7 Subsystems, their properties and their sources

The following charts discuss all the subsystems of the UTRB, including their specific functions that enable the UTRB to operate, the names of the parts, and their dimensions. Note that the rim brakes and their connecting cable and handlebar assemblies as a complete system are available commercially and can generally be picked up and installed based on any specific request of a retailer or customer. Therefore, the details of those specific parts and their dimensions have not been included in this report. The specific dimensions for all components of the UTRB can be seen in section *7.3: Dimensions for the UTRB Components.*

7.1 Components of the UTRB

7.1.1 The front wheel strut assembly

The front wheel assembly consists of a total of 16 major parts that have been labeled as seen in Figure 7. A. The operation of the front wheel strut assembly as a unit is explained in section *7.2.1: Function of the front wheel strut assembly.*

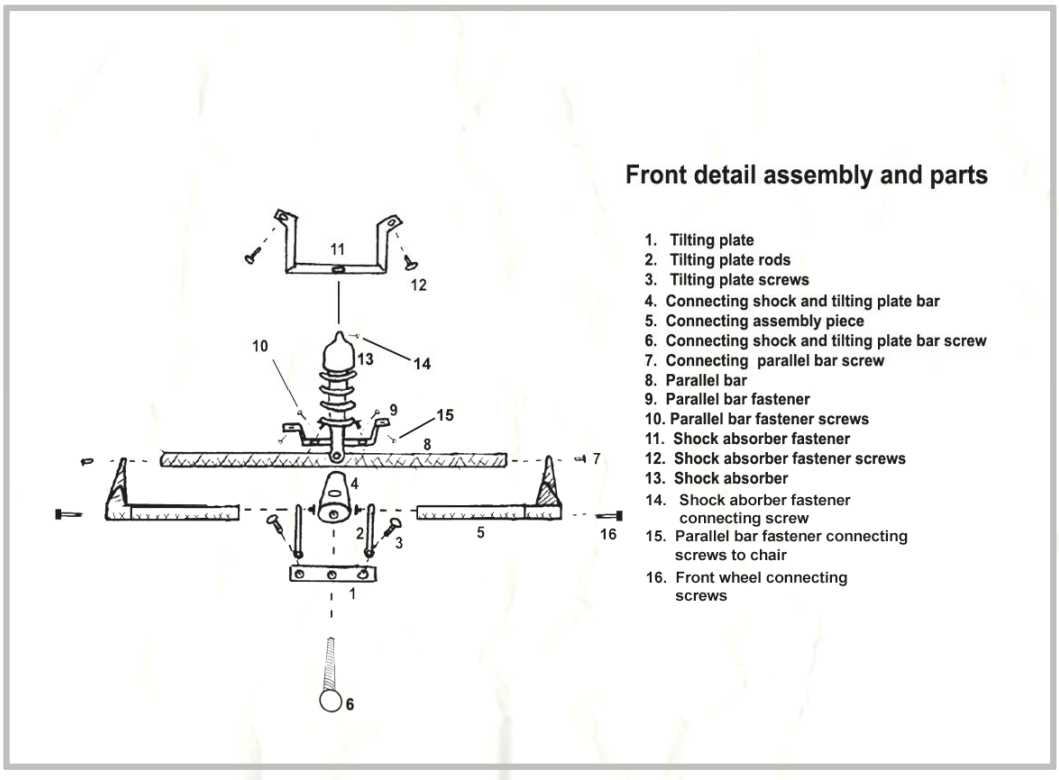


Figure 7.A

7.1.2 The front wheels

The front wheel components consist of a total of 4 parts as seen in Figure 7. B. The wheel rims are made to fit traditional standard rubber mountain bicycle tires that can be purchased at any neighboring retailer. The function of the front wheel components as a unit is explained in section *7.2.2: Function of the front wheel components.*

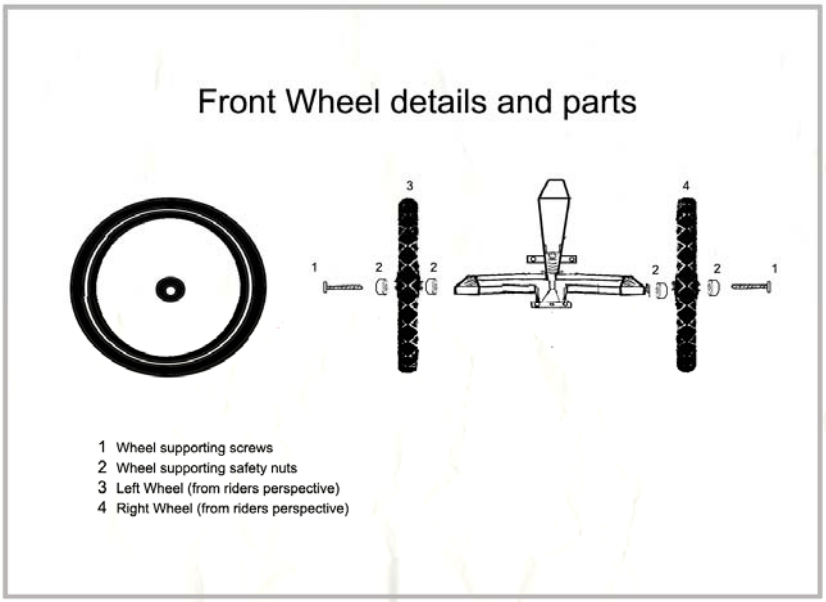


Figure 7.B

7.1.3 The rail piece

The rail piece works as a framework for the entire rowing bike assembly. With its grooves indented along its sides, it allows the rider's feet to attach to the rail assembly and slide back and forth for smooth rowing. Its elevated angle allows for gravity to assist the rollers in the rail assembly to roll effortlessly along the rail grooves. Different views of the rail piece can be displayed as seen in Figure 7. C. The function for the rail piece is explained in section *7.2.3: Function of the rail assembly components.*

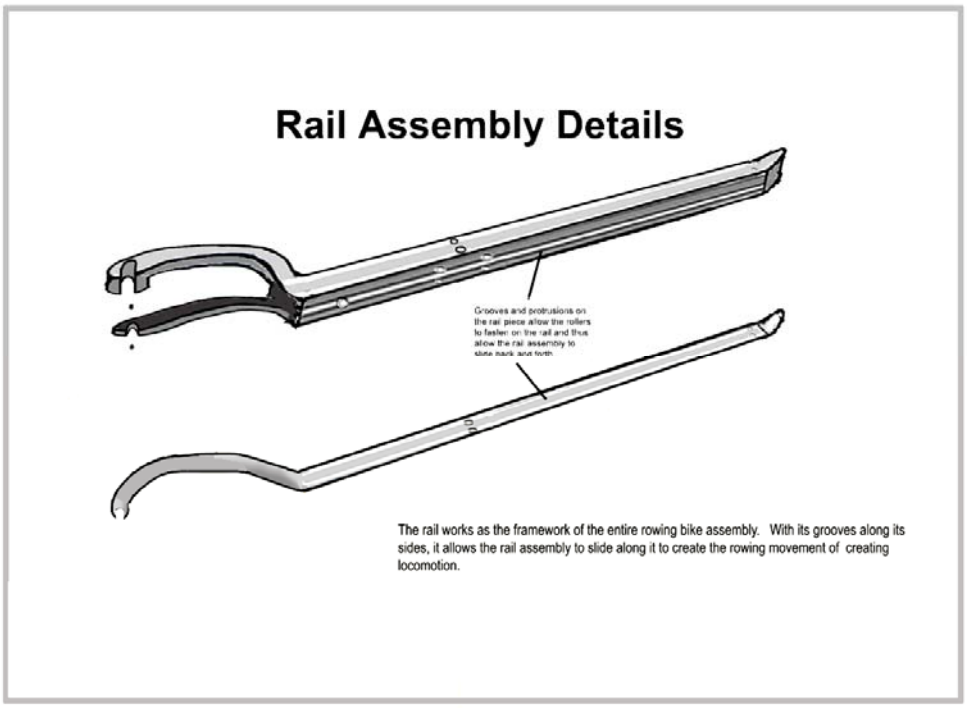


Figure 7.C

7.1.4 The rail assembly

The rail assembly is the most complex component in the entire UTRB. It is made up of 31 separate parts as can be seen in Figure 7.D. Its foot pedals allow the rider to use his or her legs to assist in performing a stroke while simultaneously pulling the drive cable to turn rear wheel for locomotion. The function of the rail assembly is explained in more detail in section *7.2.3: Function of the rail assembly components.*

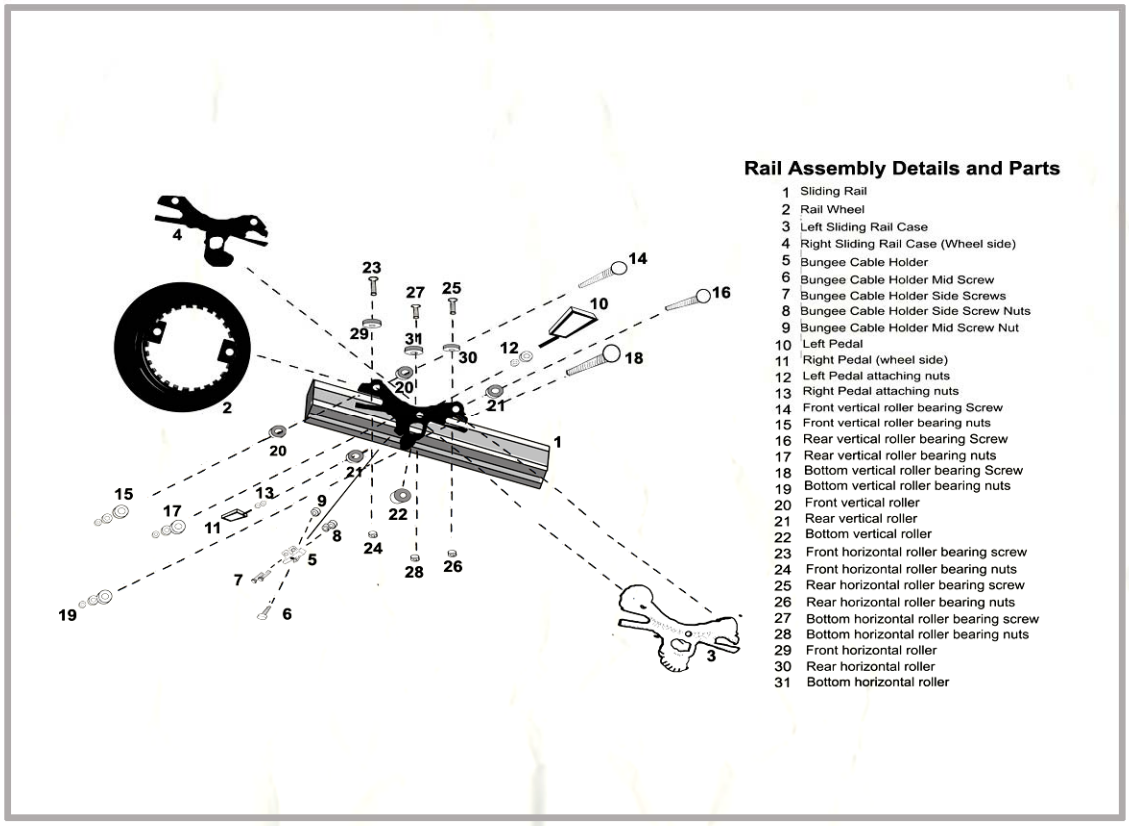


Figure 7.D

7.1.5 The rail pulley assembly

The rail pulley assembly is responsible for aligning the propulsion rope and front bungee cable by connecting the rowing efforts done by a rider and causing the rear driving wheel to propel forward. It is made up of 9 parts as can be seen in Figure 7.E. The function of the rail pulley is explained in more detail in section *7.2.5: Function of the rail pulley component.*

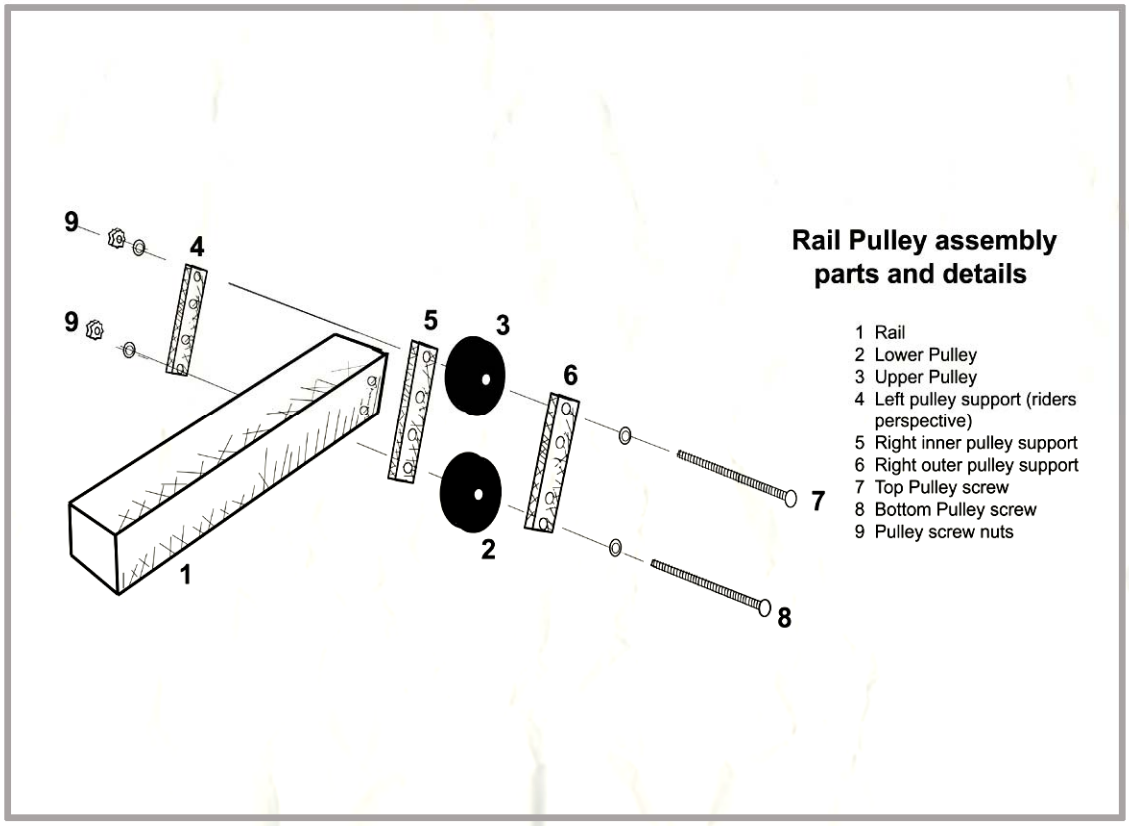


Figure 7.E

7.1.6 The T bar assembly

The T bar assembly allows a rider to perform a stroke as they bring the T bar towards their core while they row. It is made up of 5 parts as can bee seen in Figure 7.F. Further details about the function of the T bar can be seen in section *7.2.6: Function of the T bar component.*

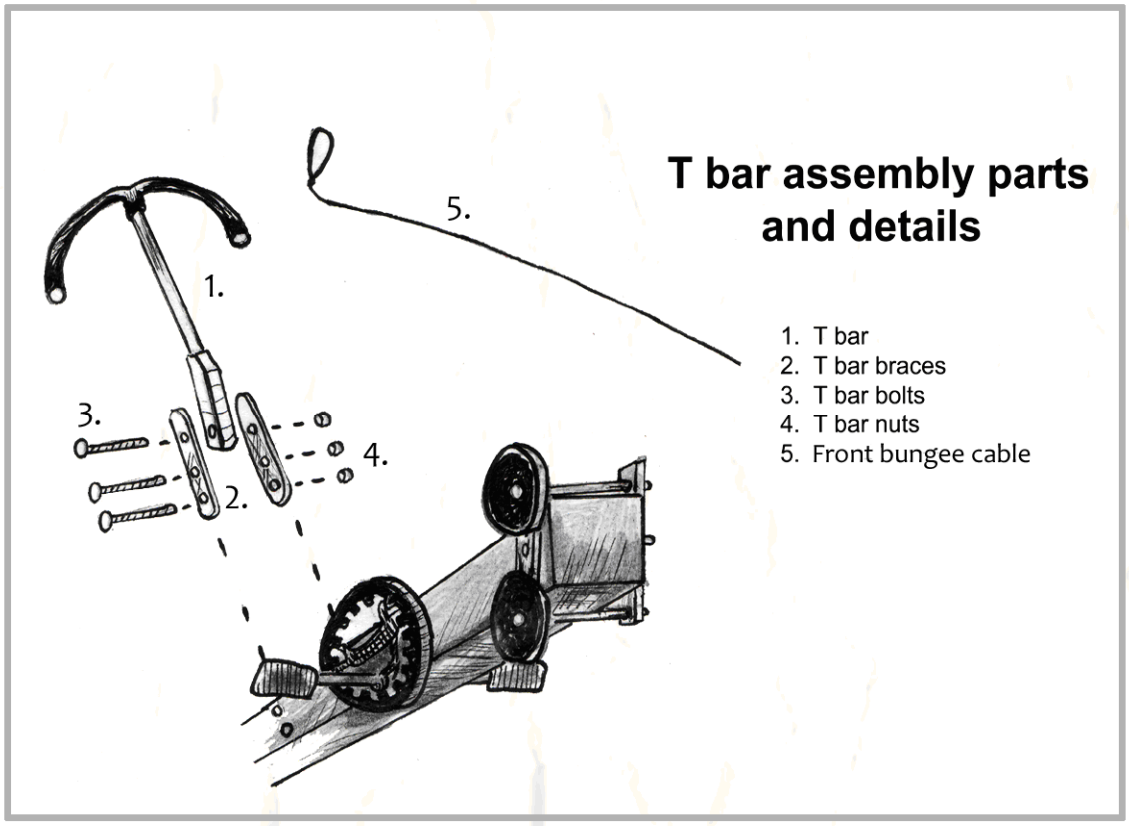


Figure 7.F

7.1.7 The seat assembly

The seat assembly allows a rider to comfortably recline back in order to minimize fatigue while performing the row. It is contoured in a comfortable reclined position whose determined angle of recline emulate a recumbent bicycle seat as used in cardiovascular training.. It is made up of 6 parts as can be seen in Figure 7.G. Further details about the seat, including lengths and angles can be seen in section *7.3.6 Dimensions for the seat assembly*

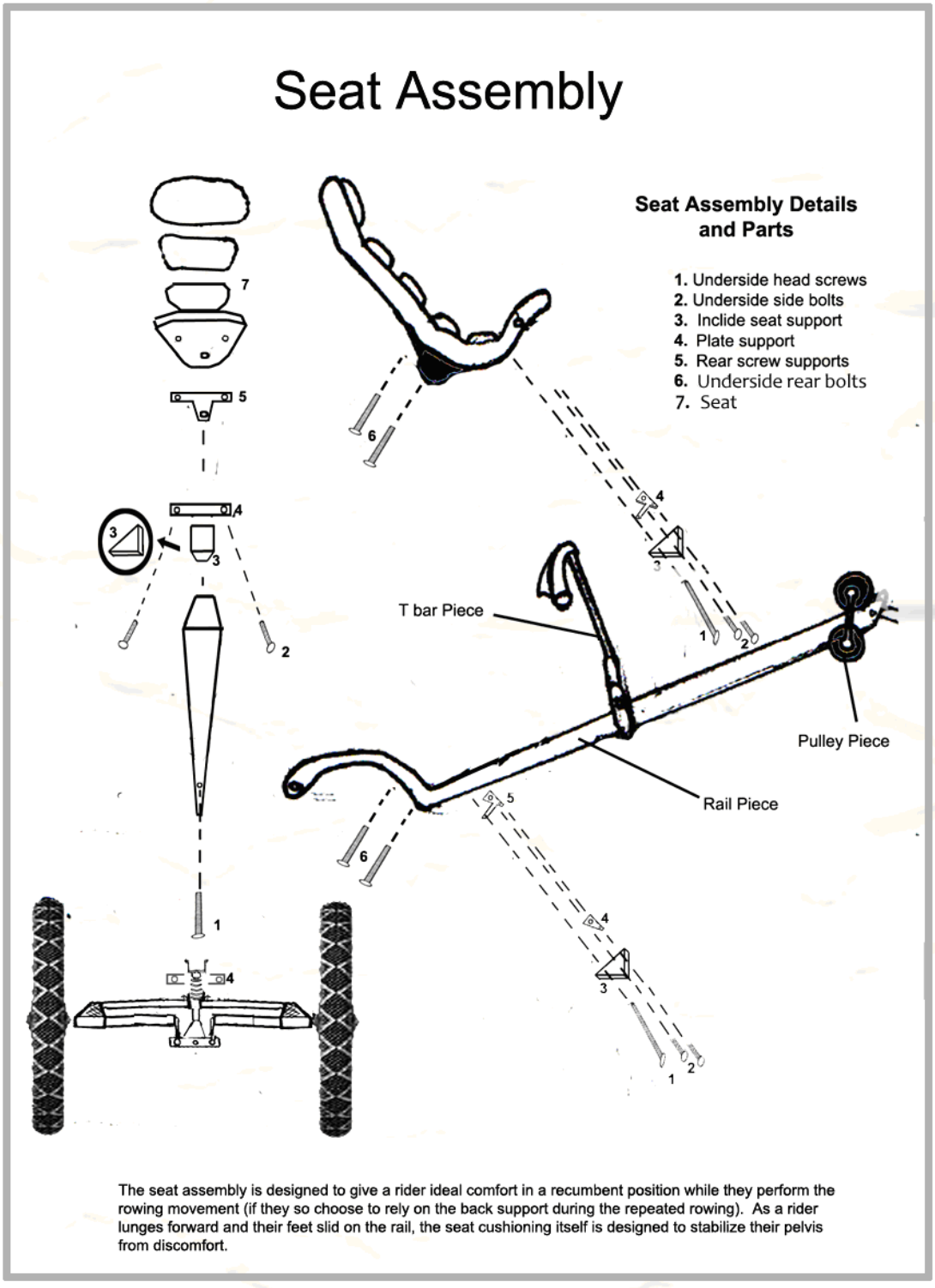

Seat Assembly
Seat Assembly Details and Parts
1. Underside head screws
2. Underside side bolts
3. Inclide seat support
4. Plate support
5. Rear screw supports
6. Underside rear bolts
7. Seat
T bar Piece
Pulley Piece
Rail Piece
The seat assembly is designed to give a rider ideal comfort in a recumbent position while they perform the rowing movement (if they so choose to rely on the back support during the repeated rowing). As a rider lunges forward and their feet slid on the rail, the seat cushioning itself is designed to stabilize their pelvis from discomfort.

Figure 7.G

7.1.8 The coil assembly

The coil assembly consists of a coil piece and a ratchet system that as it is attached to the rear wheel. Its connected propulsion rope will pull on the rear wheel and cause it propel forward in motion. The bungee cord will in turn allow the ratchet piece to recoil back to its original position, thus allowing the propulsion rope to wind around the spindle of the coil. It is made up of 13 parts as can be seen in Figure 7.H. Further details about the function of the coil assembly component can be seen in section *7.2.7 The coil and rear wheel assembly.*

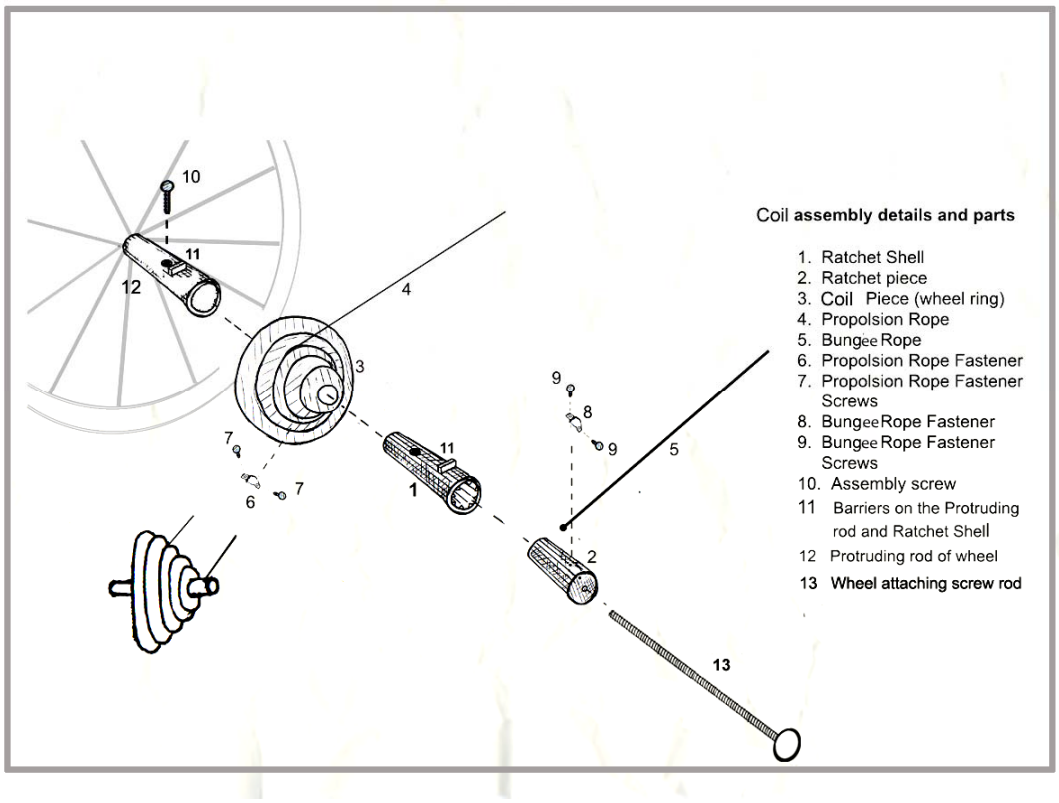


Figure 7.H

7.1.9 The rear wheel assembly

The rear wheel assembly includes the coil assembly along with it as seen in Figure 7.I. The rim brakes of choice can be purchased from any bicycle retailer and so the components of the brakes are not included in this report. The rear wheel assembly itself is the physical component that propels the UTRB forward in motion from the efforts of the rider. Further details about the function of the rear wheel assembly component can be seen in sections *7.2.7 The coil and rear wheel assembly.*

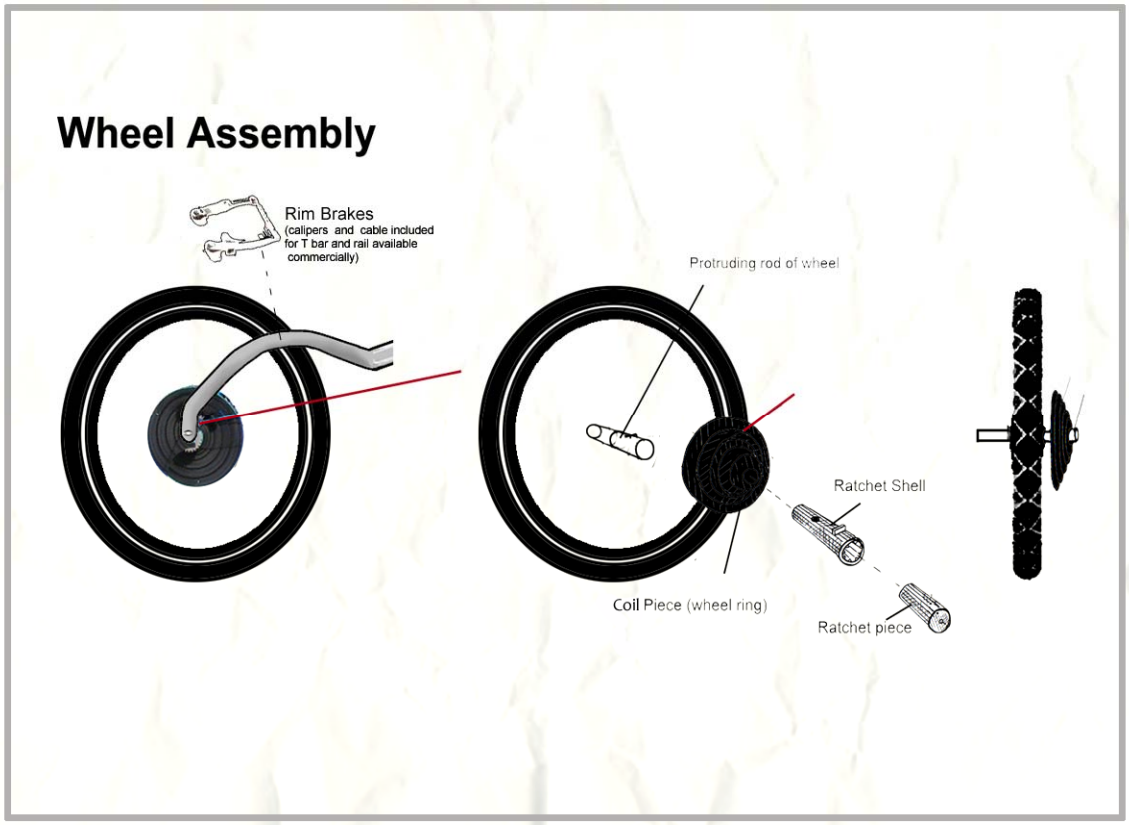


Figure 7.I

7.2 Function for each component of the UTRB

7.2.1: Function of the front wheel strut assembly

The front wheel strut assembly is responsible for allowing the rowing bike to tilt. It is responsible for supporting the front wheels on the frame of the rail piece and allowing the wheels to tilt on turns. Its details can be seen in the original drawing in Figure 7.2.A.

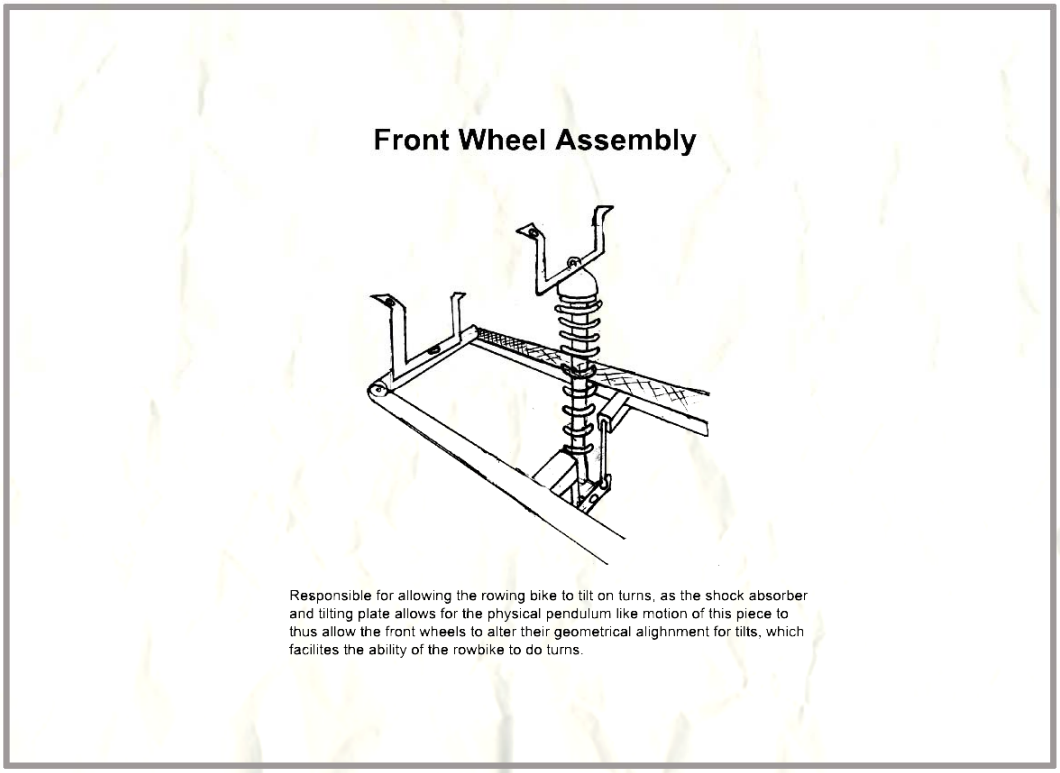


Figure 7.2.A

7.2.2: Function of the front wheel components.

The front wheel assembly as a unit allows the UTRB to tilt safely on turns. As of this time, this is a completely original design addition to pre existing rowing bikes that have been used for recreational purposes mostly in Europe. Further description of the front wheel assembly's function can be seen in Figure 7.2.B.

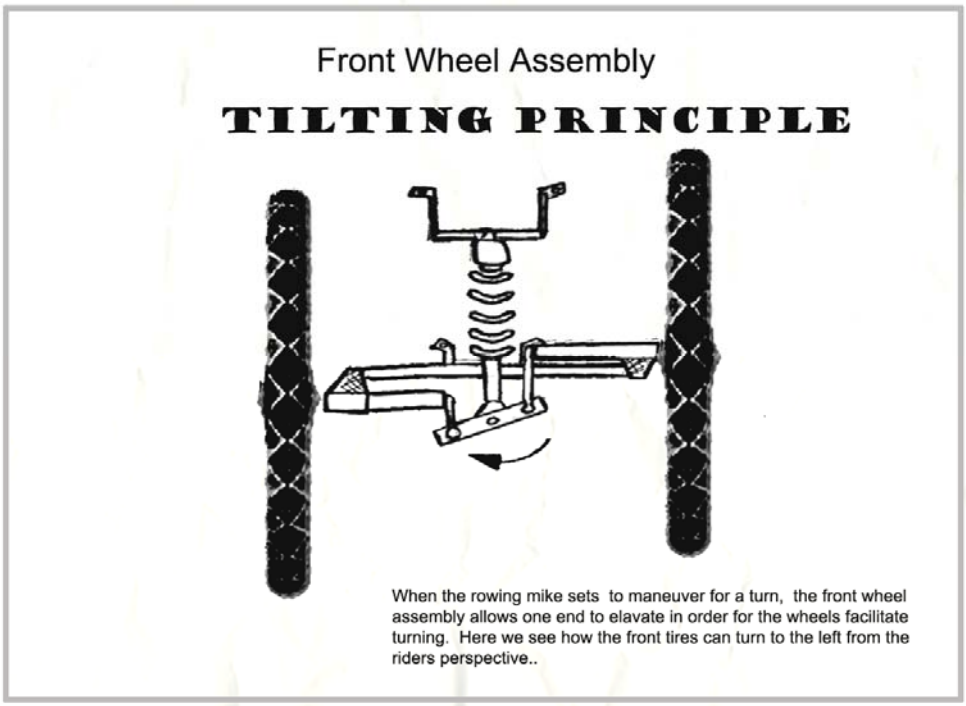


Figure 7.2.B

7.2.3: Function of the rail assembly components

The rail assembly as a whole consists of two components: the rail piece and the rail assembly itself. Figure 7.2.C demonstrates how the grooves in the rail piece allow the rail assembly to slide back and forth on it in order for a rider to properly perform the stroke correctly with their legs. The rail piece also serves as the skeletal framework for the entire UTRB as virtually all other components are attached to it for stabilization. The rail assembly assists in allowing a rider to perform a row. It also aids in the propulsion process of the rear driving wheel below as described in more detail in Figure 7.2.D.

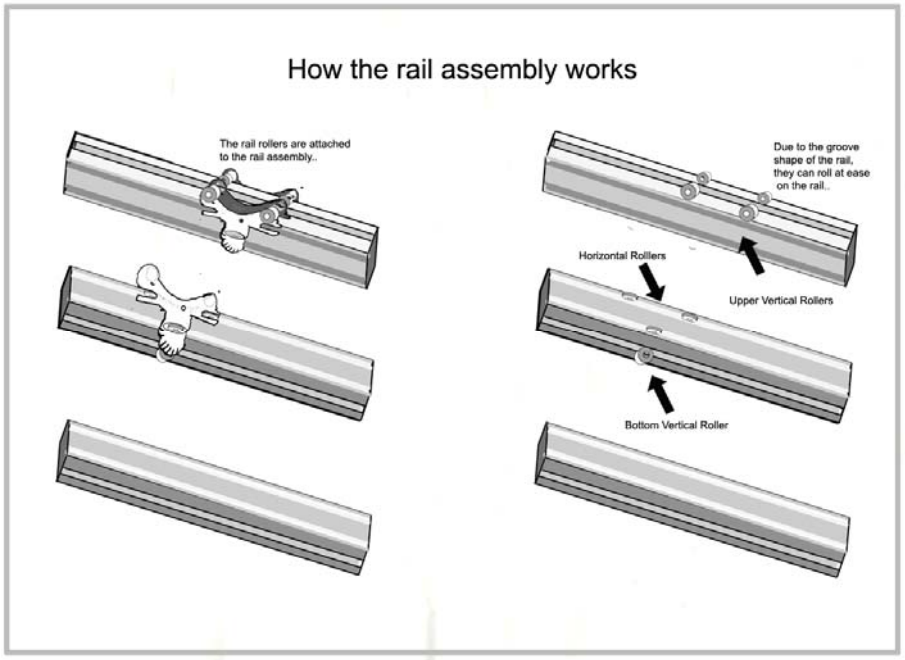


Figure 7.2.C

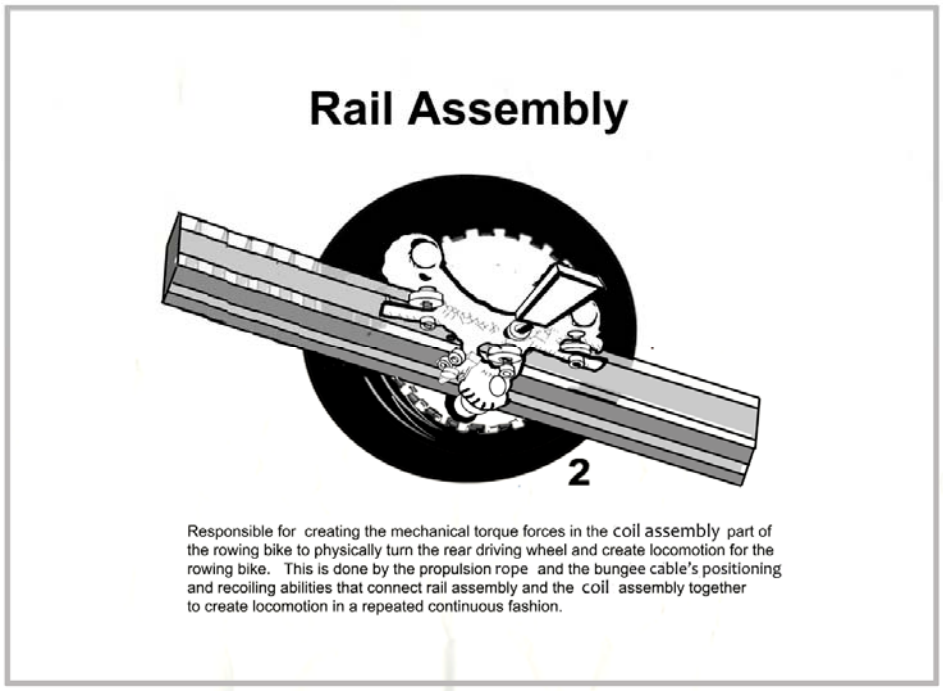


Figure 7.2.D

7.2.5: Function of the rail pulley component.

The rail pulley component aligns the propulsion rope and the bungee cable in an ideal direction to allow the stroke from the rider to drive the rear wheel forward for locomotion. Further details of the function of the rail pulley can be seen in Figure 7.2.E

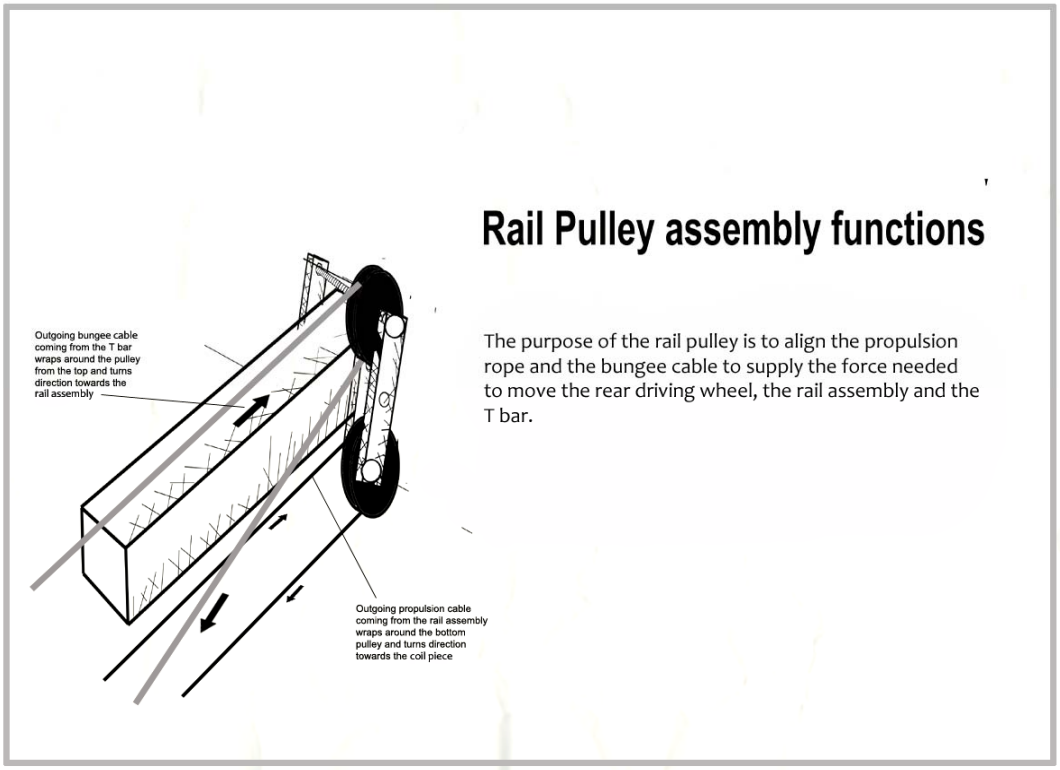


Figure 7.2.E

7.2.6: Function of the T bar component.

The function of the T bar assembly component is to allow a rider to perform the stroke movement with their upper body as their arms hold on to the bar and row it back and forth. The details what this function performs for the rest of the UTRB is described in further in Figure 7.2.F

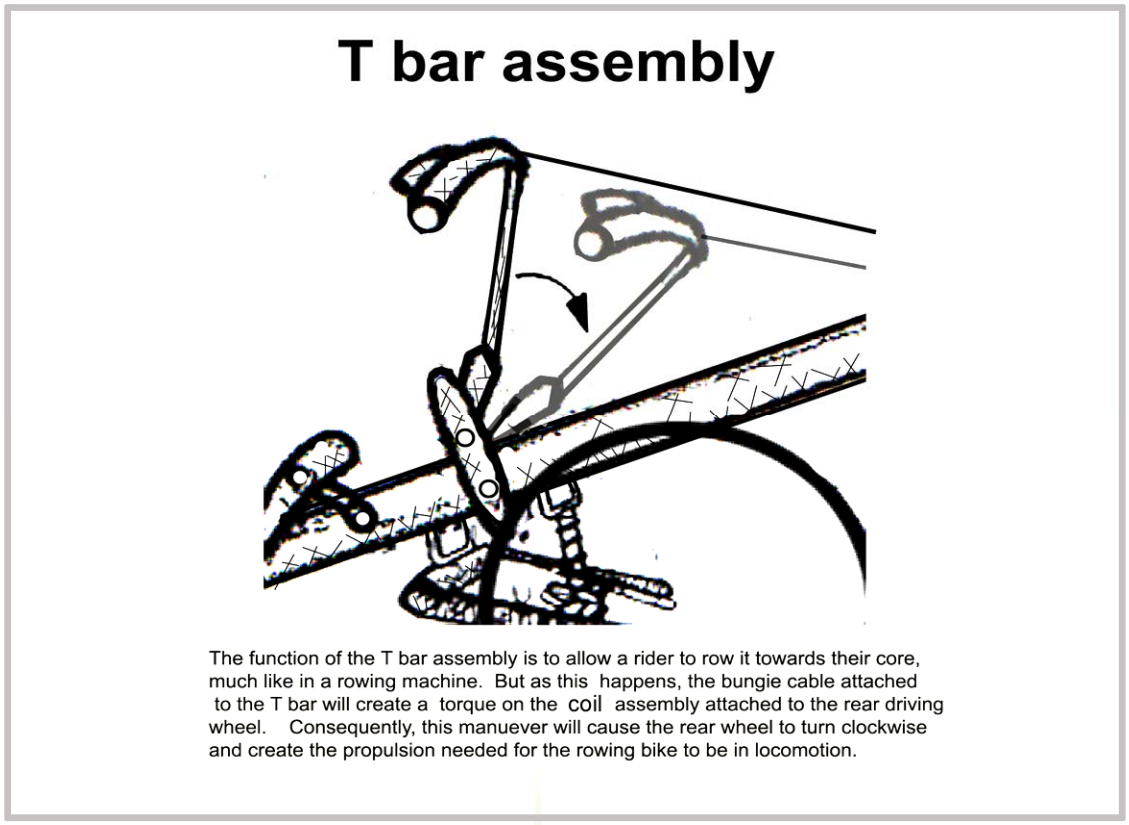


Figure 7.2.F

7.2.7 The coil and rear wheel assembly.

The coil assembly and rear wheel assembly work together to create the propulsion movement for the UTRB. The coil assembly's components as seen in Figure 7.2.G will allow the rear to turn clockwise and propel the UTRB in motion. The ratchet shell that is attached to the inner hole in the coil piece as can be seen in Figure 7.H will allow the coil piece to recoil back. This is because the bungee cord is attached to the ratchet shell, and its recoiling property when the T bar is released will assist in spinning the coil assembly back to its starting position. This will in turn wind the drive cable back on the spindle of the coil piece. The specific functions of the ratchet shell can be seen in Figure 7.2.F.

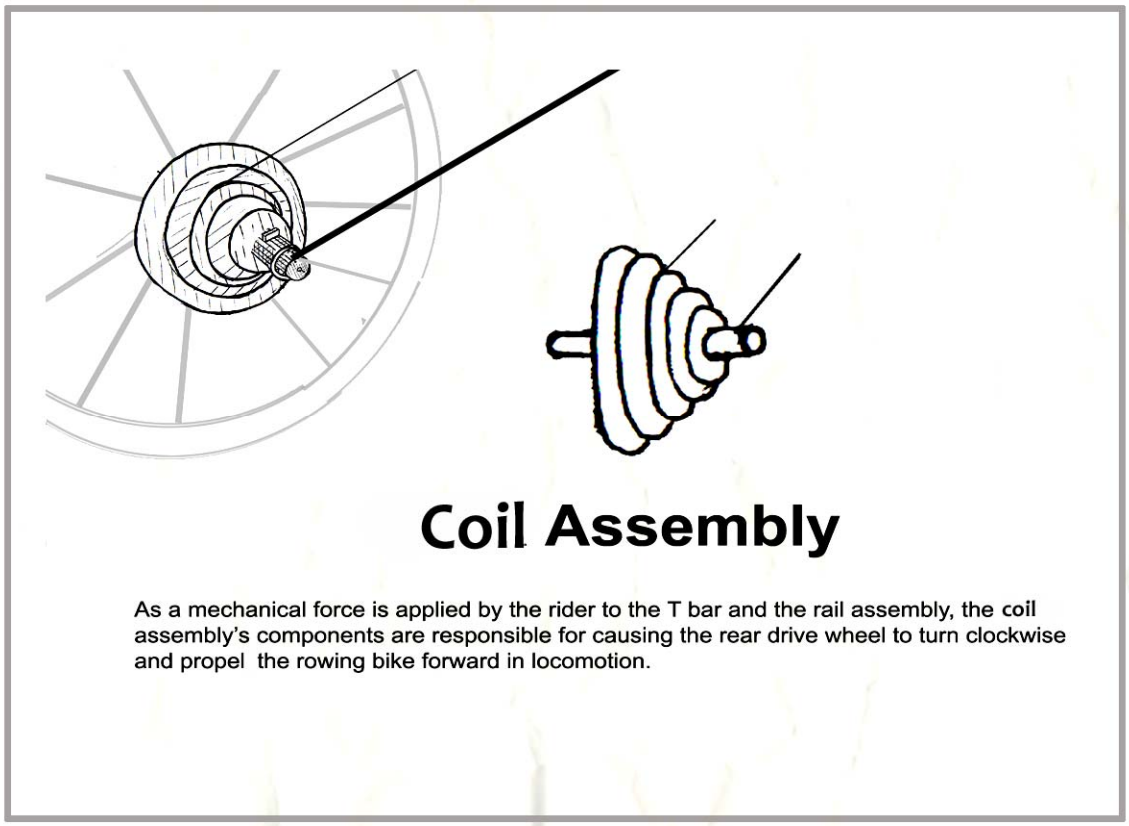
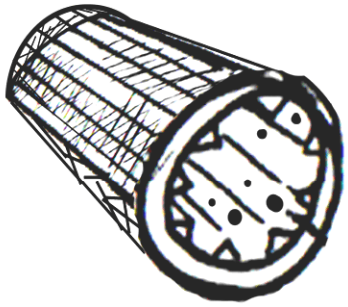


Figure 7.2.G

Principles of the Ratchet Shell



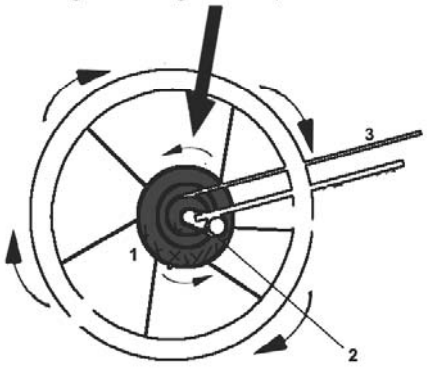
The ratchet shell works identical to the principles of how a socket wrench operates. The ratchet piece inserts into this shell, much like a nut will insert into a socket wrench. Any torque applied to the socket wrench in one given direction should allow the nut to likewise turn in that direction, but then the wrench can be re-aligned to 'spin' back to its original position to set up for the turning torque force applied to that nut. In this case, the ratchet piece is creating a torque on this shell, simply as the connected bungee cord is being recoiled back, thus causing the entire connected rear wheel assembly to turn in a clockwise fashion. However, once the bungee cord recoils back, then both the ratchet piece and its connected coil piece will spin back to their original positions ready for the next rowing movement.

Figure 7.2.H

Working together as one big unit, the rear wheel, ratchet piece and coil piece allows the UTRB to propel forward in motion whenever a rider performs a stroke and recoil the cables back to their original positions whenever the bungee ropes relax back to their original positions for the next stroke. The function of the coil piece and the rear wheel assembly is explained in further detail in Figures 7.2.I and 7.2.J.

How the Coil piece itself works

With a wider diameter than the protruding rod of the rear wheel it simply can slide into the ratchet piece and is wedged between two protruding barriers there. Working together as one unit, this allows the coil assembly to unwind accordingly as the attached propulsion rope is uncoiled of it, thus forcing the rear wheel to propel in a clockwise direction. The rear bungee rope that is also attached to the coil piece will allow it to spin back to its original position and wind the propulsion rope around its spindle whenever the bungee recoils during the eccentric part of the stroke.

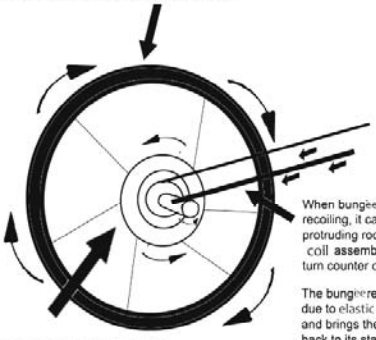


1. Coil piece
2. Protruding Rod
3. (Rea) bungee rope
4. Propulsion rope

Figure 7.2.I

How the general Coil assembly works

All the while the recoiling function is operating on this drive wheel,this drive wheel is turning clockwise because it's in locomotion propelling forward. The force that allowed this wheel to turn clockwise is coming from the alternating pulling movement of the T bar drawing in towards the rider on every row and the drawing in of the slide rail towards the rider while pulling in to prepare for another consecutive row



When bungee coil is recoiling, it causes the protruding rod of the coil assembly to turn counter clockwise

The bungee recoils back due to elastic principles and brings the T bar back to its starting position

Since the coil assembly is attached to the protruding rod of the wheel, it will turn the wheel clockwise whenever a force is applied by the propulsion rope. The coil assembly, however, is not directly attached to the protruding rod. It is simply wedged between two barriers on the rod which allow it to spin at its own rate whenever the propulsion rope uncoils and then recoil back whenever the bungee rope retracts back to its original length. Both the propulsion rope and the bungee rope are attached to the coil piece assembly.

Figure 7.2.J

7.3: Dimensions for the UTRB Components

There are seven major components that make up the UTRB. The sizes and dimensions that represent make each component can be seen here and are compatible with adjacent parts to ensure a smooth design of a UTRB. Measurements were calculated using traditional math for design analysis and trigonometry.

7.3.1 Dimensions for the front wheel assembly and front wheels

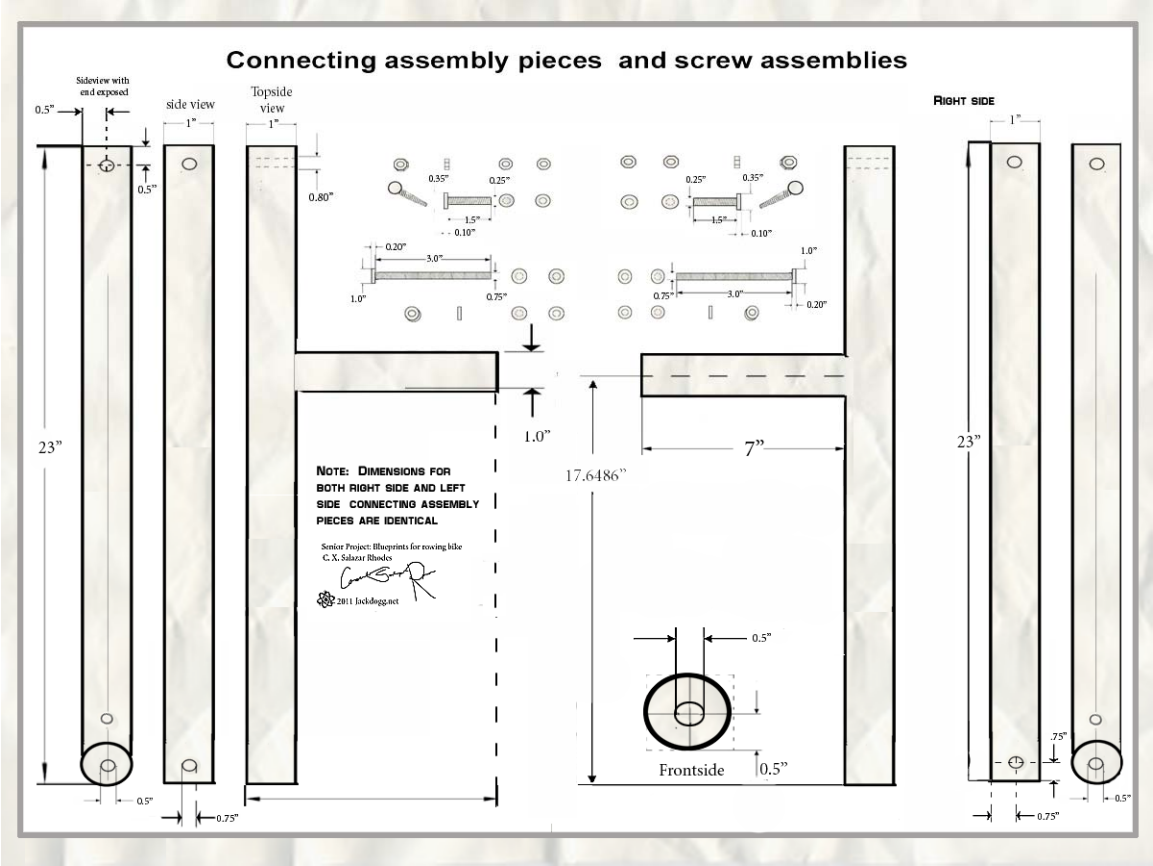


Figure 7.3.1-A

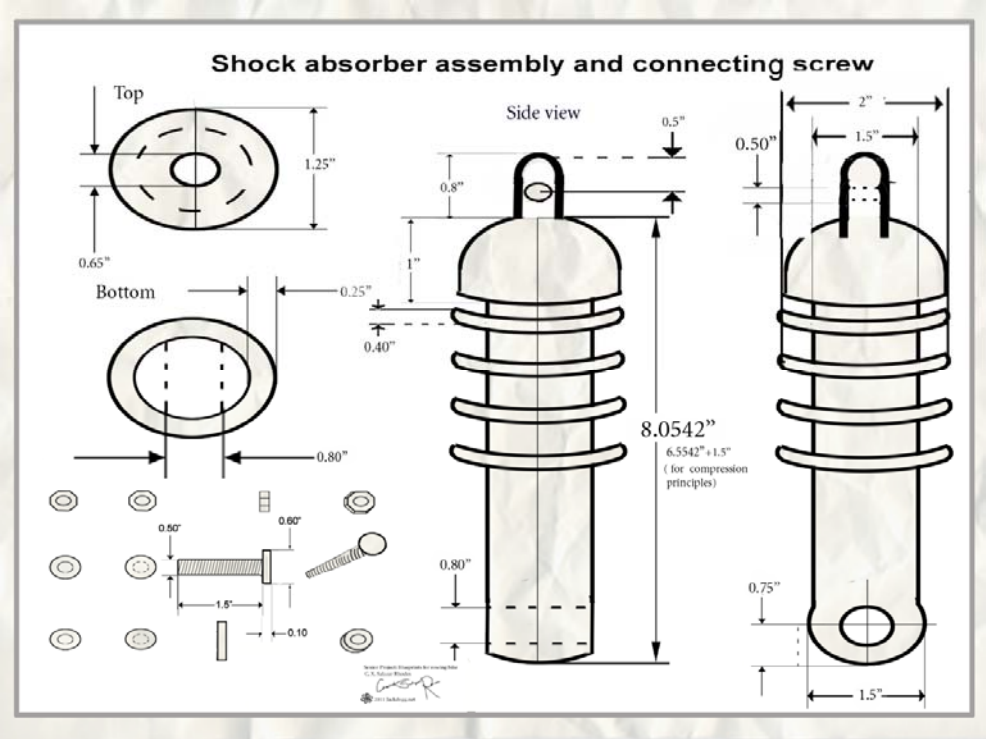


Figure 7.3.1-B

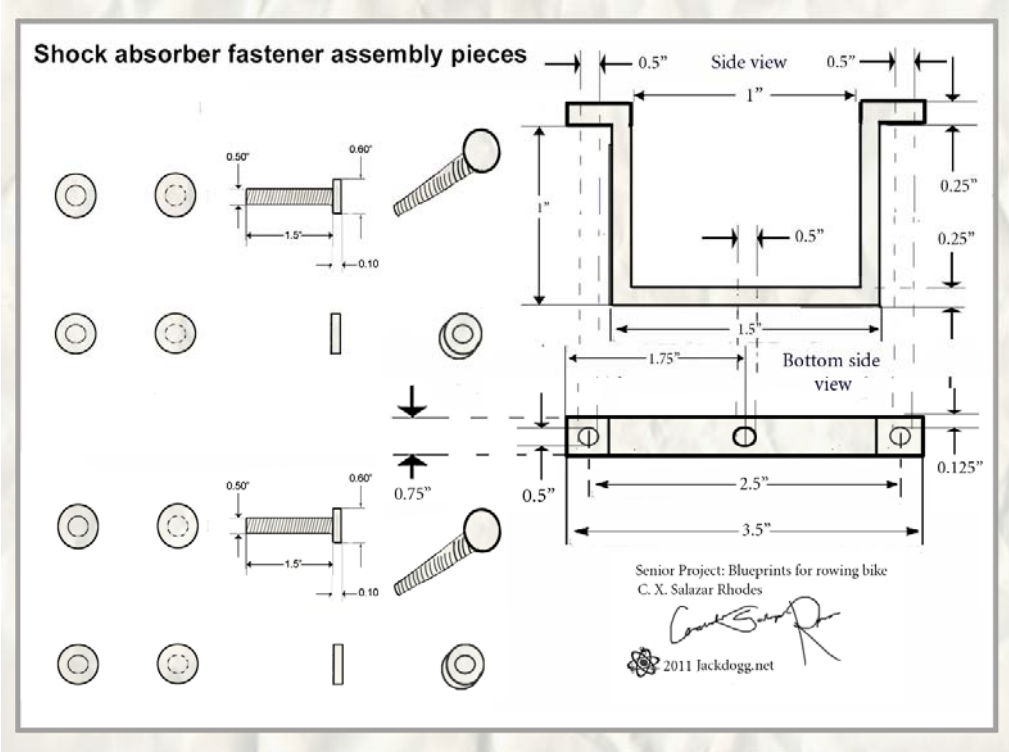


Figure 7.3.1-C

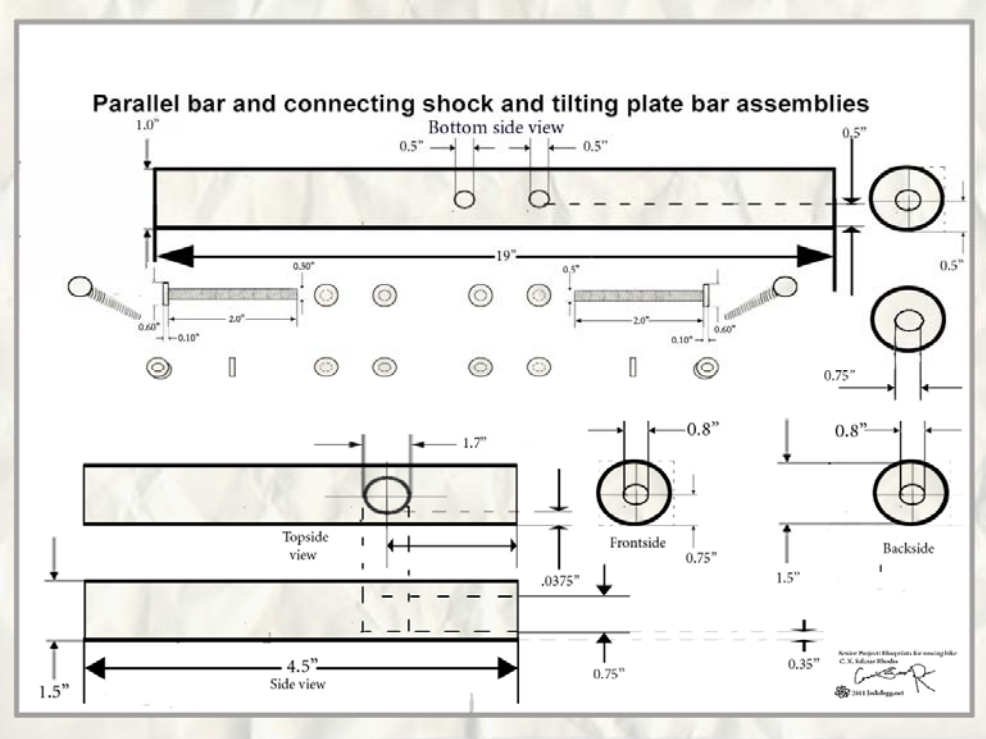


Figure 7.3.1-D

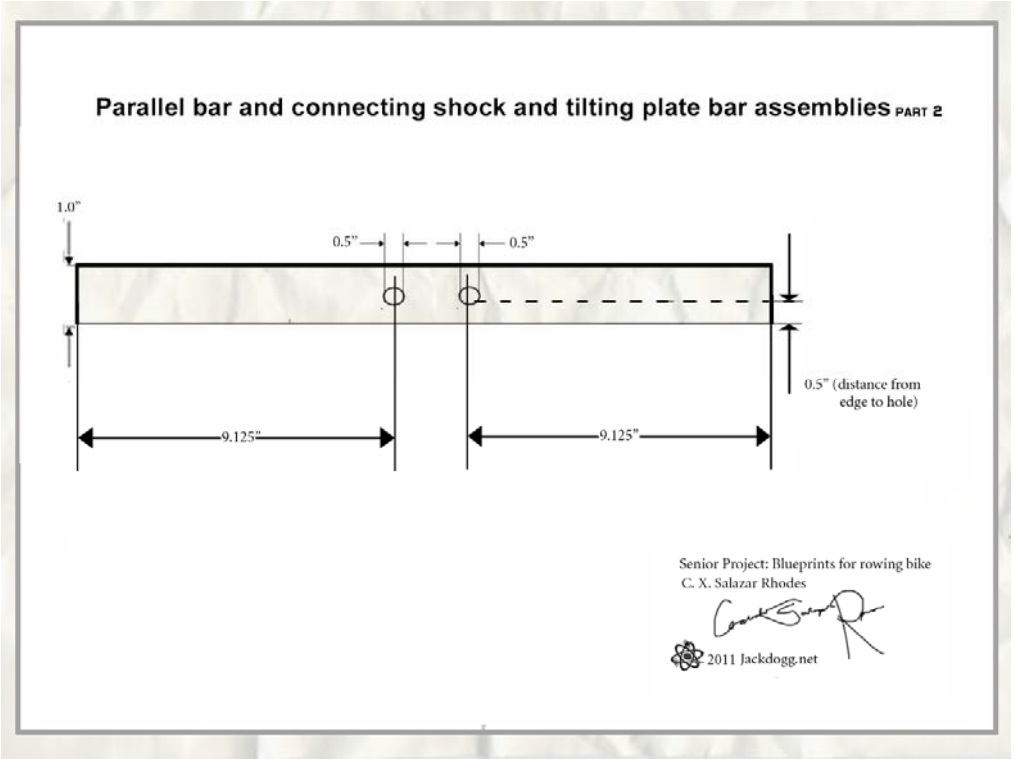


Figure 7.3.1-E

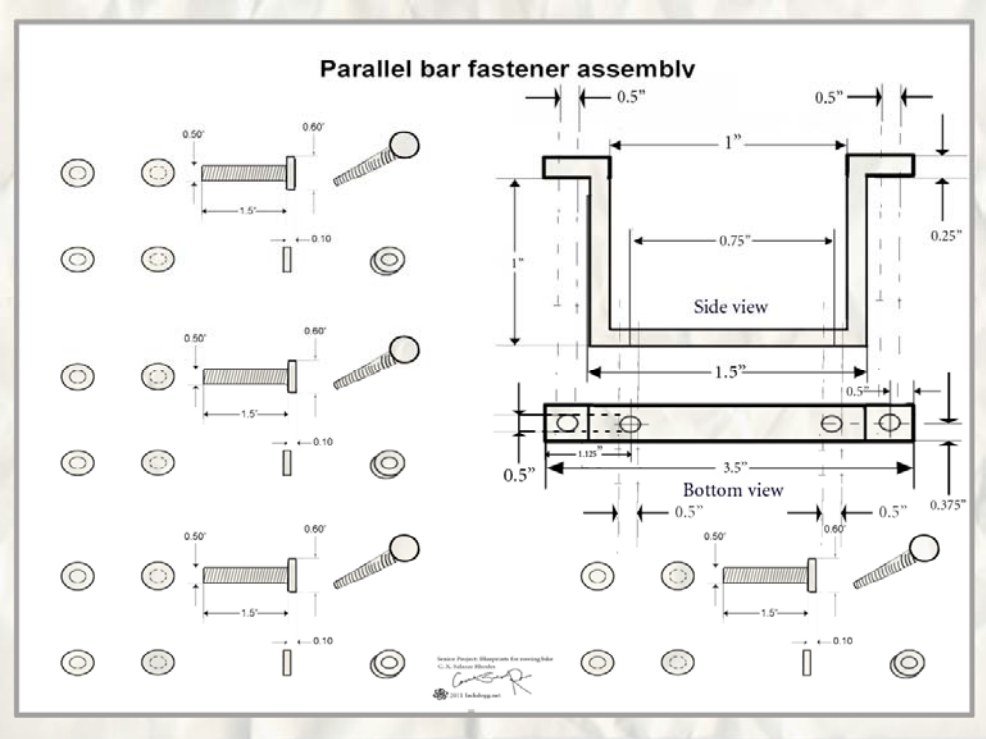


Figure 7.3.1-F

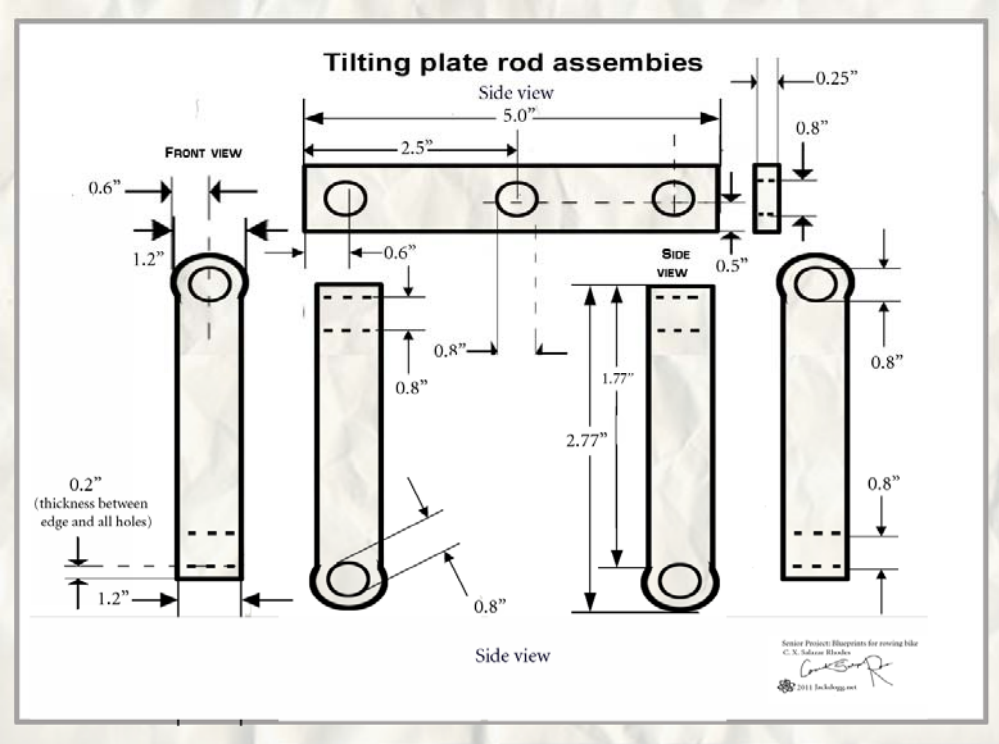


Figure 7.3.1-G

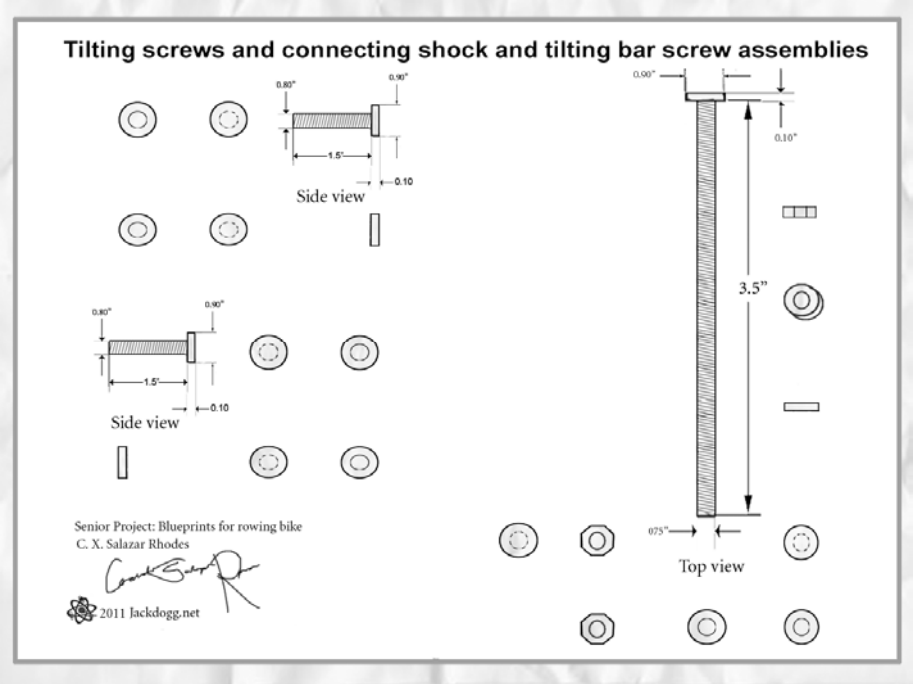


Figure 7.3.1-H

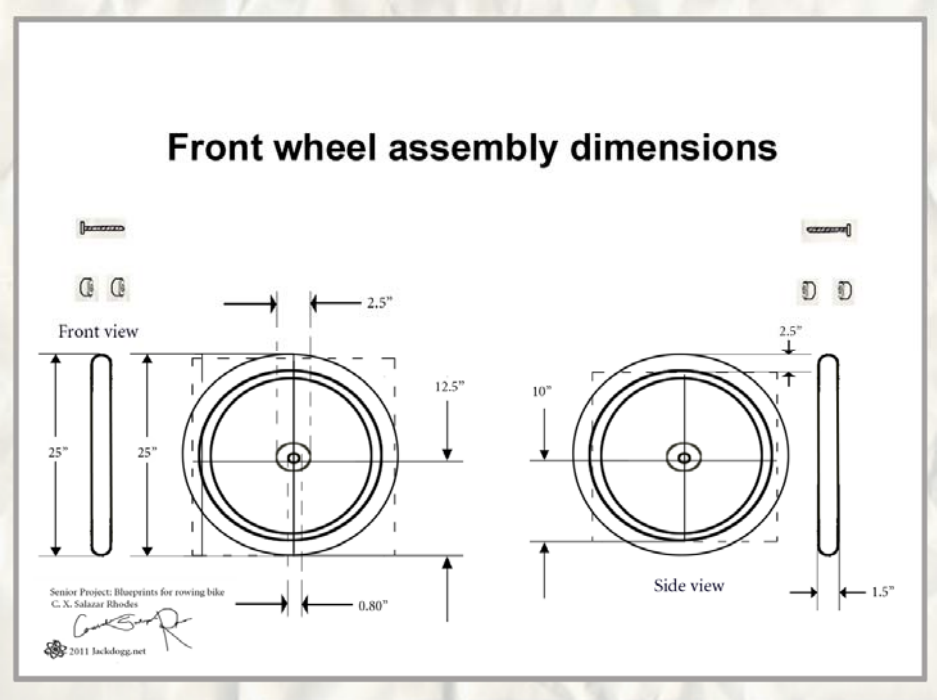


Figure 7.3.1-I

7.3.2 Dimensions for the rail piece

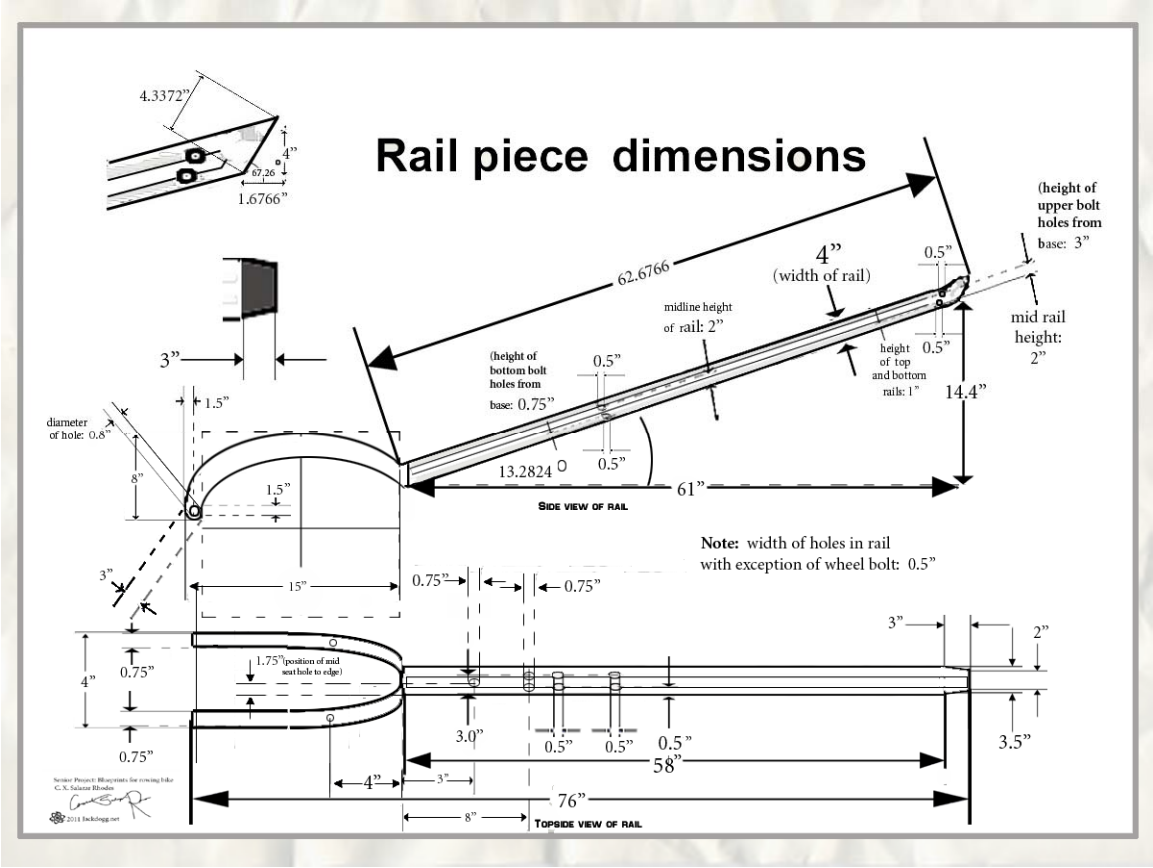


Figure 7.3.2-A

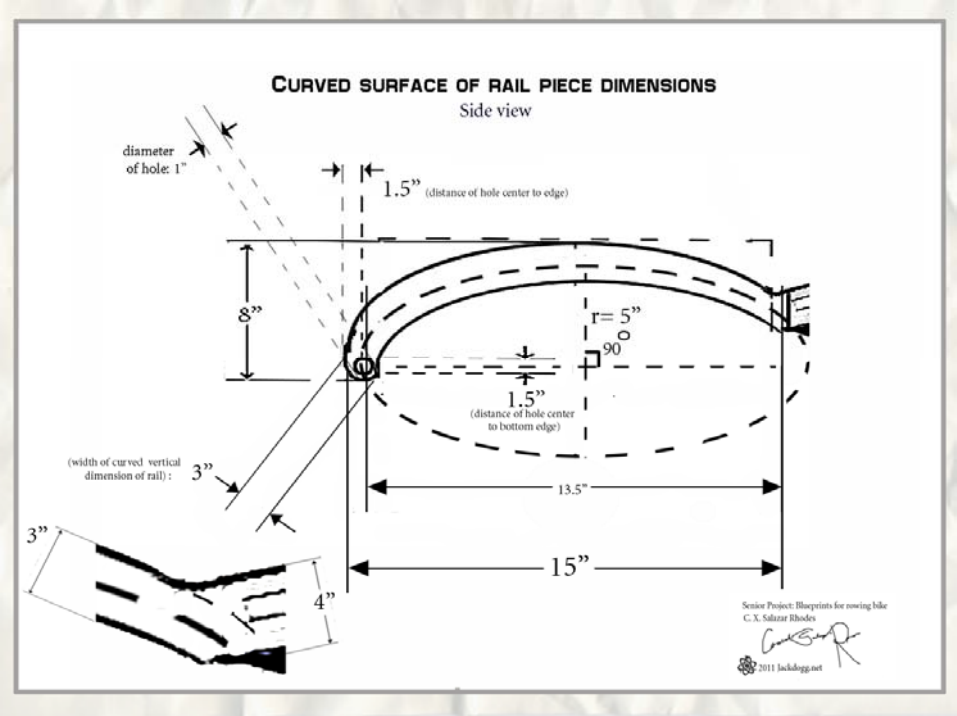


Figure 7.3.2-B

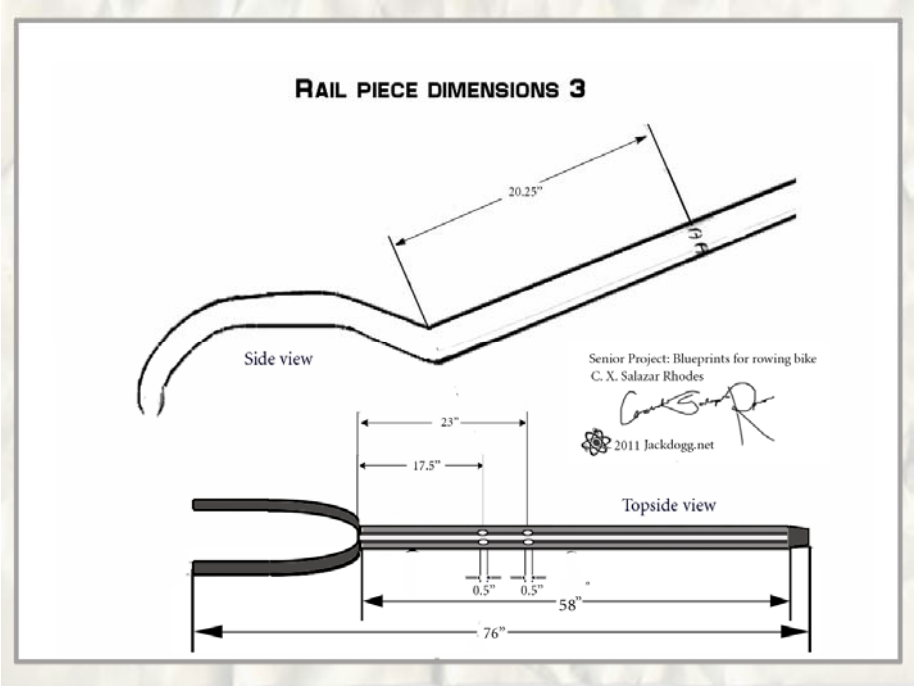


Figure 7.3.2-C

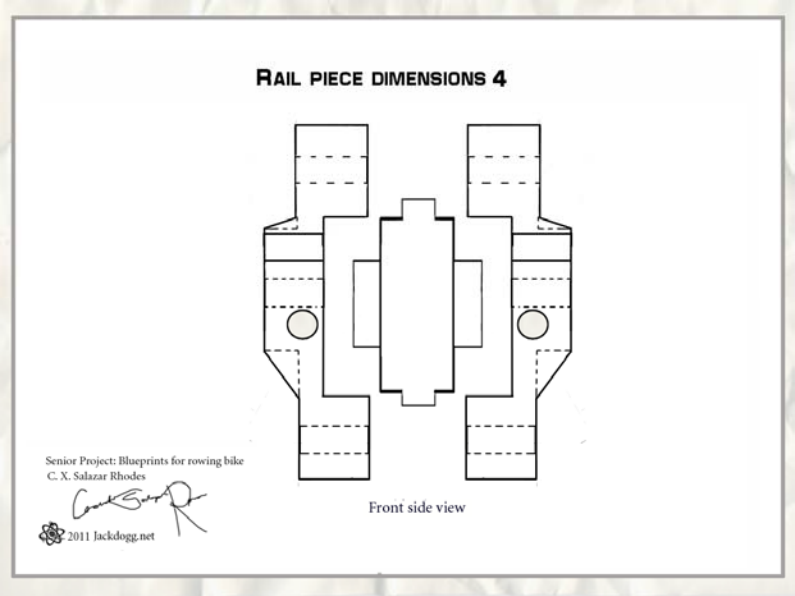


Figure 7.3.2-D

This is image is just displays how the rail would simply fit alongside the rail assembly. For the dimensions of the rail piece from a side view, see figure 7.3.2-E

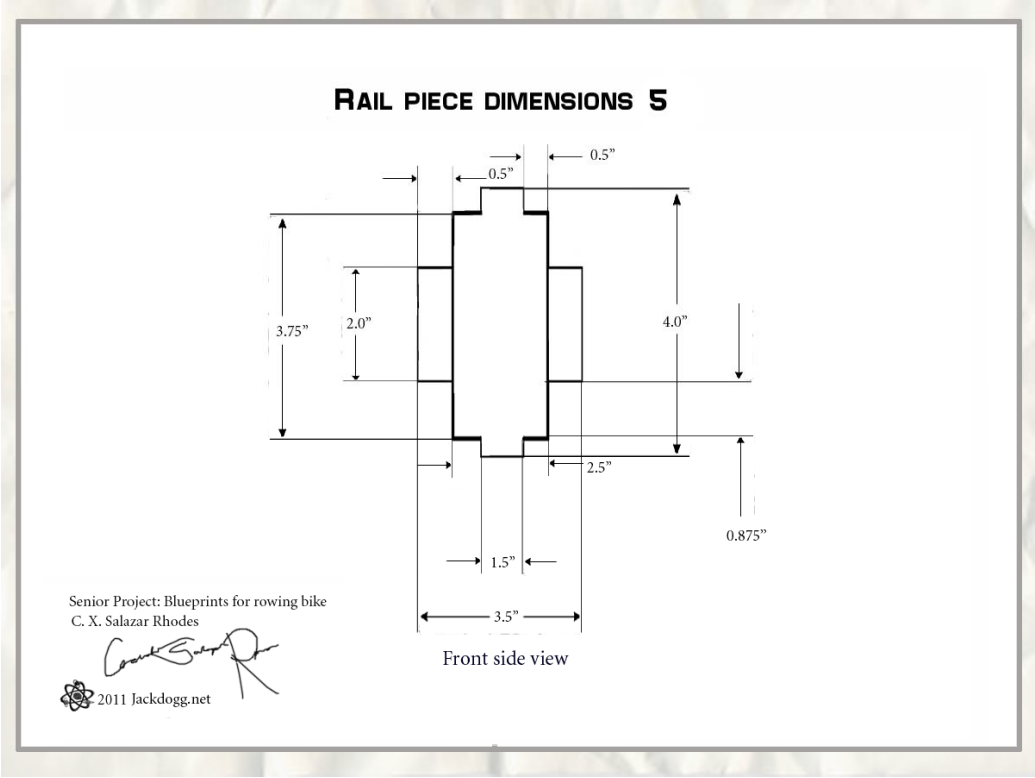


Figure 7.3.2-E

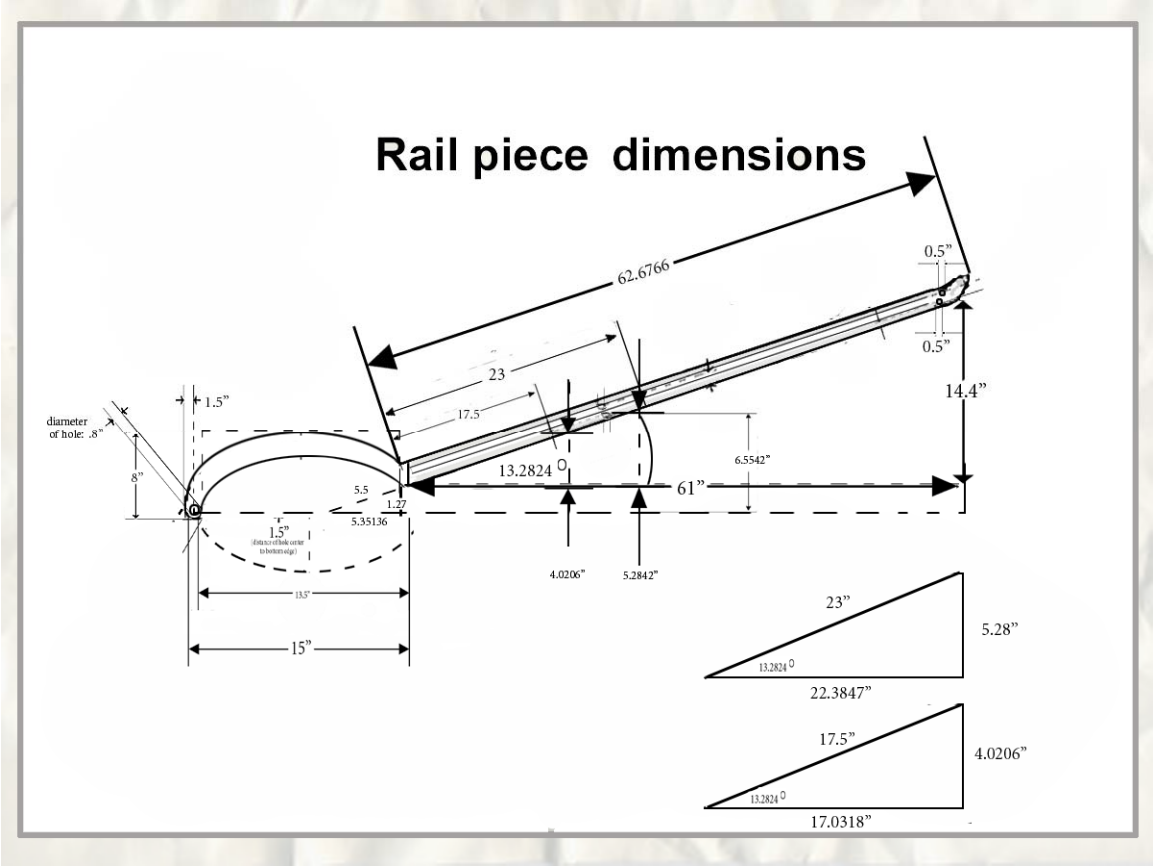

Rail piece dimensions
62.6766
0.5”
0.5”
23
17.5
14.4”
1.5”
diameter
of hole: .8”
8”
13.2824
6.5542”
61”
5.5
1.27
5.35136
1.5”
4.0206”
5.2842”
13.5”
15”
23”
5.28”
13.2824
22.3847”
17.5”
4.0206”
13.2824
17.0318”

Figure 7.3.2-F

7.3.3 Dimensions for the rail assembly

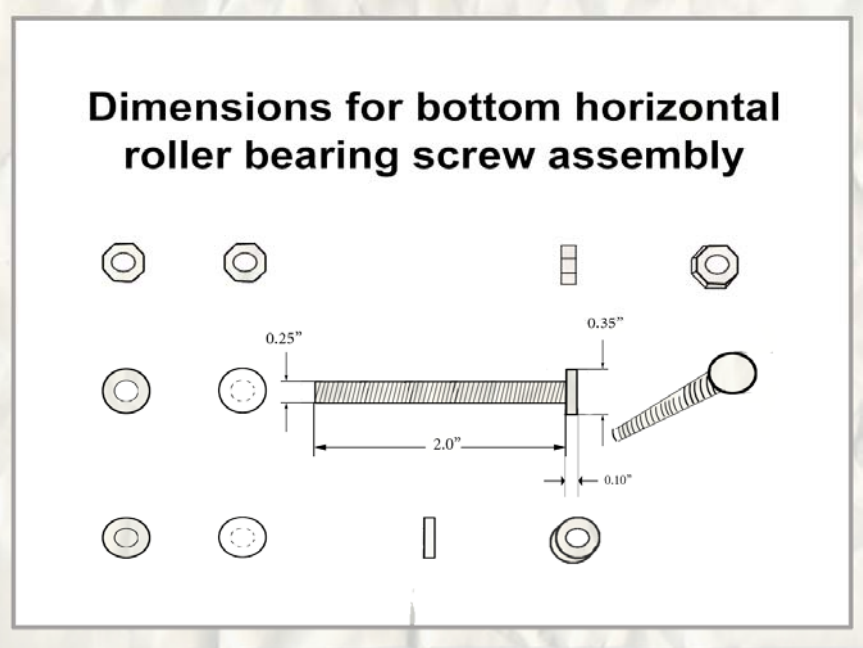


Figure 7.3.3-A

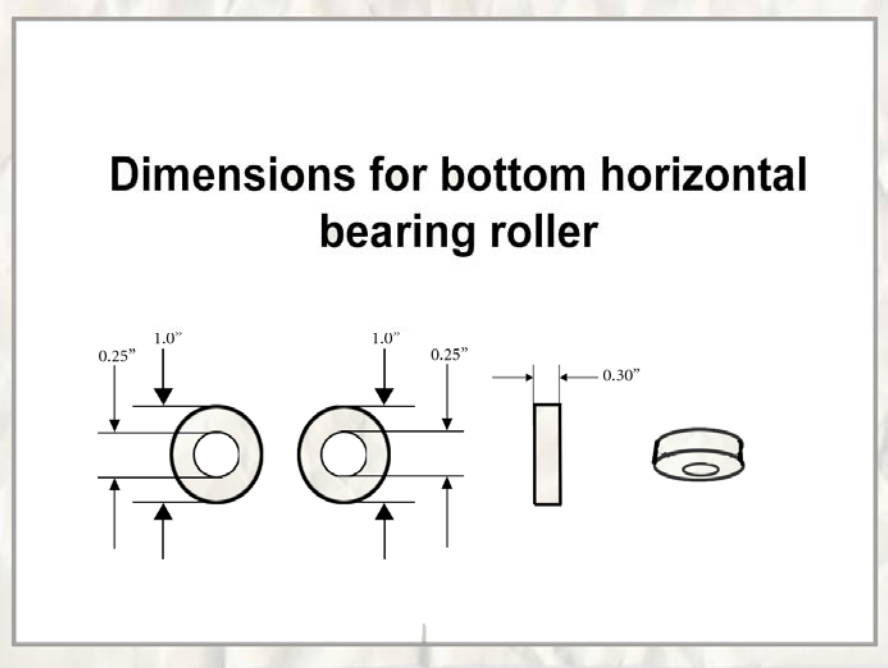


Figure 7.3.3-B

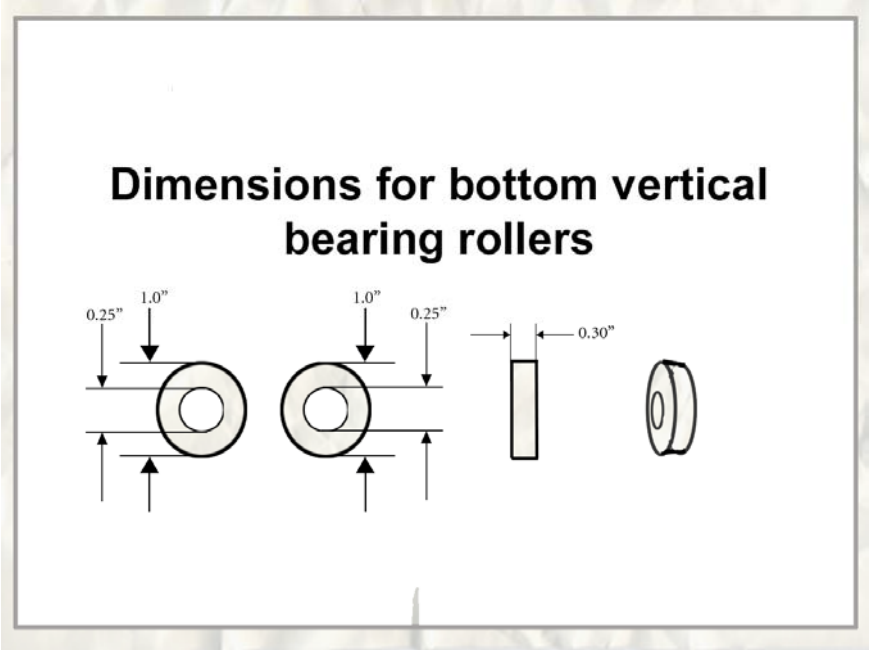


Figure 7.3.3-C

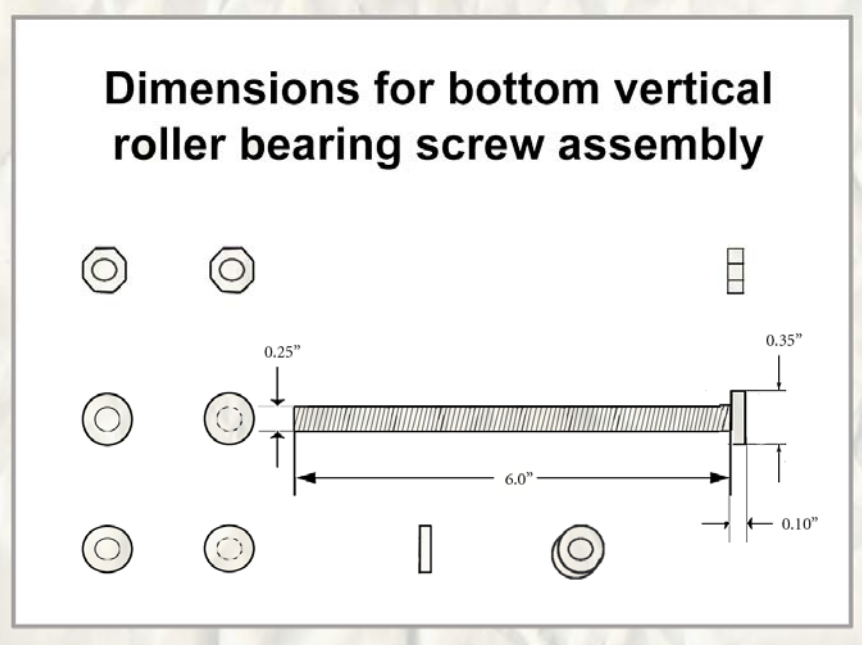


Figure 7.3.3-D

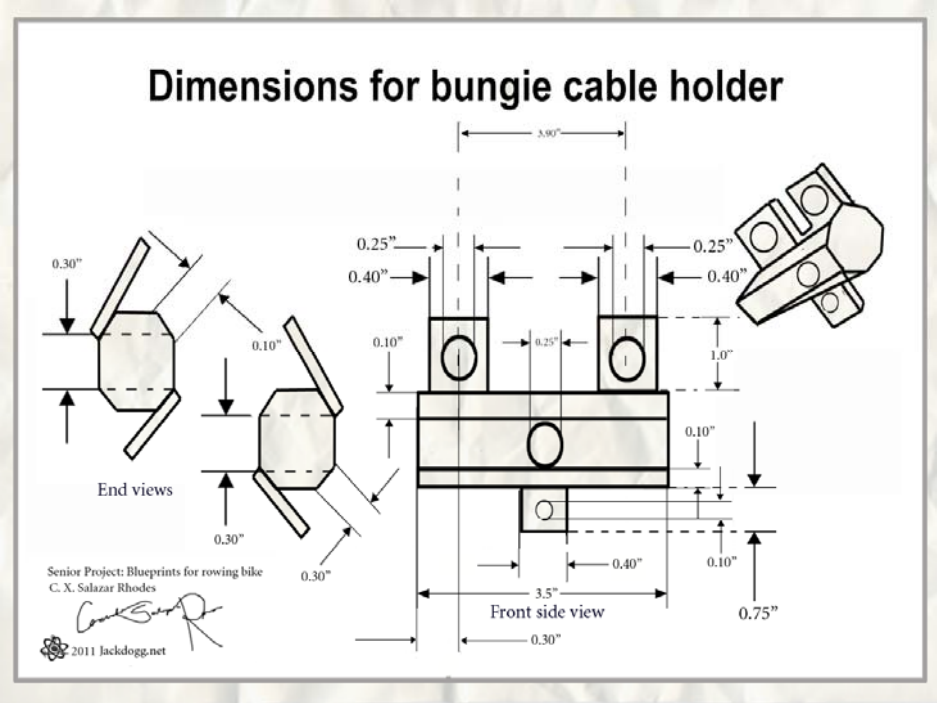
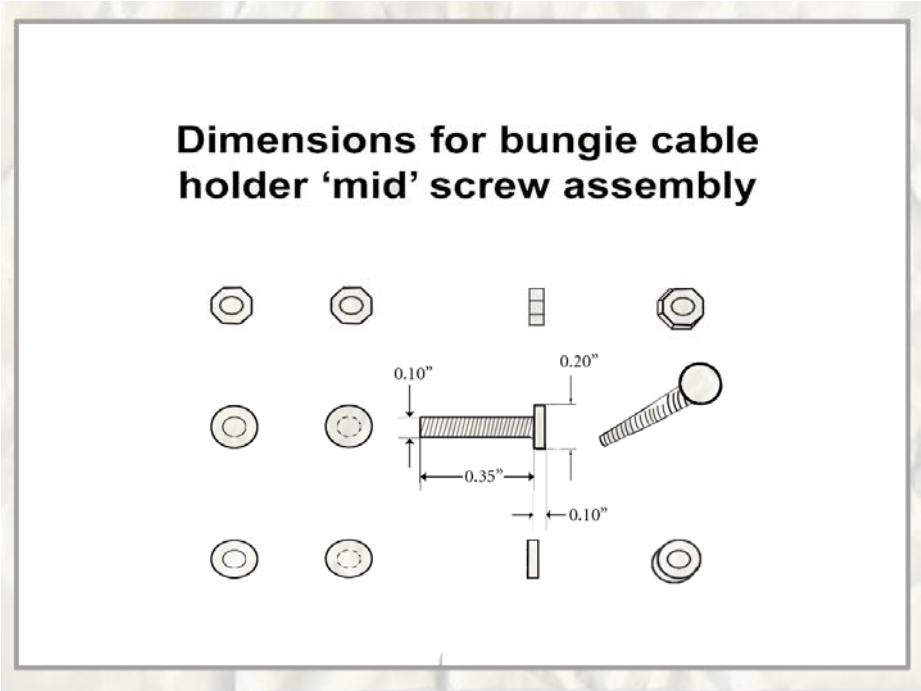


Figure 7.3.3-E



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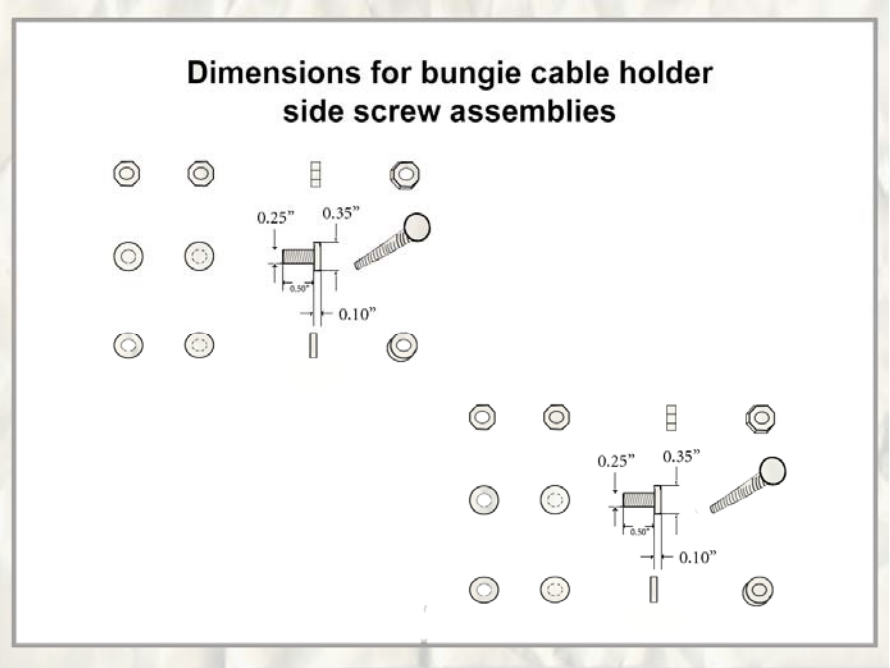


Figure 7.3.3-G

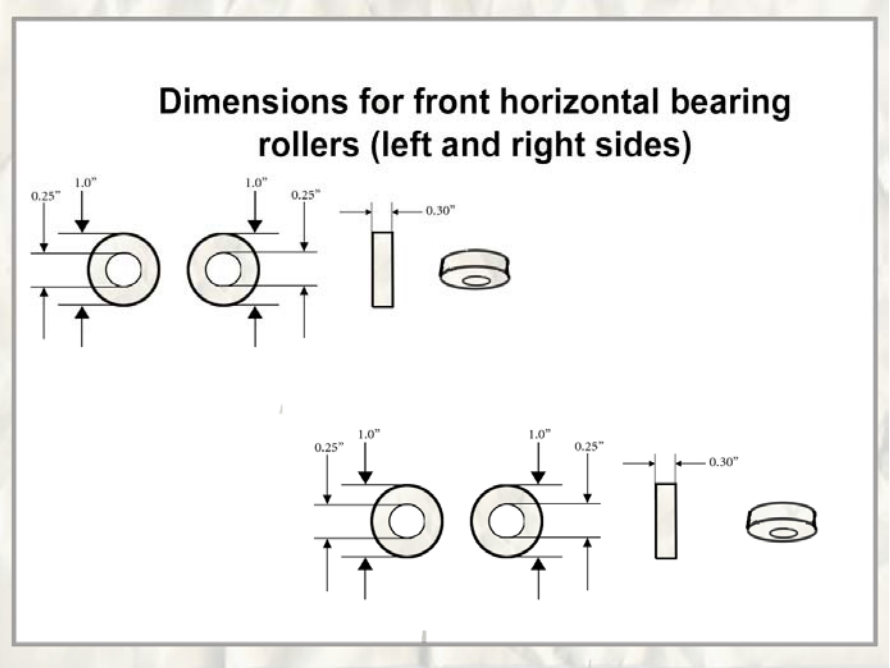


Figure 7.3.3-H

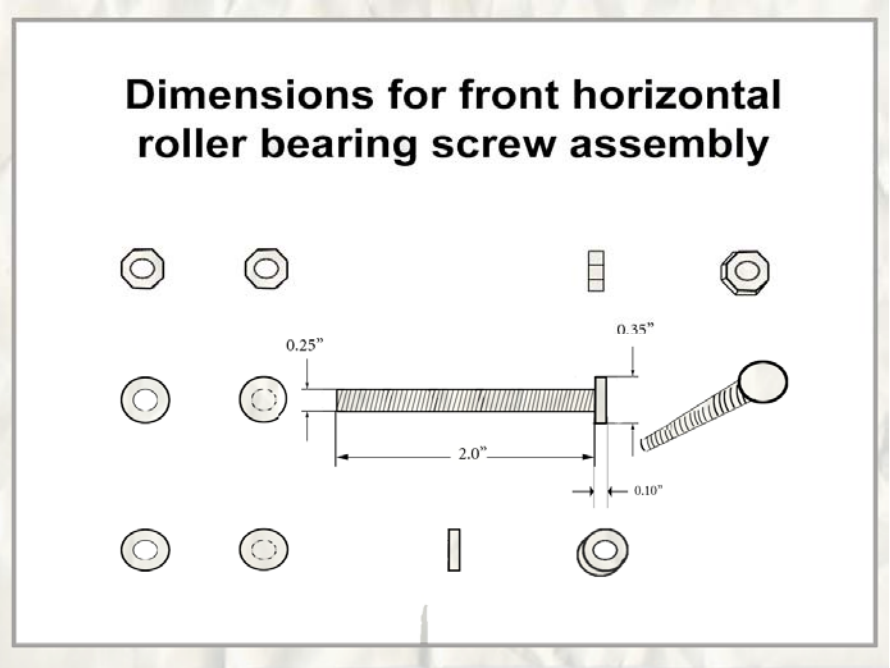
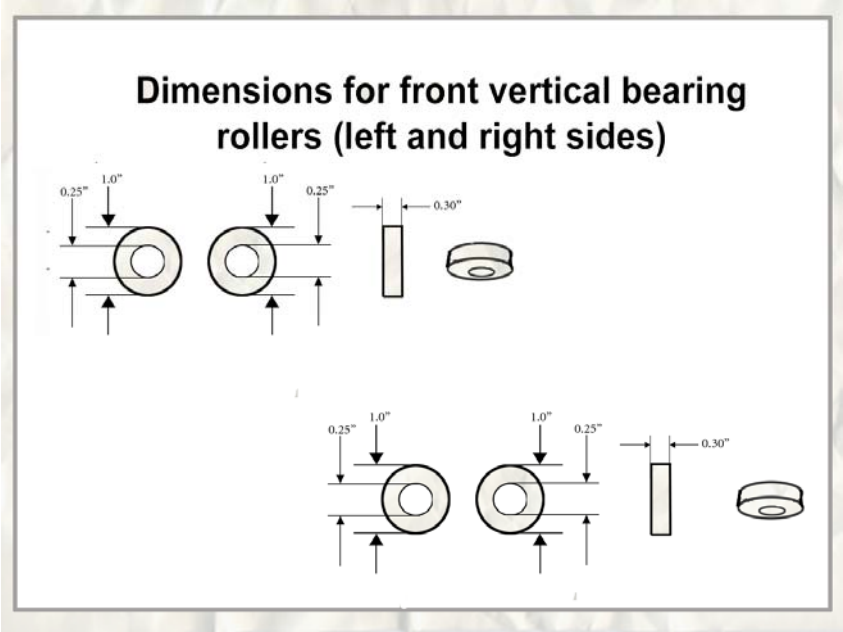


Figure 7.3.3-I



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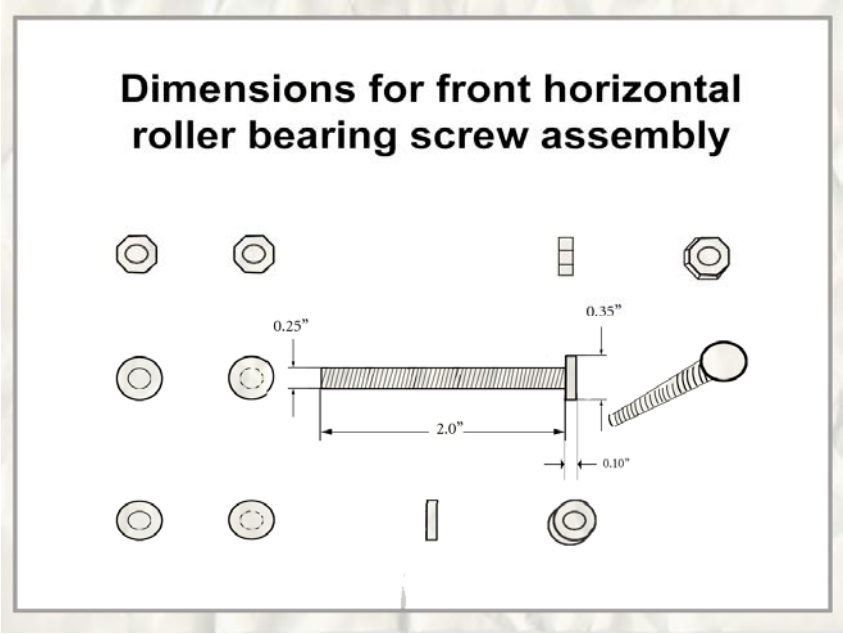

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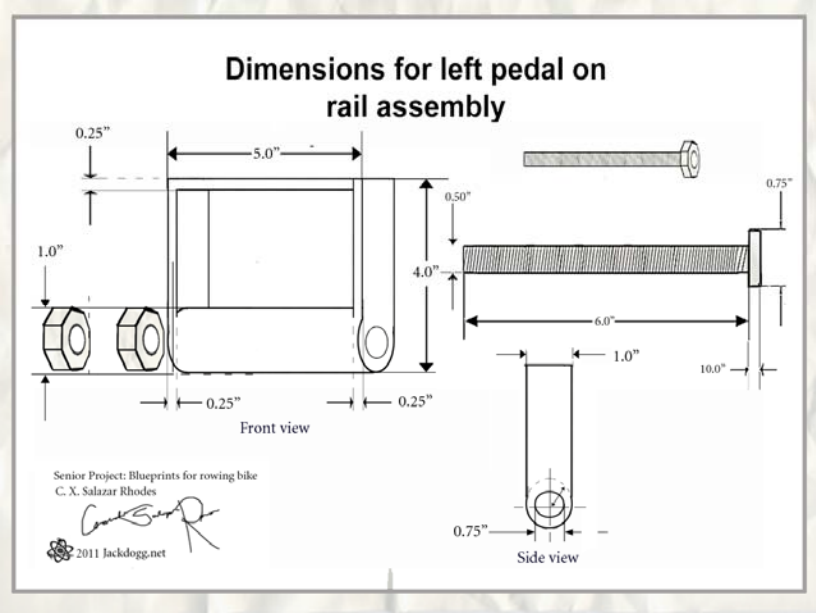

Figure 7.3.3-L

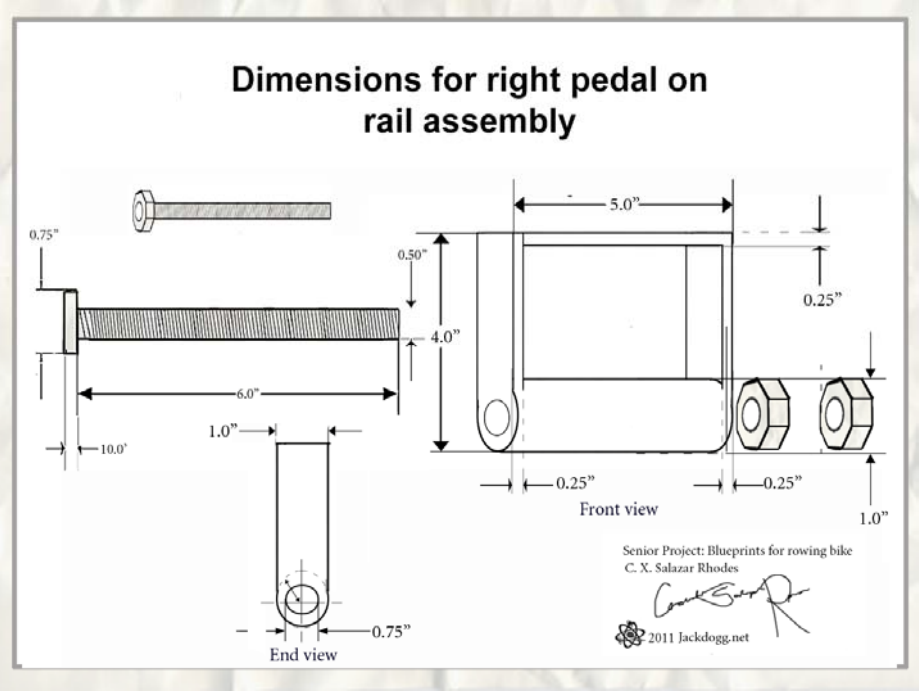

Figure 7.3.3-M

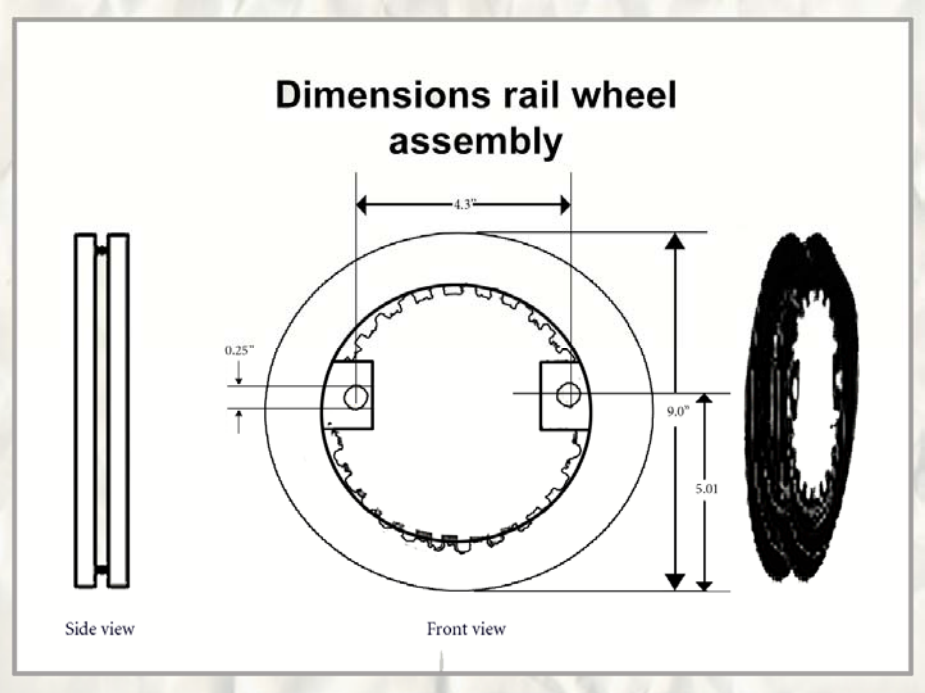

Figure 7.3.3-N

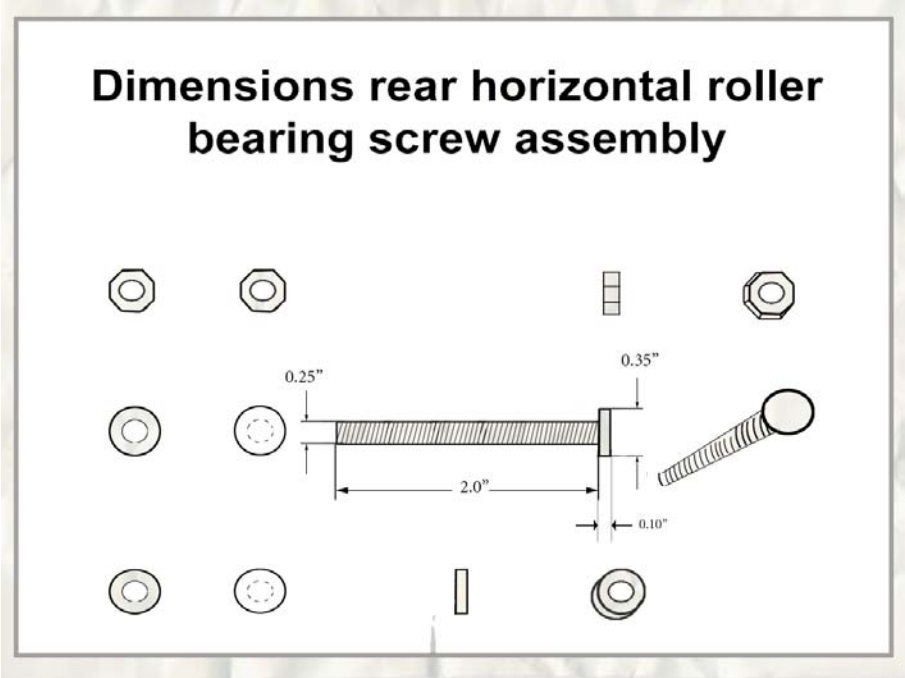

Figure 7.3.3-O

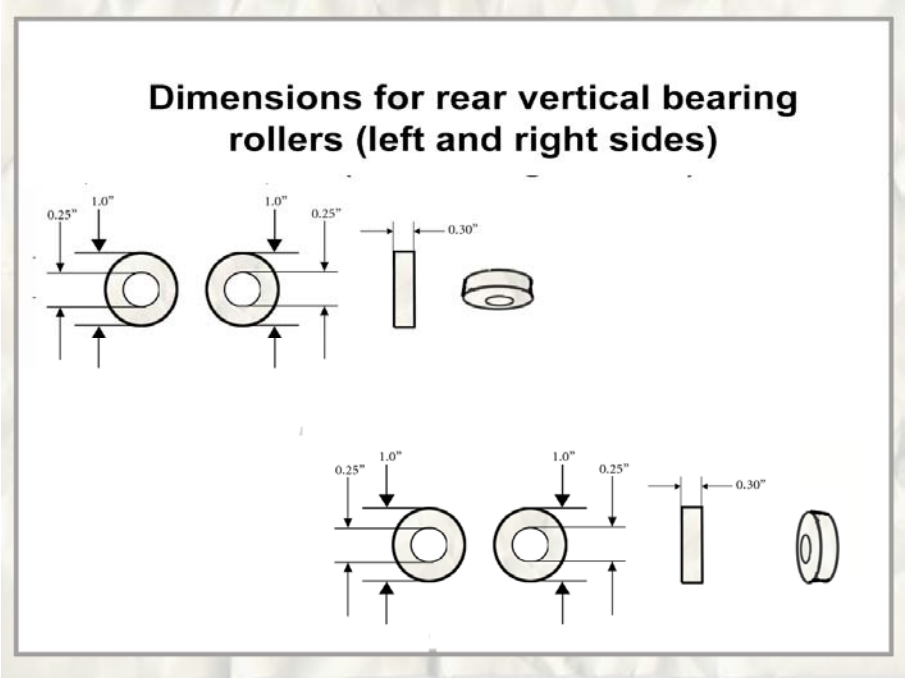

Figure 7.3.3-P

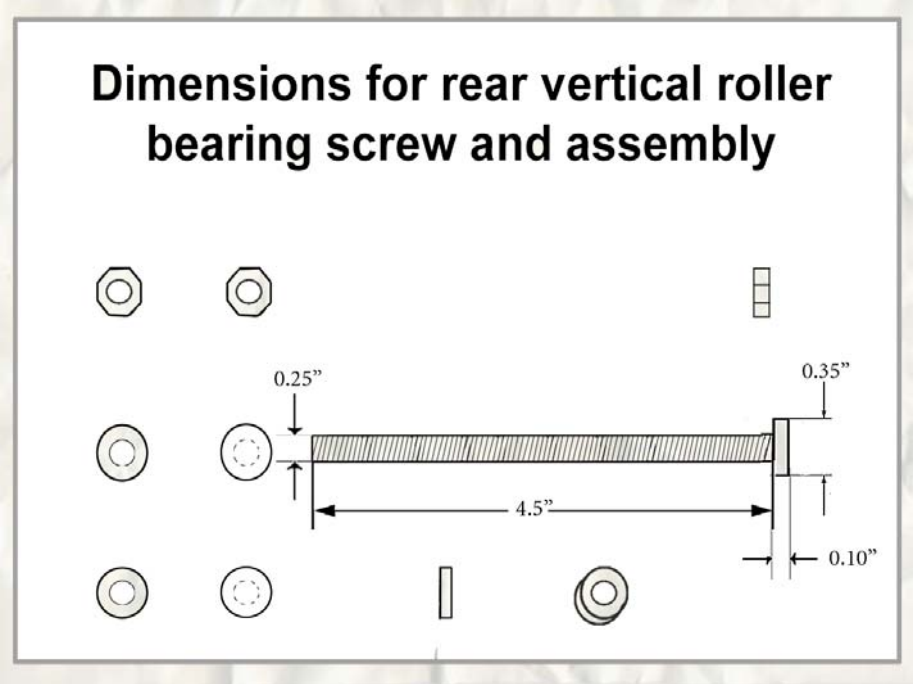

Figure 7.3.3-Q

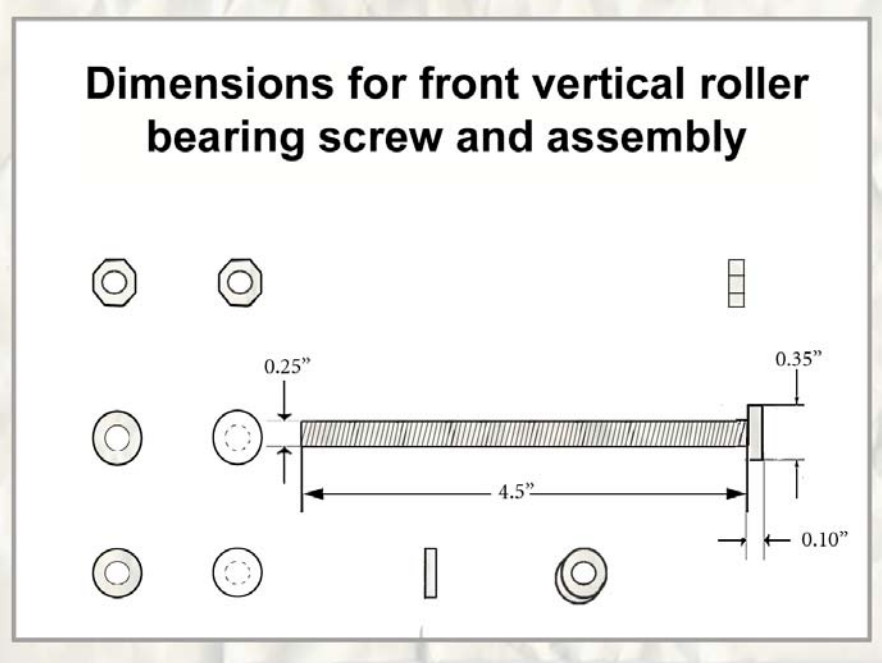

Figure 7.3.3-R

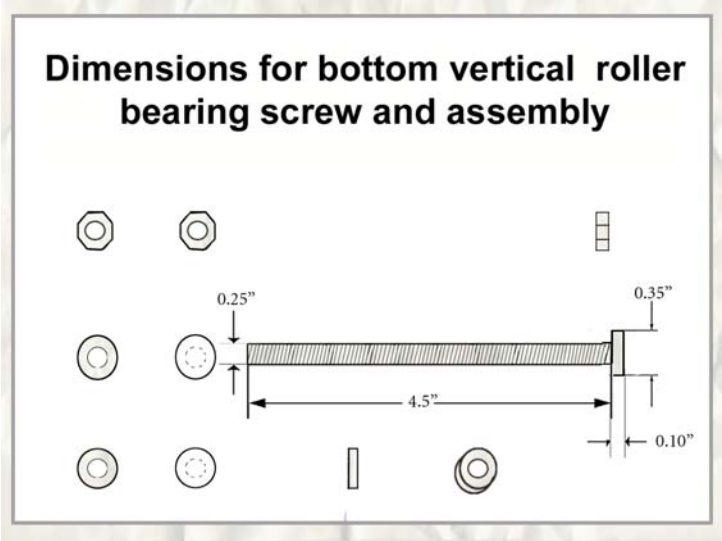

Figure 7.3.3-S

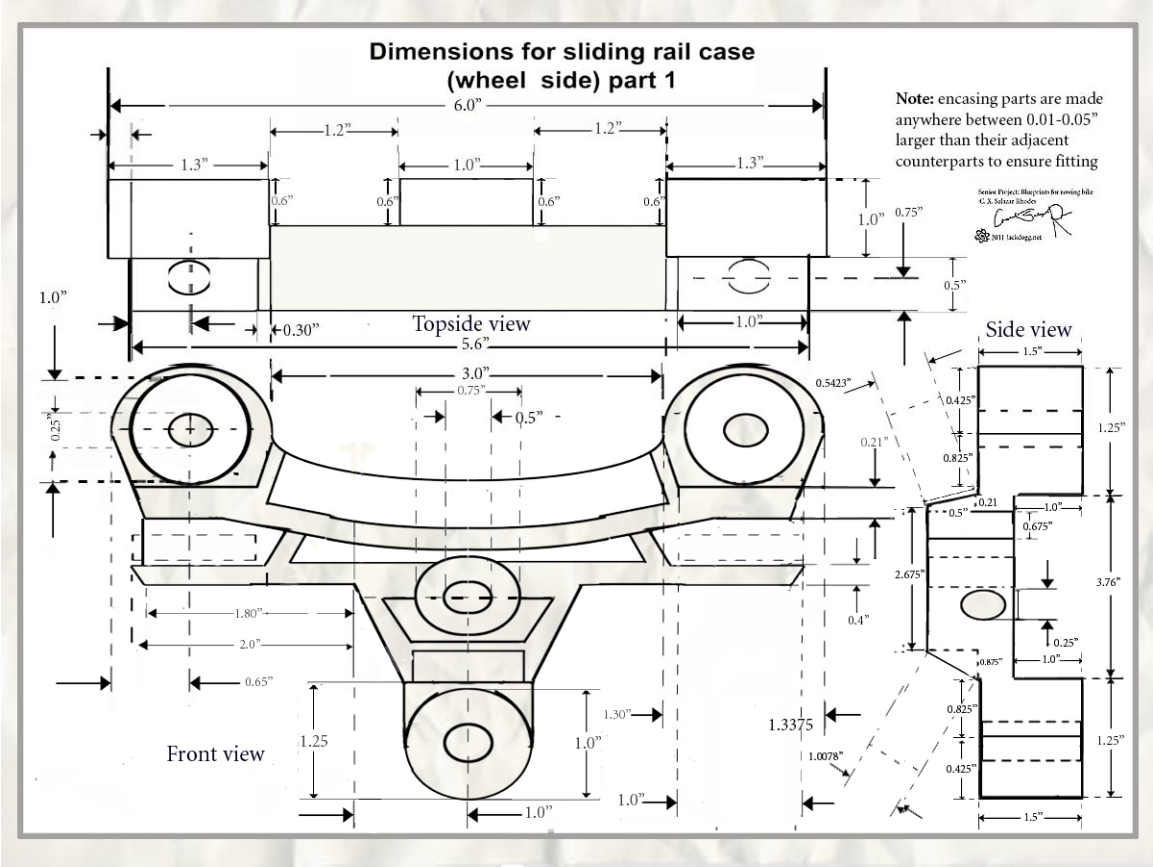

Figure 7.3.3-T

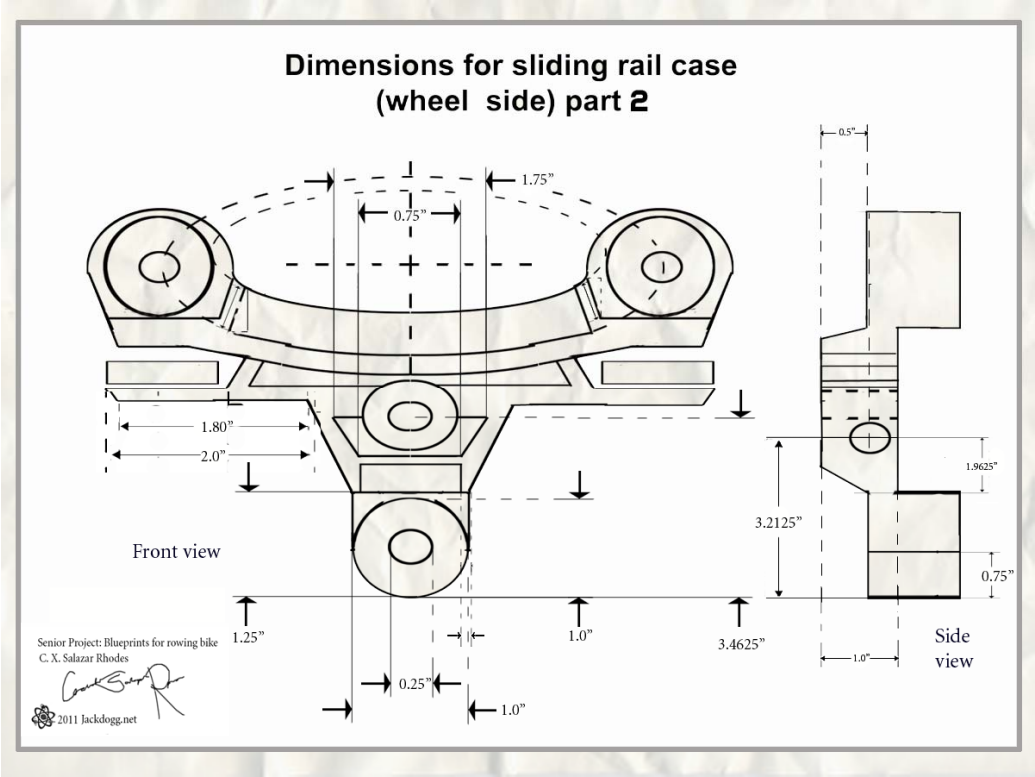

Figure 7.3.3-U

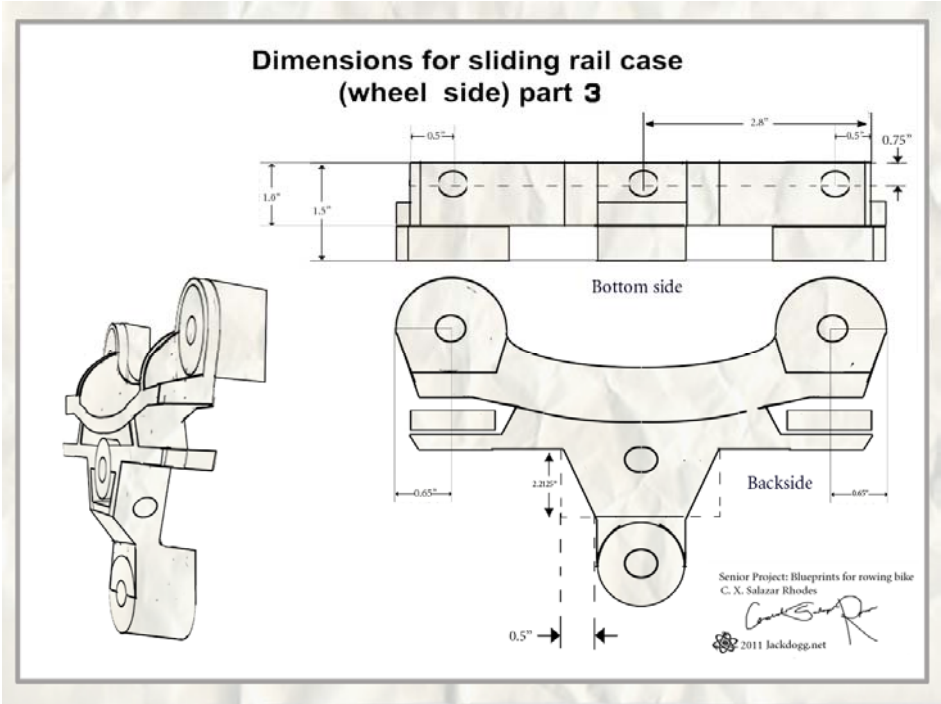

Figure 7.3.3-V

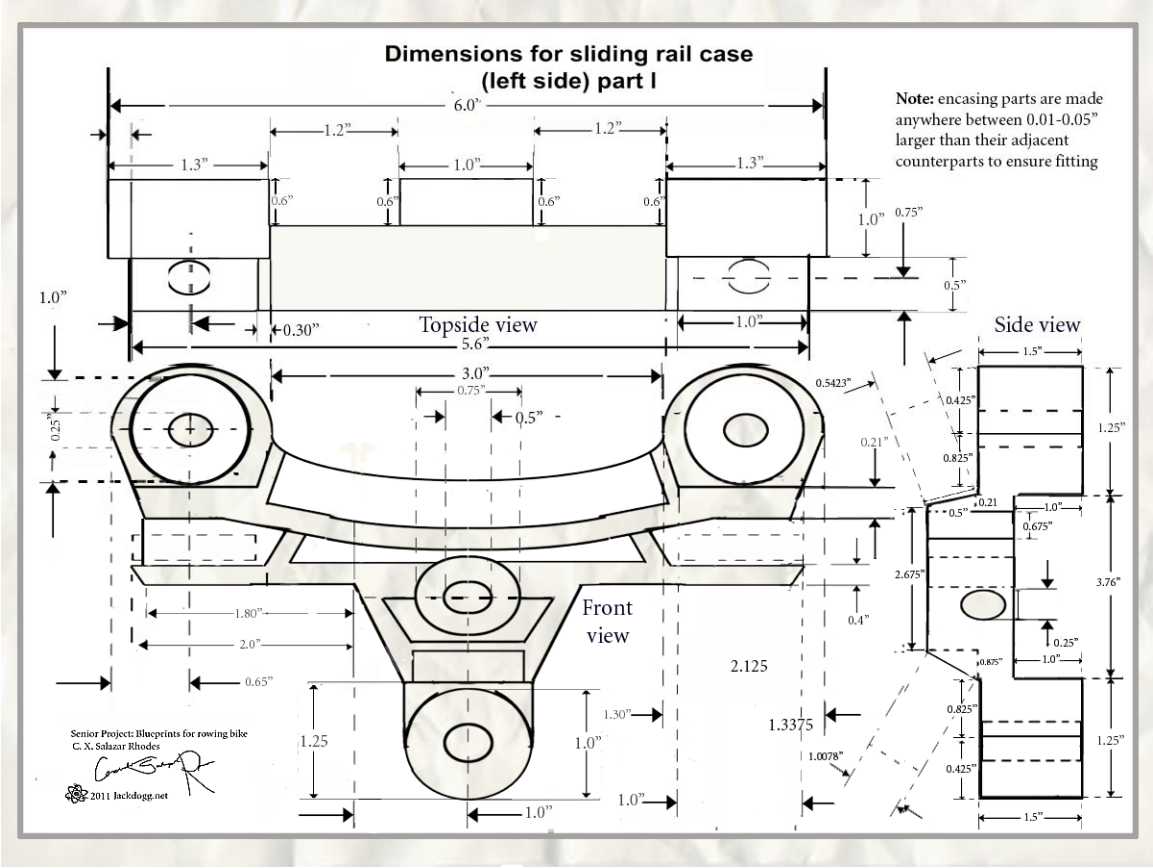
Dimensions for sliding rail case
(left side) part I
Note: encasing parts are made anywhere between 0.01-0.05" larger than their adjacent counterparts to ensure fitting
Topside view
Side view
Front view
Senior Project: Blueprints for rowing bike
C. X. Salazar Rhodes
2011 Jackdogg.net

Figure 7.3.3-W

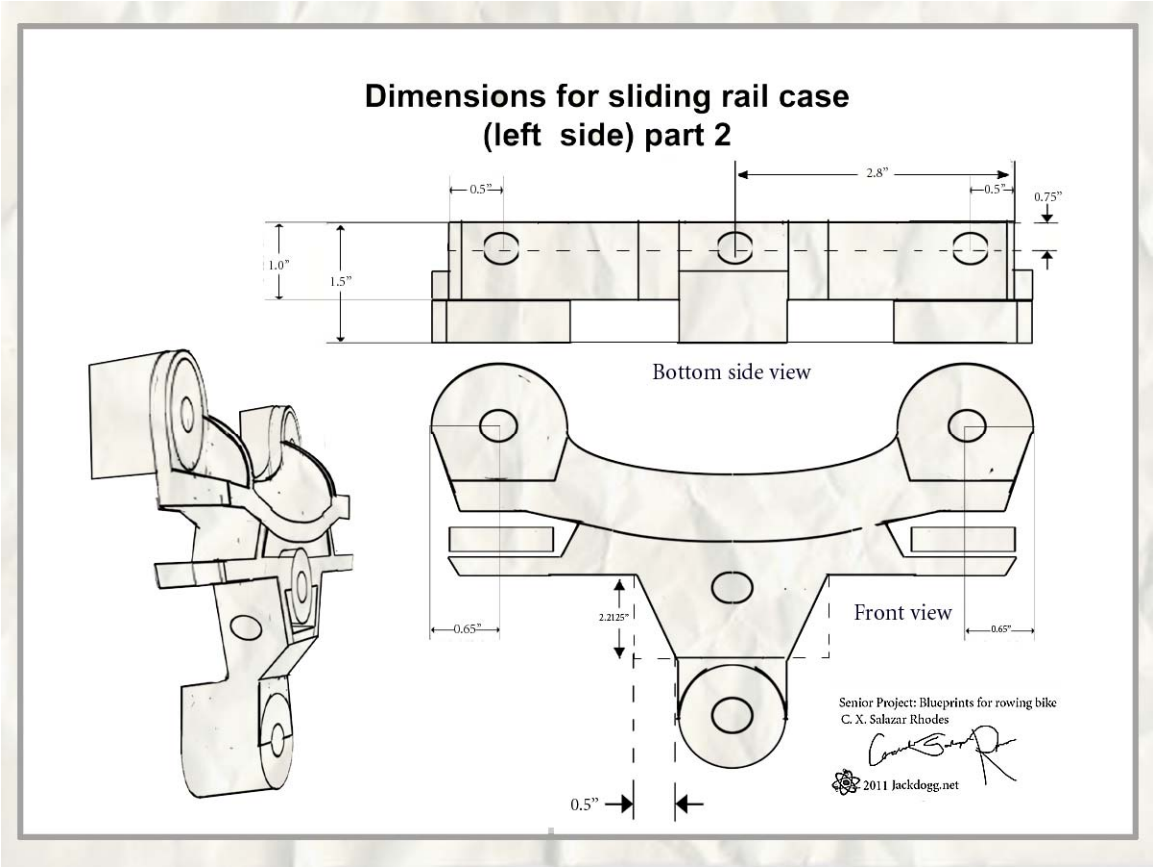
Dimensions for sliding rail case
(left side) part 2
0.5"
2.8"
0.5"
0.75"
1.0"
1.5"
Bottom side view
0.65"
2.2125"
Front view
0.65"
0.5"
Senior Project: Blueprints for rowing bike
C. X. Salazar Rhodes
2011 Jackdogg.net

Figure 7.3.3- X

7.3.4 Dimensions for the rail pulley system

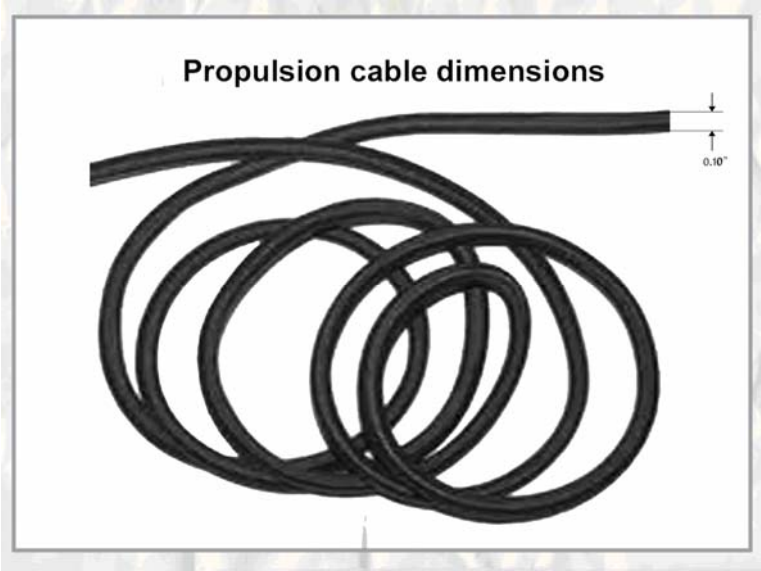

Figure 7.3.4-A

See section 6.4.1, *Drive-Train Power Scope* for more det*ails* of the drive cable

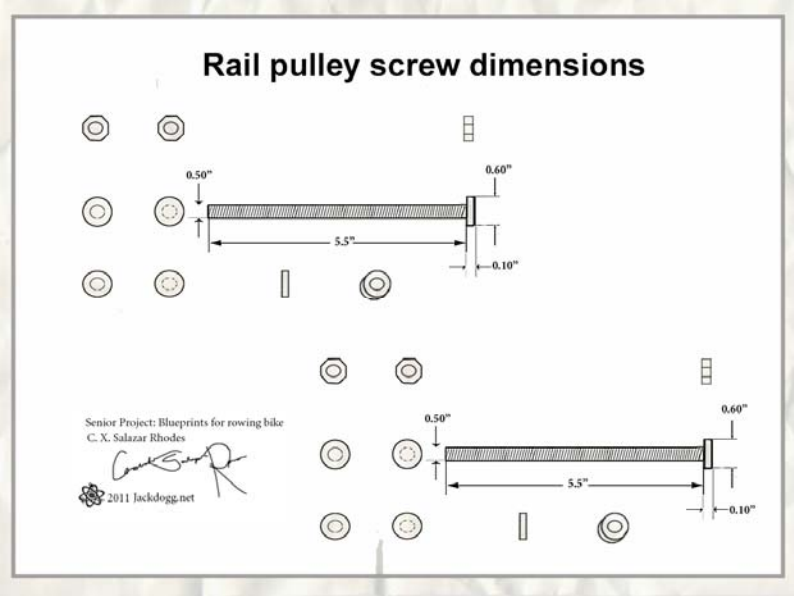

Figure 7.3.4-B

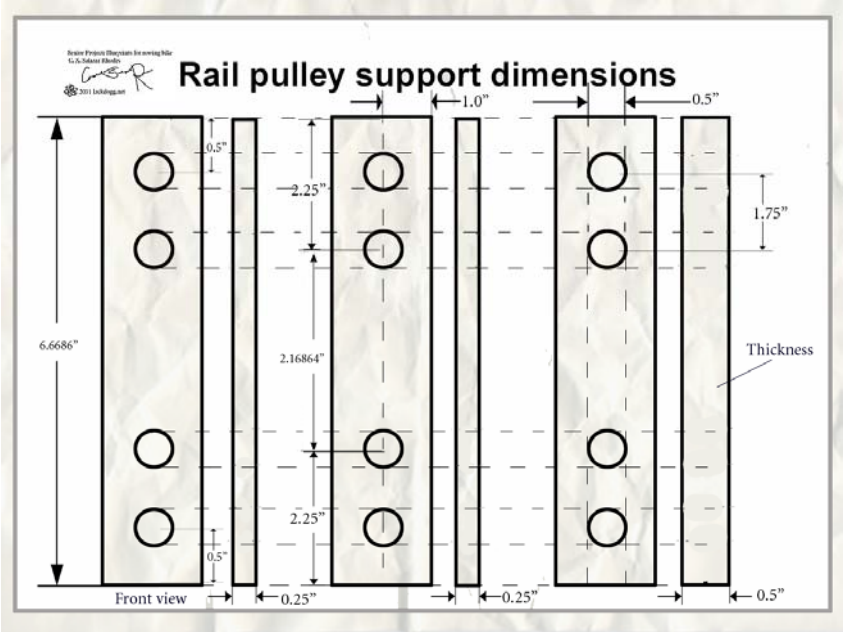

Figure 7.3.4-C

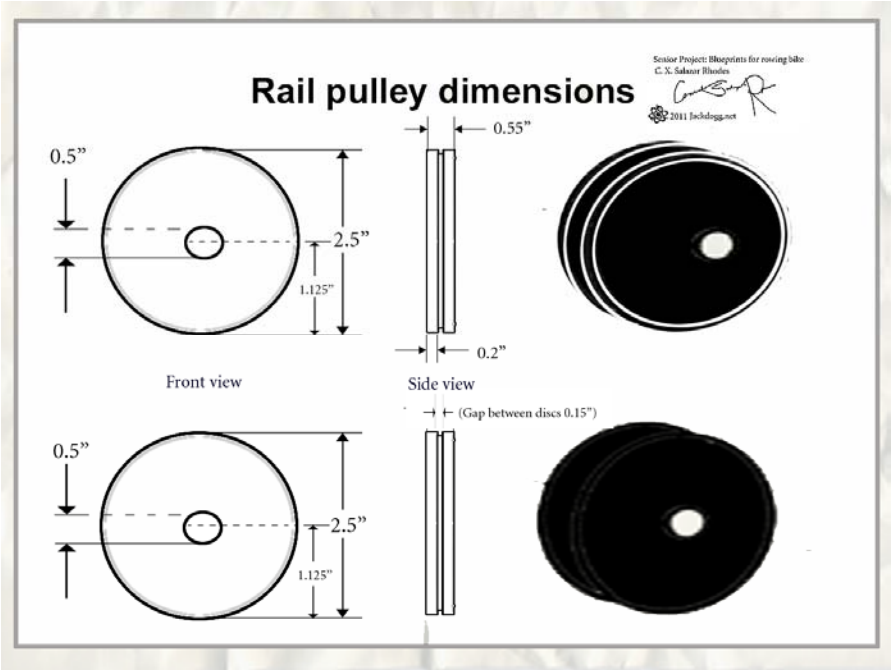

Figure 7.3.4-D

7.3.5 Dimensions for the T bar assembly

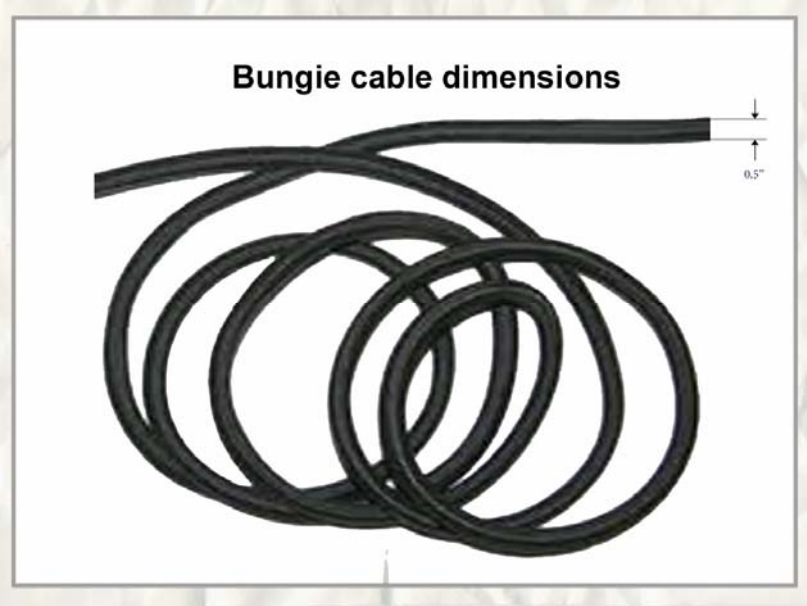

Figure 7.3.5-A

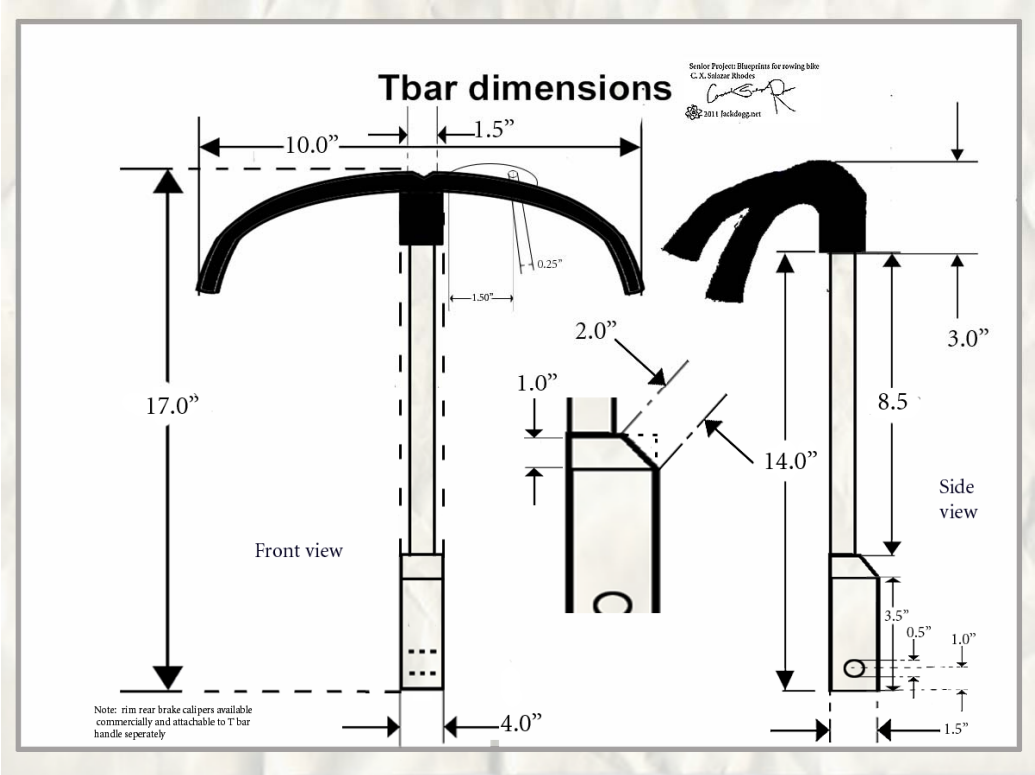

Figure 7.3.5-B

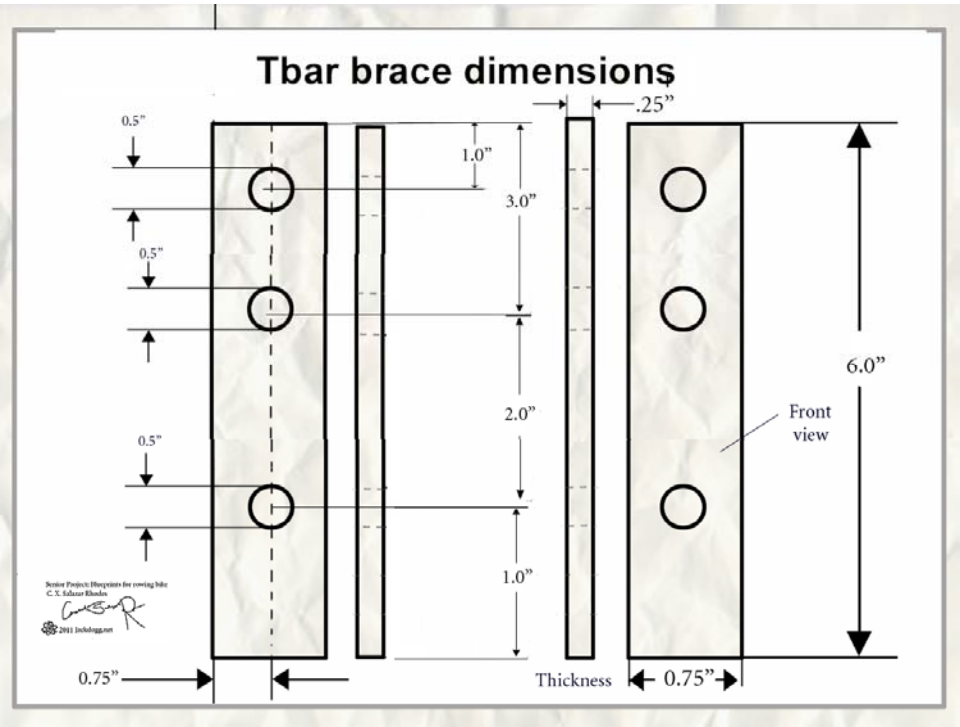

Figure 7.3.5-C

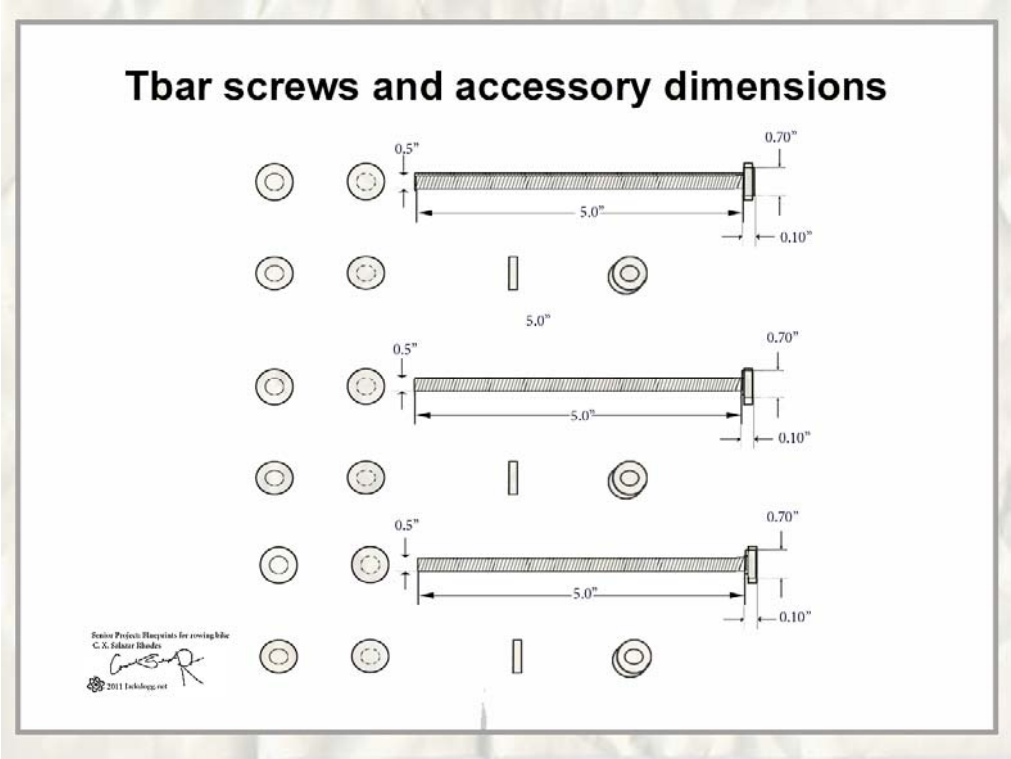

Figure 7.3.5-D

7.3.6 Dimensions for the seat assembly

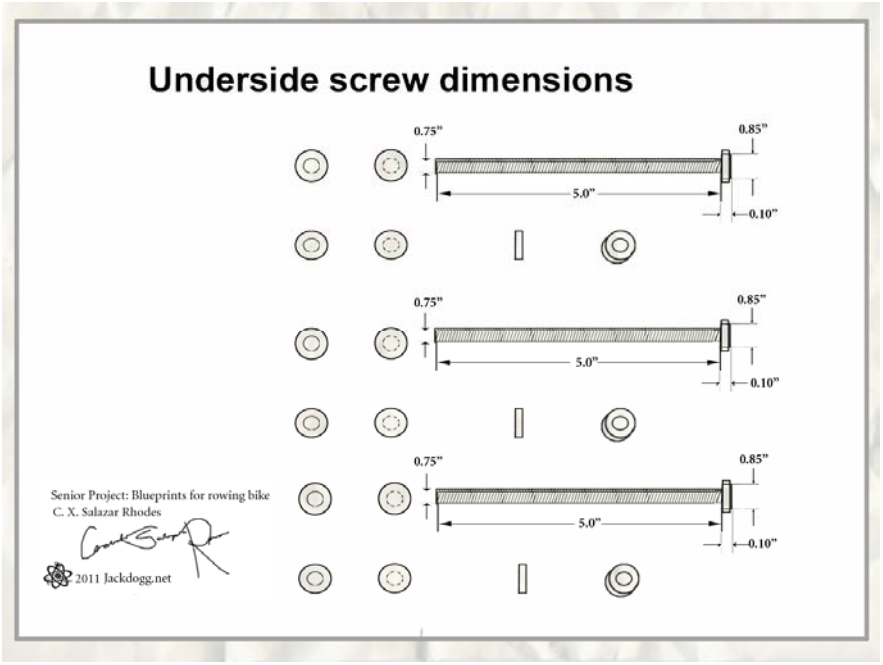

Figure 7.3.6-A

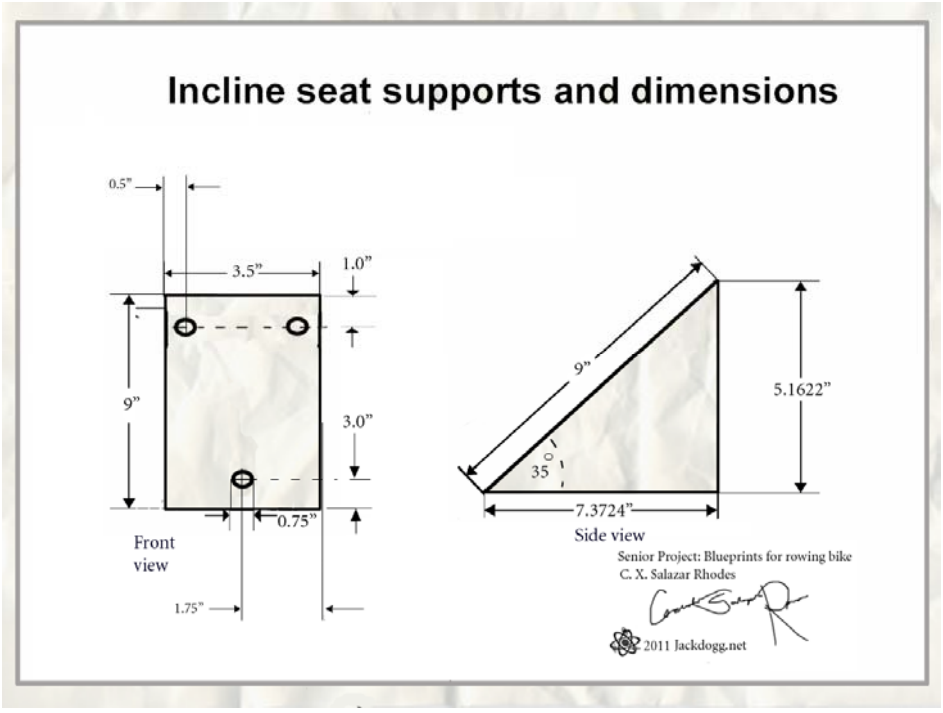

Figure 7.3.6-B

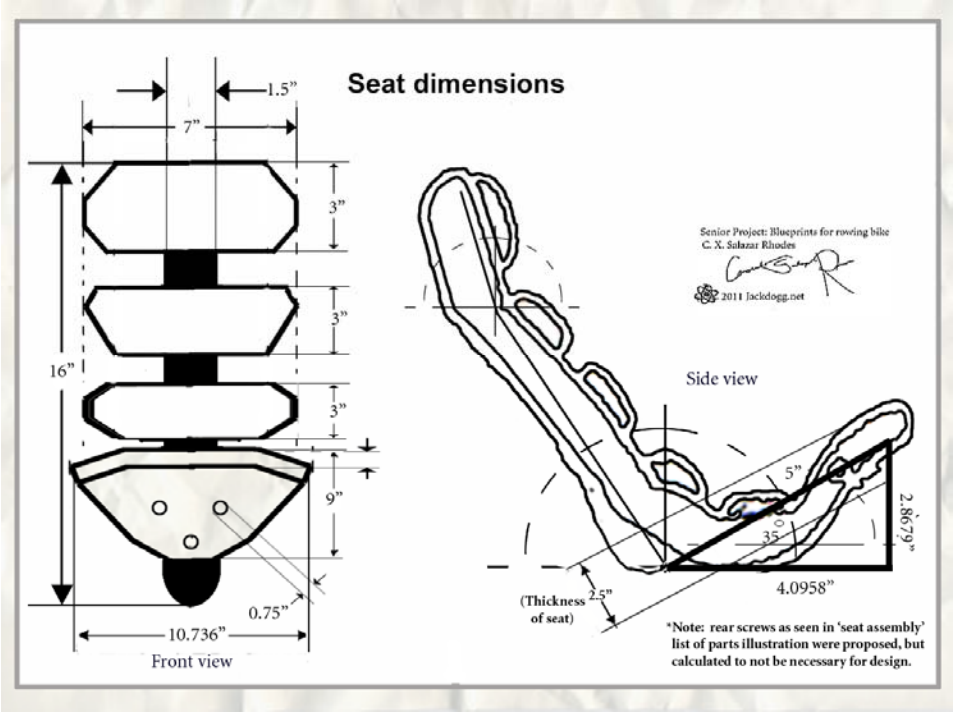

Figure 7.3.6-C

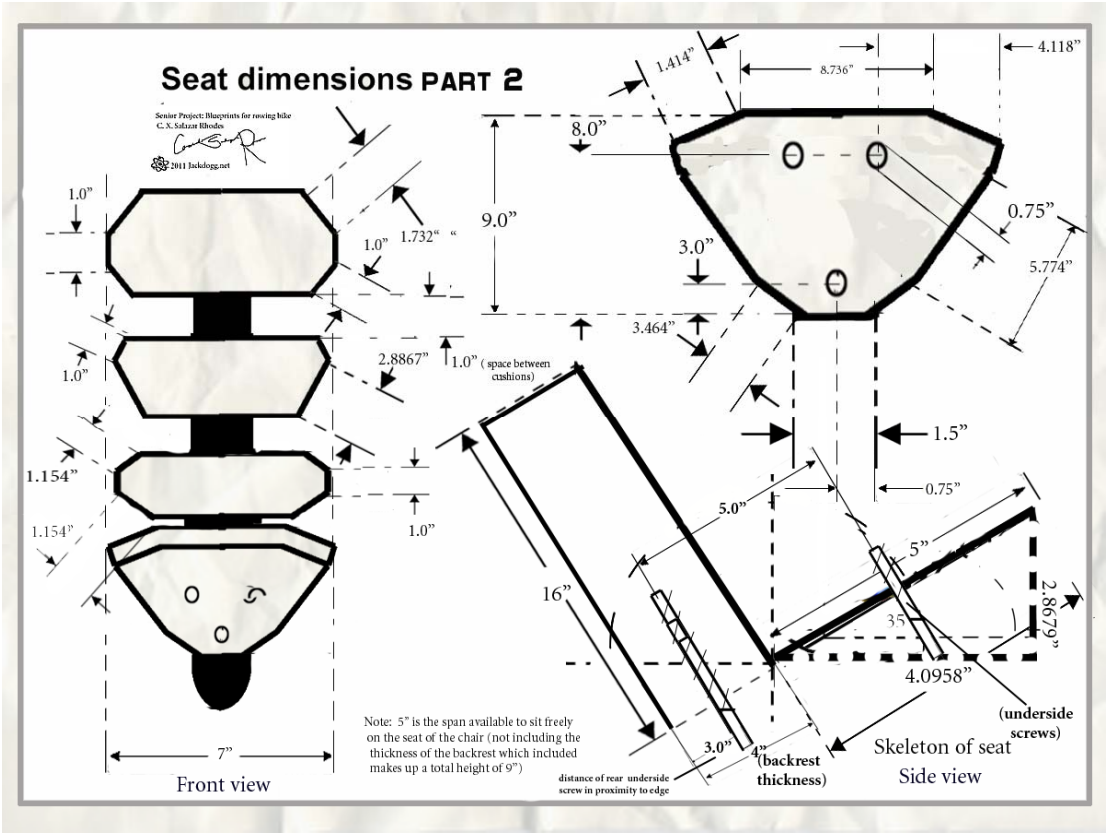

Figure 7.3.6-D

7.3.7 Dimensions for the propulsion assembly

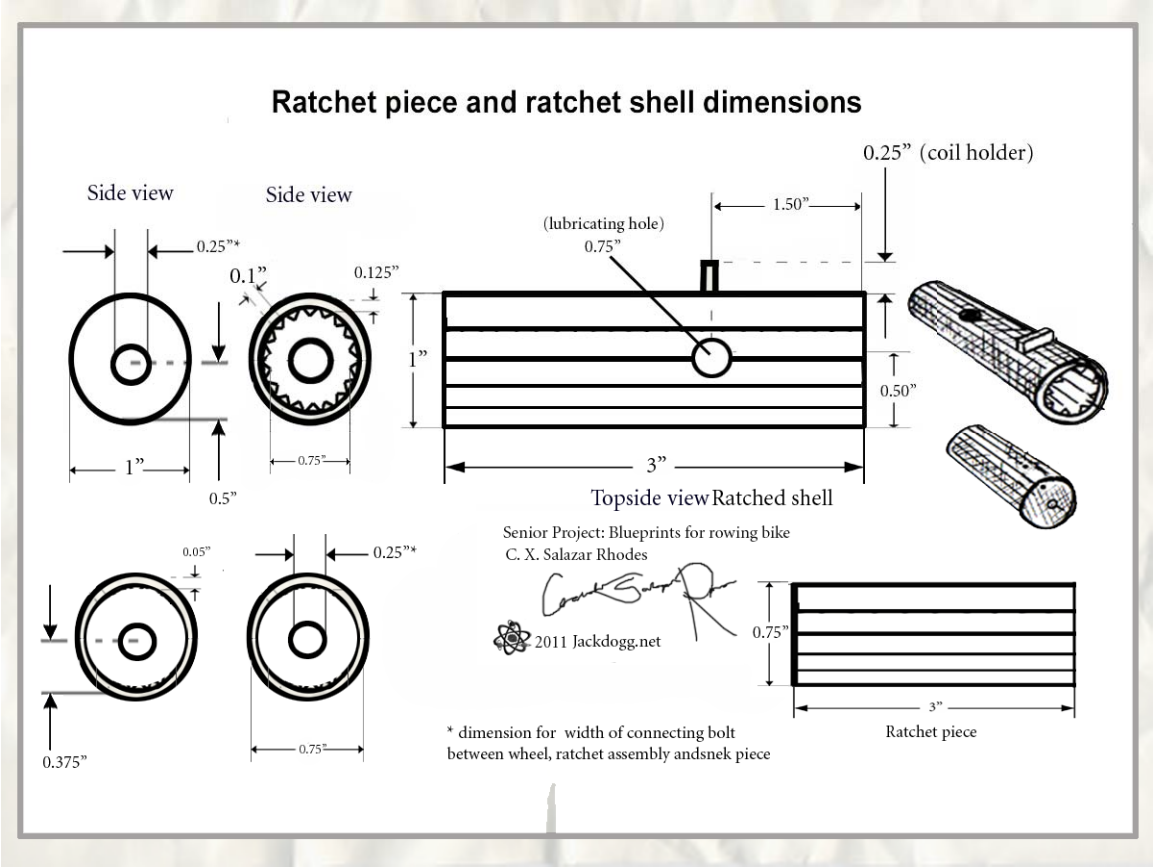

Figure 7.3.7-A

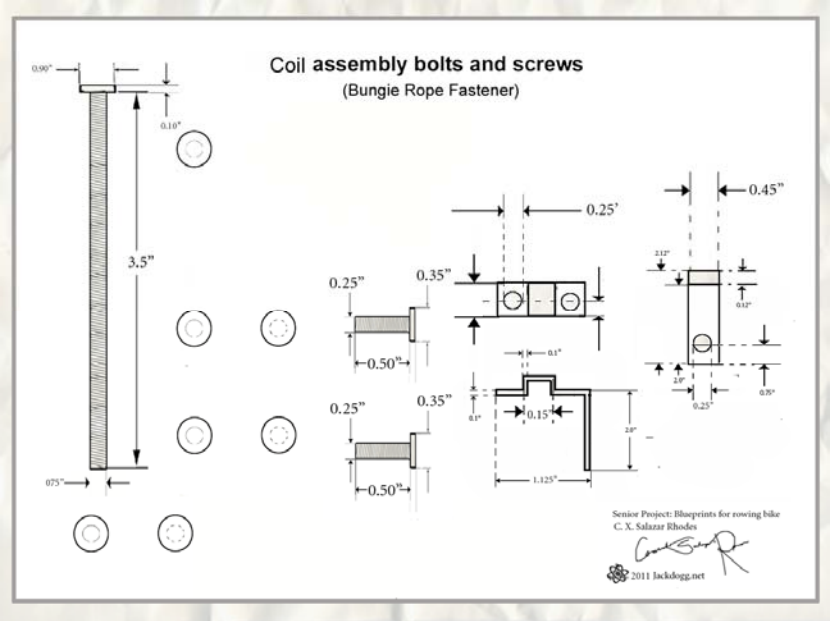

Figure 7.3.7-B

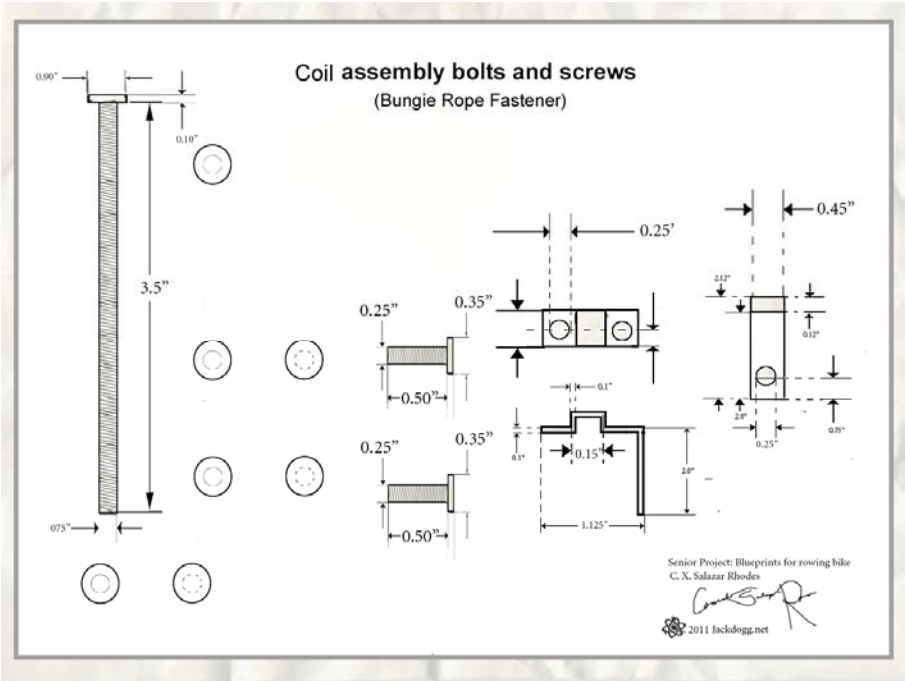

Figure 7.3.7-C

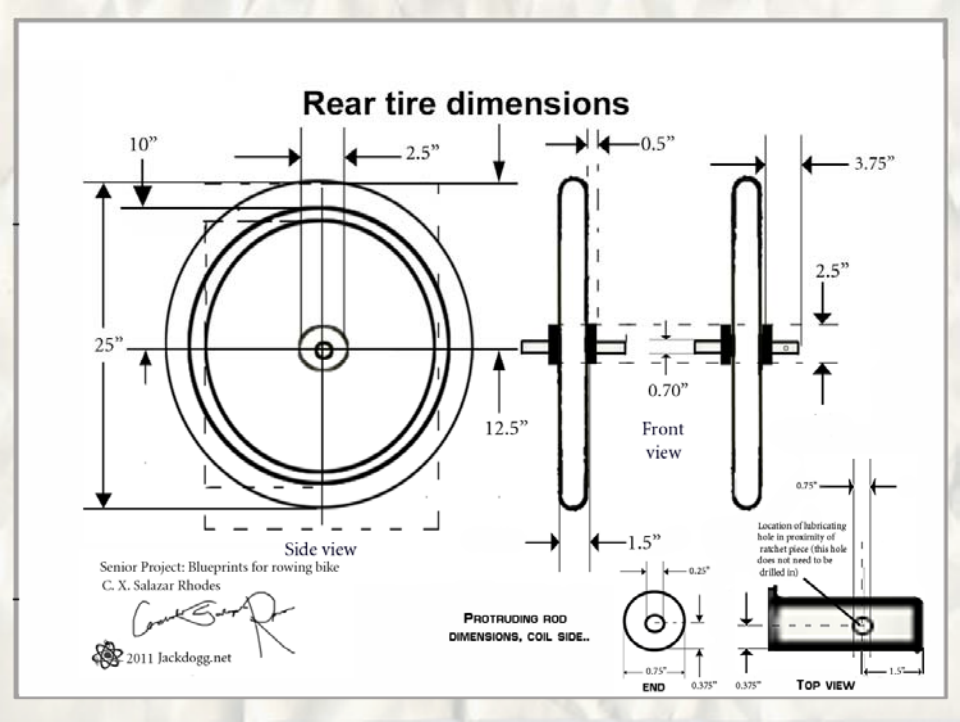

Figure 7.3.7-D

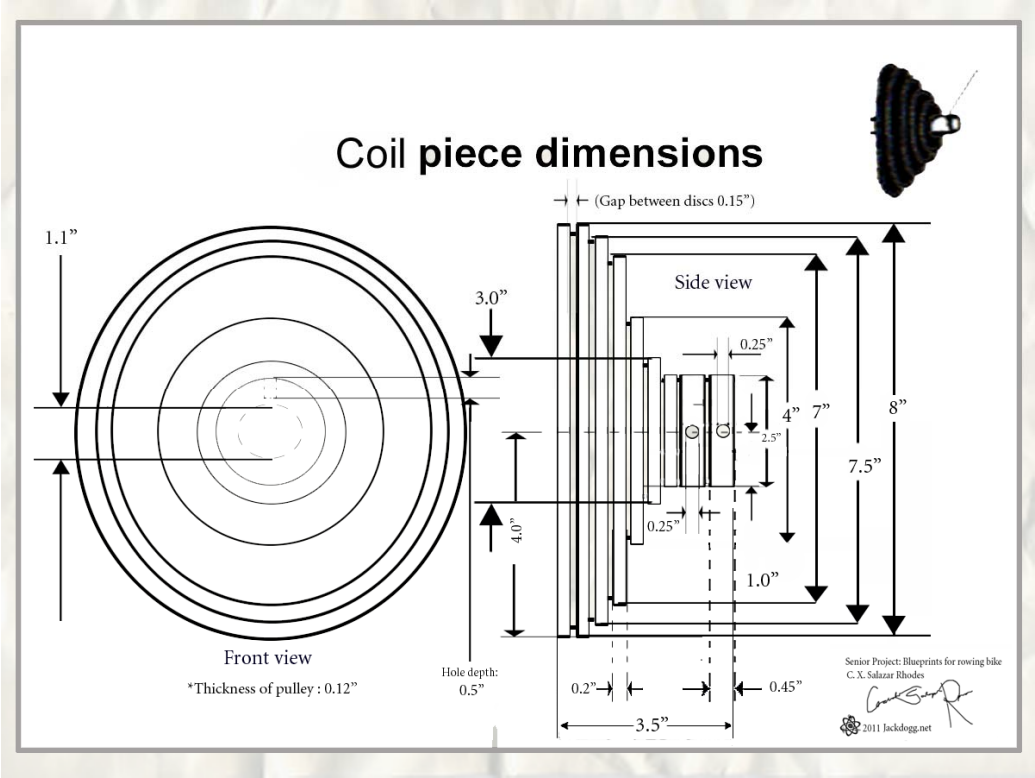

Figure 7.3.7-E