There is currently no efficient device on the market today for a paraplegic patient to put on both socks and shoes independently. Team Sock and Awe has proposed a single device that will accomplish both tasks quickly with minimal effort required by the user. Such a device could assist the roughly 125,000 paraplegics in the United States with this everyday task that is often taken for granted. Through talking with Clifford Anderson, a paraplegic who was the chief user of the prototype, the customer needs were determined. The device should be compact, it needs to be ergonomic and durable for extended use, it should be simple to use, and it should be safe.

Based on the existing products and patents, the following specifications were developed: priced less than $20, made from wood and aluminum, less than 2.25 pounds of force required for operation, device weighs less than three pounds, factor of safety between one and two, and lastly the device should have at least three degrees of freedom. A track-based design was selected for the final design. This new design was named the SS Donner (see Figure 1). A finite element analysis was conducted on the arm extenders, as they were determined to be under the most stress. Calculations were performed by hand to verify the results and showed that neither the pin nor the arm extenders would yield under the stress. The materials used to create the prototype were 6061-T6 Aluminum alloy, ASTM A36 Steel, and PVC plastic. Lastly, the total cost incurred for the final prototype was $102.67.

Mr. Anderson tested the first prototype and several design changes were necessary prior to completion of the testing. The team made the necessary changes to the design and took the second prototype back to the Polyclinic Hospital for the second round of testing. Mr. Anderson was able to successfully use the Sock Donner to put his sock on (see Figure 2), but the limited flexibility in his ankle did not allow him to use the Shoe Donner. Dr. Hills and Mr. Anderson both agree that the Shoe Donner is a viable design for most paraplegics. Team Sock and Awe recommends several design changes for the next phase of the project: reduce the size of the device by using bent aluminum tubing to create the track path rather than wood, increase the adjustability by allowing the leg support and arm extenders to be adjustable in the vertical direction, and refine the track shape to allow multiple approach angles onto the foot.