to learn. Instructions on how to read engineering drawings can be easily found online with a simple Google search.
2. Be able to safely use the tools in the List of Tools Required.
3. Be able to measure and mark hole/cut locations.

## List of Tools Required

<u>Tool</u>	<u>Purpose</u>
Hacksaw (or bandsaw)	Cut the stock parts
Power drill (and/or drill press)	Drill holes in the stock parts
17/64 drill bit	Drill holes in the stock parts
5/16 drill bit	Drill holes in the sleeve for the front wheel
Two 7/16" end wrenches, or equivalent socket set	Tighten the bolts
File (or grinder)	Smooth edges and corners
Deburring tool or a large drill bit	Smooth drilled holes
Hammer or Rubber Mallet	Pound in plastic end caps
Sewing Machine	Sew the seat
Industrial strength needle	Sew the seat
Scissors	Cut the cordura fabric
Clamps	Hold parts to table while drilling/cutting
Vise	Hold parts securely while drilling/cutting
Oven	Heat up the plastic footrest to form it
Phillips Screwdriver	Loosen screws on parking brake

## Building Instructions: Frame

Follow these instructions in order to prepare the raw materials for being assembled into a trailer frame. The main operations that you will need to perform are:

- Measuring and marking
- Cutting metal with a hacksaw or bandsaw
- Drilling
- Grinding/Deburring

These instructions rely heavily on engineering drawings that are included later. You will need to pay attention to the stock specified for each part, hole diameters, distances, and more. There are two types of drawings: Part Drawings and Assembly Drawings. Part Drawings are labeled with a P, such as P6, and Assembly Drawings are labeled with an A, such as A3. The Part Drawings are used when creating individual trailer parts while the Assembly Drawings are to assist in understanding how the parts fit together.

### **General Manufacturing Tips:**

- Using a drill press instead of a hand drill will help to reduce error.
- Using a center drill to pre-drill the holes will reduce error from the drill bit wandering.
- Almost all holes are .25 inches in diameter. To slip the bolts through the holes more easily, you may choose to use a drill bit that is 1/64 inch larger in diameter (a 17/64 inch drill bit).
- When cutting or drilling the aluminum, be sure to clamp the part being machined or put it in a vise.
- When clamping the aluminum tubing, use cardboard in between the aluminum and the vise or clamp to prevent scarring the surface of the tubing and to maintain equal pressure across the parts.

## Make Braces and Brackets

First you will make custom brackets or modify stock brackets. This will allow you to use them as guides when you drill into the aluminum tubing.

### Check the drawings.

You will be making the following parts. Here is a list to make sure you have the drawings and stock that you need:

<i>Part</i>	<i>Drawing</i>	<i>Stock</i>
Brace Hinge (x4)	P1	6061 Aluminum Flat Bar 1/8" x 2-1/2" x 4.5"
Hitch Sleeve (x1)	P2	6061 Aluminum Rectangle Tube, 2-1/2" x 1-1/2" x 6" x 1/8" wall thickness
Front Wheel Mounting Bracket (x2)	P3	6061 Aluminum Flat Bar 1/8" x 2-1/2" x 3/4"
Handlebar Bracket (x2)	P4	6061 Aluminum Bar Stock - 3" x 12" x 1/16" thick
Front Wheel Mounting Bar (x1)	P5	Aluminum tube for mounting front wheel, 1" x 2" x 24" long, 1/8" thick walls
Front Wheel	P6	From Solvit HoundAbout II Aluminum Pet Stroller Conversion Kit, Medium
L-Bracket (x4)	P7	5 in. Zinc-Plated Flat Corner Brace, 12 GAUGE
Corner Brace (x4)	P8	4" Corner-Reinforcing Brackets, Zinc-plated steel
Handlebar	P9	From Solvit HoundAbout II Aluminum Pet Stroller Conversion Kit, Medium
Brake Assembly (x2)	P10	Brake Assembly from Solvit HoundAbout II Aluminum Pet Stroller Conversion Kit, Medium
Footrest	P18	HDPE 12" x 22-1/4" x 1/4"

## Brace Hinges

DRAWINGS: P1

**Step 1. Cut 4 Rectangles from 6061 Aluminum Flat Bar 1/8" X 2-1/2" x 24" Aluminum Stock.**

Using a hacksaw or bandsaw, cut the four rectangular pieces for the Brace Hinges to the required

dimensions. Refer to drawing P1 for dimensions. It is important to keep the pieces as uniform as possible in order to make the next steps easier and to keep the Brace Hinges as similar as possible.



**Step 2. Mark and Drill Holes.**

Mark the locations of the four holes on one of the braces. Using a 17/64" drill bit, drill the four holes in the braces. When drilling, it is recommended that you clamp all 4 brackets together and drill the holes in all of them at the same time. Using a piece of cardboard between the vise and the braces will



help create even pressure on all four braces. This will make them more accurate and consistent between all the braces, so even if a hole is slightly off, it will not cause as big of a problem.

**Step 3. Cut off corners to the desired dimensions.**

This step is to help reduce the danger from having sharp corners and to improve aesthetics. In this picture a heavy-duty band saw in a machine shop is being used, but a hacksaw will also work. All 4 should be done together for uniformity. It is important that these are tightly clamped together so that none of them slip out of place while cutting. However, if cutting all four at the same time is not possible, then you can cut them individually and still have good results. The most important dimensions on these pieces are the locations of the holes relative to each other.



**Step 4. Deburr and Grind Sharp Edges.**

Using a file or a grinding wheel, deburr and grind the sharp edges and holes. There should be a radius on the corners of the braces that eliminates any sharp corner. Grind until you think it looks goo



## Hitch Sleeve

DRAWINGS: P2

**Step 1. Cut Rectangular 6061 Aluminum Rectangle Tube, 2-1/2" x 1-1/2" x 6" x 1/8" Aluminum Tubing.**

Cut the rectangle aluminum tubing to a 6" length using a hacksaw or bandsaw. If you have bought exactly 6" it will be the correct length and you can skip this step.

### Step 2. Drill Holes.

Drill all the holes except the one in the middle on the top which will be drilled when placing the footrest on. This hole will be drilled after the hitch sleeve is attached to the left base bar. You will use the footrest as a guide for that hole. Pay attention to the drawing to know which hole. In this step you should drill 4 holes in the top face and 1 hole on the side face. Note that the hole on the side face is slightly larger than 1/4" inch diameter, but all the holes in the top face are 1/4" diameter.



### Step 3. Deburr and Grind Rough edges and sharp corners.

Using a file or a grinding wheel, deburr and grind the sharp edges and holes.

## Front Wheel Mounting Brackets

DRAWINGS: P3

**Step 1. Cut 2 Rectangles from 6061 Aluminum Flat Bar 1/8" X 2-1/2" x 24" Stock**

Using a hacksaw or bandsaw, cut the aluminum stock to the dimensions given on drawing P3. It is recommended that you secure the aluminum piece in a vise or with a clamp when cutting it. You should be able to use the same stock as the Brace Hinges (previous instruction).

### Step 2. Drill Holes.

It is recommended that you clamp the 2 brackets together and drill the holes in both of them at the same time. This will make them more accurate.

### Step 3. Deburr and Grind Corners.

Using a file or a grinding wheel, deburr and grind the sharp edges and holes.

## Handlebar Brackets

DRAWINGS: P4

This process closely resembles the process of making the brace hinges. Be sure to deburr the holes after you finish drilling them.

### **Step 1. Cut 2 Rectangles from 6061 Aluminum Bar Stock - 3"x 12"x 1/16" thick.**

Using a hacksaw or bandsaw, cut the aluminum stock to the dimensions given on drawing P4.

### **Step 2. Mark and Drill the three vertical holes.**

Mark the three vertical holes on one of the rectangular bracket pieces. These holes will be used to mount the brackets onto the trailer and to attach the handlebar to the brackets. When drilling, it is recommended that the two pieces be tightly clamped together (one on top of the other) and drilled at the same time.



**\*NOTE - Steps 3-7 should be completed after the rest of the trailer has been assembled!**

### **Step 3. Mount both of the brackets and attach the handlebar.**

Mount the brackets to the vertical bars and then attach the handlebar.

### **Step 4. Position the Handlebar into desired position(s) for jogging.**

You can drill several holes into the handlebar brackets so that the handlebar can comfortably accommodate people of different heights. However, you must be careful to not drill too many holes such that the holes end up too close to each other. It is recommended that you find 3-5 positions for the handlebar that are comfortable for you and anyone that may want to push the trailer and mark those positions on the handlebar.

### **Step 5. Mark the location(s) of the handlebar hole on the bracket.**

Mark the positions of the handlebar hole on the bracket, as seen in the figure. Remove the brackets from the bars. Using the center vertical hole on the brackets (the one that the handlebar attaches to), mark at a 2" radius exactly where to drill the holes for the different positions of the handlebar.



### **Step 6. Drill the hole(s) for the handlebar in the bracket.**

After tightly clamping the brackets together (one on top of the other) drill the holes for the position of the handlebar.

### **Step 7. Cut off the unnecessary corners and round the edges, deburr holes.**

Using a hacksaw or bandsaw, cut off the excess corners (being sure to leave at least 1/2" of material between the edge and the holes) and then round the corners using a file, sander or grinder.

## Front Wheel Mounting Bar

DRAWINGS: P5

### Step 1. Cut Rectangular 1"x2"x24" Aluminum Tubing.

Using a hacksaw or bandsaw, cut the rectangular tubing to the length specified: 2"x1"x22.25 (see drawing P5).

### Step 2. Drill Holes.

Mark and drill holes. The holes in the middle of the bar need to line up with the holes for the Front Wheel Mounting Brackets and the Front Wheel Sleeve (from the Solvit Conversion Kit). It is recommended that you use these parts as stencils to mark the holes.

### Step 3. Deburr and grind rough edges and corners.

Using a file or a grinding wheel, deburr and grind the sharp edges and holes.

## Front Wheel

DRAWINGS: P6

### Step 1. Cut the Modified Front Wheel Assembly (S-bar for short)

Mark a line 3- $\frac{3}{4}$ " from the shaft of the wheel (See P6). Cut using a bandsaw or hacksaw. Make sure that the blade is perpendicular to the S-bar when cutting.

### Step 2. Drill Hole

Mark the hole for which the front wheel will attach to. When doing this, make sure that S-bar is pushed in as far as it will go into the sleeve. Then remove and drill the hole into the S-bar. Use a 5/16" drill bit. It is important to get this hole straight, perpendicular to the S-bar as shown in the figure. If it is crooked, your front wheel may lean to one side.

### Step 3. Deburr and Grind Rough Edges.

Grind the edge of the S-bar and deburr the drilled hole. Do not grind down the flat edges. Grind only where you cut the bar. It needs to fit as snugly as possible in the sleeve that comes with it to prevent the front wheel from wobbling during use.



## L-Brackets

DRAWINGS: P7

The bolts should not fit completely through the holes in the stock L-brackets before drilling them out in this step. If they do fit, you can skip this step.

### Step 1. Cut Stock L-Brackets.

Using a bandsaw, hacksaw, or tin snips, cut the excess portion off of each of the L-brackets. (A shearing tool was used in the figure, but the idea is the same).

### Step 2. Enlarge Holes.

After tightly clamping the L-brackets to a secure piece of wood, use a 17/64" drill bit to enlarge the holes.

**Step 3. Deburr and Grind Corners.** Using a file or grinding wheel, file the corners so that they are smooth, then deburr the holes. There should be a radius that eliminates any sharp corner. Grind until you think it looks good.

## Corner Braces

DRAWINGS: P8

### Step 1. Clamp the corner brace to a table.

The bolts should not fit completely through the holes in the corner braces before drilling them out in this step. If they do fit, you can skip this step.

Tightly clamp the brace onto a table. Use the most secure position for the corner brace on the table depending on the size of the clamp. For example, the clamp that is used in the figure was not able to reach over the wall of the corner brace, so the brace was positioned as shown in the figure. Otherwise, it would be better to flip the brace around such that the triangular face of the brace is in contact with the table when drilling it.

### Step 2. Enlarge the holes of the corner brace.

Using a 17/64" drill bit, drill out the holes located on the legs of the triangular corner brace.

### Step 3. Deburr holes and Grind Corners.

Using the deburring tool and file, smooth the edges of the holes and corners on the bracket.

### Step 4. Repeat Steps 1-3 for each of the four corner braces.



## Handlebar

DRAWINGS: P9

### Step 1. Cut off ends.

Cut off the ends of the Solvit Handlebar that curve down and are riveted to the mounting brackets to the specified length on drawing P9. After doing this, remove the plastic endcap from the cut off portion so that you can use it later to plug the new end of the handlebar.

### Step 2. Drill Holes.

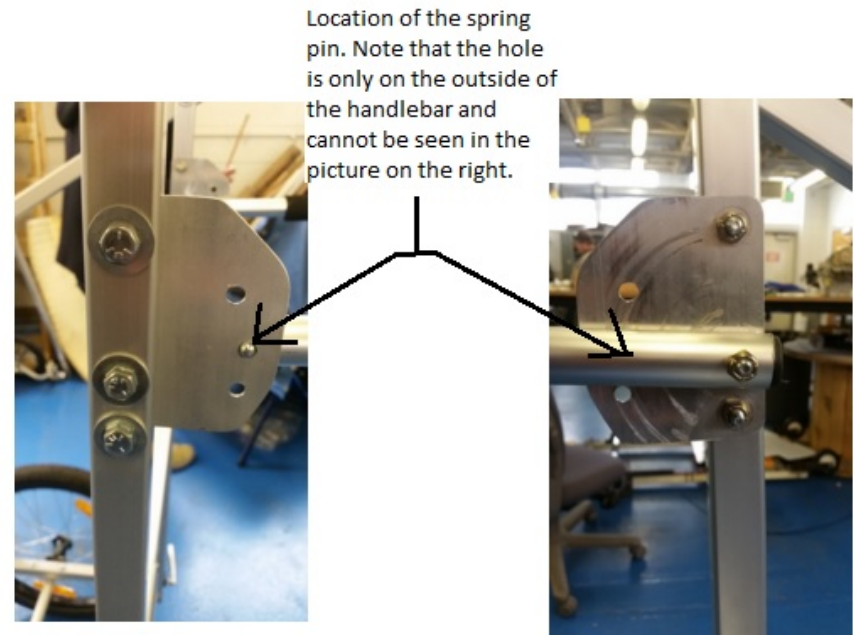
Drill the two holes shown in drawing P9, measuring from the cut end. The one closest to the cut will be for bolting to the Vertical Bar. The hole further away from the cut will be for the spring pin.

### Step 3. Deburr, grind rough edges.

Using a file or a grinding wheel, deburr and grind the sharp edges and holes.

### Step 4. Insert Spring Pin.

The spring pin goes in the smaller hole that is further inside the tube. You will need to use a screwdriver, pen, or other long tool to push it in far enough.



## Footrest

DRAWINGS: P18

### Step 1. Cut the plastic (HDPE) ¼" thick to the specified dimensions.

With a hacksaw or bandsaw, cut the dimensions of the plastic footrest material to 22.25"x12".

### Step 2. Cut out rectangular notches.

Cut out a 1 ½" by 2" rectangle, 1" from the end on either side (see drawing P18). The 2" dimensions of the rectangle are along the 12" side.



### Step 3. Round Corners.

Round the two front corners with approximately a 1 ½" radius. (You can use a can with a 3-4" diameter to use as a stencil to make an outline to cut). Cutting the plastic is easiest to do by using a hacksaw to cut a rough, rounded corner and then sanding it or filing it to give it a smooth finish.

### Step 4. File.

Use a file or sandpaper to smooth out the cuts and make the curves smooth.

### Step 5. Make a bend line.

Mark the location where the footrest will be bent - 5 ½" from the back edge (2.5" from the square notches) across the length of 22.25". This line will be used to mark the place where you will bend the plastic.

### STEP 6. Heat the Footrest to make it more pliable.

Preheat the oven to 220° F, leave the plastic in for 15 minutes (it should be pliable, but not gooey. **Leaving the plastic in for too long or at too high of a temperature will melt it!**). Remove the plastic with gloves. Place the plastic on a hard surface lifted off the ground (like a sturdy table).

### STEP 7. Clamp the Footrest.

Clamp the plastic in between a hard object, such as a bar, and the table. (We put an extra sheet of plastic on top so we didn't scratch the HDPE footrest we would be using). This gives the plastic something to be bent around.



### STEP 8. Bend the Footrest.

Once the plastic sheet is securely clamped down, bend the plastic with another bar or sturdy sheet in order to evenly apply force across the length of the plastic, and bend to approximately 90°. If the plastic is bent around this angle for approximately 5 minutes, it will relax back to approximately a 45° angle, which is the desired angle. (The plastic might not bend that far the first time. If it doesn't, repeat the heating process and bend it again. It took us three heating attempts to get the desired angle.) Also note that if you would prefer a different angle or length of plastic, you can change any of these particular dimensions.

### STEP 9. Mount the plastic.

Set the footrest on the frame. Drill six holes. Drill the first hole on the left base bar, the hole should line up with the back hole in the hitch brace and the second hole should be parallel to it on the right base bar. Drill the next two holes right before the bend in the footrest and in the middle of the aluminum bar (½" to the center of the bar). See the following image. The last two holes are optional which go under the hypotenuse lower bar on either side.



## Frame Bars

DRAWINGS: P11 – P17

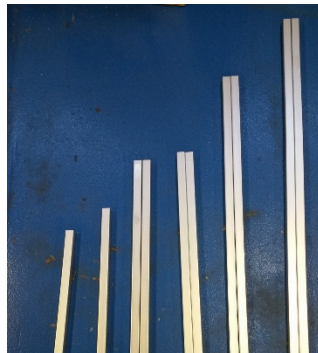
### Check the drawings.

You will be making the following parts. The machining process for each of the bars are basically the same, so the steps that follow can be applied to each of the bars. Here is a list to make sure you have the drawings and stock that you need.

<i>Part</i>	<i>Drawing</i>	<i>Stock</i>
Left Base Bar	P11	6063 Aluminum Rounded bar 1" x 1" x 44-9/16" x 1/8" wall thickness
Right Base Bar	P12	6063 Aluminum Rounded bar 1" x 1" x 44-9/16" x 1/8" wall thickness
Hypotenuse Top Bar (x2)	P13	6063 Aluminum Rounded bar 1" x 1" x 27" x 1/16" wall thickness
Hypotenuse Bottom Bar (x2)	P14	6063 Aluminum Rounded bar 1" x 1" x 26" x 1/16" wall thickness
Vertical Bar (x2)	P15	6063 Aluminum Rounded bar 1" x 1" x 36-3/4" x 1/16" wall thickness
Back Cross Bar	P16	6063 Aluminum Rounded bar 1" x 1" x 17-3/10" x 1/16" wall thickness
Base Cross Bar	P17	6063 Aluminum Rounded bar 1" x 1" x 19-29/32" x 1/16" wall thickness

### Step 1. Cut Square Aluminum Tubing.

The lengths for each are given in the drawings. Measure twice, cut once! You can check that you have the right lengths with the table above. It is better to cut them slightly longer to begin with than to cut them too short. After cutting the stock lengths, you



should have all the lengths found in the following figure. It is recommended that you cut the required parts from the following stock lengths:

-8ft length of 1/16th thick walls: Hypotenuse Top Bar (x2), Vertical bar

-8ft length of 1/16th thick walls: Hypotenuse Bottom Bar (x2), Vertical bar

-4ft length of 1/16th thick walls: Back Cross Bar, Base Cross Bar

-4ft length of 1/8th thick walls: Left Base Bar

-4ft length of 1/8th thick walls: Right Base Bar

**Step 2. Mark faces.** Mark the top and side faces, as well as the front and back ends of each tube to help maintain correct orientation when marking holes and drilling. It is also helpful to mark which bar is which (in the picture, “LB” stands for “Left Base Bar”). A permanent marker is the best tool for marking. You can use rubbing alcohol to remove the permanent marker when you have finished.



**IMPORTANT:** When marking holes, make sure that you measure from the same end of the tube for each hole. If you cut the bar to a slightly different dimension, measuring from both sides for different



holes will cause error. It is often desirable to label the end from which you are marking with a “0” for origin.

When marking holes for a stock part that will be used to attach a bracket or brace, such as the Brace Hinge or L-brackets, it is a good idea to use the bracket or brace as a stencil to mark where the holes need to be drilled. When doing this, measure and drill one hole that will be used to attach the bracket or brace. Once the hole is drilled, place a bolt through the bar and the bracket to hold the bracket in place, then use the bracket to mark the location of the other holes to be drilled. This will ensure that both holes will fit through the brace. See the following picture for an example of how this is done.

A center punch will help make sure the hole gets drilled where you want it to be.

### Step 3. Drill holes.

When drilling bars that have duplicates (such as the Vertical Bars) it is recommended that you clamp both together, one on top of the other, and drill through both at the same time. This will make sure that complementary holes line up properly and decrease the amount of drilling that needs to be done.

Drill the holes in all the bars according to the drawings.

### Step 4. Deburr Holes.

Deburr holes and edges until smooth using a file, deburring tool, or a grinding wheel.

## Building Instructions: Seat





## Introduction

The seat is designed so that anyone can manufacture it as long as they have a home sewing machine and basic sewing experience. Note that the entire frame should be completed before working on the seat, as the frame is used during the seat making process. For each step of instructions, please read the entire step before proceeding.

If making the seat yourself, you will need:

- a high strength sewing needle (upholstery or size **110/18**)
- High Strength Upholstery Thread (Black, or other desired color)
- [Dritz Heavy-Duty Plier Kit](#) for inserting the metal snaps.

Alternatively, the design can be taken to a seamstress or upholstery shop, where they would charge an hourly rate. Depending on the skill level, a professional should take between 1 and 3 hours to manufacture the seat.

## Parts needed for seat

All of the following parts should have already been listed in the Bill of Materials earlier. However, make sure that you have all of the parts below before proceeding.

- 1000D waterproof Cordura, 60'' by 2 yards.<sup>1</sup> (The D stands for Denier, which is a measure of the weight of the fabric. The higher the number, the greater the weight, which increases the abrasion resistance of the fabric)
- Heavy nylon webbing, 1 ½'' wide<sup>2</sup>
  - 1 strip, 50'' long (Top piece of webbing)
  - 1 strip, 6'' long (Top piece of webbing)
  - 4 strips, each 10'' long (for harness side strap)
  - 1 strip, 12'' long (for harness bottom strap)
  - 2 strips, each 18'' long (to attach seat to frame)
  - 1 Strip, 55'' long (to support rider's legs)
- Heavy nylon webbing, ¾'' wide
  - 2 strips, each 10'' long (for backpack straps to attach to seat)
- Industrial strength sew on Velcro, 2'' wide (Note that it is better to get sew on Velcro rather than sticky back Velcro, as the sticky back would interfere with the threading required for the seat)
  - 2 strips, each 40'' long

- 5 ladder locks (2 for top webbing, 2 for harness side straps, 1 for strap supporting rider's legs)
- 2 triglide slides (also known as three bar slides), 1 ½" (for strap that attaches seat to frame)
- 28 sets of snaps (only need 24 but have extra just in case you mess up)
- Backpack straps

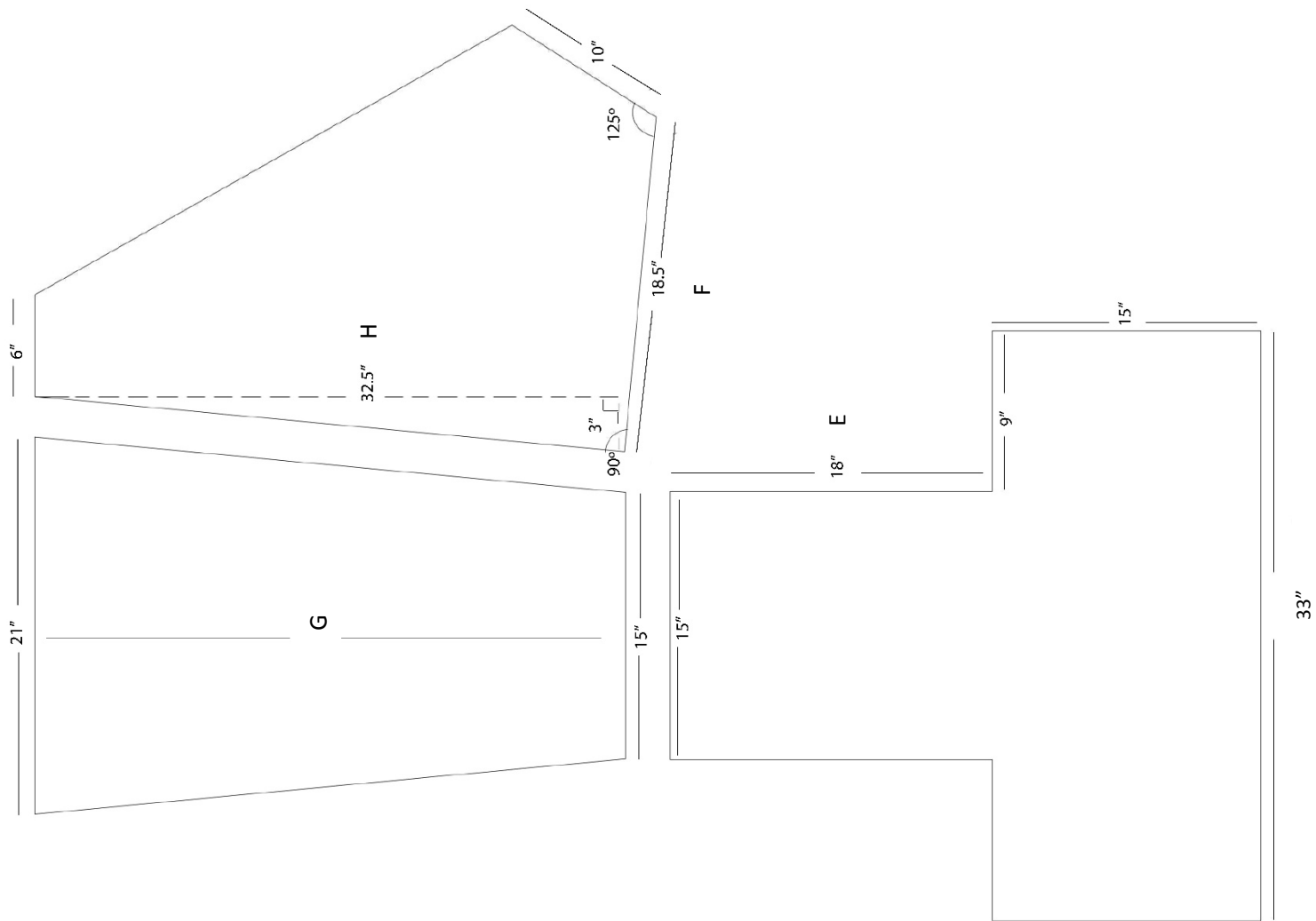


Figure 1. Fully dimensioned sketch of seat pattern

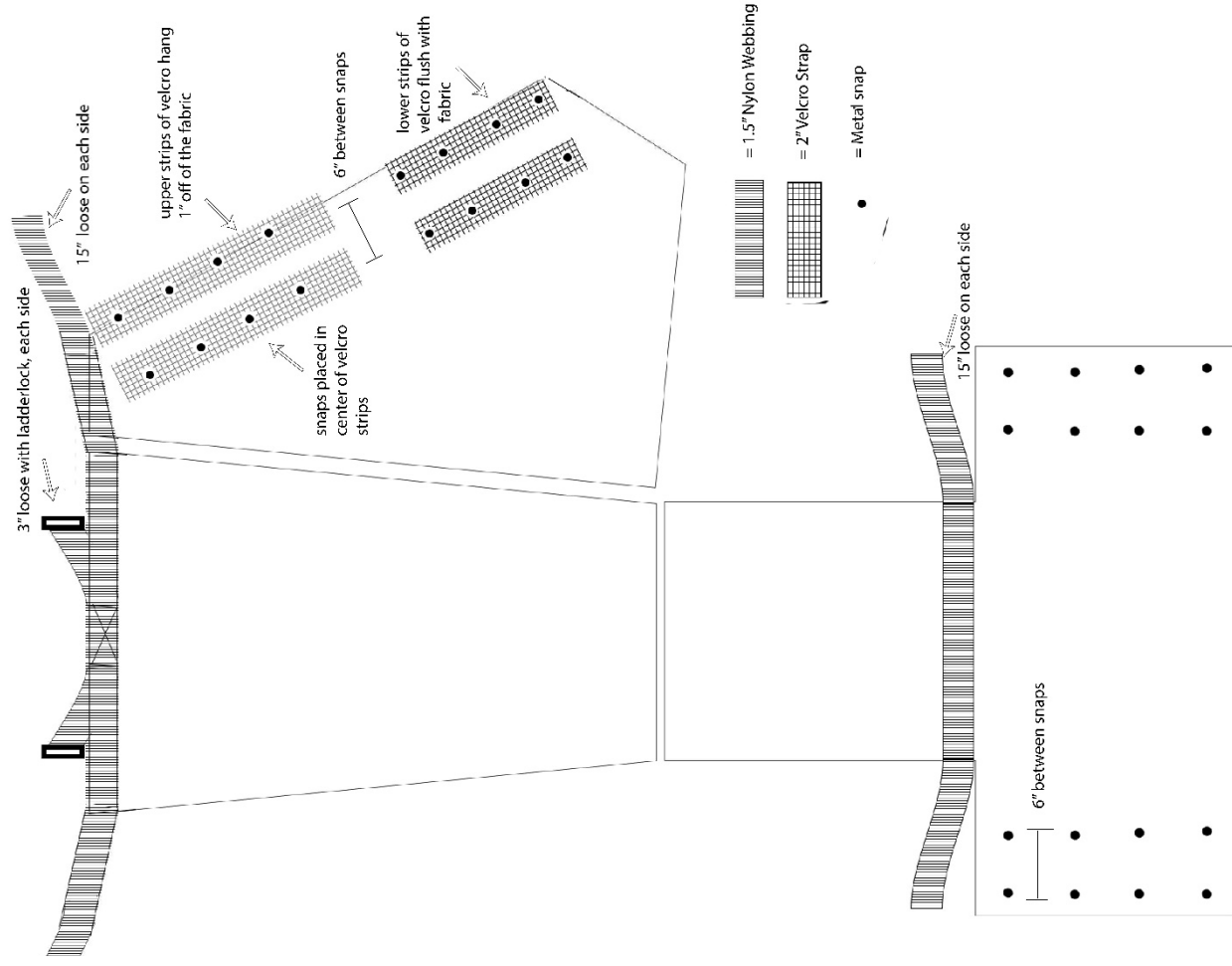


Figure 2

## 1. Cut pieces

Cut the four pieces of fabric using the outer dimensions shown in Figure 1. In reference to Figure 3 and 4, first use the specifications given in Figure 1 to cut piece A. Then flip piece A such that the show side of the fabric is facing down on top of the roll of the fabric (shown in Fig. 4), and trace around piece A to duplicate its shape. Cut out the traced shape to obtain piece B. This process is done to ensure that both piece A and B are the same size, since small errors in dimensioning the fabric can lead to significant differences in how each side turns out.

At the end of this step you should have the four pieces of fabric shown in Figure 3.

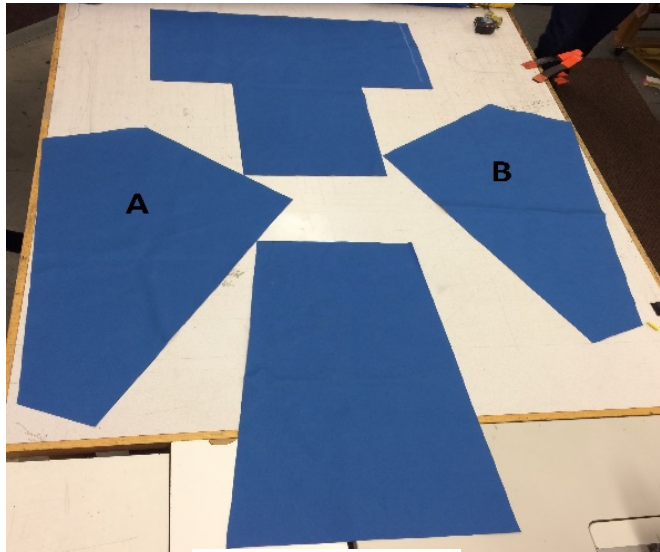


Figure 3

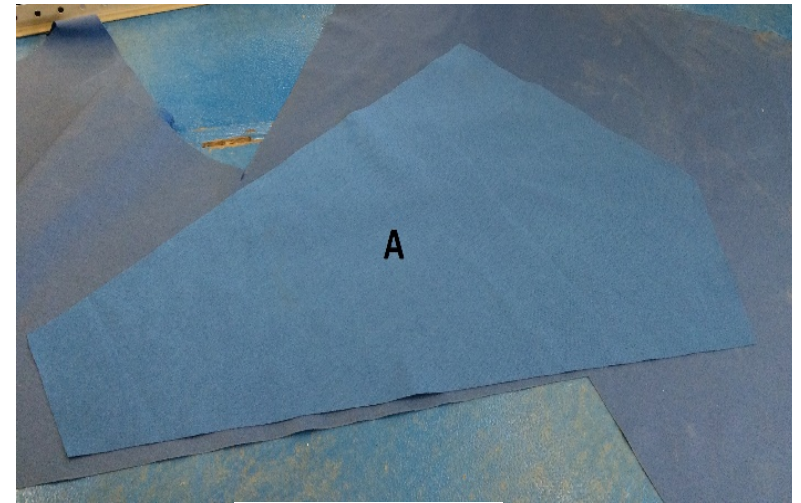


Figure 4

The seat design provided was found to be ideal for a broad range of riders. However, the seat can be customized to fit a specific user if desired. See Note 3 at the end of the sewing instruction section.

## 2. Sew together

Use Figure 5 as a reference to sew the four pieces together in the correct pattern. Be sure that the show side of the fabric is on the inside of the seat for all pieces. All seams should use a double stitch (two parallel straight stitches) to ensure strength.

After the fabric has been sewn together, be sure to hem all edges. Hem by folding back  $\frac{1}{2}$ " of fabric and using a single straight stitch.

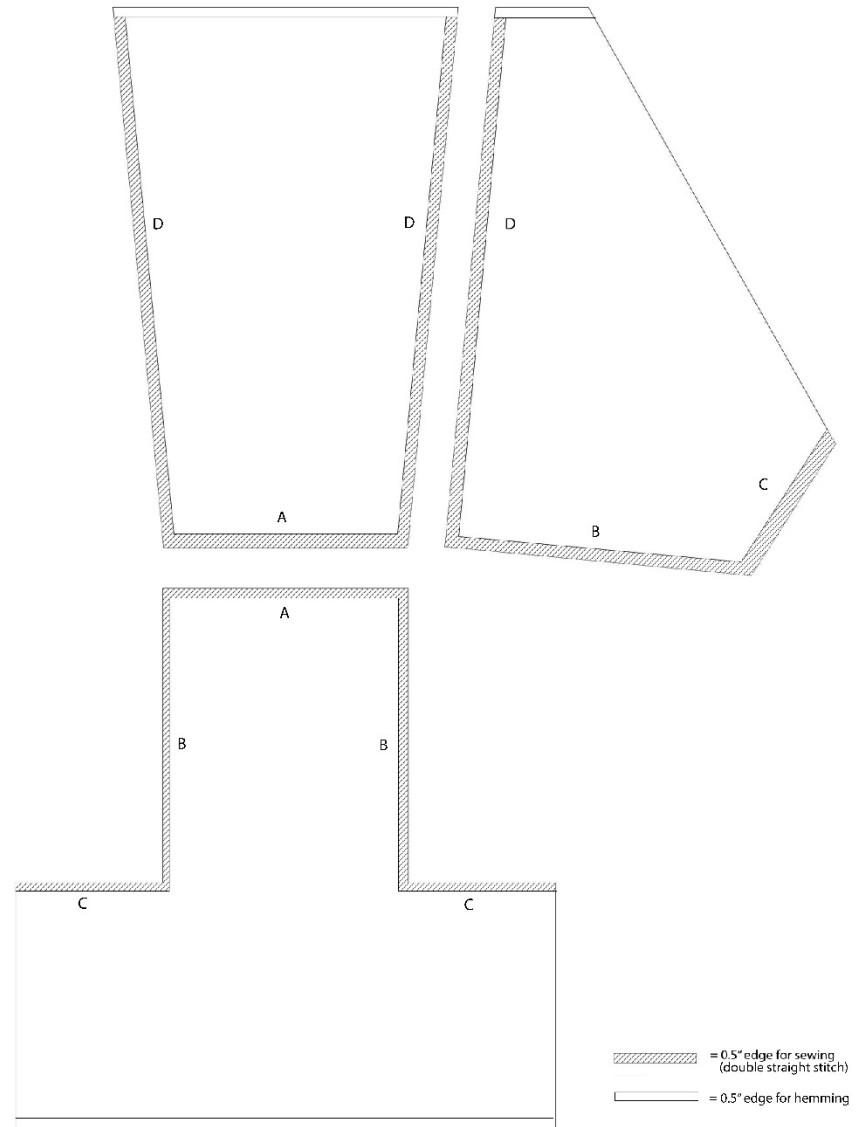


Figure 5

### 3. Nylon support webbing (top)

The strips of nylon webbing to be stitched to the fabric provide support for the rider by keeping the seat taut in those places. Place the webbing as indicated by the pattern shown in Figure 2. Use straight stitches on either side of the webbing to attach to the fabric. Extra length is allowed on either side of the webbing in order to tighten them. The webbing at the top of the seat tightens around both bars A and B as shown in Figure 8.

**Sew on webbing.** The 1½" wide, 50" long strip of webbing is sewn along the top back side of the fabric as shown in Figure 6. Finish each end off with a box X stitch where the webbing meets the end of the fabric as shown in Figure 9. This helps to strengthen the stitch so that it can hold the weight of the rider. Continue to stitch the webbing two inches further along the fabric. Take note that the webbing is no longer lined up perfectly with the fabric at this point. The stitching should come out to be similar as that shown in Figure 7.

**Attach tightening ladder locks.** Stitch the 6" long strip of webbing over the first layer of webbing as shown in Figure 9. Use a box X stitch and sew it to the center of the seat. A loose end should be left on either side of the box stitch. Sew a ladder locks onto each end of this strip.



Figure 6. Back view of seat.

Extra stitching added beyond box X stitch



Figure 7. Front view of seat draped around the frame.



Figure 8. Back view of entire jog

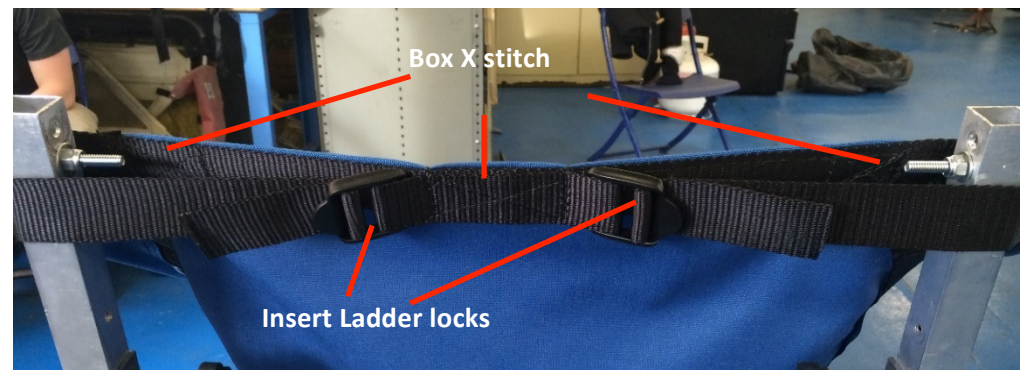


Figure 9. Back view of seat when draped over the frame.



At the end of this step, you should be able to drape the top part of the seat around the frame by inserting both ends of the 50" piece of webbing through each of the ladder locks. This is also represented in Figure 9.

#### 4. Nylon support webbing (base of seat)

The straps on the bottom of the seat hold up the rider's thighs and wrap around the right and left hypotenuse bars as shown in Figure 10. Each end of the webbing folds back and tightens together under the seat. Figure 11 shows the location of the webbing from the front view of the jogger. Stitch the 1½" wide, 55" long strip of webbing onto the fabric according to Figure 2. There should be plenty of excess at both ends. Stitch on a ladder lock using a box X stitch to one end of the strip of webbing, as shown in Figure 12.



*Figure 10. This view is taken from underneath the seat, to provide an idea of how webbing drapes around side bars.*

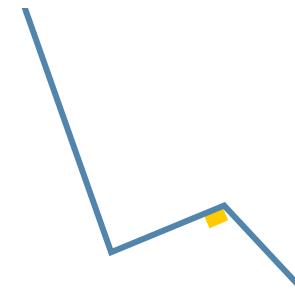


*Figure 12. Back view of seat fabric*



Location of webbing  
Webbing is stitched onto the back side of the fabric

*Figure 12. Front view of Jogger.*

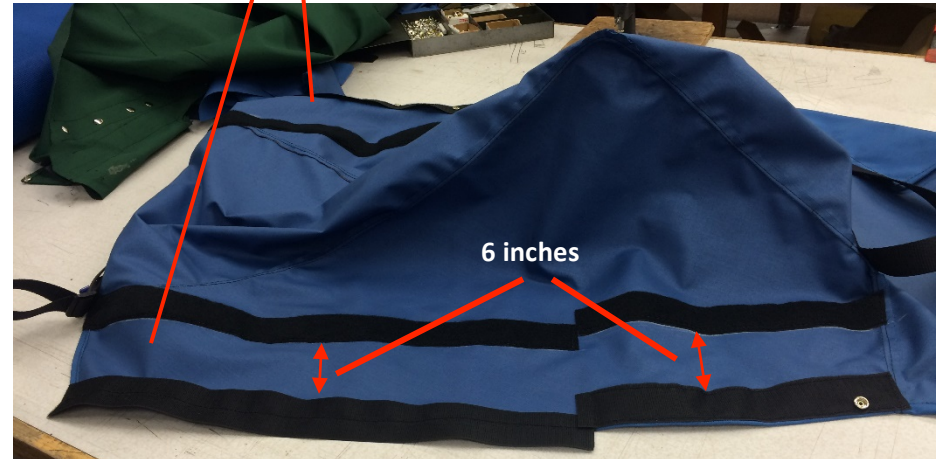


## 5. Velcro

Sew Velcro strips onto the back side of the fabric as outlined in Figure 2. Once sewn on, the seat should look like Figure 13. Do this for both the right and left side of the fabric. Follow the instructions in Figure 3 carefully and **NOTE** that the Velcro is sewn on in a staggered manner, where the upper strip of Velcro is sewn so that 1 inch hangs off the edge of the fabric. The lower strip of Velcro is flush with the fabric. This can be seen more clearly in Figure 12, where part of the Velcro sticks out from the edge of the fabric. This difference is **IMPORTANT**, as it affects how tightly the seat drapes over the frame.

As highlighted in Figure 11, the matching side of each strip of Velcro is sewn 6 inches apart from the other.

Stitch two strips of Velcro onto both sides of the fabric.



*Figure 13. Back side of fabric after Velcro has been sewn on.*



## 6. Hinge clearance

Holes must be cut from the fabric to provide access to the hinge in the frame. Now that the webbing and Velcro has been stitched on, place the seat on the frame and secure it using the top webbing and Velcro.

**Mark hole location.** Add weight to the seat to simulate its condition with a rider inside (20-50 lbs is sufficient). Then, use scissors to cut out the portion of fabric that interferes with the hinge of the frame as shown in Figure 14. The hole should begin 1.5 inches above the hinge and end 1 inch below the hinge bracket. This will ensure that the fabric does not get caught in the hinge. If the hole is not big enough, the seat can get caught in the hinge when collapsing the frame.

**Cut hinge clearance hole.** After the hole is cut, test collapsing the BTJ and adjust the hole as needed. Figure 15 shows the hinge of a completed trailer, where there is adequate space between the fabric and hinge.

After the correct size of hole has been made, be sure to hem the edges as can be seen in Figure 15.

Cut opening on both sides of the seat to provide clearance for hinge



*Figure 14. Angled side view of trailer.*



*Figure 15. View of hinge on a fully completed trailer.*

## 7. Place snaps

The snaps should be attached to the seat as shown in Figure 2. First follow Figure 2 to place snaps along the outer strip of Velcro. Note that the exact spacing between snaps is not crucial, just try to space them evenly.

**Mark the snaps** with chalk as shown in Figure 16, then fold the fabric to connect matching strips of Velcro as shown in Figure 17. This should leave a mark on the other side of Velcro (as can be seen in Figure 18) that will show where to place the rest of the snaps. Each snap consists of a stud and a socket (see box that the snaps come in). The socket is placed near the edge of the fabric and the stud is placed 6 inches into the fabric.

**Use snap pliers to attach snaps.** The snaps will need to be well pressed before they will engage correctly.



*Figure 16*



*Figure 17*



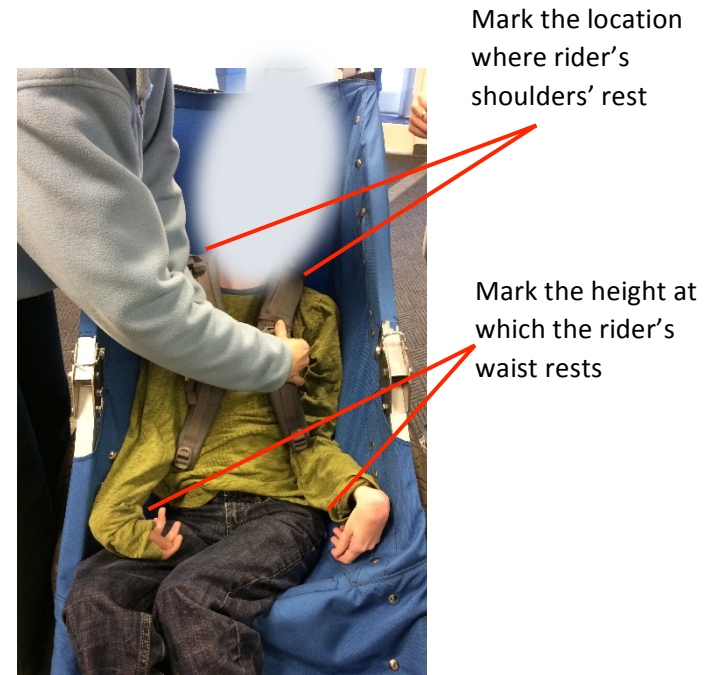
*Figure 18*

## 8. Harness

**Mark Harness Location.** To correctly place the five-point harness, first mount the seat onto the frame and have the rider sit in it. Put the backpack strap assembly behind the rider's back until the straps fit snugly around their shoulders. Mark the location of the straps with a pencil. Also mark the location (height) at which the rider's waist rests. Figure 20 shows the approximate locations of these markings.



*Figure 20. Showing approximate locations where markings should be made.*



*Figure 19. Placing rider in seat and marking locations for harness*



**Stitch on harness.** Stitch the backpack straps onto the seat fabric as marked. Then stitch both the  $\frac{3}{4}$ " wide 10" long webbing as well as the  $1\frac{1}{2}$ " wide 10" long webbing onto the side as previously marked, shown in Figure 20 and 22. Figure 21 further illustrates how to stitch both straps onto the fabric using a box X stitch for both strips of webbing. As is illustrated in Figure 22, the  $\frac{3}{4}$ " webbing goes into the triglide (three bar) slides at the bottom of the backpack straps, while each  $1\frac{1}{2}$ " webbing goes into one side of the buckle.



*Figure 21*



*Figure 22*

**Attach ladder locks/car seat clips.** Take the 1½" long webbing and stitch a ladder lock onto the end using a box X stitch as shown in figure 23.

Then, take another 1½" wide, 10" long strip of webbing and stitch it on the back of the piece with the ladder lock, as shown in figure 24. Also, take one of the clips for the car seat buckle and slide the loose end of the webbing through it.



*Figure 23*



Stitch other piece of webbing to this point

Slide one clip for seat buckle through webbing

*Figure 24*

**Thread the ladder locks.** Next, slide the loose end of the webbing through the ladder lock as shown in figure 25, then loop it back through as shown in figure 26. Now, the side strap of the harness will be able to lengthen and shorten as needed when the rider is in the seat.



*Figure 25*



*Figure 26*



To secure the backpack straps to the seat, loop the  $\frac{3}{4}$ " strip of webbing through the three bar slide attached to the bottom of the backpack strap as shown in figure 27. Do this for both sides of the seat.

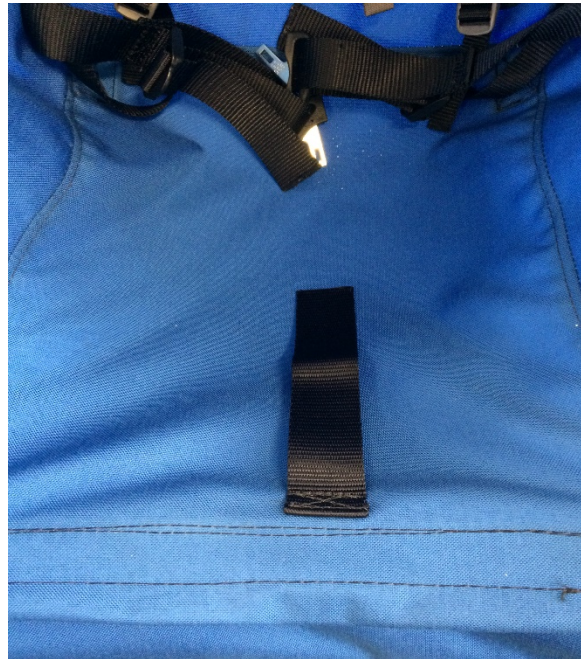


Slide webbing through  
three bar slide

*Figure 27*

**Attach buckle.** The final part of the seat harness is securing the seat buckle to the seat. To do this, first stitch the 1½" wide 12" long strip of webbing to the seat as shown in figure 28. This is also depicted in figure 22. Use a box X stitch to attach the webbing to the fabric. Next, slide the loose end of the webbing into the slide of the car seat buckle as shown in figure 29. Loop it through as shown in figure 30. Now the length of the car seat buckle can be adjusted to fit the rider.

Now the harness is fully attached to the seat. The rider can be placed in the seat and any excess unnecessary webbing from the harness can be cut off to remove clutter in the seat.



*Figure 28*



Slide webbing through bar



Slide webbing through bar

*Figure 30*



## 9. Securing seat to frame

Even though the five-point harness keeps the rider in the seat, this is not secure unless the seat is also attached to the frame. This is accomplished by stitching webbing to the base of the seat that tightens around the axle of the frame, as shown in figure 31. Stitch two 1½" wide, 18" long strips of webbing to the base of the seat using a box X stitch. Only about 2" of the webbing has to be stitched to the seat as shown in figure 32. Then loop the webbing around the axle as shown in the figure and tighten it using three bar slides.

Stitch about 2" of webbing to seat



Figure 32



Loop webbing around axle and use three bar slide to tighten

Figure 31. Back view of trailer.

## 10. Padding

Padding can be added as desired according to the needs of the rider. Since the design uses the concept of a sling seat, padding is not necessary unless a particular rider needs more cushioning at a specific area.

### Notes

1. For fabric that is 57-60" wide, 2 yards would be sufficient to cut out the required pattern, however if you would like to play it safe you could purchase 2 ½ yards to give a larger margin for fitting all the pieces on the fabric. Choose desired color. This will be the primary color of the BTJ.
2. Most of the seat parts can be obtained directly from an upholstery shop in the exact quantity that you need. Should you decide to take it there instead of sewing it yourself, then it would be worth considering getting all parts from there. Some parts which may not be available from an upholstery shop include backpack straps and the car seat buckle.
3. The most critical dimension to adjust is the leg length. To do this, have the rider sit in a wheelchair or other chair and measure the horizontal length from the base of their back to the back of their knee. This length will replace dimension E on figure 1. The corresponding dimension (F) should be ½" longer than the measured length. For example if the length measured is 15", length E will be 15" and length F will be 15.5".

Another possible length to adjust is the height of the seat. To alter this dimension, again sit the rider in a wheelchair and measure the vertical height from the base of their seat to the top of their head. Add 3" to the measured height. Use this number for dimension G on figure 1. The corresponding dimension (H) will again need to be adjusted. In this case it will be a ½" shorter than the calculated value. For example if the rider's sitting height is 30", dimension G will be 33" and dimension H will be 32.5". Note that any changes to the dimensions of the seat will slightly affect the angle that the rider sits and also slightly affect the exact location of other features such as snaps and Velcro.

## Assembly Instructions

When assembling the trailer, refer frequently to the assembly drawings to see how the parts fit together. Pay attention to which drilled holes line up to other drilled holes on corresponding parts. Please note that some of the pictures shown below contain features that have been slightly modified from the drawings, but the instructions and drawings should contain common directions. In other words, do not become confused if the pictures and drawings do not match perfectly. You will be safe by following the instructions and the drawings, using the pictures as a visual reference.

<i>Sub-Assembly</i>	<i>Drawing</i>
Base Frame	A1
Back Frame	A2
Hypotenuse Sub-Assembly	A3
Trailer	A4

## Assemble the Base Frame

DRAWINGS: Sub-Assembly Drawing 1

### Step 1. Bolt Axle to Left and Right Base Bars.

Make sure that the left and right base bars are on the correct side. Using the 1 ½" long, ¼" diameter bolts, bolt the axle to the bottom of the base bars. When tightening, make sure the fit is snug, but avoid over tightening it which causes the bars to deform.

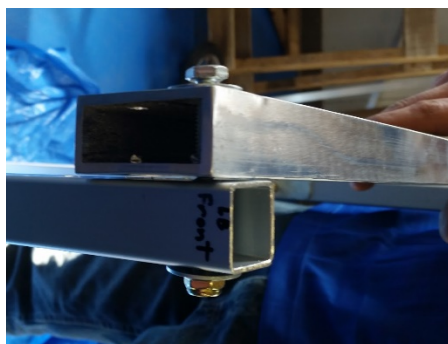


### Step 2. Bolt on the Hitch Sleeve.

You will need to put ¼" spacers in the space underneath the bottom face of the Left Base Bar and above the inside face of the Hitch Sleeve as shown. One spacer goes around the bolt furthest forward and one around the bolt furthest back. Using one of the 1 ¾" long, ¼" diameter bolts, bolt the hitch sleeve onto the left base bar in the front hole. Do not put a bolt through the middle hole or the back hole yet, as they will be used to bolt the footrest on as well.



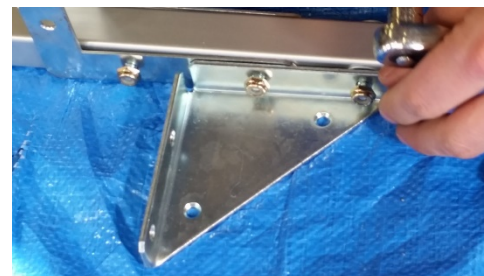
### Step 3. Bolt on the Front Mounting Bar.



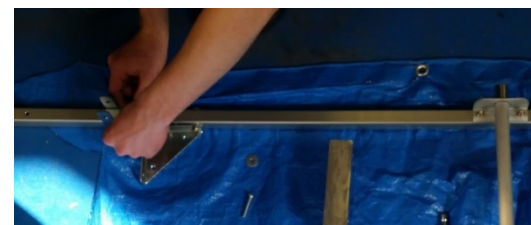
Bolt the Front Mounting Bar onto both the Left and Right Base Bars. You will need to replicate the bolt setup 4 times - twice on each side of the trailer. Be sure to use the 2 ½" long ¼" diameter bolts for this step.

### Step 4. Bolt the Corner Braces and L-Brackets to the Left and Right Base Bars.

Bolt the L-Brackets to the base bar, starting with hole closest to the 90° angle on the L-bracket, on both sides to the two base bars. Then bolt the corner braces to the base

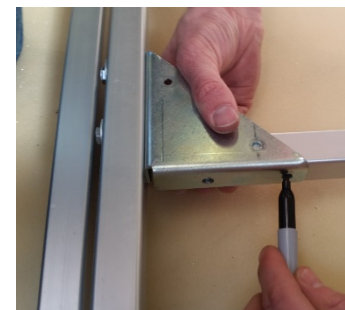


bar. Do this by lining up the inside hole of the corner braces with the second hole, furthest from the 90° angle, of L-bracket. The outside hole of the corner brace connects to the base bars with a washer in between the two (see figure below). Use the 1 ½" long ¼" diameter bolts for this step.



### Step 5. Bolt the Base Support Bar to the Corner Braces.

Make sure that the axle is bolted to the base bars when marking the holes for the base support bar. This will



make sure that the base support bar is not too long or too short. Mark the four holes in the base support bar using the corner braces as a stencil. Drill the holes out of the base support bar. Use four 1 ½" long ¼" diameter bolts to bolt the base support bar to the two corner braces

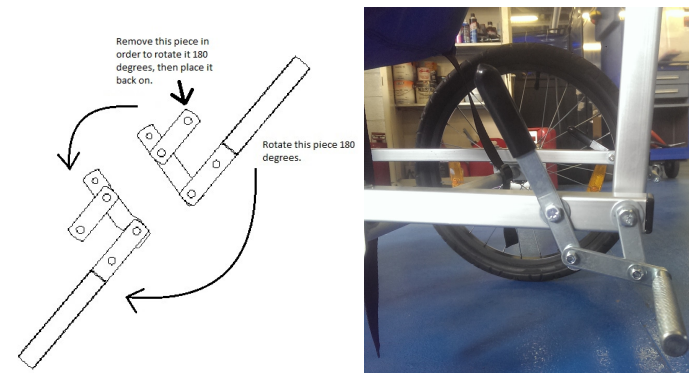
#### **Step 6. Bolt on the Front Wheel Sleeve.**

Bolt on the Front Wheel Sleeve to the front wheel mounting bar with the welded bracket on bottom, flush against the front wheel mounting bar. The holes on the welded bracket piece should be lined up with the back two holes on the front wheel mounting bar. Before Use the 1 ½" long, ¼" diameter bolts to bolt this piece onto the bar. Before tightening this piece down, position one of the front wheel mounting brackets underneath the sleeve, lining up with the front two middle holes on the front wheel mounting bar. Place a 3" long, ¼" diameter bolt through each of the holes to attach the bracket onto the bar. Now, place another front wheel mounting bracket onto 3" bolts, above the sleeve for the front wheel (as shown in the Front Wheel Mounting Assembly, drawing A2). Once all the bolts and brackets are in place, tighten the four bolts, alternating back and forth so that the sleeve doesn't become crooked due to one bolt being tightened much more than the others. Again, refer to drawing A2 in order to more clearly understand these instructions.

#### **Step 7. Bolt on the Brake**

First, bolt the front part of the brake (where the handle is with the rubber grip) onto the outside of the left base bar. Make sure that the metal rod piece is sticking out and can come into contact with the tire when the brakes are engaged. In order to orient the brake correctly for the right side, rotate the brake handle to the other side

of the assembly and unscrew the second, back metal piece in order to rotate it in the same way (see diagram below), thus inverting the brake assembly orientation. Then bolt the brake handle to the right base bar with the metal rod pointing out. Be sure not to excessively tighten either of these bolts, as that will make moving the brake much more difficult. The back part of the brake assembly, that bolts through the brake, base bar, and vertical bar will be attached at a later step, once the back frame has been assembled.



#### **Step 8. Bolt on the Footrest**

Once the footrest has been formed and the holes drilled out in the bottom part of the footrest and the base bar, attach the footrest to the base bars. Use 2 ¼" long, ¼" diameter bolts to reach through the footrest and the hitch sleeve. Be sure to use a washer on the top and bottom of the bolts. The bolts on the other side are 1 ¾".

## Assemble the Back Frame

DRAWINGS: Sub-Assembly Drawing 2

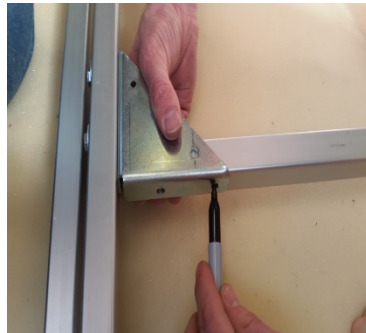
### Step 1. Bolt the Corner Braces to the Vertical Bars.

Following the same process as bolting the corner braces to the base bars, bolt them to the vertical bars. This is done by measuring marking one hole on each of the vertical bars where the corner braces will attach. Then, after drilling that hole, put a bolt through the hole and the brace and use the brace as a stencil to mark the other holes in the vertical bar. Drill out the remaining holes and attach the corner braces to the vertical bar using 1 ½" long ¼" diameter bolts.



### Step 2. Bolt the Back Cross Bar to the Corner Braces.

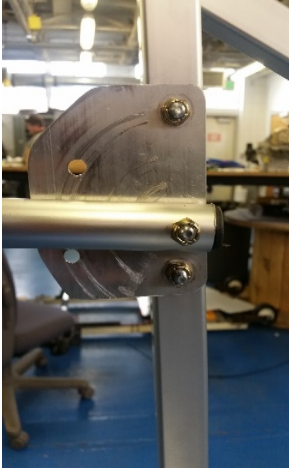
Mark the four holes in the Back Cross Bar using the corner braces as a stencil. Then drill the holes in the Back Cross Bar. Use four 1 ½" long ¼" diameter bolts to bolt the Back Cross Bar to the two Corner Braces.





### **Step 3. Bolt on the Handlebar Brackets.**

Bolt the Handlebar Bracket to the Vertical Bar using the upper and lower holes in the Handlebar Bracket using 1 ½" long ¼" diameter bolts. The Handlebar Bracket goes on the inside of the Vertical Bar.



### **Step 4. Bolt on the Handlebar.**

The handlebar attaches to the Center Hole on the Handlebar Bracket. The bolt will go through the Vertical Bar and the Handlebar Bracket. The Spring Pin inside the Handlebar should line up with the 2" radius holes that you will drill. We recommend drilling the 2" radius holes with a hand drill after assembling the complete frame so you can customize the angles for the comfort of those who will be pushing the trailer most.



## Assemble the Hypotenuse Sub-Assembly (x2)

DRAWINGS: Sub-Assembly Drawing 3

### Step 1. Bolt the 2 Brace hinges on the Hypotenuse Bottom Bar.

Repeat these steps for both Hypotenuse Bottom Bar. The two holes closest to each other on the brace hinges connect to the Hypotenuse Bottom Bar. See the following picture. Using 1 ½" long ¼" diameter bolts, bolt the brace hinges to the bars with the bolt heads facing the inside of the trailer.

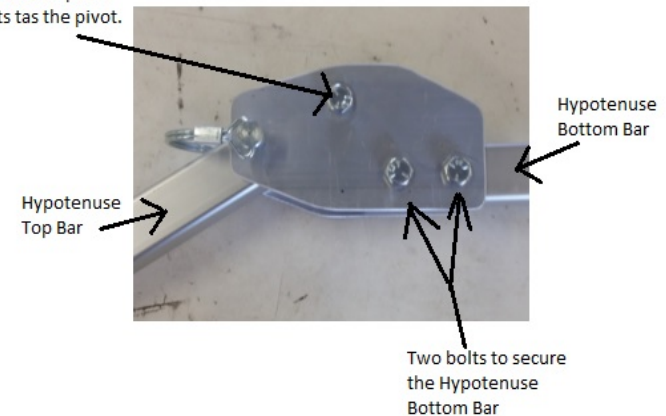


### Step 2. Bolt the Top Hypotenuse Bar in between the Brace Hinges.

Using a 1 ½" long ¼" diameter bolt, bolt the top hypotenuse bar to the brace hinges by bolting the hole closest to the end of the tube to the top center hole in the brace hinge. This creates the pivot around which the bars will rotate. Make sure the bolt heads are facing in.

### Step 3. Put a Retaining Pin through the last hole to lock the Hypotenuse Sub-Assembly in place.

Bolt for the Hypotenuse Top Bar that acts as the pivot.



## Assembling the Trailer

DRAWINGS: Sub-Assembly Drawing 2, Assembly Drawing 2

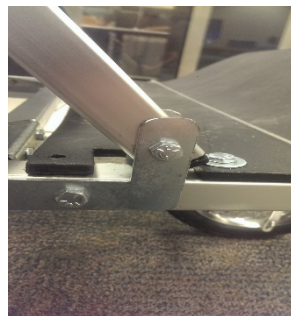
### Step 1. Bolt the Back Frame to the Base Frame.

This occurs with the brake on both sides. It is now time to put a bolt through the brake, vertical bar, a spacer, and the corresponding vertical side. The bolt used should be 3" long  $\frac{1}{4}$ " diameter. Again, be sure not to tighten the bolt too much so that the trailer can still collapse easily.



### Step 2. Bolt the Bottom Hypotenuse Bar in between the L-Brackets on the Base Frame.

Use a 1  $\frac{1}{2}$ " long  $\frac{1}{4}$ " diameter bolt to bolt the hypotenuse bottom bars to the L-brackets with the bolt head facing out.



### Step 3. Bolt the Hypotenuse Top Bar on the outside of the Back Frame.

Using a 2  $\frac{3}{4}$ " bolt the hypotenuse top bar to the vertical bar with a spacer in between them and the bolt head facing out. Repeat this for both sides.

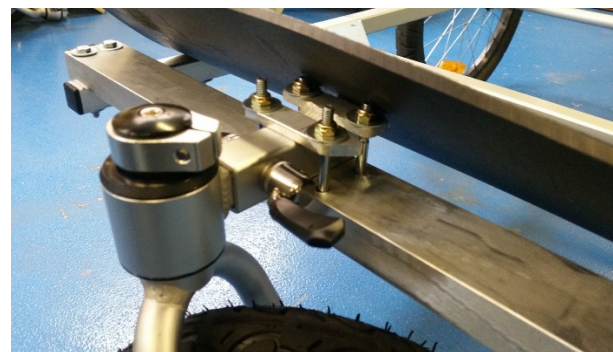


### Step 4. Attach the Back Wheels.

Push the quick release button on the wheel and insert into axle. Repeat for each of the back wheels.

### Step 5. Attach the Front Wheel.

Insert the Front Wheel into the Front Wheel Sleeve. Insert the quick-release bolt through the hole. Replace the nut and washer then tighten the bike quick release mechanism.



### Step 6. Put the Seat on the Frame.

Loop the top strap over the vertical bars. Tighten the strap to the desired tautness. Wrap the bottom strap around the bottom hypotenuse bars before velcroing and snapping the entire seat to the frame. Wrap the seat around the hypotenuse bars, then snap and velcro it together. Tighten the strap under where the knees go on the hypotenuse bottom bar. Then wrap the back two hanging straps around the axle to attach the seat to the axle and tighten the straps.

### Step 7. Insert Tube Plugs.

Insert Tube Plugs into the ends of all tubes. For the Front Wheel Mounting Bar, use 2 Tube Plugs. Sand or grind down one side on each plug and insert both as shown. Using a hammer or rubber mallet for this step is recommended, but not required. Also, using a 5-minute epoxy or superglue to help the plugs stay in will help prevent them from wiggling out from extended use, but is not



required.

### Step 8. Adjust the stiffness of the front wheel.

The ability of the front wheel to swivel can be adjusted by loosening or tightening the top bolt of the front wheel assembly. Tightening it will help prevent it from wobbling as much, but it will not swivel as easily. To tighten it, loosen the clamp around the top bolt before tightening the top bolt. Be sure to not over tighten the top bolt when adjusting the stiffness. Finally, retighten the clamping mechanism around the top bolt assembly. See the diagram for more detail.

Top Bolt of the front wheel assembly.



Clamp around the top bolt assembly.