Special Needs Tricycle – Lower Cost Alternative

Project

There are thousands of children across the country who are not able to ride a standard bicycle due to physical disabilities. There are special tricycles that exist to accommodate such riders, but cost between $1500 and $4000 and have limited adjustability. The goal of this project was to design a functional and repeatable tricycle that would meet the needs of these children at a much lower price.

Market Cost: $1500 - $4000

Methods

In order to keep the cost down, several design and manufacturing requirements were taken into consideration. The goal was to create a design that someone could recreate using common tools and practices.

- Minimize Custom Parts
  - No machining, only cutting and welding
- Use standard bike parts
  - Easily sourced and inexpensive
- Utilize 3D Printing when Appropriate
- Parts and Labor Donations from Local Sources

Design

3D Printed Direct Drive System

Fully Adjustable Seat

Fully Adjustable Handlebars

3D Printed Pedal Attachments

Conclusion

Requirements (All Met or Exceeded)

1. The crank arm of the pedals shall not exceed 4 inches.
2. There shall be no obstruction within a box 12 inches long by 14 inches high by 30 inches wide, where the back of the box (length) touches the front most piece of the seat post, and the bottom of the box (height) is less than or equal to 4 inches above the pedal axis.
3. The handlebars will turn a maximum of 60 degrees from the center position and shall have a minimum height of less than 27.5 inches from the pedal axis and maximum height of more than 32 inches from the pedal axis. The handlebars shall adjust to any angle from 90° to 180° relative to the main axis of the front fork.
4. The tricycle shall withstand a minimum horizontal force of 13 lbf, applied to the seat at the maximum seat height, in any direction without tipping over.
5. There shall be a parking brake that maintains immobility of the motionless tricycle on an incline of 5 degrees while carrying a load of 300 pounds, which can be engaged and disengaged by a person standing next to the tricycle.
6. The lowest seat height shall be less than 16.5 inches above the pedal axis and the highest seat height shall be higher than 21.5 inches above the pedal axis. The minimum horizontal distance from the base of the neck of the seat to the pedal axis shall be less than 11 inches and the maximum shall be more than 15 inches.
7. The pedal straps shall adjust to compensate for feet of child size 10 to adult size 10, including accommodation for non-straight for placement up to 45 degrees clockwise or counterclockwise from straight-forward.
8. The tricycle shall transmit motion forward and backward.
9. The width of the seat shall be between 10 to 12 inches.
10. There shall be a mechanism that maintains the pedals tilted less than 30° forward or backward from level at all times during operation.
11. There shall be a mechanism that maintains a 200 pound child upright in the seat.

Custom Tricycle Cost: $580

Special thanks to Mike Stokes, Shaun Dahle, and the USU Center for Persons with Disabilities.

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