

**CHAPTER 6**  
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# All Terrain Stroller for Physically Challenged Young Adults

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## INTRODUCTION

The all terrain stroller (Figure 6.1) was designed for physically and mentally challenged young adults. The stroller is meant to be an alternative to a wheelchair while enjoying recreational activities such as taking a walk. Currently, the commercial market for all terrain strollers is limited to two different designs. The first type of stroller provides all the needed features in a stroller; safety, stability, and support, but at an overwhelming price. The other design is at a lower cost to customers, but it lacks the previously mentioned design criteria. The obvious solution and motivation for this design is a safe, stable stroller with the necessary back support at an affordable price.

## SUMMARY OF IMPACT

The all terrain stroller provides the opportunity for the passenger and the individual pushing the stroller to enjoy a variety of outdoor activities. With a traditional wheelchair, choices are limited to those activities that take place on smooth level surfaces. The all terrain stroller has larger tires that allow the stroller to be used on grass, sand, gravel, etc. The all terrain stroller provides the opportunity to turn a traditional walk into an adventure.

## TECHNICAL DESCRIPTION

The design of the all terrain stroller started with the modification of a commercially available product, the Special Needs II, which is manufactured by Racing Strollers Inc. The motive behind this selection was the overall appearance of the product and the price. This design incorporates a three-wheeled aluminum frame with a removable sling seat. The rear axle supports two rear tires approximately 20 inches apart. The single front wheel is centered between the two rear wheels. The wheelbase (from center of front wheel to rear axle) is 37 inches.

The Special Needs II has three main inadequacies. The first is its lack of safety features. This design does not contain any safety straps for the upper body. Without any upper torso restraints, the passenger can easily fall forward. There is no protection from the front wheel; therefore, without foot straps, the passenger may place his/her feet on the wheel while it is moving. The Special Needs II also lacks a guard on the wheels to protect fingers and toes from moving wheels.

The second problem with the Special Needs II is the sling seat. The young adults who will benefit from an all terrain stroller usually suffer from some form of spinal deformity. After sitting in a sling seat for an extended period, the sling seat can actually increase the deformities in the passenger's back.

The third and most important issue deals with the stability of the stroller. In the Special Needs II, the passenger's center of mass is positioned directly above the rear axle. If the passenger leans forward and then throws his/her weight into the seat, the stroller will tip over backward potentially causing serious injury to the passenger. It only takes 17 pounds of force applied into the back of the seat to tip the stroller over.

The first step in modifying the Special Needs II was to determine where the passenger's center of mass should be located to prevent the stroller from tipping over. The new design was targeted towards a passenger that weighed 125 pounds. This sized passenger can apply over 80 pounds of force to tip the stroller over. If only 17 pounds of force is required to tip the stroller, then it is obvious that a 125-pound passenger can easily tip the stroller over. The moment equation about the rear axle was written to find the distance at which to place the center of mass to prevent tipping. In this new design, the center of mass of the passenger is placed 10 inches in front of the rear axle. At this location, it would take over 100 pounds of force to tip the stroller over. A 125-pound passenger could not

physically apply enough force to tip the stroller over. This new design has made the stroller stable.

To increase the support for the passenger's back, solid foam seats replaced the sling seat. The bottom seat was positioned at an incline of 10 degrees. The angle between the backrest and the seat was 110 degrees. These angles are the suggested angles for proper seating for a physically challenged individual. This new seat helps the passenger instead of increasing deformities.

By adding safety straps for the upper torso, the passenger is prevented from falling forward and the upper body is held in a proper position. Spoke coverings

over all three wheels prevent the passenger's fingers and toes from entanglement with the spokes. A front fender was added to protect the passenger's feet from the front wheel. Foot straps were attached as an additional safety feature.

The approximate cost of manufacturing the all terrain stroller is \$500, including the purchase of the commercially available Special Needs II stroller that was modified.

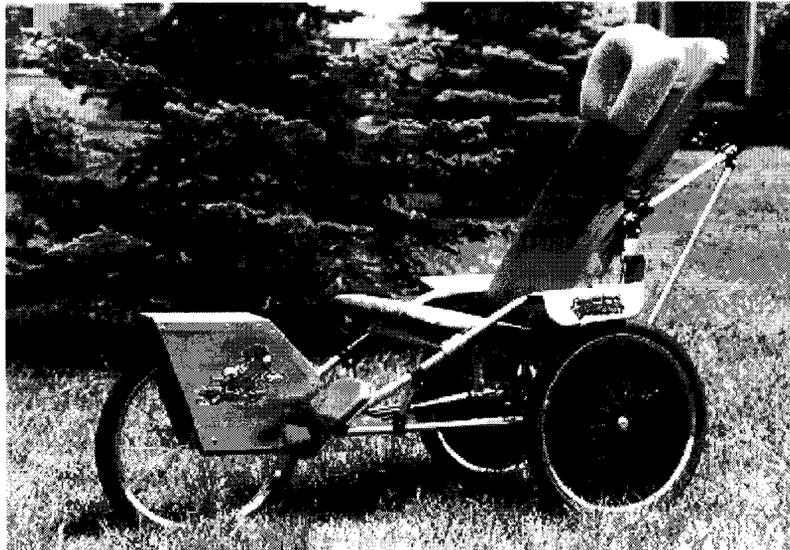


Figure 6.1. Modified All Terrain Stroller.

