Navy Air Systems Command (NAVAIR)

H-53E Oil Cooler

Western Carolina University
School of Engineering + Technology

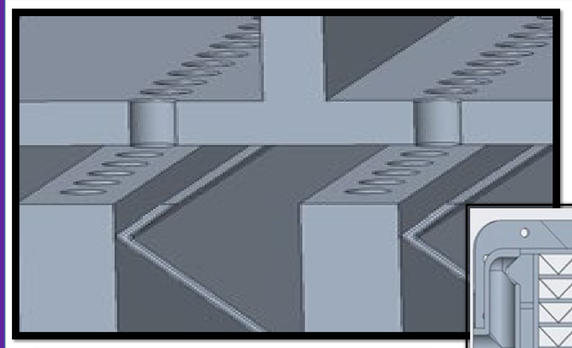
Objectives

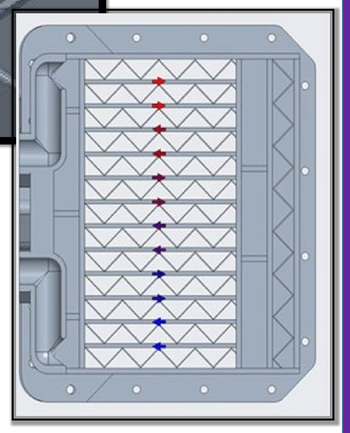
- Obtain a new, more effective design for the current cooling system.
- Reduce the workload on the H-53E pilots.
- Reduce impurities and contaminants generated from inadequate cooling and lubrication.

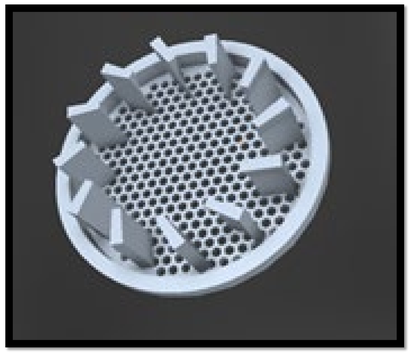
Requirements

- Oil type – MIL-PRF 23699
- Oil flow (Engine) – Must flow at 5.8 GPM
- Oil flow (Gearbox) - Must flow at 6.5 GPM
- Oil out temp (Engine) - Max temperature is 225 DEG F
- Oil in temp (Gearbox) - Max temperature is 226 DEG F
- Inlet air temp (Gearbox) - 130 DEG F
- Heat Rejection (Gearbox) - Must not fall below 1500 BTU/min
- Heat Rejection (Engine) - Must not fall below 1400 BTU/min
- Air flow – Max flow is 2700 CFM at 0.070 LBS/FT

Concepts



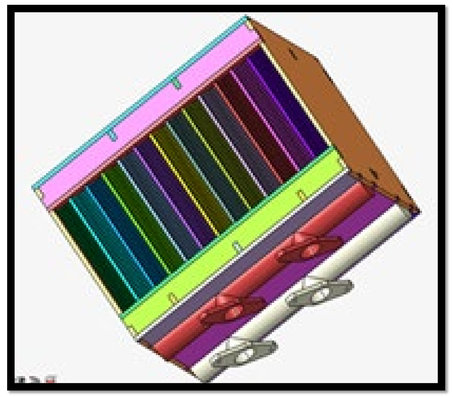


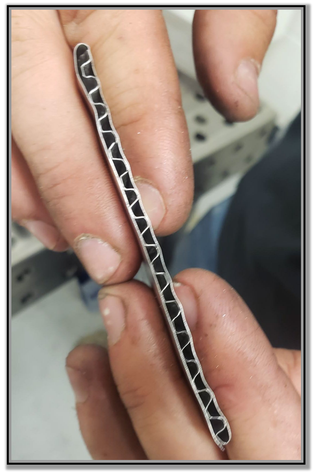


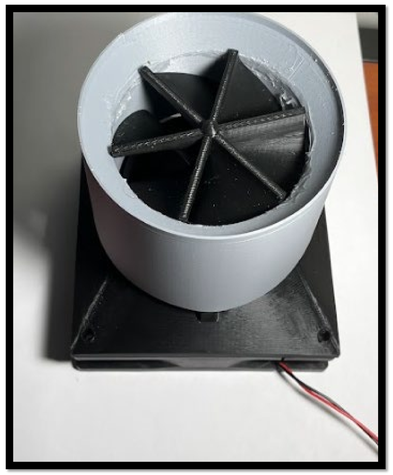
Problem Statement

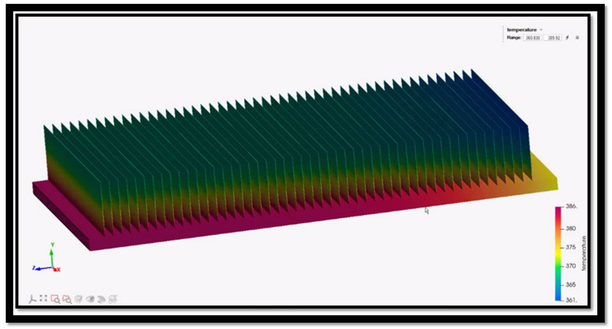
Design a system that will efficiently cool the oil in the engine and the gear box for the H-53E helicopter.

Final Design









Results

Radiator:
Meeting the sponsors specifications in internal fluid flow restriction, the system experiences increased heat rejection and efficiency through the optimization of fins' size, and material heat transfer capability.

Flow/Particle Separator:
This diverter system has been designed to eject F.O.D. before it can contact the radiator causing direct and indirect failures of the aircraft. It uses centripetal force to expel the heavier than air particles, while effectively allowing cleaner air to pass through the improved radiator system.

Summary

Microchannel radiator
- System integration with minimal effort
- Uses current mounting design, inlet/outlet, and bypass
- Better heat transfer by 30% to 40% over tube and fin
- Requires 30% less fluid capacity
- Smaller and lighter per BTU extracted

Flow diverter and Guard
- Attaches to outside of radiator
- Filters out larger particles using centripetal force
- Diverts particles away from radiator
- Protects fins from debris and damage

Team & Acknowledgements

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