

New Perspectives, Ancient Phenomenon

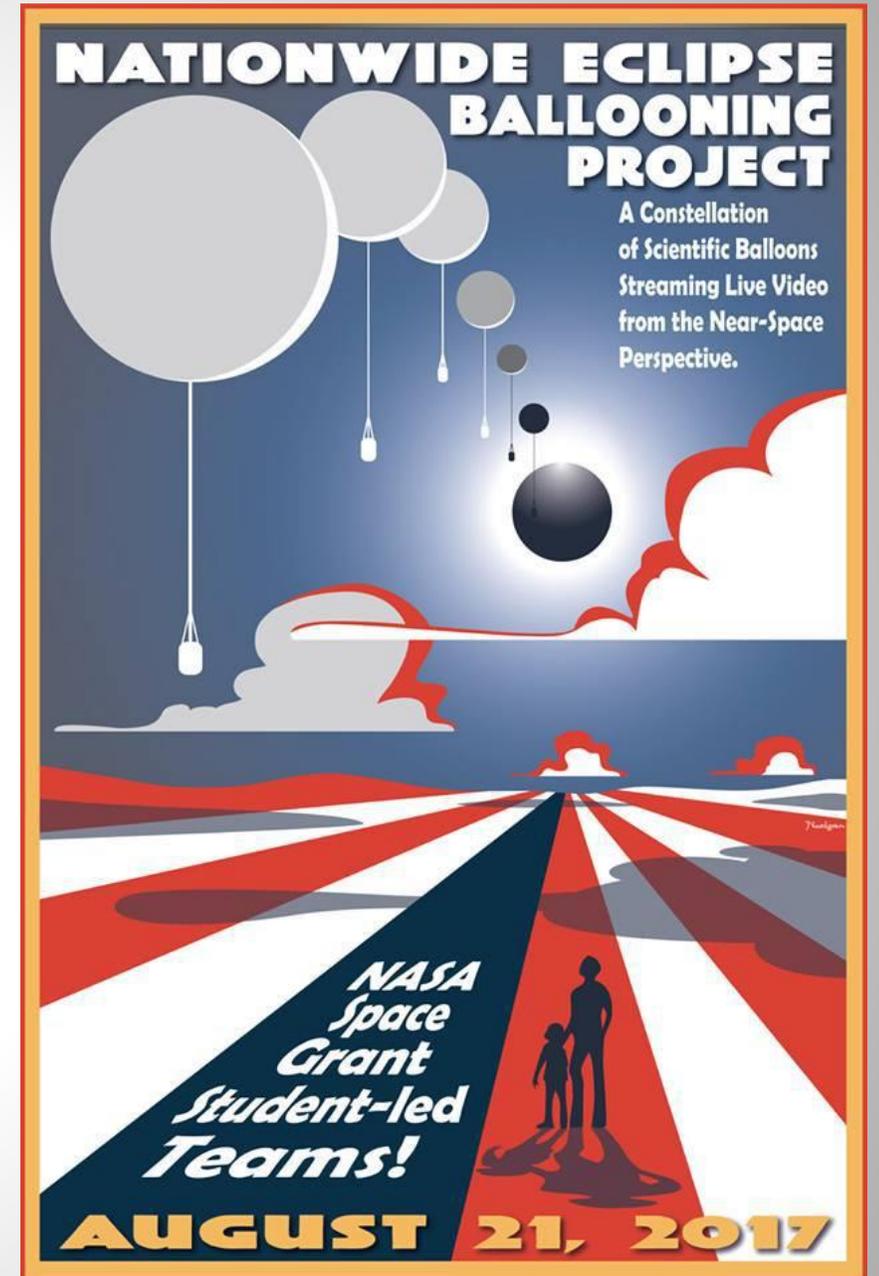
High Altitude Ballooning
Through a Solar Eclipse

Denise Buckner



NDSGC Summer Fellowship: Eclipse Ballooning Project

- Montana Space Grant Consortium
- NASA sponsored project
- 55 teams across the path of totality
- Began in 2013
- Student designed payloads
- Goal: live stream video footage of totality from the edge of space (up to 115,000 ft)
- Largest coordinated balloon launch ever



TOTAL SOLAR ECLIPSE ON AUGUST 21, 2017

... also along the path of the
... shadow ... which ...
... completely obscured ...
... during the total solar eclipse of
... 2017, as well as the fraction
... of the sun's area covered by the moon
... the path of totality. The lunar
... enters the United States near
... City, Oregon, at 8:55 a.m. EDT
... begins in the United States in
... City, Oregon, at 10:16 a.m. EDT.
... of totality will end in Charleston,
... Carolina, at 2:40 a.m. EDT. The
... shadow leaves the United States
... a.m. EDT. A partial eclipse will
... be throughout the United States.

... COME IN NORTH AMERICA
... BE ABLE TO EXPERIENCE
... ECLIPSE.

... EXPERIENCE
... 2017 ECLIPSE
... CROSS AMERICA
... THROUGH THE EYES OF NASA
... <http://eclipse2017.nasa.gov>

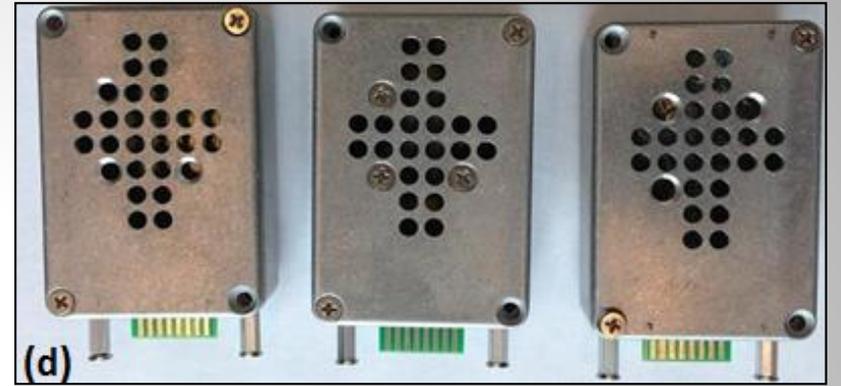
... v.nasa.gov

Lunar magnitude data from NASA
Lunar Reconnaissance Orbiter and
Japan Aerospace Exploration Agency
SSELE lunar orbit were used to
precisely calculate the location of
moon's shadow. Land shading is
... a global model of images from
NASA's Moderate Resolution
Imaging Spectroradiometer, and elevation
... based on data from ICMA's Shuttle
Radar Topography Mission. Population
... profiles are from NASA's Jet Propulsion
Laboratory Developmental Earth
...
©2016 NASA's SolarWx Visualization

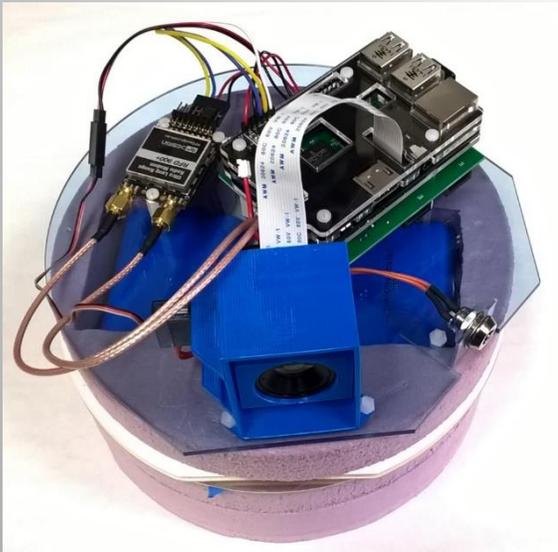
... NASA-11-825-GSFC (Rev. ...)

Payloads

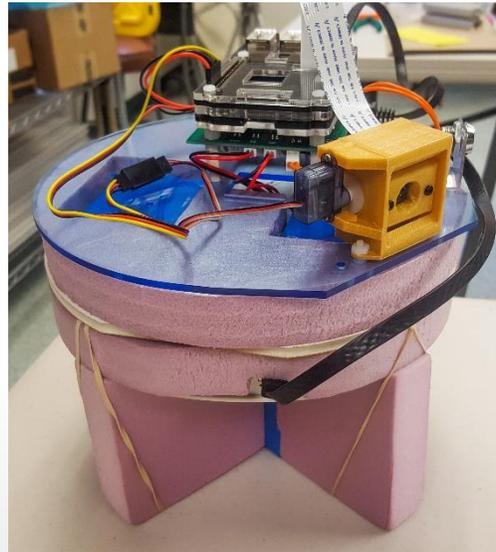
- Imaging
- Sensors
- GPS
- STEM education



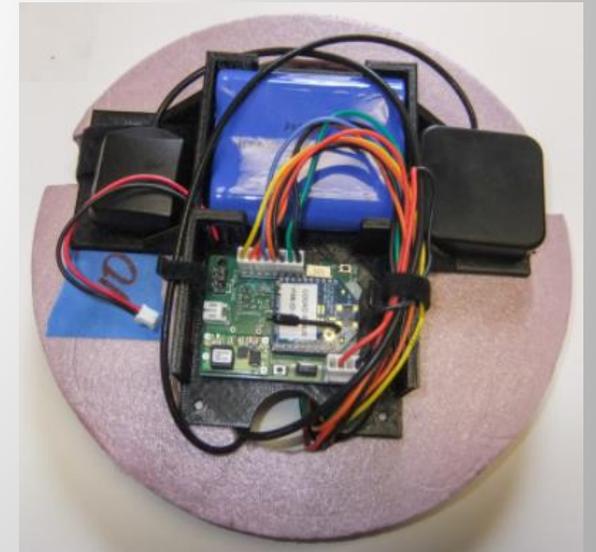
Ozone Sensor: collaboration with UNF



Still Image



Live Video



Iridium GPS

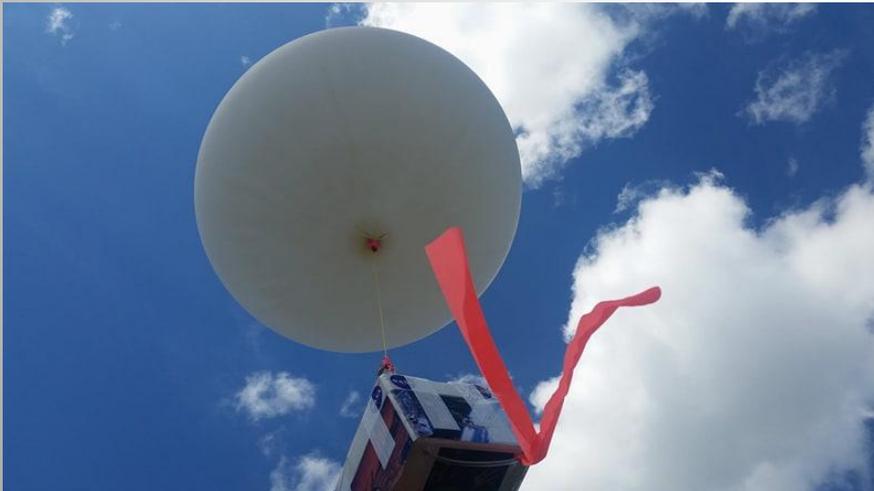
Ground Station



- Student designed
- Communication with payloads
- Live imagery

Systems and Operations Tests

- Connectivity tests
- Mobile launch station
- Airport test
- Tethered operations
- Procedural updates



Trip to Rexburg, ID





- Launch team
- Payload integration, fill, and launch
- Launch site: Camus Wildlife Refuge ~20 miles upwind of ground station site





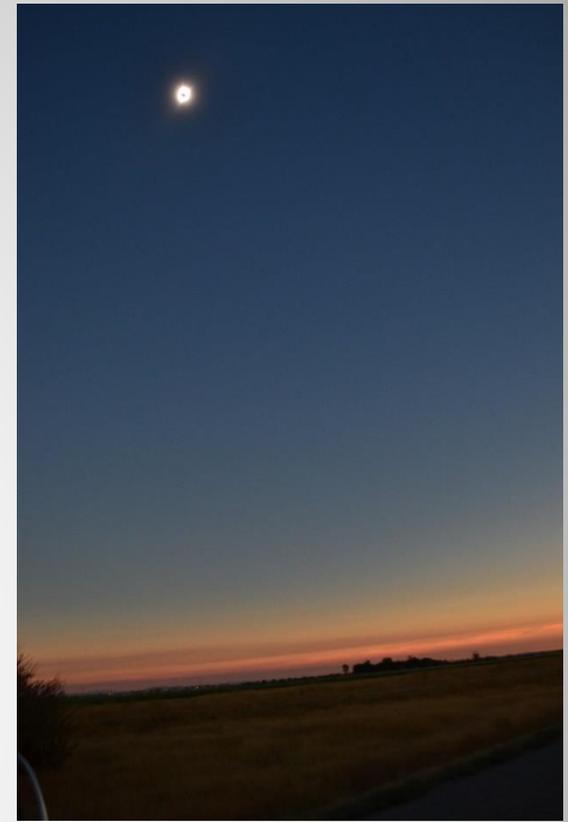


- Ground station team
- ~20 miles away from launch site
- Rexburg airport
- Track payloads



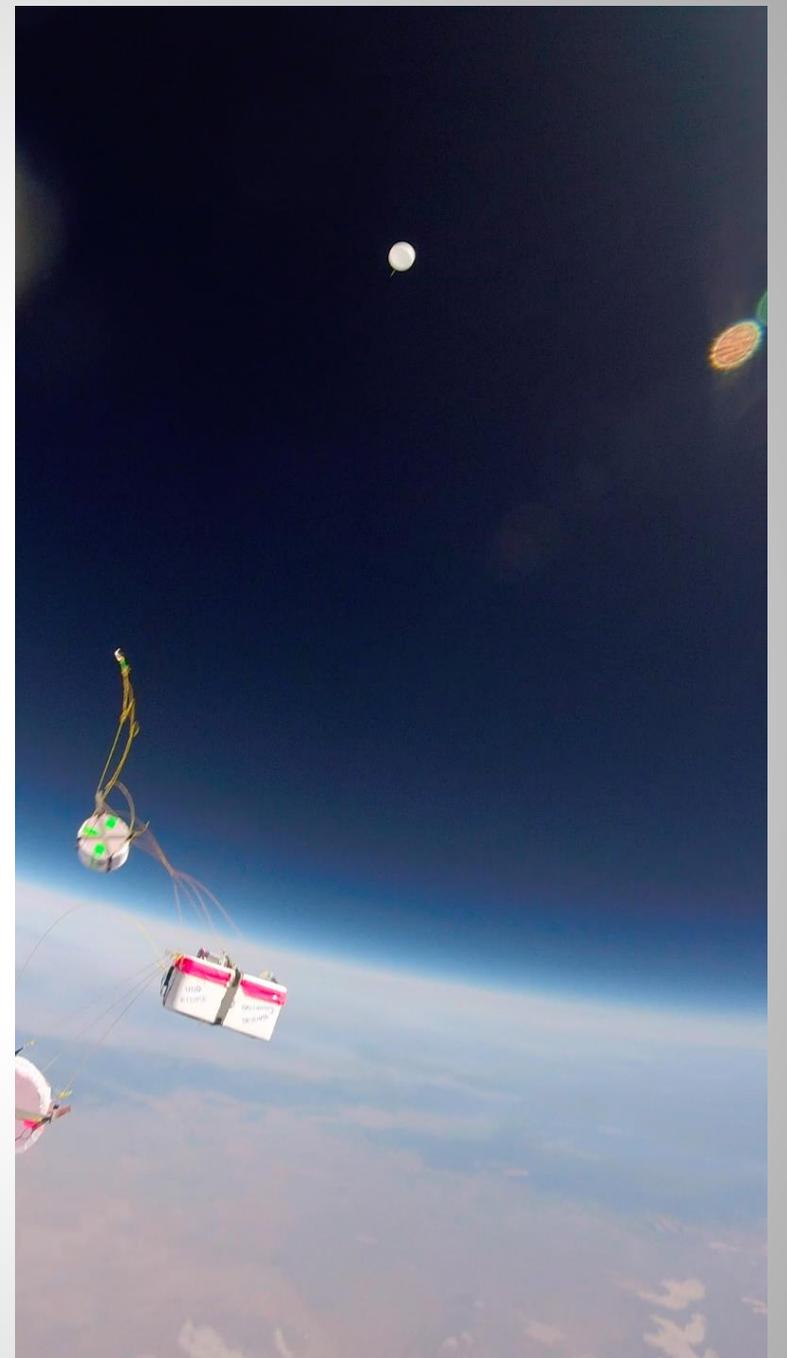


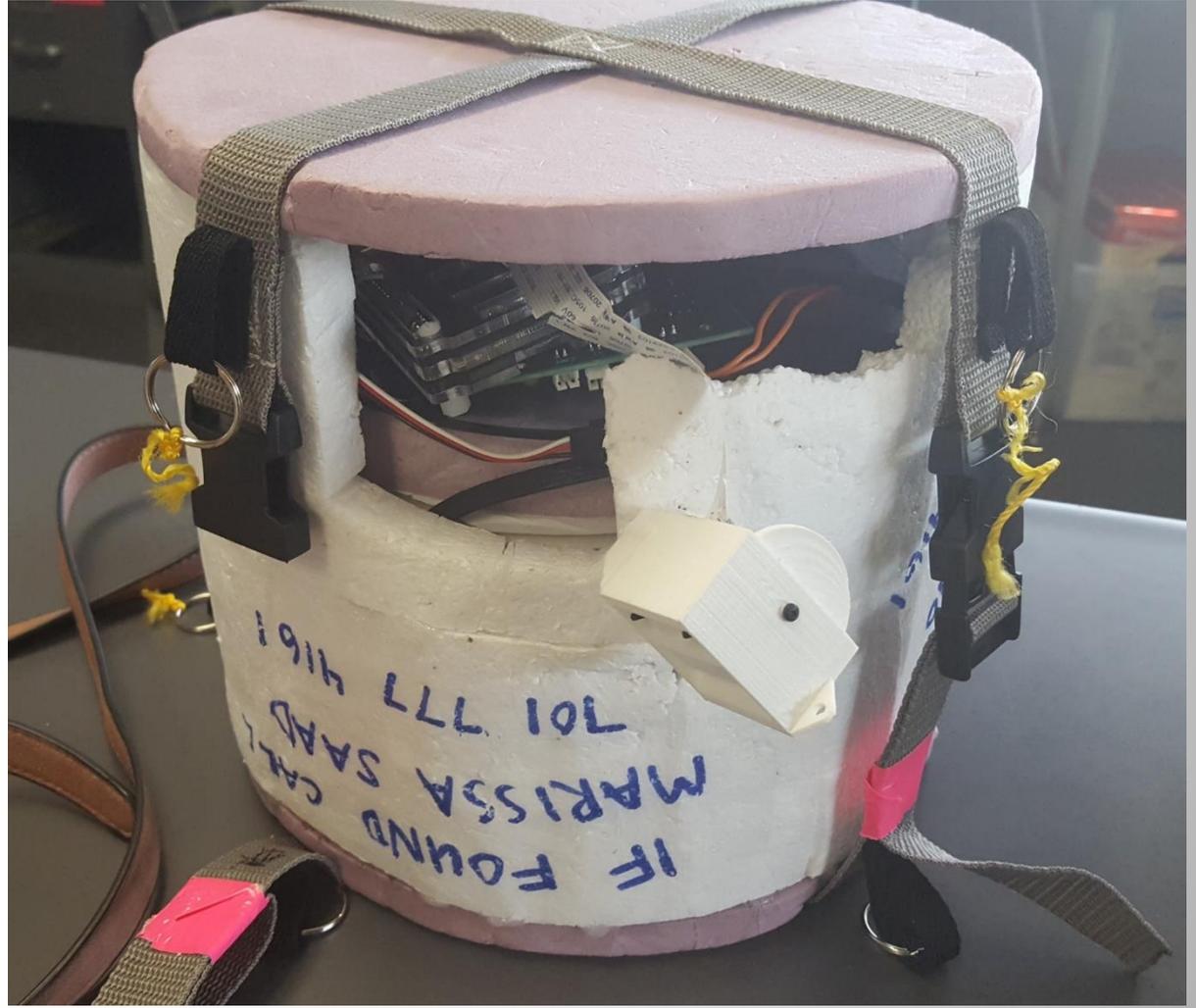
Totality





- Burst altitude: 68,301 ft
- Turbulence and payload separation
- Freefall and recovery

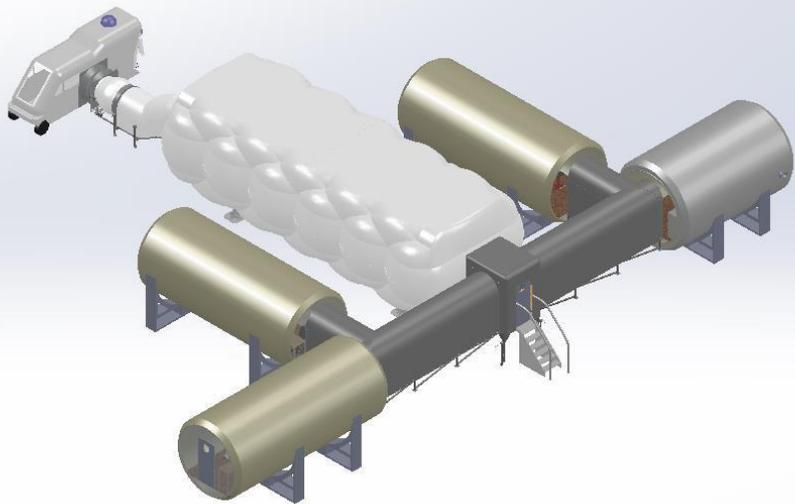






Inflatable Lunar Martian Analog Habitat EVA

- Applying Eclipse lessons to space research
- 14 day mission in NASA EPSCoR ILMAH
- Inform future Mars settlements
- Low cost, self contained weather forecasting system
- Human factors in work environment



System Components



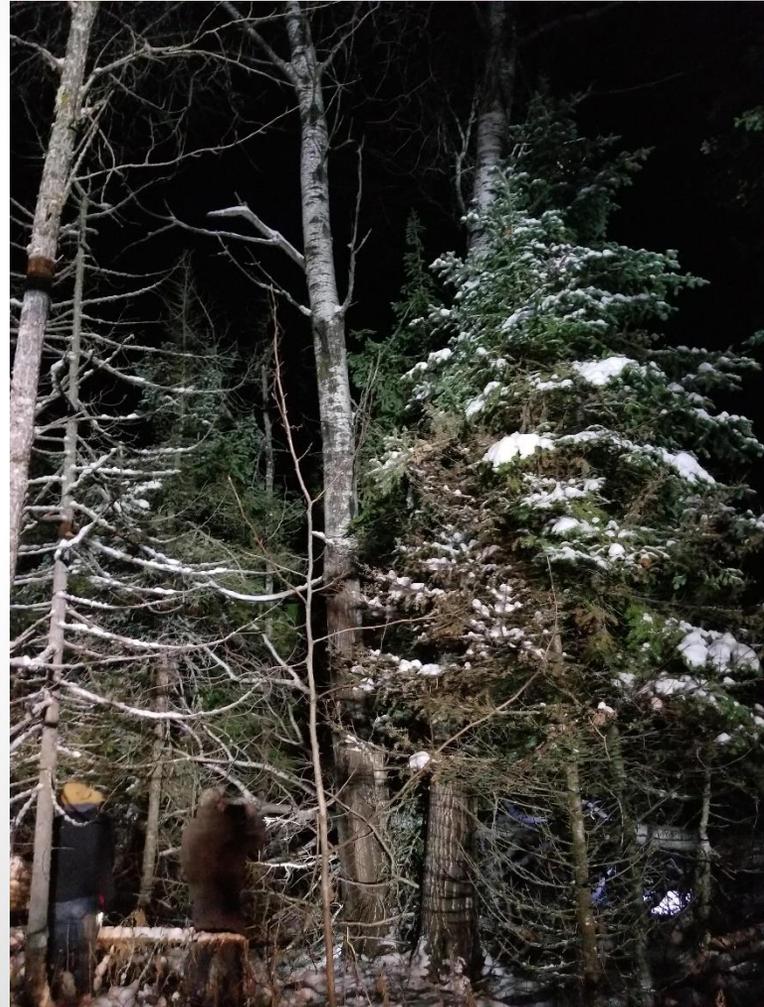
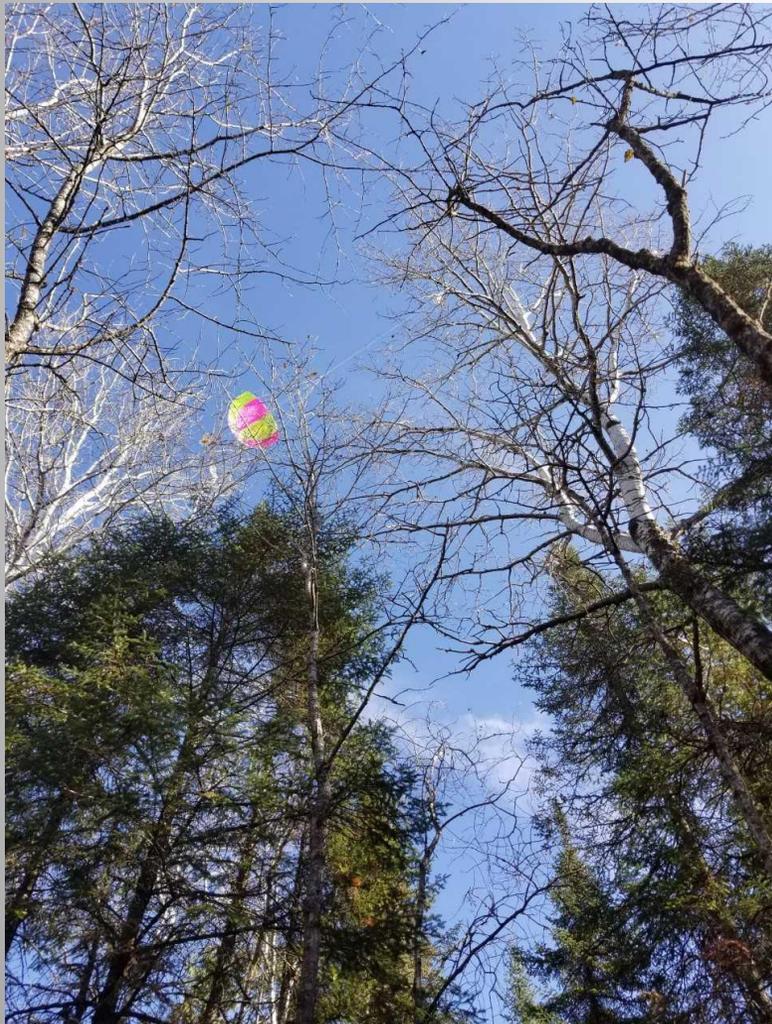
- Payloads:
 - Radiosonde: measures temperature, pressure, and humidity
 - Iridium GPS (eclipse)
 - Go Pros
- Ground Station
 - Radio for radiosonde data (eclipse)
 - PC for GPS data
- Equipment and tools
 - EVA lab
 - Spacesuit – fill tool interface
 - Tool belt







Retrieval



Future Applications

- ILMAH missions (V and VI upcoming)
- Education: NSBC and West Fargo Mega Launch
- In – house equipment fabrication with electrical and software engineering applications
- Eclipse
- Astrobiology thesis launches



Thank you!

- North Dakota Space Grant Consortium
- Caitlin Nolby and Marissa Saad
- UND Space Studies
- Dr. Jim Casler
- Dr. Ron Fevig
- Dr. De Leon
- Montana Space Grant Consortium
- NASA
- Wes Solway, Lance Wilson
- Ballooning team
- Peter Henson, Anamika
- Joseph Clift, Stefan Tomovic, Prabhu Victor

