Prone Cart

Overview
The customer is a tetraplegic who has little use of his arms and no use of his lower body. Additionally, a medical complication resulted in the removal of the femoral head to his femur, causing discomfort while sitting in a wheelchair. As a result, the customer spends fifteen hours a day in bed because he is only comfortable while lying on his stomach. He requires a cart that will allow him to move while in this position so he will be able to be more productive around his home.

Objectives
The team will build a “prone cart” which will enable the customer to comfortably and safely navigate his home while lying on his stomach. The position of the cart will also be adjustable such that he can easily find a position that provides the most comfort.

Approach
- The team met the customer in person at his home in order to evaluate the problem and assess customer needs.
- The customer needs were weighted and existing products and patents were analysed for concept generation.
- The prone cart was chosen during concept selection based upon customer needs.
- The device was segmented into two subsystems, with a portion of the team dedicated to each system.
- A proof-of-concept alpha prototype was constructed from cardboard.
- Materials for each system were chosen and ordered to begin beta prototype construction.
- CAD models for each custom part were created before construction began.
- Each system was built individually as a beta prototype.
- Hand calculations and FEA were utilized to prove the integrity of the design and to assist with design modifications.
- Once all modifications were complete, the entire cart was assembled as a finished product.
- The cart was tested by a team member with a body type similar to the customer.
- Special attention was taken to ensure that there were no deflections during, since this could lead to potential failure.

Outcomes
- The customer will be able to comfortably move around a home and spend less time in bed.
- The prone cart is structurally sound and should enable the customer to be more productive for the foreseeable future.
- The cart cost under $1000, which will save the customer money. Existing prone carts can cost up to $30,000.