Ergonomic and Adjustable Seat Cushion Bolster Design Challenge

Overview
Ford Motor Company, the industry leader for seat comfort, challenged the PSU Capstone team with a design innovation to improve seated comfort as well as ingress and egress with a new bolster design that could be implemented into their existing seat structure and packaging space. The team implemented a cable and bolster adjustment system in the lower seat bolsters. Additionally, an on-campus survey was conducted to determine user satisfaction for the redesign.

Objectives
The goal of this project was to redesign Ford’s Perfect Position seat to implement a new bolster adjustment system that increased comfort, adjustability, and ease of ingress and egress.

Approach
- An external search was completed in order to gather information on pre-existing car seat technology
- Ford’s current seat design was deconstructed in order to understand available space within the seat
- Ideation sessions were used to brainstorm 20+ design concepts
- A final design concept was selected through the use of DFMEA and concept scoring techniques
- A site visit was completed at which the team presented the proposed design to Ford engineers
- The selected design involved the use of a cable, spring, and motor system to move the bolsters inward and outward, as well as an air bladder/hinge system to allow for bolster angle adjustments
- The design was prototyped within the existing seat structure
- An on-campus survey was conducted to measure customer approval ratings and test the prototype
- Survey questions were created to evaluate comfort, adjustability, and ease of ingress/egress of the redesigned seat
- Survey data analysis was performed using JMP statistical software
- Final design was constructed and presented at Design Showcase

Outcomes
- The customer approval ratings for comfort and adjustability of the redesign were 69% and 90% respectively according to survey results
- The redesign was also rated higher for ease of ingress/egress by survey participants
- The redesign allows for an additional width adjustment of 40 mm on either side of the seat
- Proposed future work:
  - Implement similar system in upper bolsters
  - Explore use of pulleys in design to increase safety and durability