Design of a Novel Endosurgical System

Overview
Current endoscopic procedures are limited by their functional capabilities and safety concerns. The team’s task is to design a novel accessory for the endoscope than can provide a safer and more efficient manner for the endoscope to reach the site of surgery, thus expanding the scope of procedures that can be performed. This should be a novel design that has never been accomplished previously.

Objectives
The objectives for this semester were to generate a novel concept for an everting structure for an endosurgical system, generate CAD models, and to build a prototype to simulate this concept.

Approach
- Attended an original site visit with surgeons in Hershey to permit the team to identify customer needs and create objectives used for the course of the semester
- Conducted several weeks of patent and intellectual property searches
- Generated multiple concepts for different solutions to increase the functionality of the endoscope
- Selected a concept that promoted better locomotion and stabilization
- Generated multiple SolidWorks models detailing the concept using an everting saline-filled sac
- Performed Finite Element Analysis using SolidWorks to determine the force needed to displace the saline-filled sac
- Tested for the best possible eversion and stabilization by performing tests relating to the volume, lubrication, and force needed to evert and stabilize the device
- Analyzed data from testing and illustrated results in tables and graphs
- Built a prototype using rapid-prototyped and commercial products
- Communicated with the sponsor via additional site visits and conference calls throughout the semester to ensure that the team was on target

Outcomes
This project resulted in several outcomes:

- Multiple concepts were generated as possible solutions for both locomotion and stabilization of the device.
- A novel concept and prototype was designed and built.
- CAD Models were provided for an everting, saline-filled sac.
- Patient safety was theoretically improved by reducing trauma and the time required to perform surgery.