NVESD/ U.S. Army 2 - Blackbody Target For Sensor Testing

Overview
The Night Vision and Electronic Sensor Directorate (NVESD) currently uses heated targets for sensor testing. These targets are used to assess how an aircraft thermal sensor performs in adverse weather conditions. The team has been tasked with creating a similar heated target, another target that can be heated or cooled, and a central control system for both. In addition to building new targets, this project focused on making the targets more rugged and transportable.

Objectives
The main objectives for this project were to create two 18x18 inch targets, one heated and one heated and cooled, ruggedize both of them, and create a central control system. In addition to that, both targets should have a temperature uniformity of 0.5 degrees Celsius and be able to achieve and maintain a temperature offset of +15/ -10 degrees from ambient temperature.

Approach
- Gathered customer needs and requirements from the sponsor at the kickoff meeting and continued communication throughout the semester
- Researched existing industry blackbodies
- Generated concepts on what to use for cooling aspect of the heated/cooled target
- Generated ideas for ruggedization of targets to protect against rain, snow, etc.
- Compared microcontrollers to decide which one to use for the control system
- Tested multiple features of the control system including temperature control
- Selected thermoelectric coolers for the heated/cooled target because they can be heated or cooled
- Performed testing to decide how many thermoelectric coolers it would take to achieve the necessary temperature uniformity
- Fabricated full prototype including heated only target, heated/cooled target, and central control system
- Performed testing of prototype to assure that all sponsor objectives were met

Outcomes
- The sponsor will eventually scale the design of the 18x18 prototype for use on two 36x36 inch targets
- The design created is more durable, weather resistant, and easily transportable for testing
- A cooled target is a unique product that is not readily available in industry due the difficulty of its implementation