Transmission Component Reverse Engineering and Process Planning

Overview
The Pennsylvania State University’s Applied Research Lab (ARL) was approached by the Defence Advanced Research Project Agency (DARPA) with a project aimed to reduce the lead time of the process to manufacture an automotive transmission. The IE 480W team was assigned three components of the transmission to reverse engineer and develop process plans for efficient fabrication in a low volume setting.

Objectives
Deliver the ARL team with:
- 3D Solid models of the three transmission components: synchronizer hub, synchronizer sleeve, and front bearing retainer
- Rapid prototypes
- Process plans which outline the process to fabricate the parts in the Industrial Engineering Department Factory for Advanced Manufacturing Education (FAME) laboratory

Approach
- Reverse Engineering
  - Part analysis
  - Measurements
- 3D Modeling using SolidWorks®
- Rapid Prototyping using OBJET® printer
- Process Planning
  - Research/Collaboration with FAME lab technicians
  - Development of standard and plans for each component
  - Casting the front bearing retainer for proof of concept

Outcomes
- 3D SolidWorks® models
- Rapid prototypes
- Blank casting of Front Bearing Retainer
- Process plan standard
- Detailed process plan for each transmission component for fabrication in the FAME laboratory