

## **Product Design Specifications**

Portable elevating and transfer seat for wheelchair users

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### **Function:**

People who use wheelchairs are limited when they cannot elevate their seat or need assistance to transfer out of their chair. While elevating seat lifts exist, they may be expensive, and not all people qualify for this feature. Additionally, users often have to manually transfer to and from bed, chairs, and toilet seats.

The goal for this project is to address this problem by designing an affordable aftermarket product that can be added to the wheelchair. This product needs to provide seat elevation and transfer assistance.

### **Client Requirements:**

- Device needs to fit the current wheelchair.
- Device must be able to lift at least 6 inches.
- Device needs to support and raise/lower 250 pounds safely.
- Device must be able to fit through doors and hallways.

### **Design Requirements:**

#### **1. Physical and Operational Characteristics:**

- a. *Performance requirements:* The product should have the ability to elevate the user by 6 inches. If possible, the product should also be able to lower the user by 2-3 inches. In order to provide transfer assistance, the product should allow the user to move forward or laterally, relative to the location of the seat. Ultimately, these features should allow the user to move from the wheelchair to a surface at a higher elevation, without needing help from another person. Additionally, the product must support the weight of the user, and it must not compromise the stability of the wheelchair or the safety of the user.

- b. *Safety*: The device must also allow for safe movement up, down and forward along with laterally on and off of his wheelchair. The material and connections must be strong enough to support 250 lbs of weight while transferring. Finally, the device, if detachable, should be able to be removed and stored without straining or putting the user in danger.
- c. *Accuracy and Reliability*: The device should be functional for a user with limited to no lower body movement and limited upper body strength. The device should be reliable and have the ability to withstand everyday use from the user without breaking down. The part of the device that is in contact with the user should fit properly while causing no pain or discomfort to the user. The device should be constructed with slick, sturdy material allowing for efficient and easy transfer from one object to the other.
- d. *Life in Service*: The device should last indefinitely
- e. *Shelf Life*: The device should be able to withstand multiple uses everyday with some uses coming in short succession of each other. The device should last indefinitely. Some elements may need to be adjusted if the user's needs change or upgrades for the device are designed. Depending on the design, batteries may need to be replaced along with wiring, and other small pieces of hardware.
- f. *Operating Environment*: The model will mostly be used in an outdoor and indoor environment, so it needs to be able to withstand both conditions. The device will also be a part of a moving object, so it needs to be able to withstand bumps and jerks along the way. Finally, the device needs to support the weight of the user at all times when used.
- g. *Ergonomics*: This device should support a weight of 250 pounds. It should be comfortable for the user to both sit in and operate.
- h. *Size*: The device should be able to fit on the the seat of the wheelchair, while not being too wide or too long where it would impede the user's use of going in and out doorways. The maximum size the device can be is 20in x19in.
- i. *Weight*: The device should not be too heavy where it negatively affects the speed of the chair, but it still needs to have enough weight to support the weight of the user while raising or lowering.
- j. *Materials*: Components that the user will not be sitting on should be made of a material with minimal friction such as a lightweight metal or finished wood. Cushioned material should be used for any permanent seat to increase the comfort of the user.
- k. *Aesthetics, Appearance, and Finish*: The device should look professional and match the rest of the wheelchair in design and comfort. It should be comprised of neutral colors.

## 2. **Production Characteristics:**

- a. *Quantity*: 1
- b. *Target Product Cost*: Less than \$250

## 3. **Miscellaneous:**

- a. *Standards and Specifications*: No regulatory requirements exist for this project at this time.

- b. *Customer*: The client wants a device that can be used to elevate the wheelchair seat approximately six inches in order to help the user more easily transfer to a higher surface. The client also wants this device to be able to move laterally and distally to provide additional help for the user in transferring surfaces.
- c. *User-related concerns*: The client wants the device to fit through a door with ease and to avoid any parts behind or above the head.
- d. *Competition*: Current equipment on the market are too expensive even with insurance. The user believes the current products are “over designed” . Additionally, there are currently no products that can be added on to a wheelchair in order to provide elevation or transfer assistance; however, there are existing designs that integrate these features directly into wheelchair. Some examples include:
- A wheelchair design that uses cloth bands that are attached to a canvas or plastic seat. These bands are secured around the arm rests and attached to a power shaft that is mounted below the seat; the power shaft is used to shorten or length the cloth straps in order to move the seat up or down [1].
  - A wheelchair design that uses an adjustable seat supporting mechanism beneath the seat, that is actuated by a hand crank. The mechanism includes foldable tubular link members that are connected to each other and can pivot in order to raise or lower the seat. The seat supporting link mechanism is directly connected to the rest of the frame of the wheelchair including other metal side supports and the front and back wheels [2].
  - Carex Health Brands sells a portable lifting seat that raises and tilts in order to help the user reach a standing position. This seat is self-powered and uses a hydro-pneumatic gas spring, and it can lift up to 340 lbs; however, this product is not designed for attachment to a wheelchair specifically [3].

#### 4. References

[1]. W. R. Griffin, “Elevating wheel chair seat,” 05-Feb-1963.

[2] J. P. Minci, “Portable and adjustable wheel chair,” 02-May-1961.

[3] Carex.com. (2018). *Upeasy Seat Assist Plus*. [online] Available at:

<http://www.carex.com/item/CCFUPE3/Upeasy-Seat-Assist-Plus/#.W6GhnuhKjIU> [Accessed 19 Sep. 2018].