Fire Helmet Impact Absorption

Overview
There are currently no standards or tests relating to rotational impact absorption required by any regulating body, including the National Fire Protection Agency (NFPA). MSA Safety Inc. required that our team produce a variety of concepts based on reducing torsional forces in fire helmets. Our project has produced three design concepts that will provide a reduction in the rotational forces that increase the risk of concussions and head or neck injuries.

Objectives
- Develop concepts that will allow for absorption of rotational impacts on fire helmets.
- Review current products and research competitive patents

Approach
- Initially we reviewed relevant patents and competitors’ products
- We visited the MSA Safety Inc. facility to better understand current helmet design and testing
- The team then focused on creating many concepts while avoiding possible patent infringement
- MSA Safety Inc. Provided feedback regarding our concepts and gave additional input to consider
- After concept generation, we screened the concepts using AHP and concept generation charts
- Additional concept evaluation using DFMEA allowed the group further refine our concept selection
- Through our extensive concept analysis, we focused our designs down to three
- At this point, we created SolidWorks models and began Matlab analysis and Finite Element Analysis
- We refined our CAD Models and sent the files for 3D Printing
- The 3D printed model allowed the team to demonstrate proof of concept
- We presented our analysis and prototype

Outcomes
- This project was ground-breaking, the company had no prior research into this problem.
- Our team laid the groundwork for MSA Safety Inc. to improve the current helmet design and safety requirements.
- MSA Safety Inc. will be able to review all of our concepts when they move forward with new helmet development.