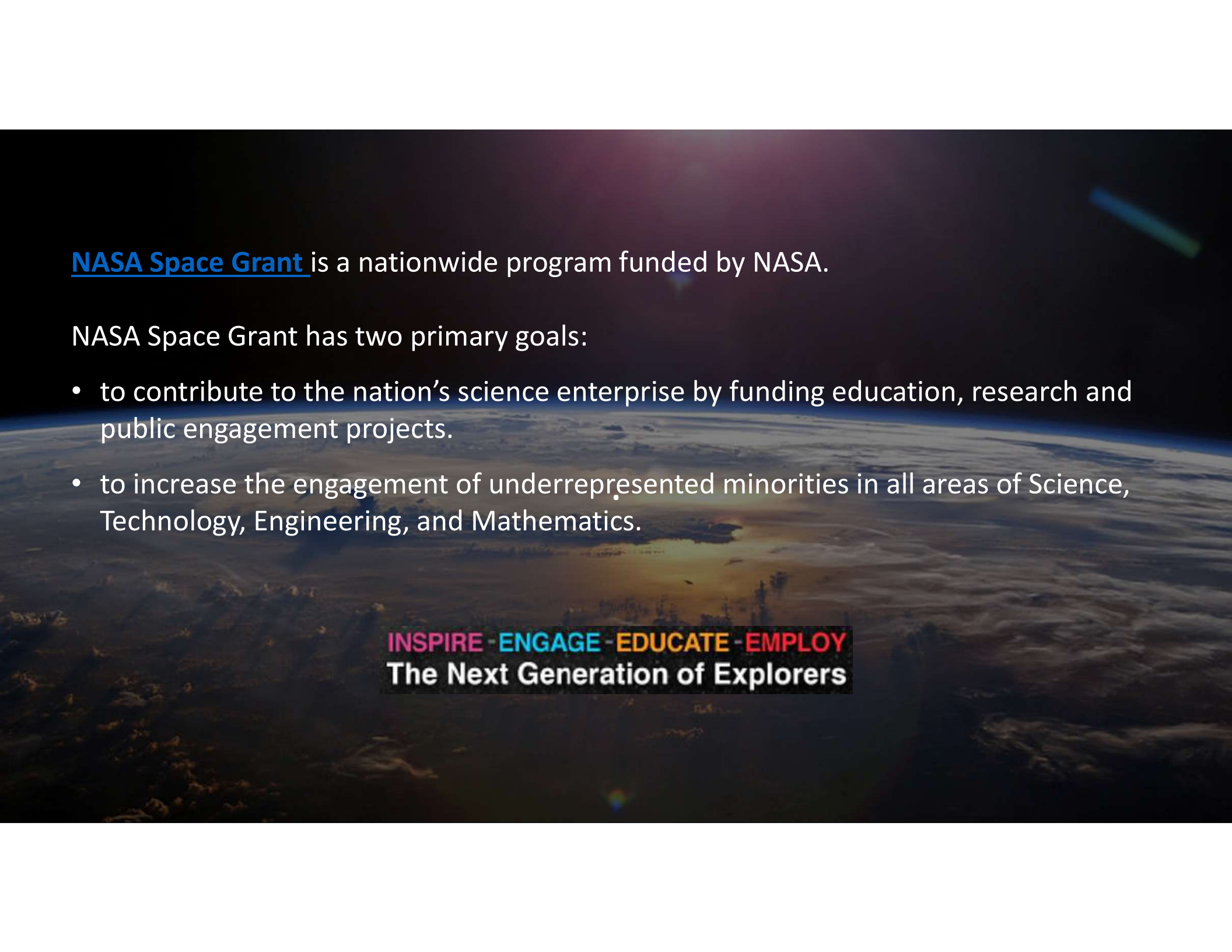


High Altitude Payload Project



Casa Grande Union High School
Near Space Research Team
ASCEND



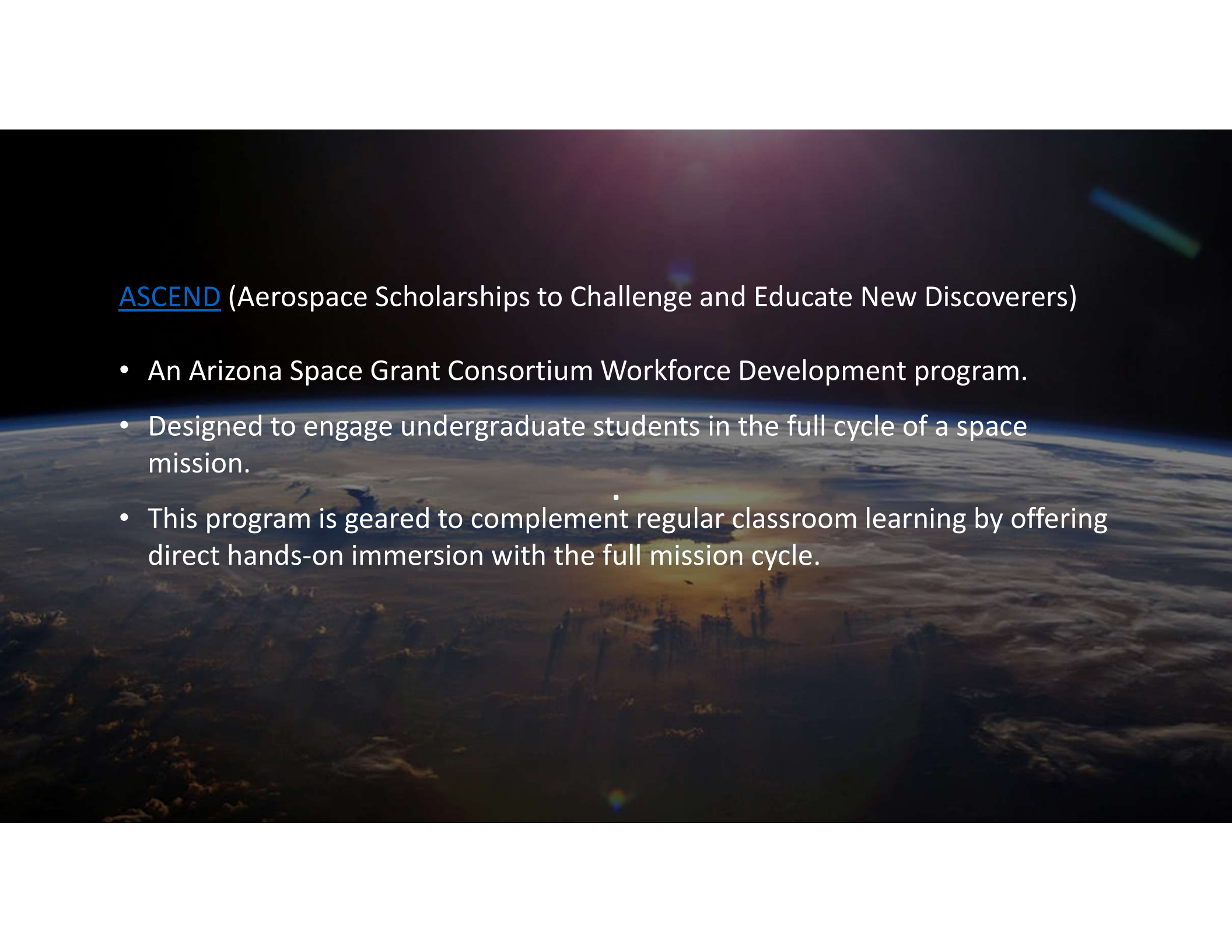


NASA Space Grant is a nationwide program funded by NASA.

NASA Space Grant has two primary goals:

- to contribute to the nation's science enterprise by funding education, research and public engagement projects.
- to increase the engagement of underrepresented minorities in all areas of Science, Technology, Engineering, and Mathematics.

INSPIRE - ENGAGE - EDUCATE - EMPLOY
The Next Generation of Explorers

A background image showing a view of Earth from space, with the curvature of the planet and the thin blue atmosphere visible against the blackness of space. A bright light source, likely the sun, is visible in the upper right, creating a lens flare effect. The Earth's surface shows clouds and landmasses.

ASCEND (Aerospace Scholarships to Challenge and Educate New Discoverers)

- An Arizona Space Grant Consortium Workforce Development program.
- Designed to engage undergraduate students in the full cycle of a space mission.
- This program is geared to complement regular classroom learning by offering direct hands-on immersion with the full mission cycle.



Spring 2021

Mr. Morris teaches SCI195 High Altitude Balloon at CAC.
ASCEND's Michelle Coe agrees to pilot CGUHS in the ASCEND Program.

Summer 2021

Students from CGUHS attend a 2-day ASCEND workshop at Phoenix College.

Fall 2021

CGUHS launches first high-altitude instrument payload.

Spring 2022

CGUHS launches second high-altitude payload.
CGUHS presents at the AZ Space Symposium.

Fall 2022

CGUHS participates in ASCEND.



CGUHS Near Space Research Team

Neal Allado – Programmer

Ella Barth – Electrical Systems

Evan Centeno – Systems Integration

Angel Gonzalez – Power Management

Jonathan Lawson – Programmer

Danika Liebhart – Designer

Melody Limon – Designer

Elijah Ramirez – Fabrication

Elias Razo – CAD SolidWorks

A photograph of Earth from space, showing the horizon and clouds. The sun is visible in the upper right, creating a lens flare. The text "Mission Statement" is overlaid in white.

Mission Statement

We will design, construct, test, and fly a sensor payload to gather data about the atmosphere.

Science Question

We want to know where the Ozone layer begins and where it ends as we ascend in altitude at the time and location of our flight.





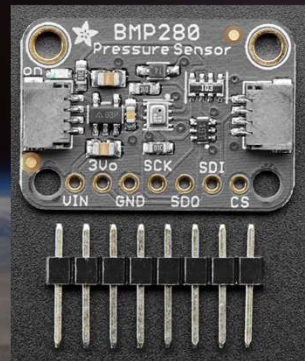
Objectives:

To record data on the following parameters as we rise through the atmosphere:

- O_3 (ozone)
- O_2 (oxygen)
- Temperature, humidity, and pressure

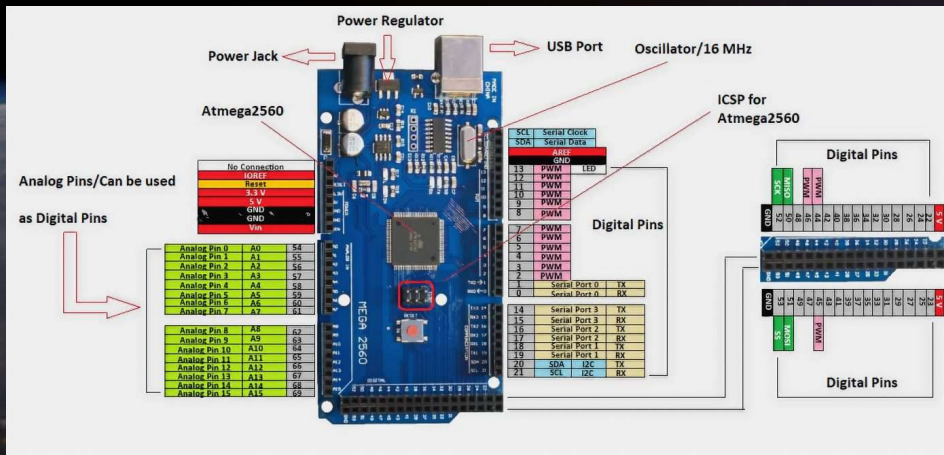
To acquire a photograph of the curvature of the Earth using a AKASO EK7000 4K Action Camera.

Sensors

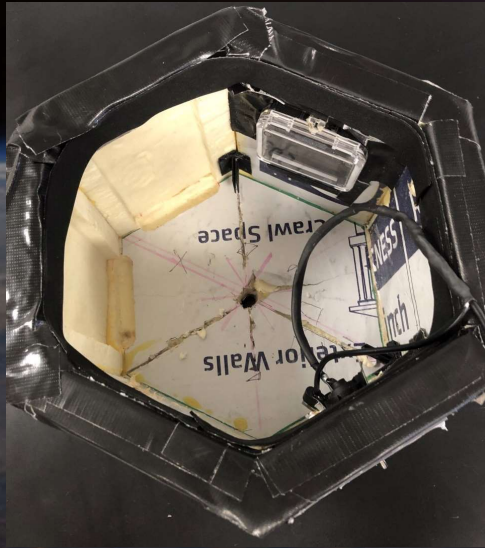


- Lightdow 4k Action Camera
- BMP 280 – Pressure, Humidity and Temperature Sensor
- Gravity: I²C Oxygen Sensor
- Gravity: I²C Ozone Sensor

Controller Board



Enclosure



- Sika Rmax Pro Select R-Matte foam insulation board, 1" thickness, R-13
- Interior is divided into 3 bays by removable Lexan panels.
 - Power System
 - Controllers and Sensors
 - Camera
- Top is covered by a hexagonal Lexan panel and closed-cell foam tape isolator.

Programming

```
void setup()
{
  Serial.begin(9600);
  while(!Oxygen.begin(Oxygen_IICAddress)) {
    Serial.println("I2c device number error !");
    delay(1000);
    pinMode (ledPin, OUTPUT);
  }
  Serial.println("I2c connect success !");
}

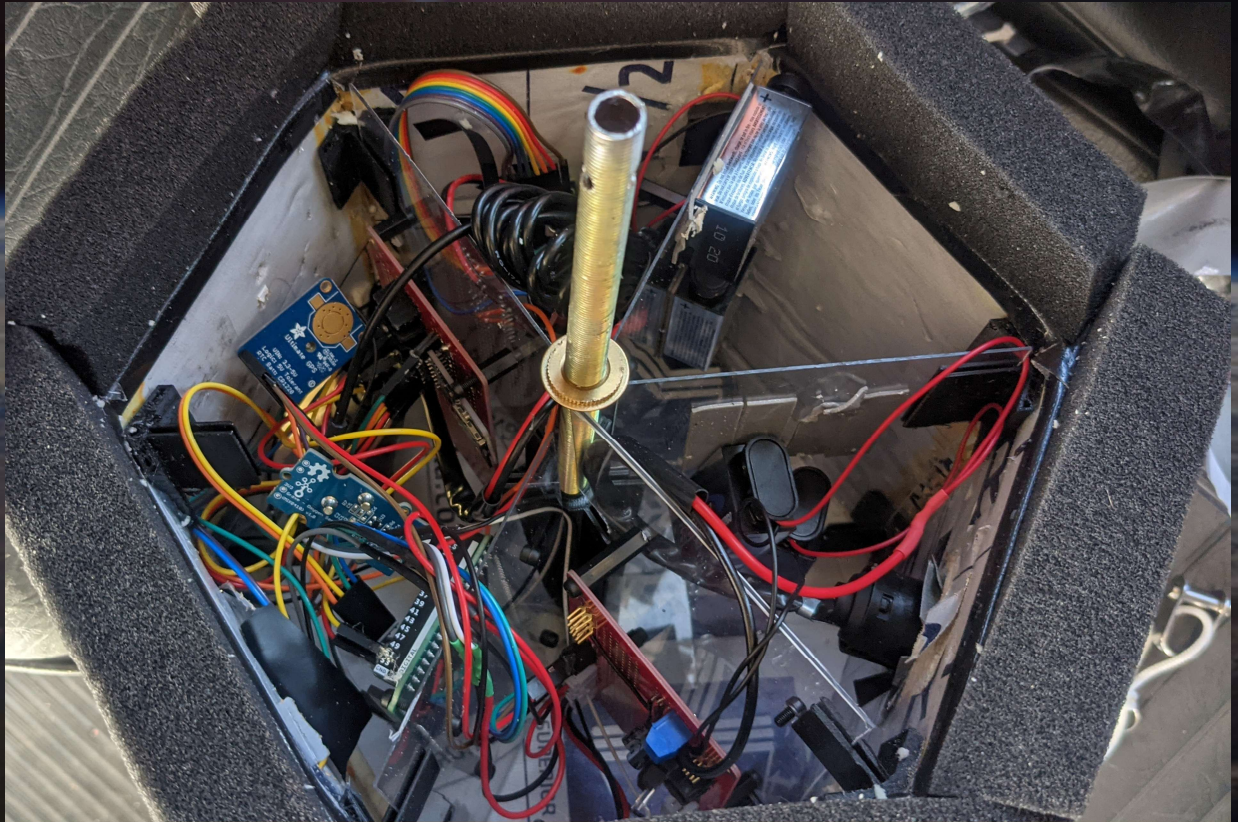
void loop()
{
  float oxygenData = Oxygen.getOxygenData(COLLECT_NUMBER);
  Serial.print(" Oxygen concentration is ");
  Serial.print(oxygenData);
  Serial.println(" %vol");
  delay(1000);
  digitalWrite(ledPin, HIGH);
  delay(1000);
  digitalWrite(ledPin, LOW);
}
```

```
void setup()
{
  Serial.begin(9600);
  while(!Ozone.begin(Ozone_IICAddress)){
    Serial.println("I2c device number error !");
    delay(1000);
  }
  Serial.println("I2c connect success !");

  /**
   * set measuer mode
   * MEASURE_MODE_AUTOMATIC      active mode
   * MEASURE_MODE_PASSIVE        passive mode
   */
  Ozone.setModes(MEASURE_MODE_PASSIVE);
}

void loop()
{
  /**
   * Smooth data collection
   * COLLECT_NUMBER              The collection range is 1-100
   */
  int16_t ozoneConcentration = Ozone.readOzoneData(COLLECT_NUMBER);
  Serial.print("Ozone concentration is ");
  Serial.print(ozoneConcentration);
  Serial.println(" PPB.");
  delay(1000);
}
```


Fall 2021 – Altitude 103,670 feet



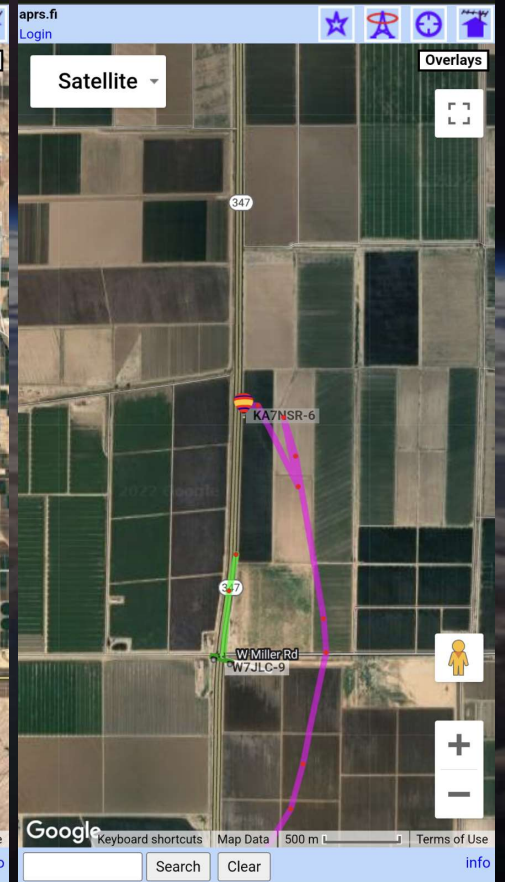
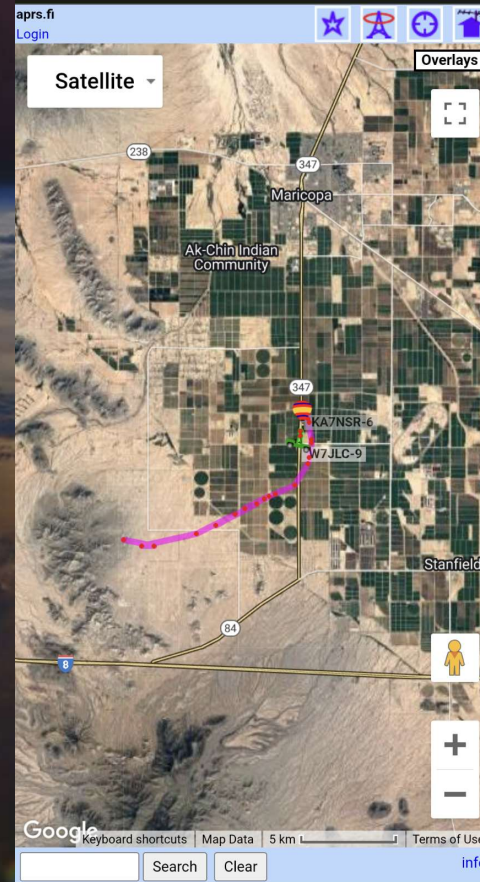
Slide 13

MJO

List the failure modes. What are the things that did not perform as expected.

Morris, John, 2022-04-12T19:28:20.696

Spring 2022 – Altitude 97,000 feet



Science Mission to Forensic Investigation: Root Cause Analysis

Fall 2021

Data card error resulted in a loss of all data.

Spring 2022

Mishandling of the power supply and camera resulted in damaged power connectors and no data collected.



Slide 15

- MJ0** This is too small for the audience to see. Suggest a summary page then a separate page for each item.
Morris, John, 2022-04-12T19:27:18.040
- MJ1** A root cause analysis is a process. You list all of the things that it could be, then narrow it down to the likely causes. Then, you test those causes to see which recreates the failure. Once you have identified the root cause, you must design countermeasures so that the fault will never happen again.
Morris, John, 2022-04-12T19:29:32.224
- MJ2** Your root cause analysis will be the core of your presentation. I would like to see you use the 5 Whys and the Fishbone methods.
Morris, John, 2022-04-12T19:35:45.403
- MJ3** <https://www.youtube.com/watch?v=t7FcK8jV2yA>
Morris, John, 2022-04-12T19:41:47.387
- MJ4** <https://www.youtube.com/watch?v=JbRx5pw-efg>
Morris, John, 2022-04-12T19:42:44.793

Fall 2022 Important Dates

September 24, 2022 - HAM Radio Workshop hosted by CGUHS

November 18, 2022 - ASCEND Pre-Launch Workshop

November 19, 2022 - ASCEND Fall Launch

March 31, 2023 - ASCEND Pre-Launch Workshop

April 1, 2023 - ASCEND Spring Launch

April 2023 – Arizona Space Symposium

Appreciation

John Morris
CGUHS

Michelle Coe
U of A

Clinton Jacobs
ANSR



Arizona Space Grant Consortium Members

<https://spacegrant.arizona.edu/about/membership>

Arizona Space Symposium

<https://spacegrant.arizona.edu/students/symposium>