Project Name – Starter Ring Gear Support Design and Analysis

Overview
Lycoming asked our team to look at two of their current designs of the ring gear support. Our goal was to do an analysis of these designs and then do a redesign of the models to reduce the total weight of the support, while considering cost and machinability. Our team gathered data and produced multiple designs to effectively reduce the weight of the supports, without sacrificing the structural integrity of the pieces.

Objectives
Our team's main objective has been to provide Lycoming Engines ring gear for maximum weight reduction. It was our initial hope that by the end our team will have found a way to significantly reduce the weight of the ring gear, and we can confidently say that we have met this goal.

Approach
- We first gathered the relevant forces that a starter ring gear would undergo during operation
- These forces were implemented into Abaqus, with the CAD models that they provided for us
- Determined customer needs from the problem statement, and by speaking with our sponsors
- Weighed these needs in a AHP Matrix to determine which metrics to focus most heavily on
- Began generating results from FEA and thinking of how to redesign for maximum efficiency
- Went through various iterations of redesigns in SolidWorks, using the same aluminium alloy
- Generated FEA of these new models, and began to considering changing materials
- 3D printed each model from MNE Printing to get a hands-on feel for the project
- Switched from aluminium to magnesium alloys for the final design, which produced the greatest weight reduction
- Confirmed this model passed the FEA with a valid Factor of Safety

Outcomes
- Final model made out of magnesium alloy
- Utilizes circular cuts for ease of machining
- Lycoming Engines can reduce the weight of their starter ring gears by 52%
- Successfully adding additional mounting holes on the front face, which allows Lycoming Engines to use this model on multiple aircraft instead of only a few
- Cost increased 72% by switching to magnesium, but this is a cheap price to pay for such significant weight reduction
- Factor of Safety is still significant enough to pass FAA Regulations