Radial Engine Project

Group P1

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Aim of the Project

Complete the manufacturing of a Radial Engine using CAD CAM methods.

Objectives:

- Analyse the current status of the Radial engine, and generate CNC programs for any outstanding components.
- Design and manufacture an alternative engine stand and incorporate a motor to operate the engine for display purposes.
- Investigate the propeller CAD model and complete the manufacture of engine propeller.
- Create a full set of engineering working drawings must be created from the solid models and complete a SolidWorks simulation of the working engine to show the operation of the engine.

Background

The radial engine project is an ongoing initiative aimed at designing and manufacturing a fully functional radial engine assembly.

Initially undertaken by previous teams, the project involved modelling all the necessary engine components in SolidWorks. A SolidWorks assembly could then be produced, this assembly was used to confirm that everything was dimensionally accurate, as well as simulate the engine's operation and check for any design defects (Figure 1) .

Week Ending:	Task	% Complete
4th October 2024	Complete initial design work	100%
18th October	Complete CAM programmes	100%
25th October	Complete design on stand	100%
8th November	Finish machining	10%
15th November	Final Assembly	100%
22nd November	Create animation	100%
1st December 2024	Project submission	Milestone

Design Review & Updates:

Images 1&2 – Components Modelled in SolidWorks

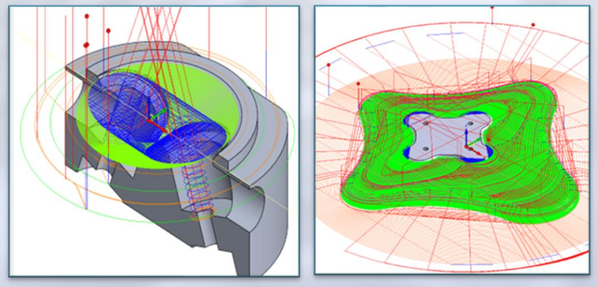
The current phase of the project began with a thorough assessment of the existing SolidWorks assembly. The team reviewed all the listed components, documented the quantities on hand, and identified all the parts missing.

During the review process, several components were identified which could benefit from a redesign to enhance their performance and simplify manufacturing.

Components that were updated include:

- Crankshaft reduced to 8mm to allow a coupler to be attached.
- Reduced diameter on counterbalance to accommodate a needle bearing.
- Repaired CAD Model after Surface irregularities were identified.

Programming & Manufacturing:



Images 3&4 – Examples of CAM Programs created

The engine was manufactured using a range of different machining methods, including mill-turn, indexial 5-axis machining, and high-speed surface (HSS) techniques.

CAM programs were developed for all new components, as well as those with modified or updated designs (Figures 3&4)

The programs that were created include:

- Crankshaft, both sides male and female (counterbalance).
- Piston, as the original program was missing
- Propeller, due to issues in surface quality.
- All components for the new radial engine stand

Final Solution:

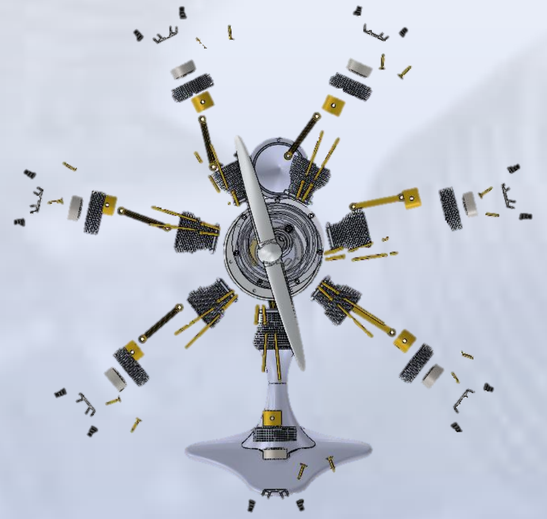


Image 5 – Exploded View of the SolidWorks Assembly

Image 6- Evolution of stand design

Conclusion:

In conclusion all the objectives were met

- Status of the radial engine was analysed
- All necessary CAM programmes were generated
- Alternate stand was created which incorporates a motor
- CAD model for the propeller was assessed and fixed including CAM programme
- A full set of working drawings were made
- A SolidWorks simulation was created to show the operation of the engine

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