

**Team Members** – Dustin Birchall • Parker Harding • Tyler Pilet • Lucas Pye • Jeffery Rutledge

**Sponsor** – Unison Industries LLC, Kevin Walker, **Instructor** – Shayne McConomy • Chiang Shih, **Faculty Advisor** – Juan Ordonez

## Summary

The main goal is to develop the most lightweight heat sink design possible which will cool a control panel on board of a UAV developed by Unison Industries. Team 19 will adhere to the engineering design process in order to determine the major and minor variables in constructing the optimal heat sink design.

## Objectives

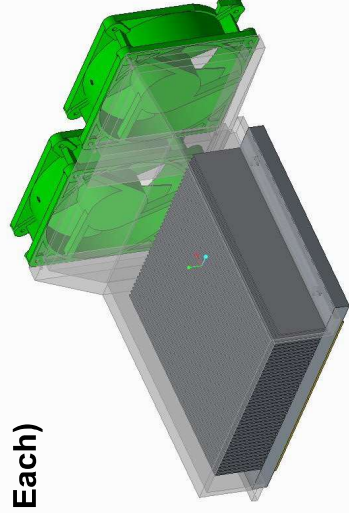
- Design and construct a Heatsink to keep the aircraft's circuitry below an operating temperature of 135°C
- Lightweight: Under 4.5 kg or 10 lbs
- Physically small in size: Under 267 x 185 mm
- Remove 300 Watts of heat
- Minimize use of our \$2000 budget
- Efficiently organize 24 Semiconductors in sets divisible by 3

## Design

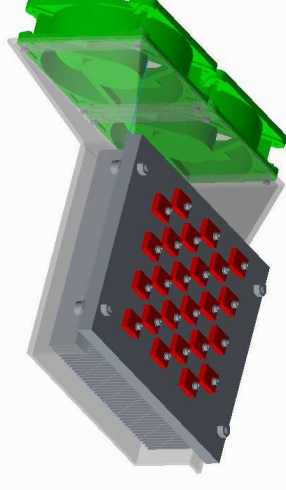
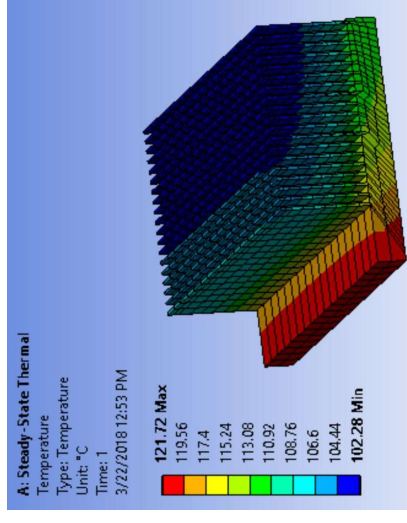
- Two 89 mm fans (0.06 m<sup>3</sup>/s Each)
- Aluminum Air Duct
- Aluminum Heat Sink

Dimensions:

- Base: 178 X 216 mm
- Fin height: 39.9 mm
- Fin Spacing: 3.175 mm
- Fin Thickness: 1.27 mm



## Results



## Discussion

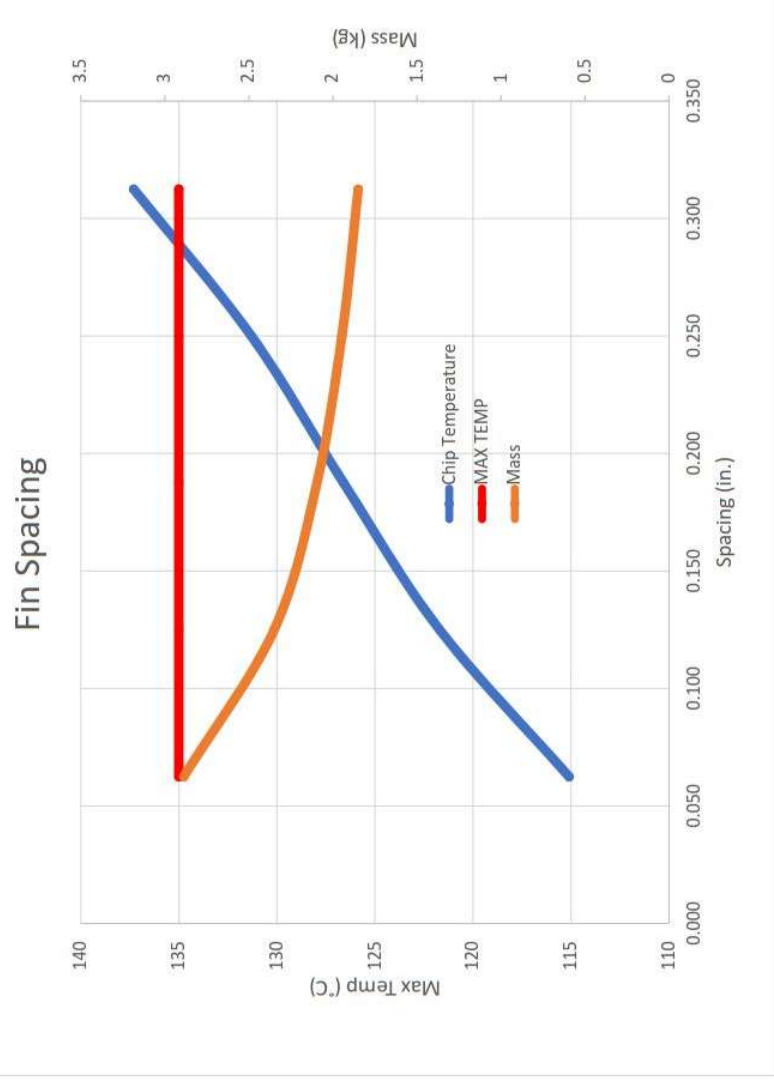
- Our design maintains a temperature below 135°C with a max temperature of 121°C.
- There are some areas not as necessary for heat transfer (marked in dark blue on the FEA).
- Increasing fin spacing reduces weight but increases max temperature.

## Testing Set-Up

- The final stage to this project is experimental validation
- Resistors will be powered via a power supply to produce heat loads and test heat sink performance.
- With a thermal imaging camera we can mark locations that are close to ambient temperature
- These cooler regions will be removed
- We predict that a chamfer on the side the air comes in will not only reduce the weight, but also improve cooling in the back region

## Future Work

- Further optimize design
- Reduce the thickness and weight of the base plate
- Observe how changing parameters such as fin height, thickness, and baseplate area affect heat transfer.
- Determine the scabability of the heat sink and how heat transfer is effected



## Acknowledgments

Team 19 would like to give a special thanks to Kevin Walker, our sponsor, for giving us the opportunity to be a part of this great project and Dr. Juan Ordonez, our advisor, for his technical support and advisement. Team 19 would also like to thank Dr. Shayne McConomy and Dr. Chiang Shih for preparing and guiding us throughout the design process. A Special thanks to Jeremy Parker at Parker Services LLC for providing us with free materials and exceptional labor for our duct design.