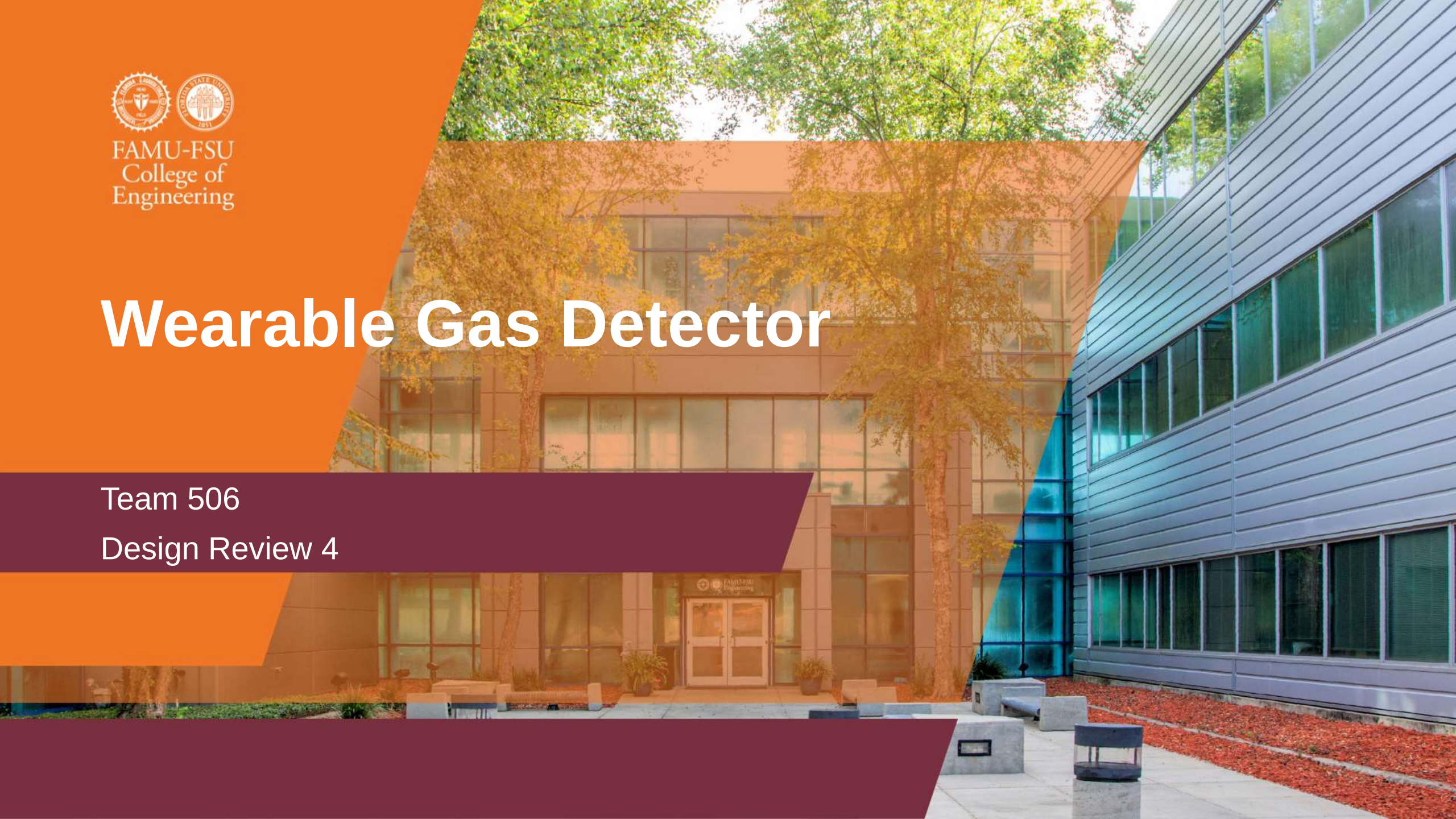


FAMU-FSU College of Engineering

Wearable Gas Detector

Team 506

Design Review 4

Team Introduction

Shawn Butler
Manufacturing Engineer

Ben Labiner
Mechatronics Engineer

Alex McIvor
Power Management Engineer

Jane Nordhagen
Systems Engineer

Michaela Porcelli
Mechanical Engineer

FAMU-FSU College of Engineering

Sponsor and Advisor

Engineering Mentor
Franklin Roberts
Central Intelligence Agency (CIA)

Academic Advisor
Shayne McConomy, Ph.D.
Senior Design Professor

Project Background

Building collapse sites often contain hazardous gases, posing a danger to search and rescue responders

Current gas detectors are hand-held and bulky, making them difficult to monitor and control when wearing response gear

Objective

The objective of this project is to design a wearable gas sensor to assist in search and rescue operations for the CIA (Central Intelligence Agency)

Key Goals

Sense

Notify

Protect

Key Goals

Sense

Notify

Protect

Key Goals

Sense

Notify

Protect

Key Goals

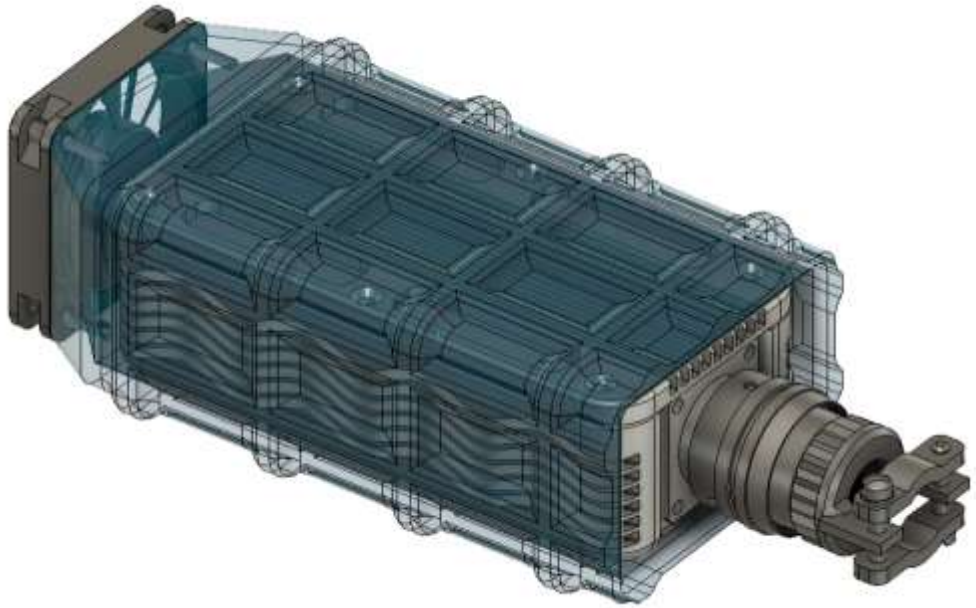
Sense

Notify

Protect

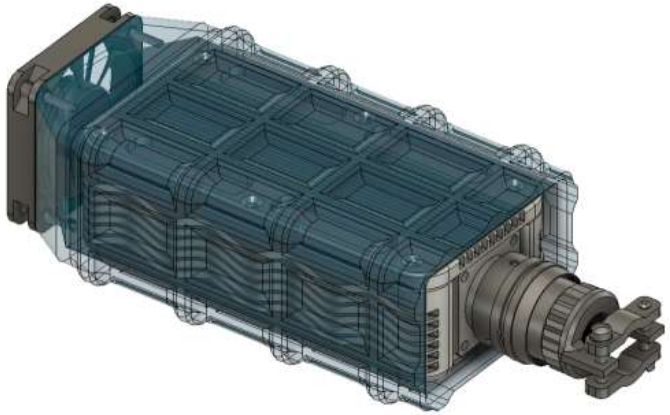
Selected Final Design: Modular Sensing Box

- Variability in mounting location and greater customizability in user experience
- Can be used with a wide range of potential wearable displays
- Sensors can be moved to appropriate elevations depending on situation
- Surrounding box can be used to spread heat and increase durability



Design Layout

Computing Box



Sensor Suite

Additional Batteries

T505 Display

Computing Box Contents

- Box contains
  - Main computer
  - 1hr Battery (Green Box)
  - Voltage Regulators
- Box exterior is a large heat sink to keep internals cool
- Fan moves air over the box to increase cooling ability

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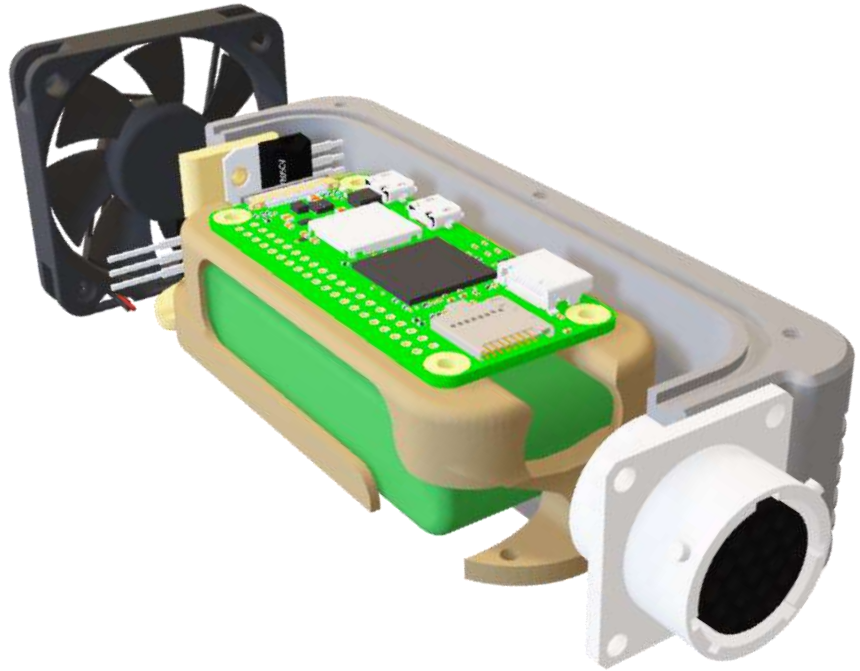
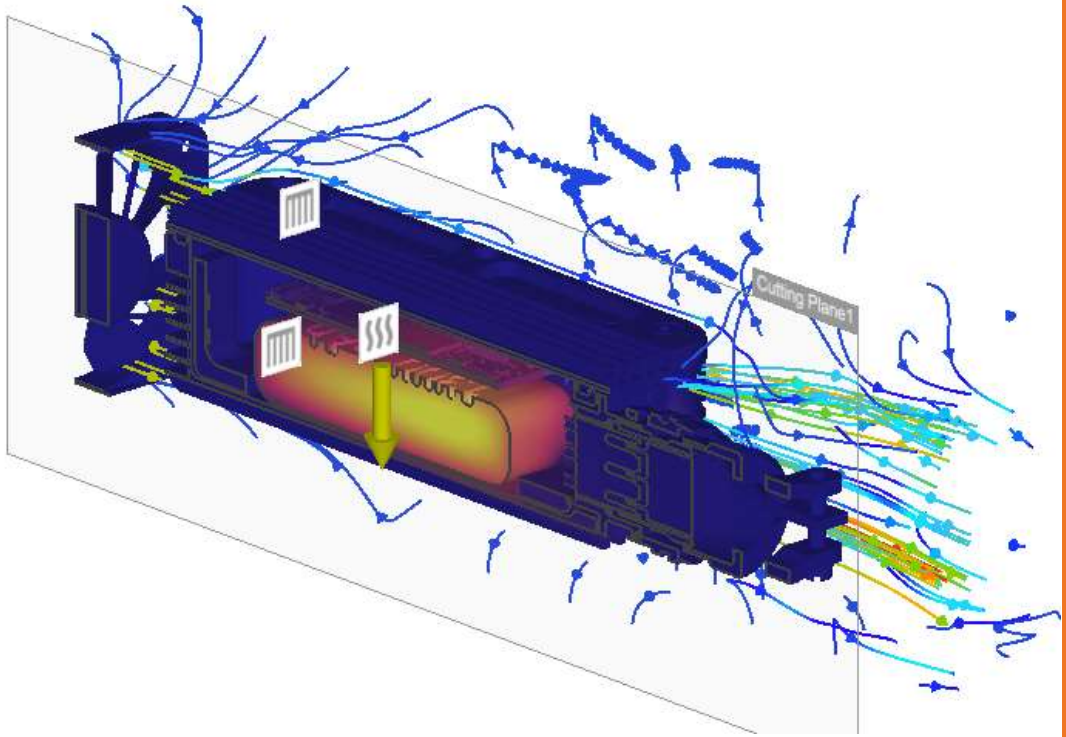


Thermal Analysis

- CFD(Computational Fluid Dynamic)-based cooling analysis was run on this box to determine if the fins would be adequate
- Simulation shows that all components will remain in safe range in standard operating conditions
- Real box is being manufactured to validate simulation results (2024 Al)

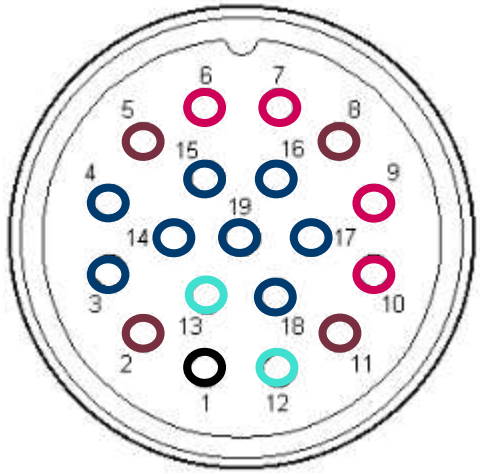


Sensor Suite

- Sensors to be used
  - Nevada Nano MPS Combustible Gas Sensor
  - Gravity Oxygen Sensor
- Oxygen sensor is necessary to compensate for errors in the combustible gas sensor
- Suite will be movable to accommodate user needs

Main Output Connector

- The computational box will be fully sealed to the environment with only a single output port (19 pole mil-spec connector)
- Main connector uses soldered connections, so quick connectors will be used internally



1. Common Ground
2. Main PWR Out
3. Cell 1 V
4. Cell 2 V
5. Main PWR Return
6. Combustible Tx
7. Combustible Rx
8. 3.3V Out
9. Oxygen SDA
10. Oxygen SCL
11. 5V Out
12. LCD SDA
13. LCD SCL

Additional Batteries

- To increase the usage time of the product without manufacturing a larger box, an external Battery Management System (BMS) will be used
- This will be stored inside T505s backpack
- Internal battery will power system for approximately 1hr
- Extended battery life will be 24hrs

Mounting System

- This is the integration between Team 505 and 506.
- For the standalone box there will be slots around the casing of the gas sensor device which we then can put straps on it.
- The straps are adjustable and can fit on either the arm or the leg of a person

Future Work

- Hardware
  - Manufacture box and test heat sink capability
  - Manufacture mounting mechanism for box and sensors to integrate with T505
  - Purchase BMS and build electrical circuit
- Software
  - Write code to read data from combustible gas sensor and oxygen sensor
  - Adjust script to run on SBC and collect internal data from the computer (CPU temp)
  - Work with T505 to display acquired data

Questions?