Overview
Lycoming Engines is a general aviation manufacturer of air-cooled piston engines. The task was to redesign the alternator and compressor bracket assembly for use in air-cooled aircraft internal combustion engines. Lycoming is currently looking to reduce the weight and complexity of their engines as original equipment manufacturers are willing to pay a premium for weight savings.

Objectives
The main objective is to redesign the accessory engine brackets to be more lightweight, less complex, more environmentally friendly and easier to manufacture. The design focus was to maintain the strength of the existing brackets, remove material where possible and ensure deformation was minimized. These objectives were met by using an iterative process which modified the geometry and removed material from the brackets. The finite element analysis software ANSYS was used to compare the stress concentration and deformation of the baseline and redesigned brackets.

Approach
Customer needs and engineering specifications were developed for the design task. The team determined that weight, safety, strength, materials, and anti-corrosiveness were the most important factors to improve the design. The original brackets were analyzed using ANSYS to determine baseline stress and deformation on the original brackets. These original brackets were then redesigned with a focus on material removal and geometry change in order to reduce weight using an iterative process. Research into different manufacturing methods and corrosive resistant coating paralleled the FEA analysis. Finally, each iteration was 3D printed using PLA plastic and the final redesign of each bracket was 3D printed in high quality ABS plastic.

Outcomes
The brackets were redesigned to have a 56% reduction weight while maintaining the strength needed to be safe in flight. The cadmium coating was eliminated as the material the brackets are made from was switched from steel to aluminum. Additionally, the number of pieces for the bracket assembly was dramatically reduced from seven to two. It is recommended that Lycoming use investment casting for mass production to keep costs low and make the manufacturing process as easy as possible.