# HYPERLOOP CONTROLLER

UC SANTA BARBARA engineering

HYPERLOOP POD COMPETITION

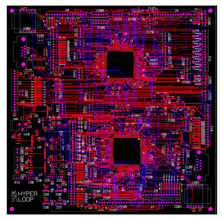
Team: Celeste Bean, Connor Buckland, Cameron McCarthy, Connor Mulcahey, & Ben Hartl  Advisor: John Johnson  TA: Will Miller

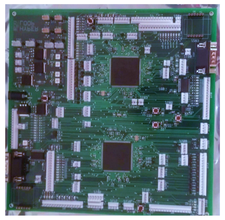
## THE HYPERLOOP

- New mode of transporataion to connect cities < 700 miles apart at up to 700mph
- Depressurized tube reduces drag
- Magnetic levitation reduces friction

## PRINTED CIRCUIT BOARD

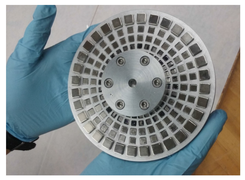
- 2 NXP LPC 4088 microcontrollers
- Redundency for extensibility
- 430 components



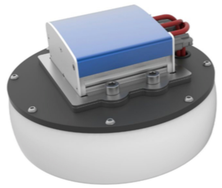


## MAGNETIC LEVITATION

- Controls 6 ArxPax H3.0 magnetic levitation hover engines
- Ensures that engines maintain stability during flight



ARX PAX

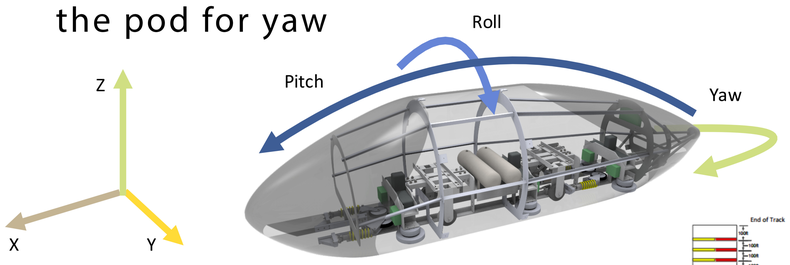


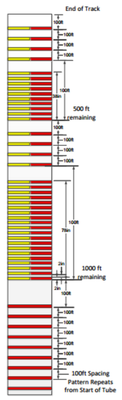
## COMPETITION & TEAM

- Hosted by SpaceX, design 1/4 scale pod
- 24 person interdisciplinary team (CE, CS, EE, ME, Physics, Economics)
- $50,000 raised from sponsorshpis, crowdfunding, and our university
- Selected as 1/30 of original 12 teams to test on 1mi track at SpaceX HQ 08/2016

## ATTITUDE & NAVIGATION

- Track roll, pitch, yaw
- 4 short ranging sensors on the bottom of the pod for roll and pitch
- 4 long ranging sensors on the sides of the pod for yaw

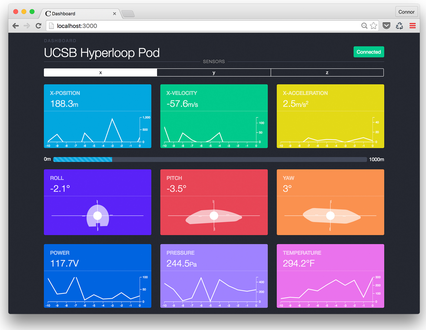




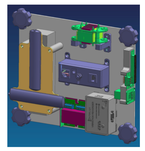

- Track position, velocity, acceleration
- Reflective strips on tube every 100' tracked by 2 photoelectric sensors
- Space between strips tracked by 2 intertial navigation units

## COMMUNICATION

- Web application telemetry dashboard
- Secure application level protocol
- Data reported at least once per second




Ethernet Over SPI



Network Access Panel

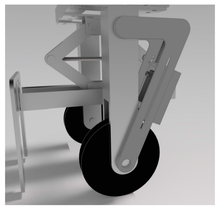
METEOR node.js Bootstrap

## POWER MANAGEMENT

- Detects battery voltage levels
- Issues alerts is voltage is too low or high
- Determines current draw to calculate power consumption

## ACTUATION

- Actuate mechanical systems:
  - Service propulsion wheels
  - Maglev & pneumatic brakes
  - Pod height controller
- Run emergency procedures



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