

# Auto Assist

## Team 15 – Calvin University

### Background

Every year, more than 37,000 people above the age of 65 are injured entering or exiting a vehicle. Beyond this number, thousands more struggle with the seemingly basic task of traveling in vehicles.

Jeanne Lewter, Ryan MacIntyre's grandma and our client, faces this problem daily. The flexibility and mobility of her legs are limited, causing her to need constant help when getting into or out of a car.

Her specific needs include needing assistance to lift her legs and feet over the bottom threshold of the car and swivel herself to a forward-facing orientation once in the car. Our goal was to create a solution for Jeanne that not only solved these problems, but also promoted her independence and made traveling easier and safer.



### The Team



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### Our Solution

Our solution accounted for various considerations that were specific to Jeanne's needs and physical limitations.

#### Swivel Seat

A lazy-Susan bearing was incorporated to swivel the seat 100 degrees. This allows Jeanne to be able to maneuver from an accessible position outside of the vehicle to one safely inside the vehicle.

#### Foot-Lifting Mechanism

Multiple drawer slides were attached from the seat to the footrest to allow for stability as Jeanne's feet are lifted from the ground to above the threshold of the car. The lifting action is accomplished by a high-strength rope that is winched around a spool, driven by a stepper motor.

#### Motor Gear Reduction

The pulley system's foot-lifting action needed to be done in a manner that fit within Jeanne's needs. The foot-lifting speed was controlled with a 3:1 gear ratio attached to the motor, allowing Jeanne's feet to be lifted at a comfortable and safe rate.

#### Push-Button Control

A simple interface consisting of an "up" and "down" button was designed so that Jeanne could easily operate the foot-lifting mechanism as needed when entering and exiting the vehicle. Pushing the green button controls the raising of her feet, and pushing the yellow button controls the lowering of her feet.



### Objectives

There were various objectives to be achieved in the design and construction of the Auto Assist device:

#### Function

- Automatically raise and lower the feet of the user 33 inches from the ground over the threshold of the car
- Swivel 100 degrees
- Foot plate supports 100 lb<sub>f</sub>
- Seat supports 200 lb<sub>f</sub>
- Dimensions fit Buick Envision

#### Price

- Cost less than \$700 for the user

#### Operations

- Simple two-person interface
- Button-controlled "up" and "down" function

#### Time

- One-minute use

### Design

#### Components

The final design for the Auto Assist device consisted of a swiveling seat which utilized a lazy-Susan bearing and a motorized pulley system—controlled with an Arduino Mega 2560—to lift the feet of the user.

#### Pulley System

High-strength rope was used in the pulley system due to its flexibility and load-bearing capacity. Drawer slides were used as a guide for the rope and to provide stability as the feet of the user are raised. An Arduino and a simple controller interface allows the user to operate the device's lifting mechanism.

#### Controls

The controls for the Auto Assist include the use of an L298N motor driver, which controls the direction of the stepper motor by changing the polarity of its input voltage from a 12V battery. An intuitive button system was implemented into the controls for ease of operator use.



### Acknowledgments

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**Manufacturing Consultant:** Chris Sorensen