

Handicap Accessible Bicycle

Product Design Specifications | February 1, 2017

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Function: Handicapped Accessible Bicycles vary greatly in style and design based on the specific person's needs, age, and financial income. The objective of this design is to create an easily accessible bike attachment for an adult client who has limited mobility and is still affordable for most persons. In addition to its function this design should be similar in dimensions to that of a common wheelchair. This design will improve the quality of life and also provide therapeutic exercise for the client.

Client Requirements:

- Budget
 - Sidecar cost must stay within a \$1,000 budget but under \$500 is preferred
 - Bike cost preferably no more than \$100
- Sidecar
 - Height must be around the height of clients Tsunami rigid frame sn: ts009326 wheelchair
 - Should contain a small storage space for medications
 - Preferably detachable
 - Must be able to fit in trunk of minivan
 - Sidecar must be on the side or the back of bike
 - Prefer sidecar to have pedals
 - Seat belt for safety in case of uneven surfaces
 - Arm rests on seat

Design Requirements:

1. Physical and Operational Characteristics:

a. Performance Requirements: The sidecar must have the proper size to contain the client's 5'4" height. The totality of the bike and the sidecar must be

able to hold around 350 pounds of maximum weight. The seating for the client must also be very secure. If the client is moving around too much, her brain injury could be aggravated. Ideally, the bicycle should be easily storable in a minivan and in a basement. Ideally, the sidecar will be next to the bicycle driver, or behind the bicycle.

b. Safety: Safety is a major concern for our sidecar design. Biking is a dangerous endeavor by itself, and when the sidecar is attached, it will increase the space the bike takes up on the road and increase its risk of getting hit. We need to ensure our bike is as visible as possible to prevent any accidents. In addition to the risk of impact injuries, our client specifically needs a smooth ride to prevent injuries from excessive bouncing due to a bumpy road. A final safety concern that must be accounted for is in the stability of our sidecar attachment. Our client doesn't have the best stability, so we will need to make sure she is secured with a seatbelt or harness style design.

c. Accuracy and Reliability: The accuracy and reliability of the side car must be of top priority. Faults in this category can cause severe headaches and potential seizures for our client. This design must provide a smooth reliable ride.

d. Life in Service: Our sidecar should withstand the conditions of the terrain and maintain mechanical stability for as long as the client decides to use it to demonstrate its durability.

e. Shelf Life: The sidecar itself should be durable enough to withstand the weight of the passenger. It should also hold up during long periods of storage in the winter months.

f. Operating Environment: The bicycle must be able to withstand the bumping from standard bicycle trails. The sidecar and bicycle may also be ridden on roads on occasion. It must also be able to withstand the total weight of our clients, about 350 pounds maximum.

g. Ergonomics: Our sidecar must be comfortable for the rider to be in for extended periods of time. The attachment also must be easy for the rider to be assisted into and out of the sidecar. Should we pursue a design that includes a detachable aspect, it should also be easily removed and attached so our clients can spend less time setting up their bike and more time enjoying it.

h. Size: The size of the sidecar and bike combination must not exceed that of what can be stored within a minivan.

i. **Power Source:** The sidecar does not require a power source because it is not contain any circuitry or motors. The sidecar care will be powered manually.

j. **Weight:** There is no weight constraint for the sidecar but should be light enough to maximize storage convenience. The client should be able to lift it into a vehicle for transportation.

k. **Materials:** The client is in need of a bicycle, so a cost effective bicycle capable of having a form of a sidecar must be found and attached. In order to create the strongest possible frame for sidecar must be used. It should incorporate thick metal poles and thick metal sheets that must be welded in an appropriate manner. A suitable secure seat must also be used for to ensure our client's safety. If need be, safety harnesses may be employed to prevent jarring to our client's head.

l. **Aesthetics, Appearance, and Finish:** Our finished product doesn't have many aesthetic requirements. The one requirement of our client aesthetic wise was that the attachment not look childish. It would also be preferable if the sidecar attachment didn't substantially increase wind resistance to prevent fatigue for the rider. From a safety perspective, our design's finish should be highly visible to drivers in a variety of weather conditions.

2. Product Characteristics:

a. **Quantity:** The client desires one functional product that can allow the passenger to participate in a bike ride.

b. **Target product cost:** The client would like to keep the sidecar expenses under \$1,000 but would prefer it to be no more than \$500. A bike purchase will be necessary and should not exceed \$100.

3. Miscellaneous:

a. **Standard and Specification:** None required.

b. **Patient-Related Concerns:** Bicycles are notorious for being unstable. The bicycle must be made as stable as possible because serious injuries to our client could leave her severely injured given her current situation. Bicycle are also very jarring when going over bumps. The seating system must be made as secure as possible to prevent aggravating the client's handicap situation.

c. **Competition:** There are competing designs for a variety of handicapped accessible bike attachments. Some incorporated a trailer attachment for placing

a wheelchair on and stabilizing it. Some were modeled after bike taxis used in east asia. Others had more of a traditional sidecar design. They range in price from around \$1000 up to \$4500.

d. Customer: The sidecar is designed for a client with limited mobility and balance who can operate a common the pedals of a stationary bike.