FNL25: Challenge Parameters Webinar

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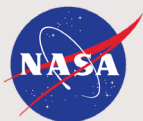
FNL25: Challenge Parameters Webinar

MARS: Abotossaway, Blue Origin
MOON: Nez, GE Aerospace

Overview

- Challenge Definition and Requirements
- Challenge Components - Sensors
- Challenge Components - Microcontrollers
- Challenge Testing
- Challenge Integration
- Challenge Data and Results

MARS CHALLENGE
Mark Abotossaway

Challenge Definition and Requirements

- Competition Handbook outlines the Challenge Requirements
  - Teams must research / select sensors to measure the following during the rocket flight
- MARS
  - Set of sensors that will measure and record data during flight
  - Must be independent of Rocketry Avionics (COTS altimeter / GPS)
  - Sensors / Microcontrollers do not need to be co-located
 - Sensors shall not inhibit the safe operation of the rocket components

Challenge Components - Sensors

- Competition Handbook outlines the Challenge Requirements
  - Teams must select and integrate a suite of sensors in your rocket, which will measure and record various data
- MARS
  - Airspeed AND Pressure AND Orientation AND Acceleration AND Deflection
  - May be additional hardware to be used with sensors
  - Considerations should include cost, **size**, performance, reliability, sampling

Components – Sensor Examples
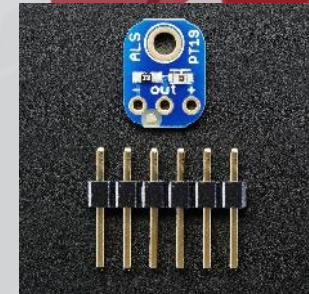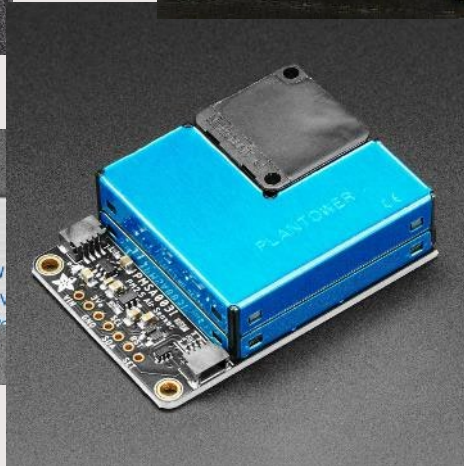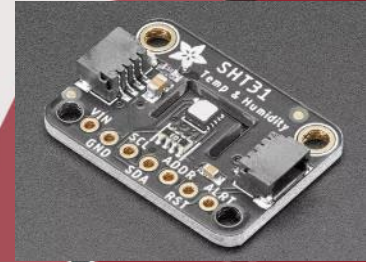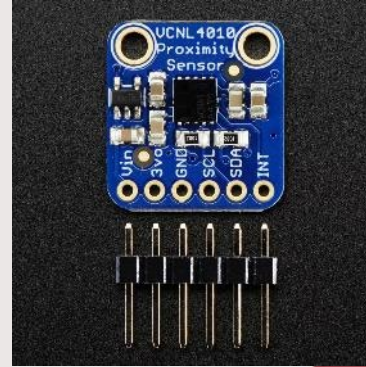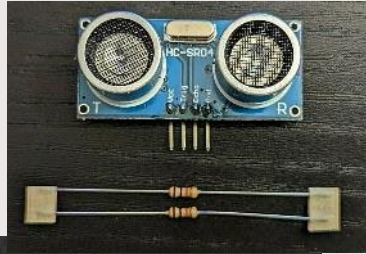
Challenge Components – Microcontroller

- Competition Handbook outlines the Challenge Requirements
    - Teams must select a microcontroller(s), to be used to control your sensors, and store data
- MARS
    - Teams can select any suitable microcontroller to use with sensors
    - Teams can select more than one microcontroller
    - Teams can select different microcontrollers
    - Considerations should include cost, performance, **size**, data storage

Components – Microcontroller Examples
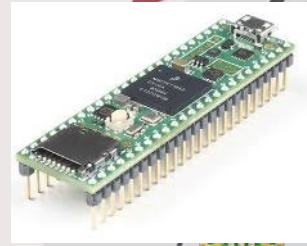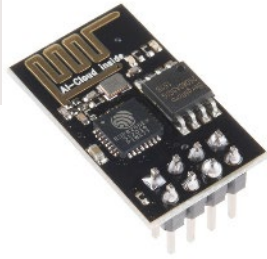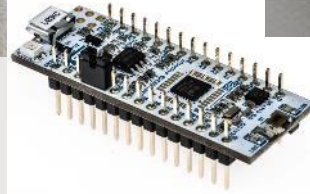
Challenge Components - Power

- Competition Handbook does not constrain the power sources for the sensors and microcontrollers, however;
  - Power sources should be considered during component selections
  - Power sources should consider wait time on launch pad, and the duration of flight
  - Power sources should be secured against high accelerations and impacts
    - LiPos should be secured in a solid structure
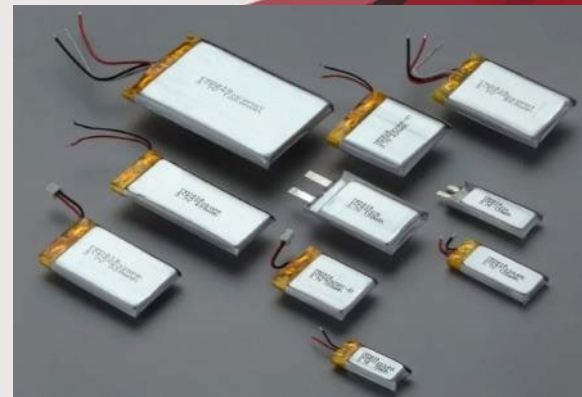
Challenge Components - Switches

- Competition Handbook does not constrain the switches to turn on the sensors and microcontroller
  - Options include:
    - Manual switches on the outside of the rocket
    - Bluetooth power-on of the microcontroller remotely
  - Understand / test the required distance to power-on if applicable
  - Understand / test transmissibility of rocket materials if applicable
  - A mechanical switch in the circuit may be helpful for troubleshooting / power management

Challenge Component Testing

- Project Management is an expected component of your Reports
    - Suggest you extensively test your sensor / microcontroller packages
    - Can be ground or flight tests
- MARS
    - Suggest you test each component individual
        - Under ideal conditions and extreme conditions (if possible)
    - Suggest you test the complete sensor assembly, under conditions
    - Suggest you test the sensor packages, while in the rocket, after install
    - Suggest you test the range of your remote power

Challenge Integration

- Competition Handbook does not constrain the integration of your sensors
  - Integrate your sensor package anywhere in the rocket – do not need to be co-located
- MARS
  - Teams will need to decide where to place each sensor package
    - External or internal, in avionics bay or in a dedicated bay
  - Sensor packages must not interfere with operation of rocket
    - Cannot interfere with motor ejection, or parachute deployments, for example
  - Sensors should be removable, but are required to be flown whether functioning or not
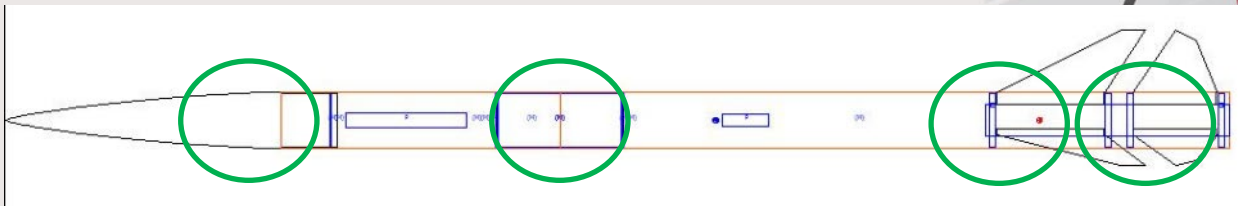
Challenge Data and Results

- Competition Handbook outlines the Challenge Requirements
    - Requirements dictate you need to store sensor data, for post-processing
    - You will compare sensor data to COTS data in post-flight analysis
- MARS
    - Consider data rate and velocity of rocket
    - Consider amount of data needed to be stored

    - In PLAR, compare the accuracy of your measurements (airspeed for example), versus the airspeed as measured by your COTS altimeter
    - For deflection, you will compare against a bench test deflection

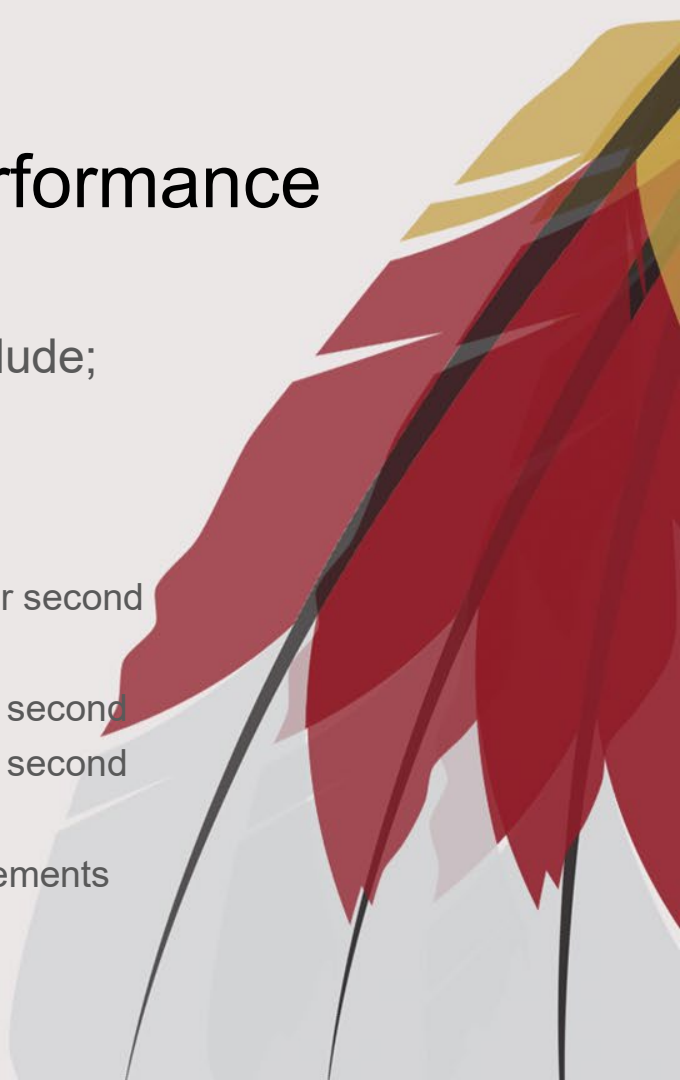# Challenge Requirements - Rocket

- Minimal Rocket Vehicle requirements for this challenge include;
- MARS
    - Minimum airframe diameter is 4-inches
    - Airframes can be COTS or fabricated (or combination)
    - Motors limited to K400 or K535

Challenge Requirements - Performance

- Performance requirements for the rocket flight include;
- MARS
    - Expected Altitude   3200' – 4000' AGL
    - Stability margin   Greater than 1
    - Minimum rail exit velocity   Greater than 52 feet per second
    - Thrust to weight ratio   Greater than 5:1
    - Drogue parachute descent rate   Range 45 – 65 feet per second
    - Main parachute descent rate   Range 15 – 20 feet per second

    - Choose / arrange your components to satisfy these requirements

MOON CHALLENGE

Brittany Nez

Challenge Definition and Requirements

- Competition Handbook outlines the Challenge Requirements
  - Teams must research / select sensors to measure the following during the rocket flight
- MOON
  - Set of sensors that will measure and record data during flight
  - Must be independent of Rocketry Avionics (COTS altimeter / GPS)
  - Sensors / Microcontrollers do not need to be co-located
  - Sensors shall not inhibit the safe operation of the rocket components
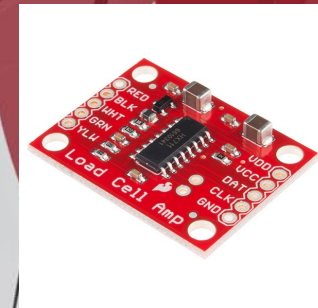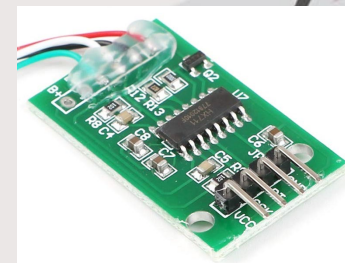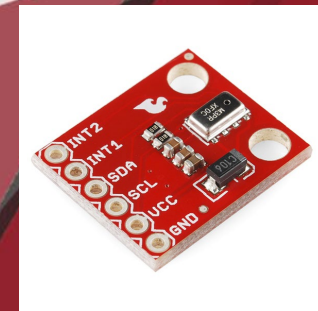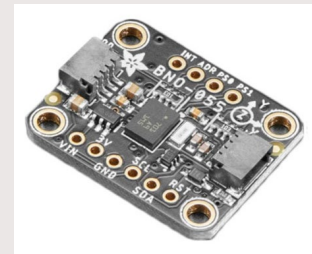
Challenge Components - Sensors

- Competition Handbook outlines the Challenge Requirements
    - Teams must select and integrate a suite of sensors in your rocket, which will measure and record various data
- MOON
    - Choose 2 of 4 of the following sensors:
        - Airspeed
        - Pressure
        - Orientation
        - Acceleration
    - May be additional hardware to be used with sensor
    - Considerations should include cost, performance, reliability, sampling

Challenge Components - Microcontroller

- Competition Handbook outlines the Challenge Requirements
  - Teams must use an Arduino Uno as challenge microcontroller, to be used to control your sensors, and store data
- MOON
  - Teams can use more than one microcontroller
  - Considerations should include cost, performance, size, data storage
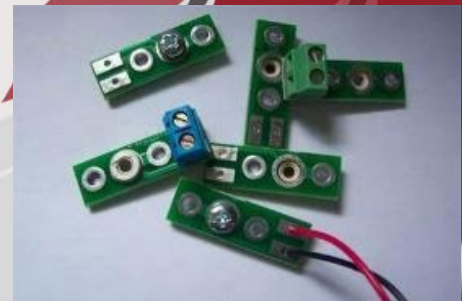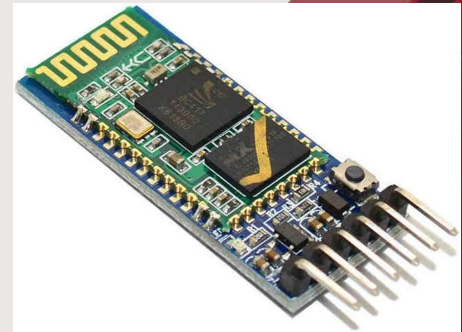
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Challenge Component Testing - Optional

- Project Management is an expected component of your Reports
  - Suggest you extensively test your sensor / microcontroller packages
  - Can be ground and/or flight tests
- MOON
  - Suggest you test each component individual, under ideal conditions and extreme conditions if possible
  - Suggest you test the complete sensor assembly, under conditions
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Challenge Integration

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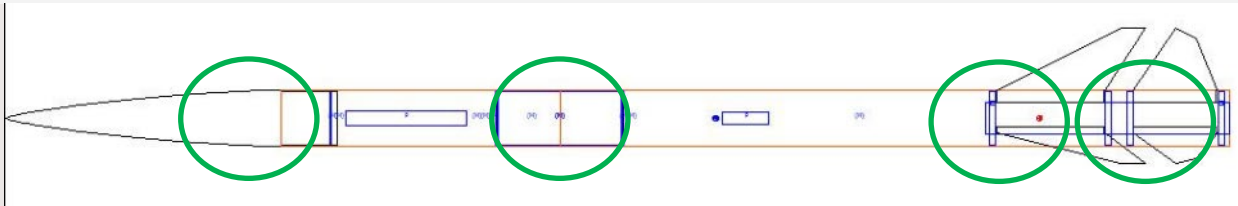
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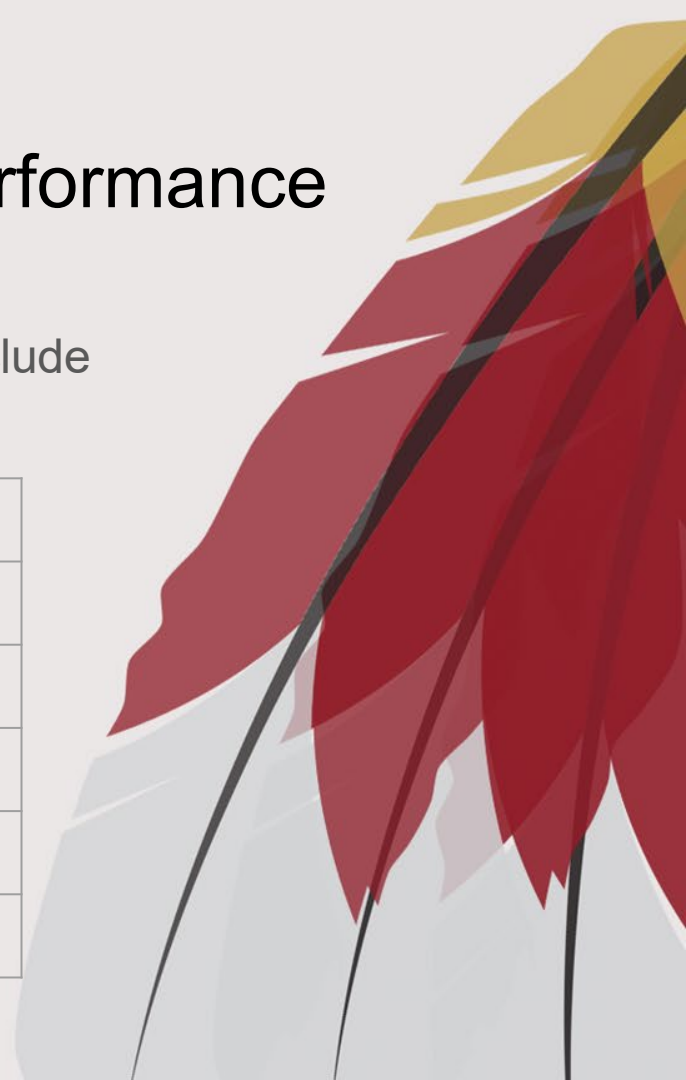 - Motors limited to K400 or K535

Challenge Requirements - Performance

- Performance requirements for the rocket flight include
- MOON

Expected Altitude	3000' - 4000'
Stability margin	greater than 1.0
Minimum rail exit velocity	Greater than 52 feet per second
Thrust to weight ratio	Greater than 5:1
Drogue parachute descent rate	45 – 65 feet per second
Main parachute descent rate	15 – 20 feet per second

Questions?