



CAPSTONE UCSB PROJECTS

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# STABILIZED SAILBOAT MARINE CAMERA

2021-2022

# WHO IS TELEDYNE FLIR?

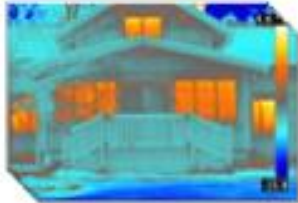
- World's market leader in thermal imaging
- \$2B Revenue across 6 divisions

## Surveillance



- Airborne systems
- Maritime systems
- Land systems
- Border surveillance
- Tactical vision
- Command & Control software

## Instruments



- Building inspection cameras
- Electrical/mechanical cameras
- Lab/R&D cameras
- Test & measurement tools
- Firefighting cameras

## OEM & Emerging



- Thermal camera cores & components
- Intelligent Traffic
- Personal Vision Systems
- Mobile

## Maritime



- Multifunction displays
- Instruments
- Sonar
- Radar
- Thermal cameras

## Security



- Thermal security cameras
- Visible-light security cameras
- DIY security systems
- Software and analytics

## Detection



- Radiation detectors
- Explosives detectors
- Chemical-biological threat detectors
- Mass spectrometry systems

# WHO IS TELEDYNE FLIR?

- Major facilities in Santa Barbara, Portland, Boston, London, and Stockholm
- 600 employees in Santa Barbara
- About 80 engineers (40% from UCSB)
- Usually about 5 interns active at any time

# WHERE ARE WE LOCATED?



6769 Hollister Ave. Goleta CA 93117 USA



# STATEMENT OF THE PROBLEM

The #1 reason for sailboat collision is due to not being able to see behind the sails



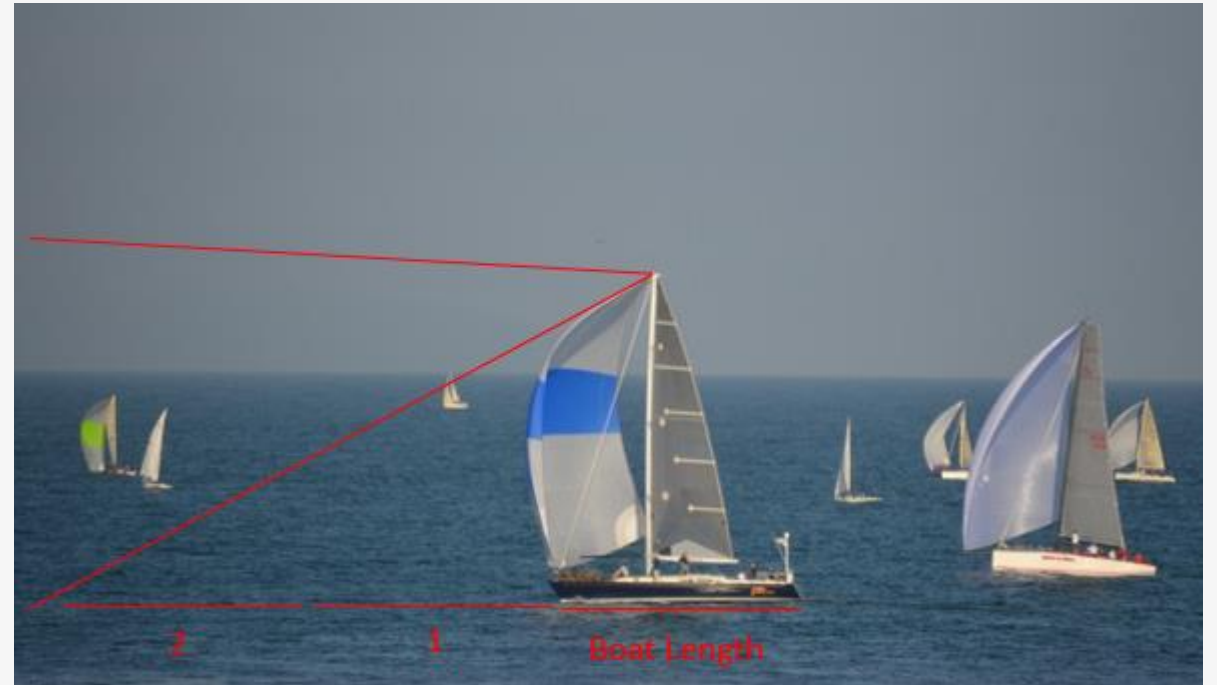
# PROPOSED SOLUTION

- Designing a mast head mounted camera



# PROPOSED SOLUTION

- The camera must be able to see 2 boat length in front of the boat.

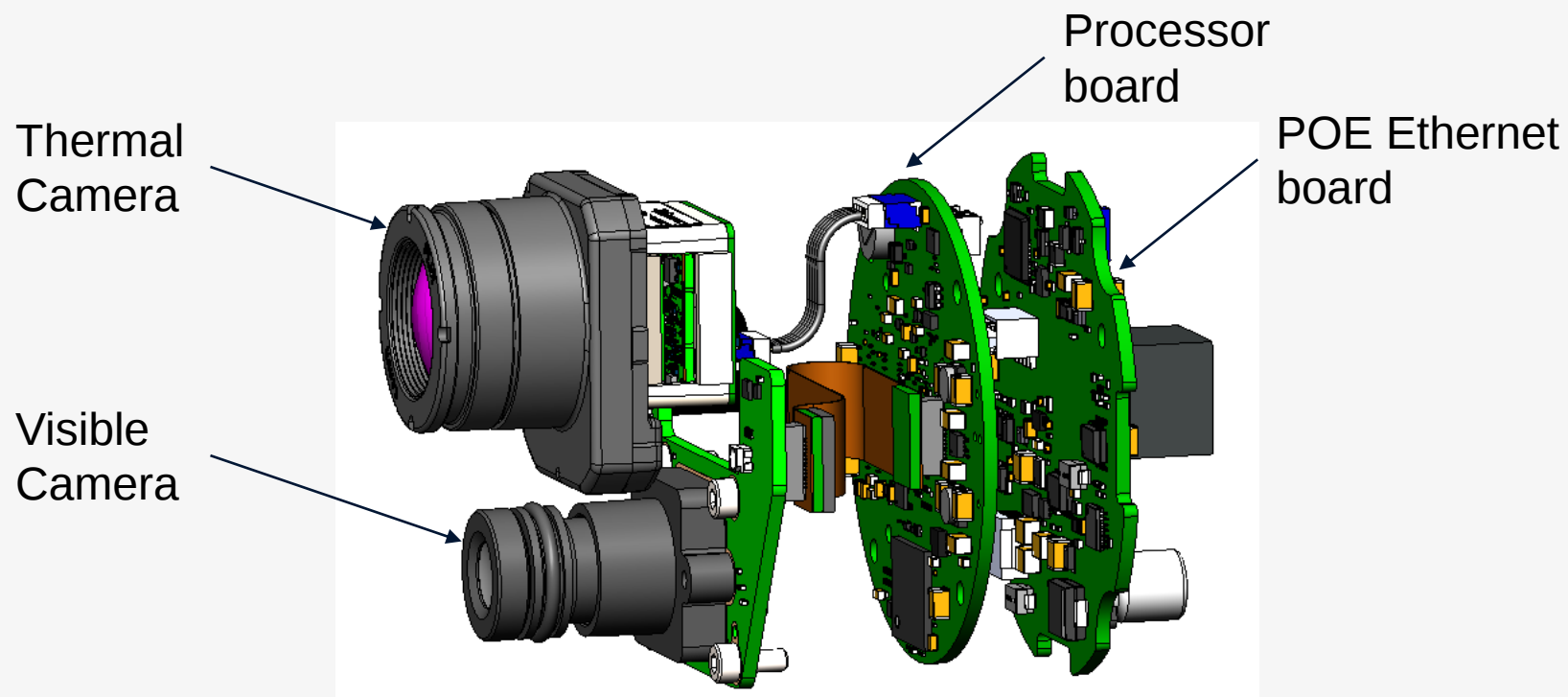


# PROJECT CHALLENGES

- It became apparent that the camera will require a dynamic mechanical roll system because sailing boats lean sideways while going upwind.

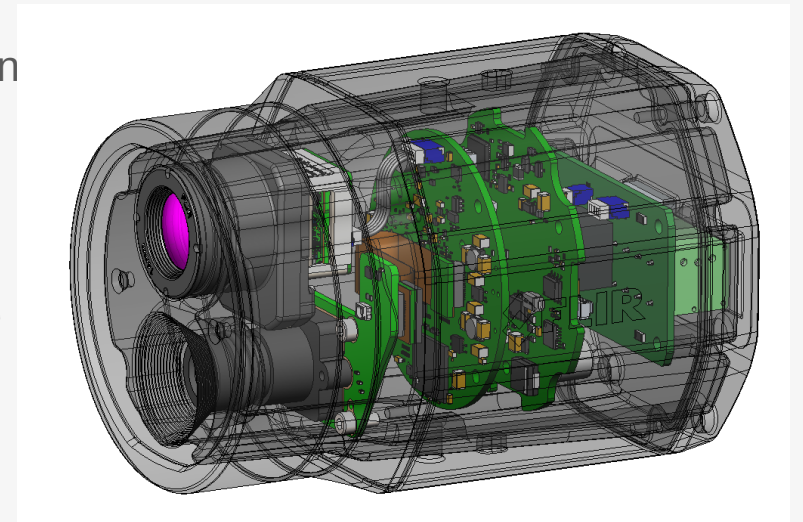


# TELEDYNE FLIR WILL SUPPLY



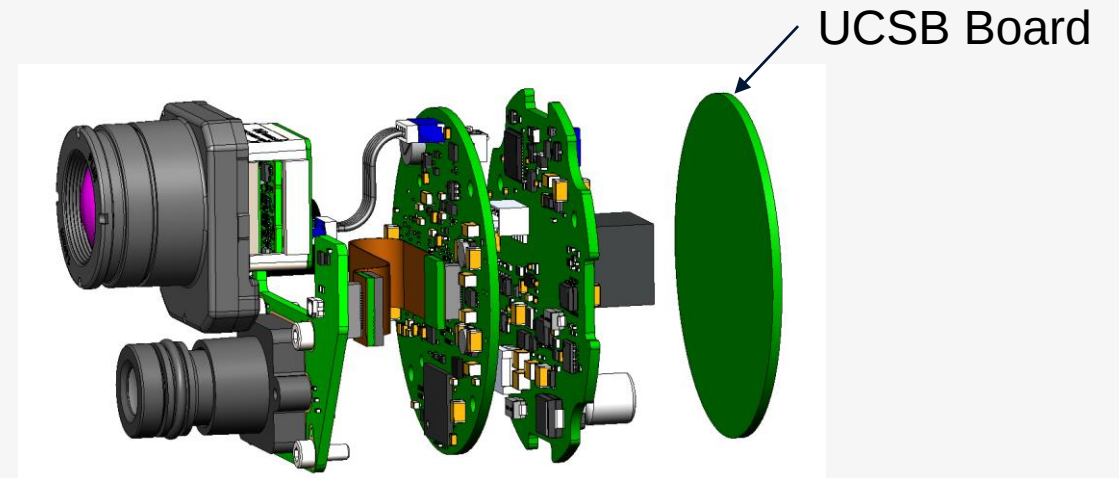
# UCSB MECHANICAL PROJECT TASKS

- Design dynamic roll compensation systems to keep the camera horizontal in all time.
- Provide the electrical team the board dimensions and mounting points.
- Design an external waterproof enclosure.
- Industrial design look and feel is important
- The design will need to take high volume manufacturing under consideration
- Design interface cables between motor and controller board
- Design bracket system to attach the enclosure to the mast of the boat.
- Thermal analysis will need to be performed in order to properly manage the thermal source inside the enclosure
- Perform waterproof testing
- Perform roll system validation



# UCSB ELECTRICAL PROJECT TASKS

- Create a 3rd board to control the motor with a micro processor and IMU (Inertial Measurement Units).
- The IMU combines a gyroscope with an accelerometer in one system-in-package (SiP). It enables real-time motion detection, as well as optical image stabilization (OIS).
- Create schematic
- Design board layout based on mechanical team requirements
- Place components based on electrical requirements
- Produce and assemble board
- Design interface cables between motor and controller board
- Generate micro processor code to keep the camera always horizontal independently of the mast motion
- Define ethernet waterproof connector interface to the customer



# UCSB TEAM TASKS

- Work as one team!
  - Coordinate mechanical and electrical specifications
  - Coordinate mechanical and electrical task timeline
  - Performing functional test
- 
- Win the best project of the year!

# TELEDYNE FLIR TEAM AND TASKS

- Support the project
- Answer technical questions
- Provide customer voice
- Provide a minimum of one hour per week of on-site supervision
- Win the best project of the year!



Senior Engineering  
Manager  
*Electrical Engineer*



Director of Mechanical  
Engineering  
*Mechanical Engineer*



**TELEDYNE**  
**FLIR**

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