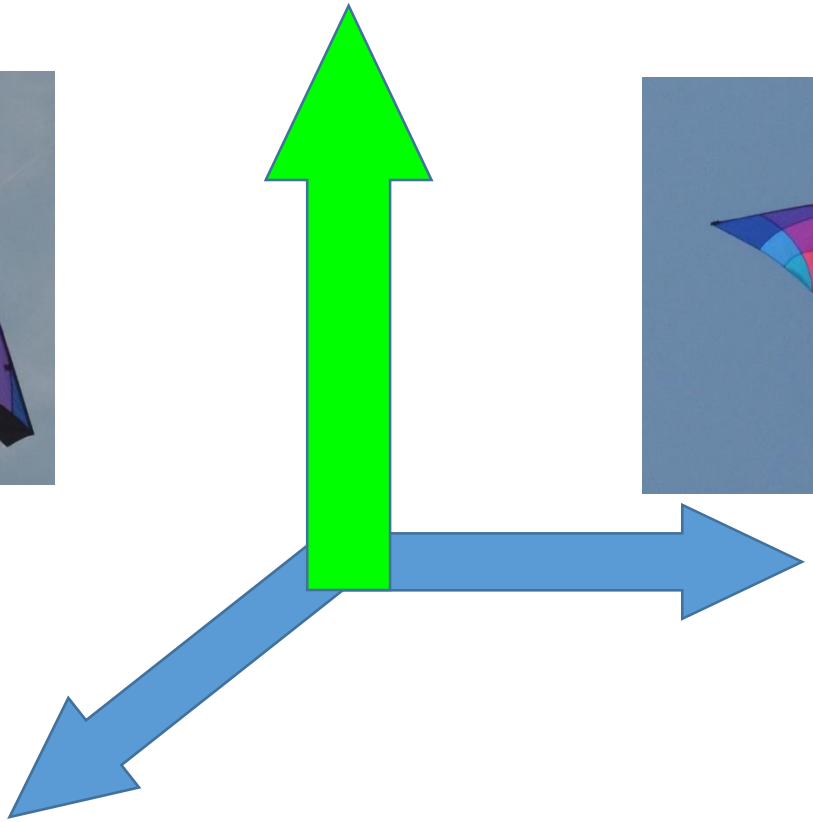
UP!

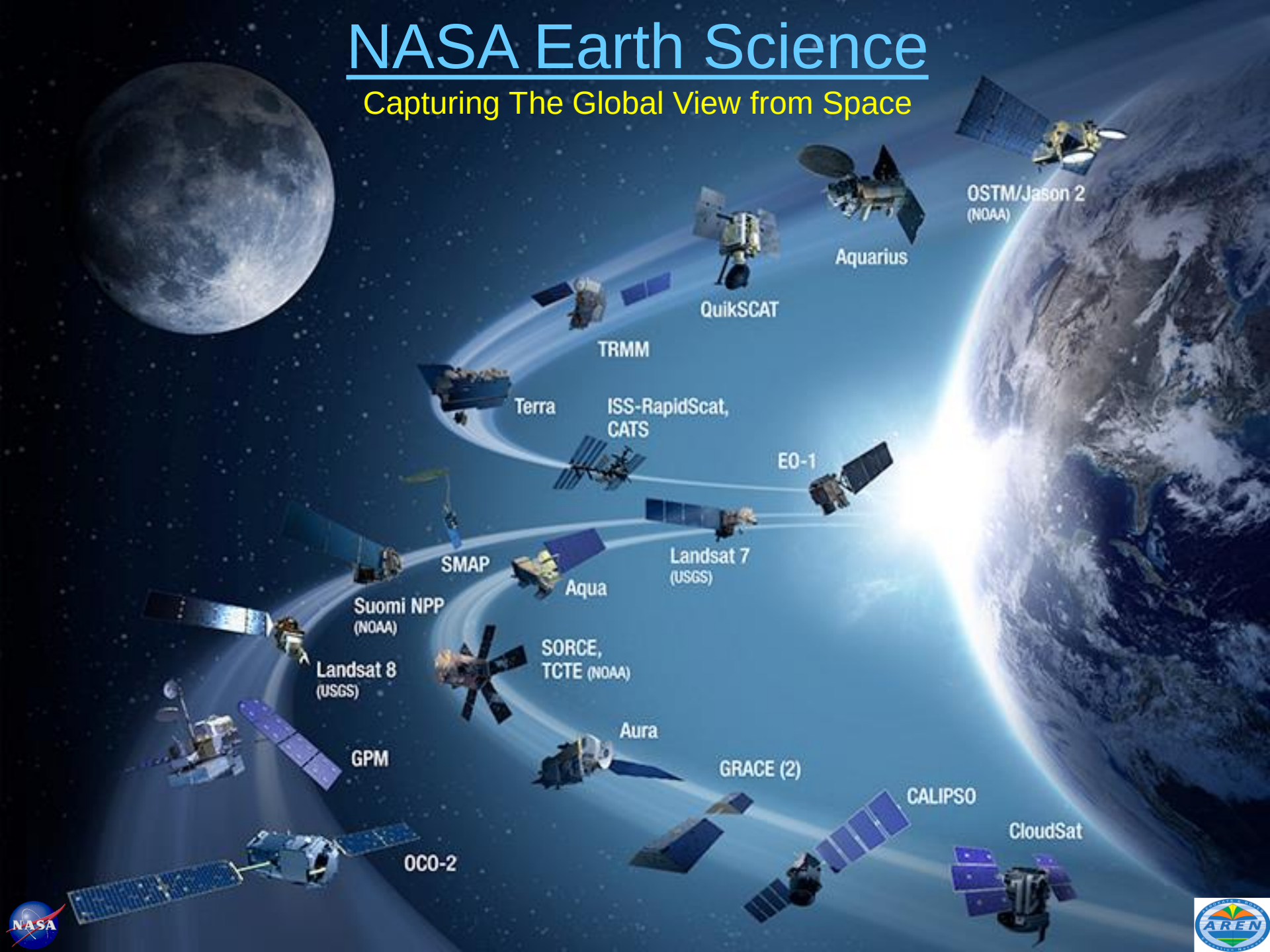


A New Dimension in Learning

Geoff Bland (NASA), David Bydlowski (Wayne RESA), Andy Henry (Wayne RESA), and the *AEROKATS and ROVER Education Network (AREN)* Team

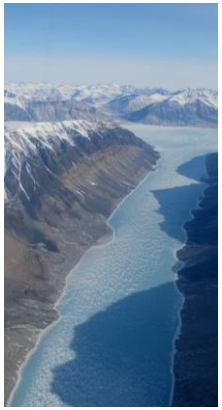
NASA Earth Science

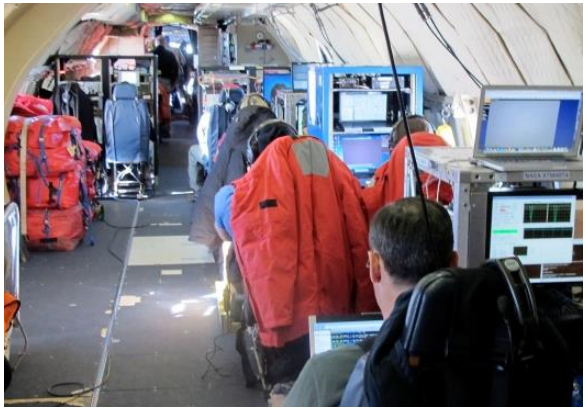
Capturing The Global View from Space

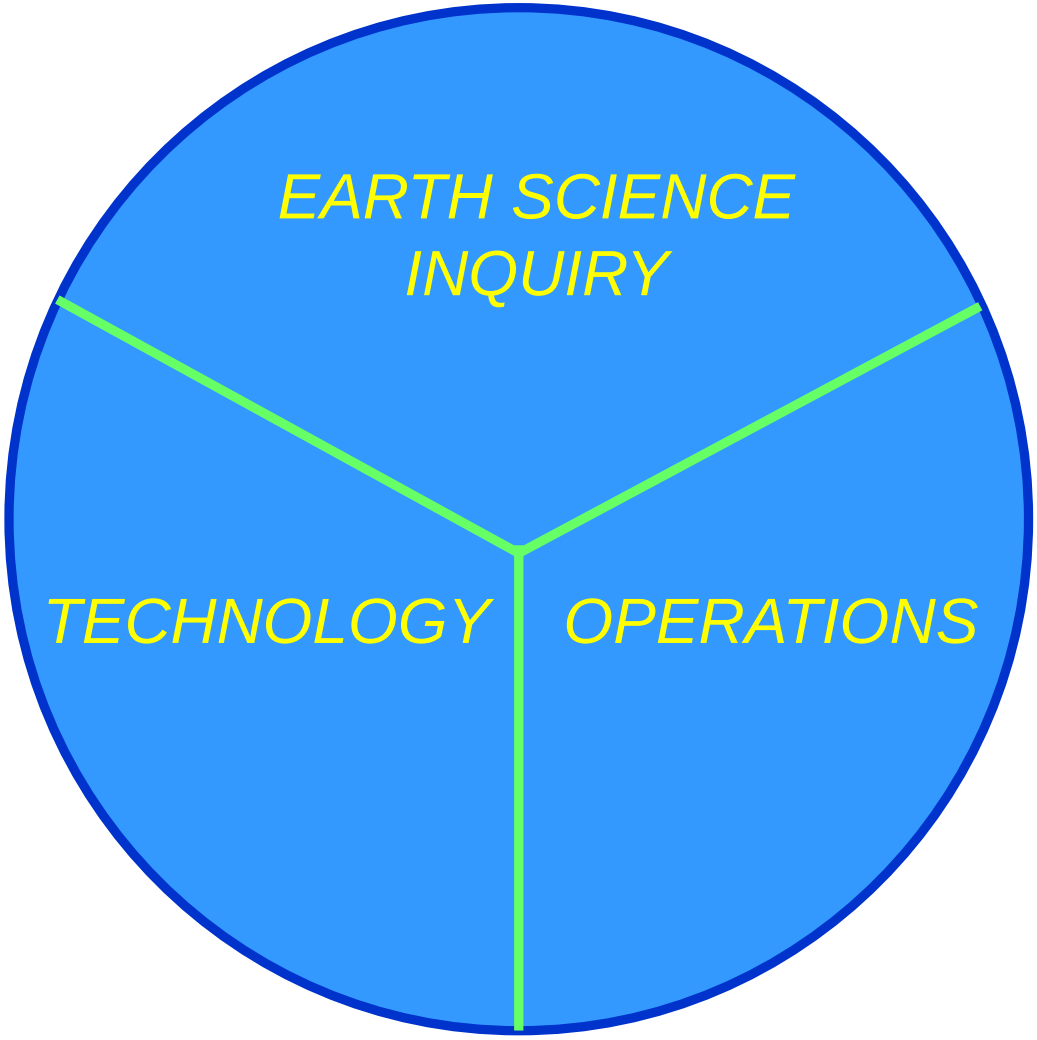


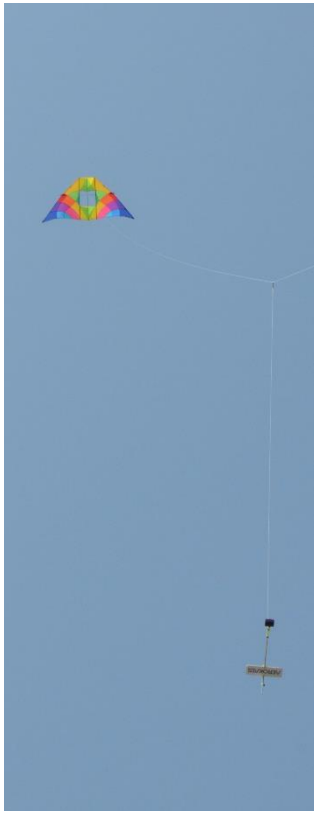
NASA Airborne Science Program

A Detailed Perspective









Train the Next Generation Workforce, Engage the Public, Enhance Life Long Learning

UP – Making It Happen…

“AEROKATS”

Advancing Earth Research Observations with Kites and Terrestrial Sensors

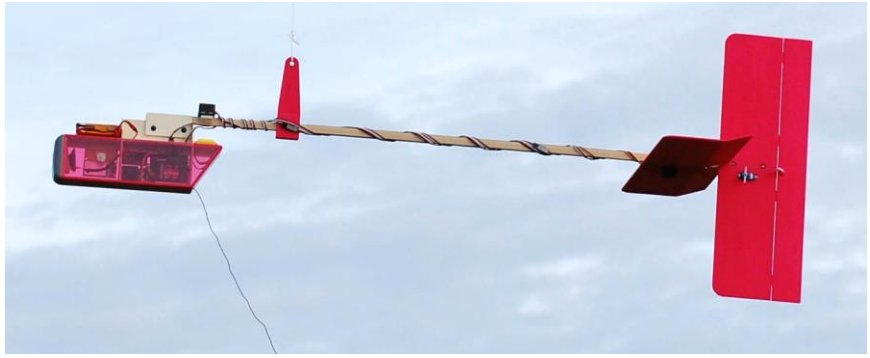
- ***AEROKATS and ROVER Education Network (AREN)*** - part of the NASA Science Activation Collective (Kristen Erickson/NASA HQ)
- **David Bydlowski/PI**, and Andy Henry (Wayne Regional Educational Service Agency, Wayne MI)
- NASA GSFC, GSFC/WFF
- Anasphere LLC
- Chesapeake Bay Environmental Center
- Montana State University
- Public Lab
- University of Maryland Eastern Shore
- University of South Florida
- Washington College

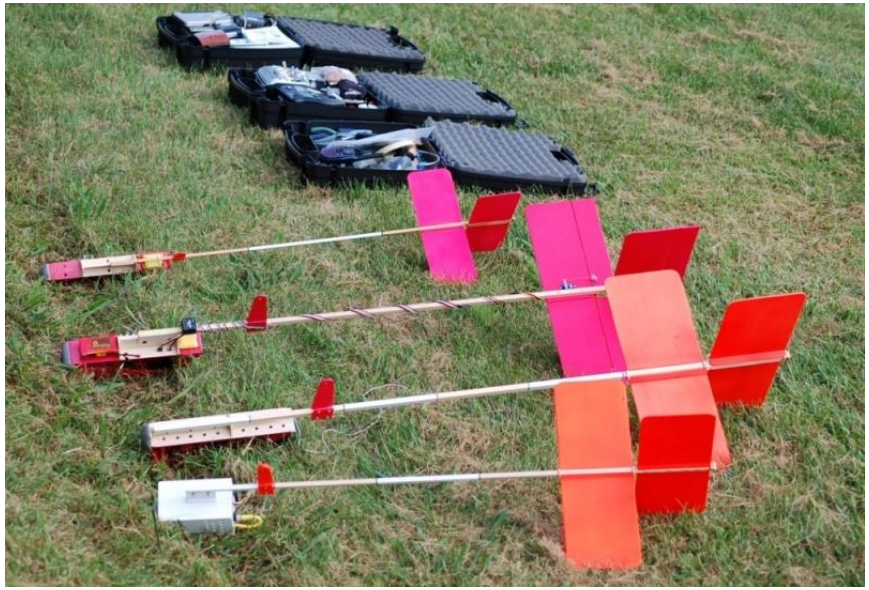
UP – Making It Happen…

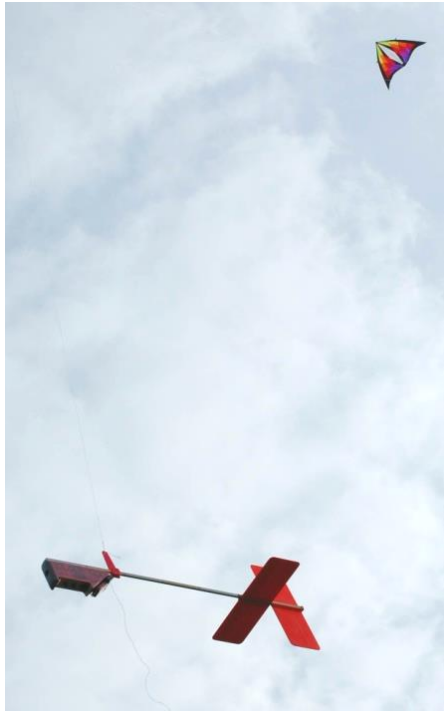
- **Team Work:** Communications, Roles
- **Mission Planning**: Weather, Go/No-Go)
- **Briefings:** Pre and Post Operations
- **Multiple Kite Types** for Varying Winds
- **Practice and Proficiency**
- **Checklist, Procedures**
- **Safety:**
  - Risk Assessment and Mitigation
  - Personnel Protective Equipment (PPE) – Gloves, etc.

1912 *Picavet* Alternative –2012 *Aeropod*

…a NASA Technology







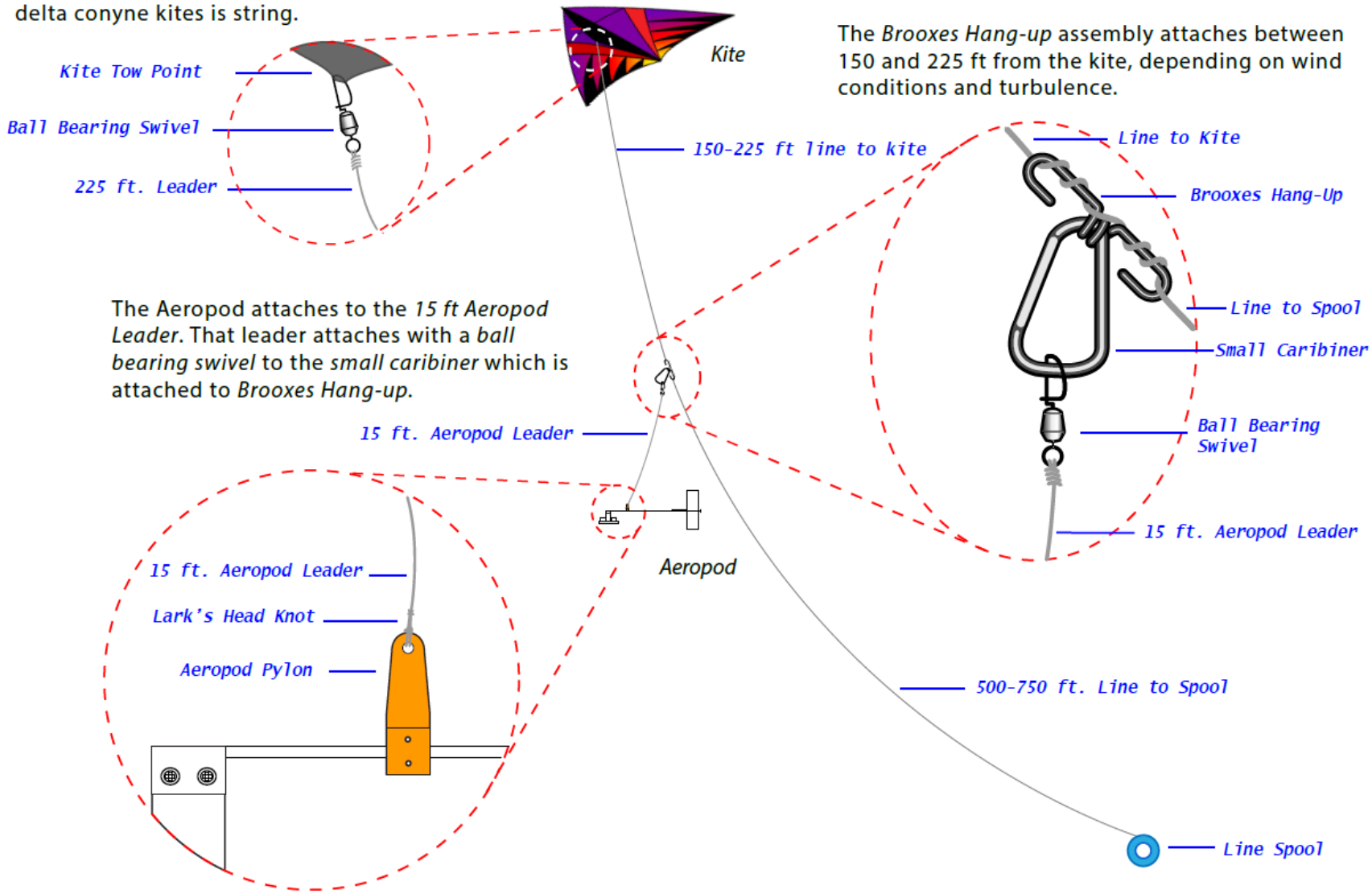
UP – Making It Happen…

Kite, Line, and Aeropod Connections

The Kite attaches directly to the line with a a ball bearing swivel at the *tow point* on the kite. The tow point on the ITW delta kites is fabric. The tow point on many delta conyne kites is string.

The *Brooxes Hang-up* assembly attaches between 150 and 225 ft from the kite, depending on wind conditions and turbulence.

The Aeropod attaches to the *15 ft Aeropod Leader*. That leader attaches with a *ball bearing swivel* to the *small caribiner* which is attached to *Brooxes Hang-up*.



NOTE: Drawing not to scale

©AREN Project – Andy Henry 20170418

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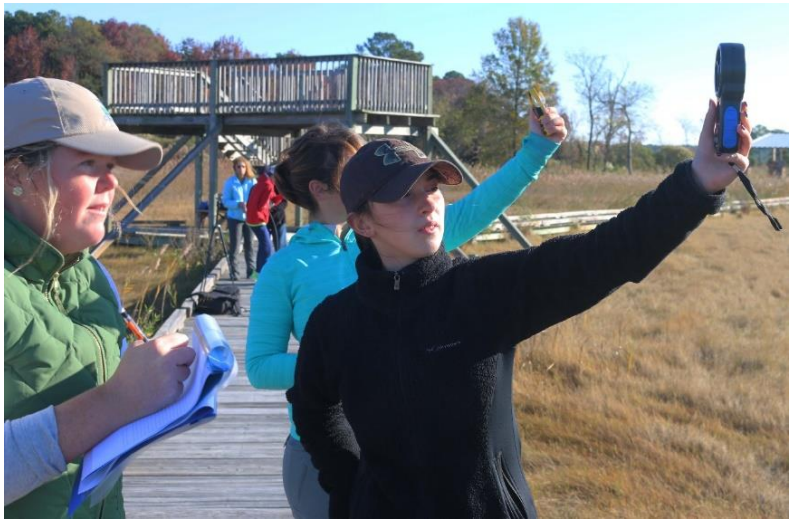
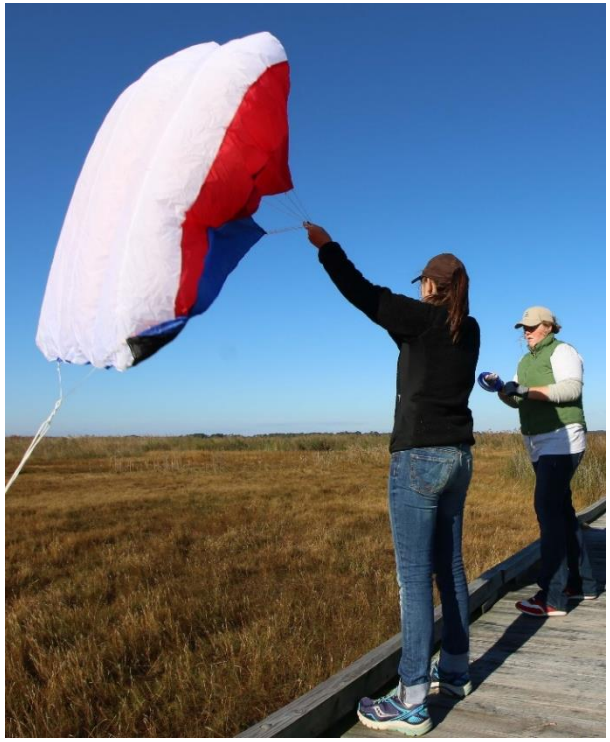
***AEROKATS* Levels** (preliminary)	***NuBee***	***Cadet***	***Pro***	***Expert***	***Master***
Activity Focus:	**Kite Flying**	***MonoCam* Imaging**	*Profiler* or *ProCam*	Experimental System	New Measurement Tool or Method Concept
Roles:	Pilot/Co-Pilot	Instrument Operator	Instrument Operator and Data Analyst	Instrument or Platform Engineering and Fabrication	Development and testing of a new concept
Required Documentation:	Start LogBook	Share Image with Team Member	**Written Report to Teacher (or other Adult)**	**Presentation to Peers**	Application to Review Panel w/ Documented Results
"Certification" Upon Completion:	Self Declared	Team Member Endorsement in LogBook	Teacher (or other Adult) Endorsement in LogBook	Teacher (or other Adult) Endorsement in LogBook	**Certificate from Review Panel**

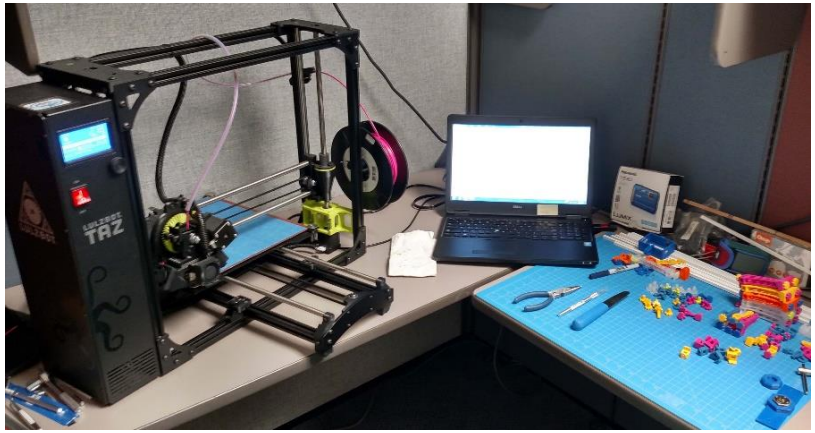
UP – Making It Happen…

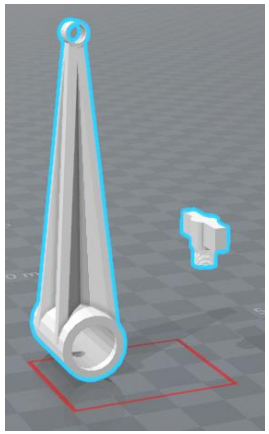
UP – Making It Happen…

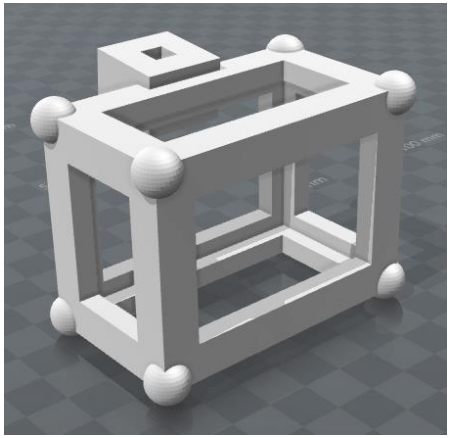




UP – Making It Happen…







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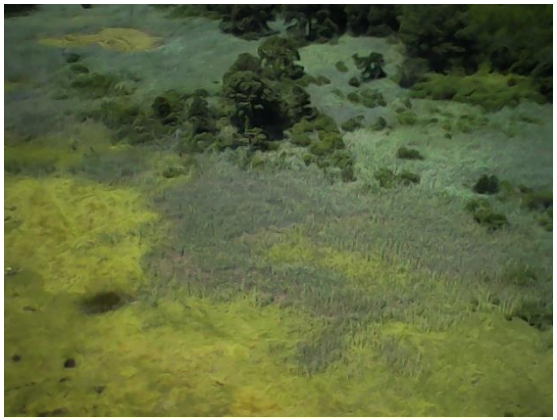
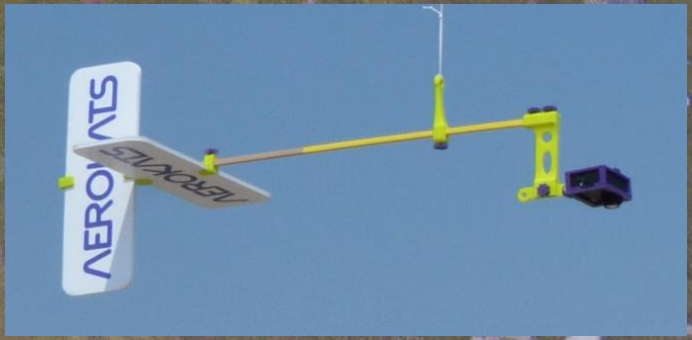


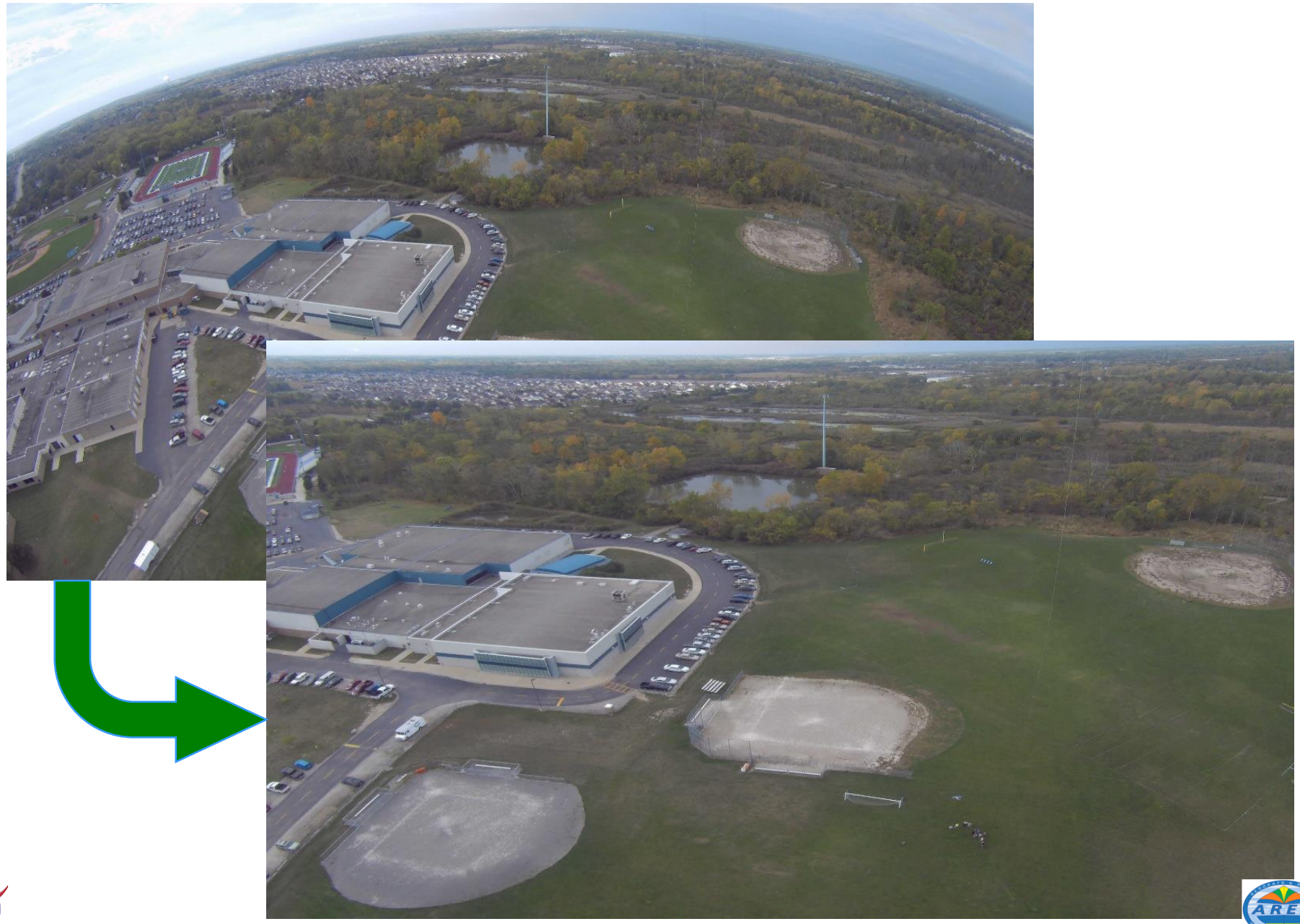
UP – Making It Happen…

UP – Making It Happen…

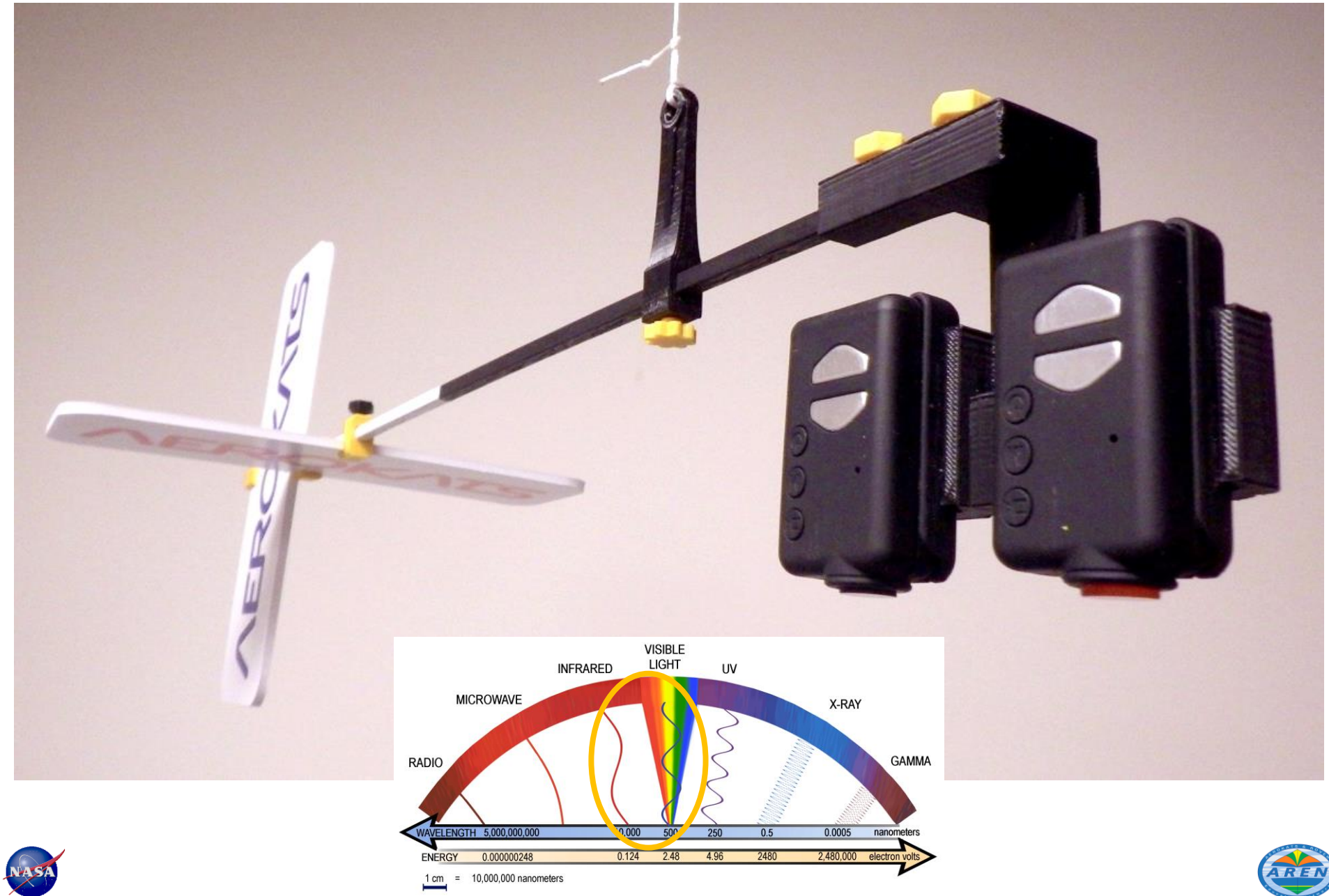
MonoPodSport



Lens Distortion Correction Tool

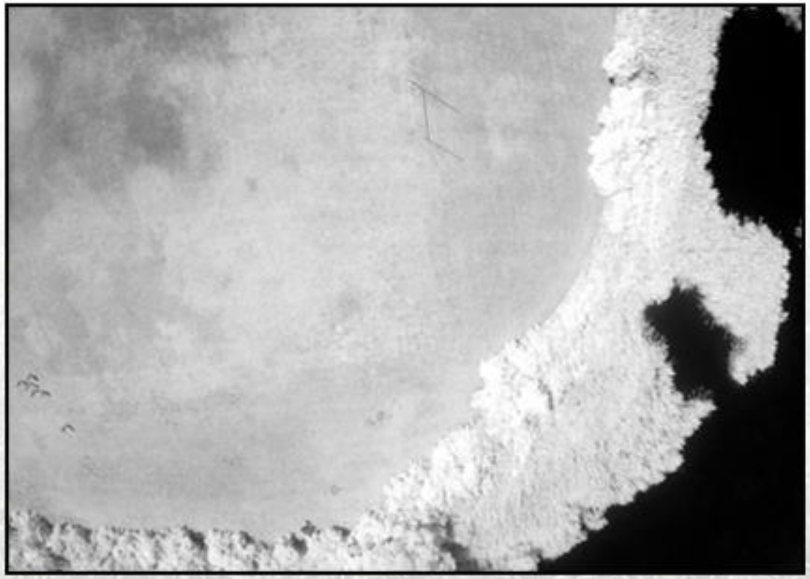


TwinCam


VISIBLE LIGHT
INFRARED
UV
MICROWAVE
X-RAY
RADIO
GAMMA
WAVELENGTH 5,000,000,000
250
0.5
0.0005
nanometers
ENERGY 0.000000248
0.124
2.48
4.96
2480
2,480,000
electron volts
1 cm = 10,000,000 nanometers

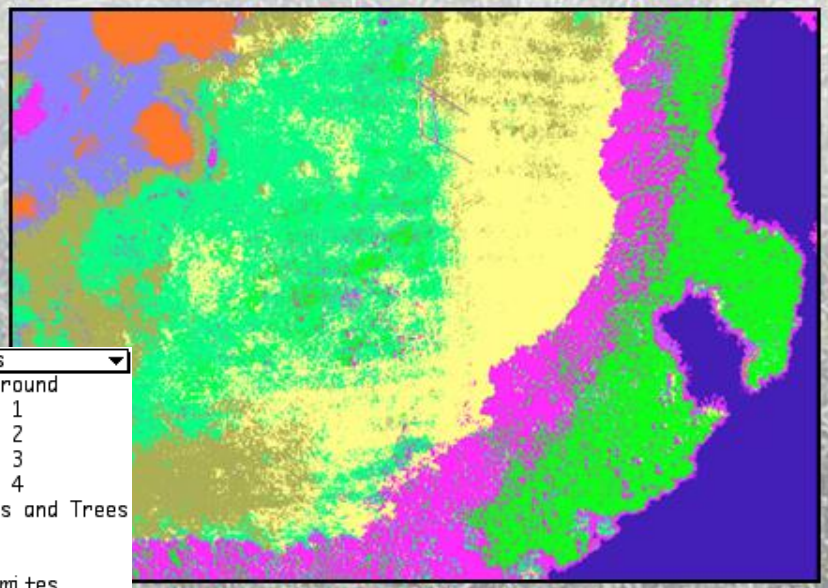
Twin Cam Image Processing - Classification Example

Visible (RGB)



Near Infrared (N)

Composite (NRG)

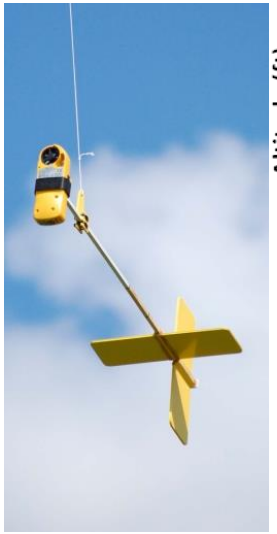


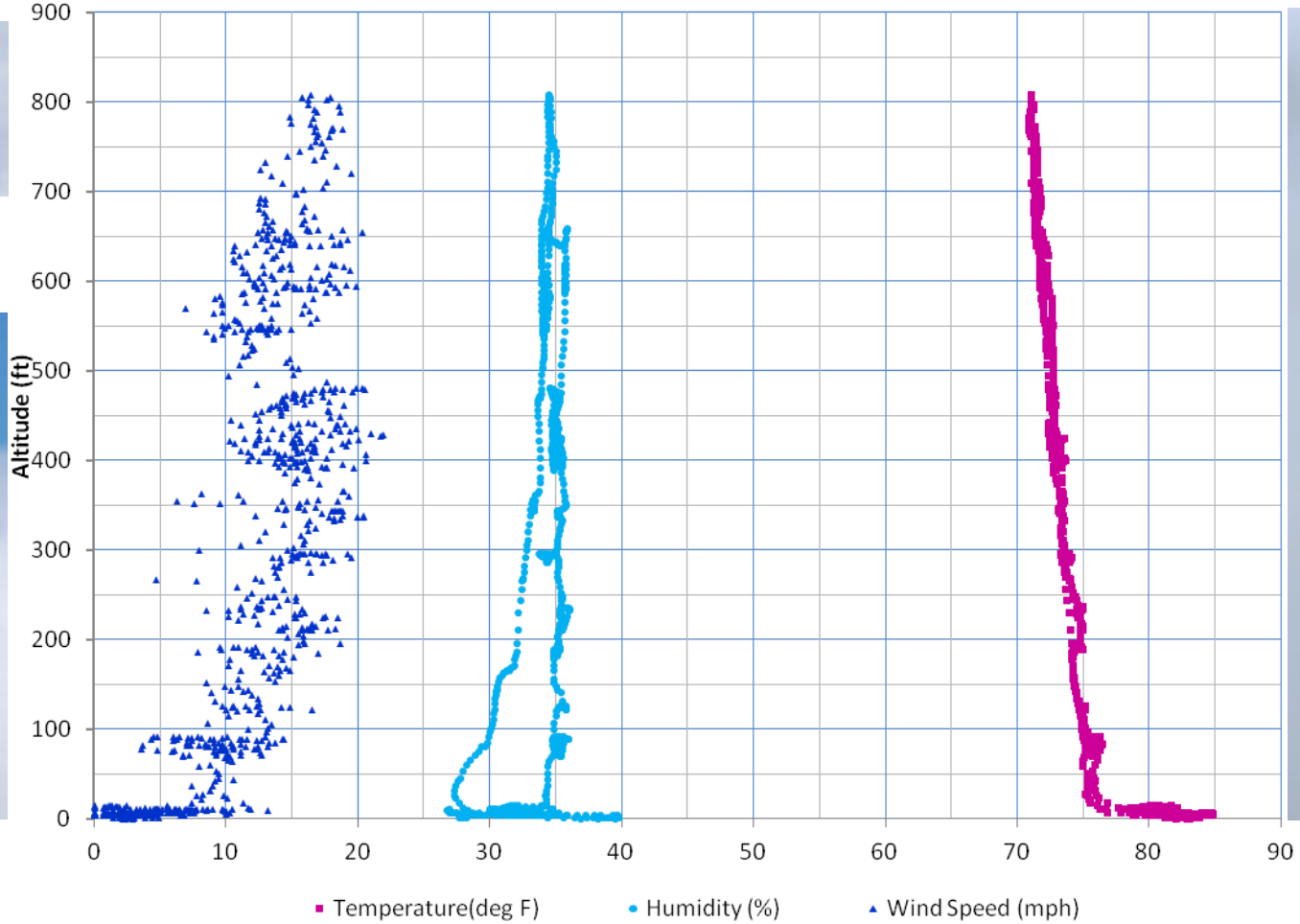
Classes
background
Grass 1
Grass 2
Grass 3
Grass 4
Shrubs and Trees
Phragmites
Grass 5
Water

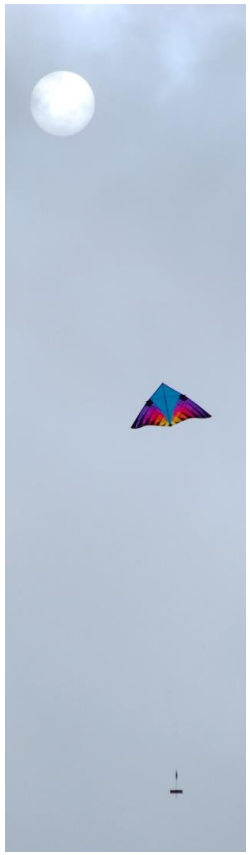
Classified

Profiler

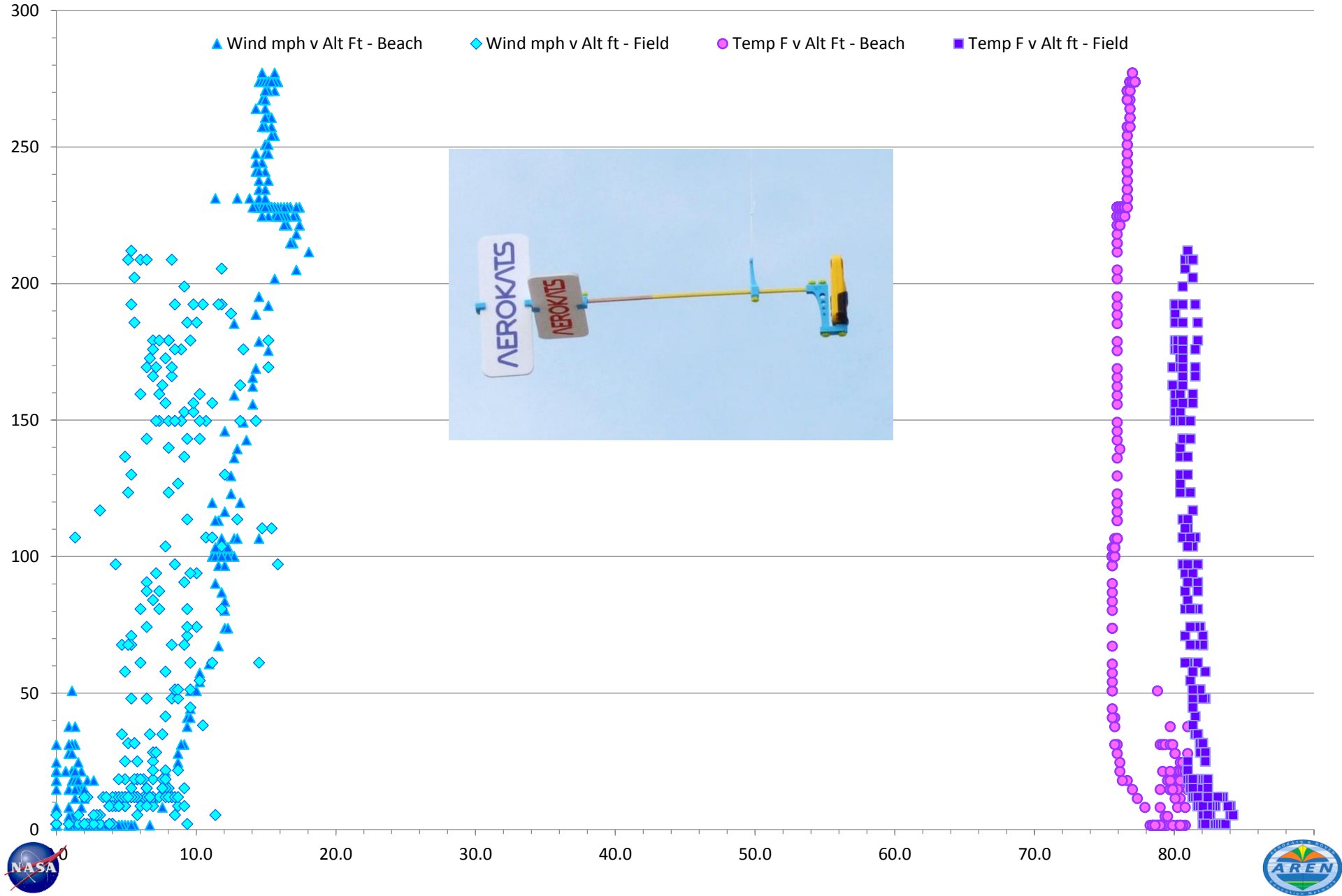
Boundary Layer Studies



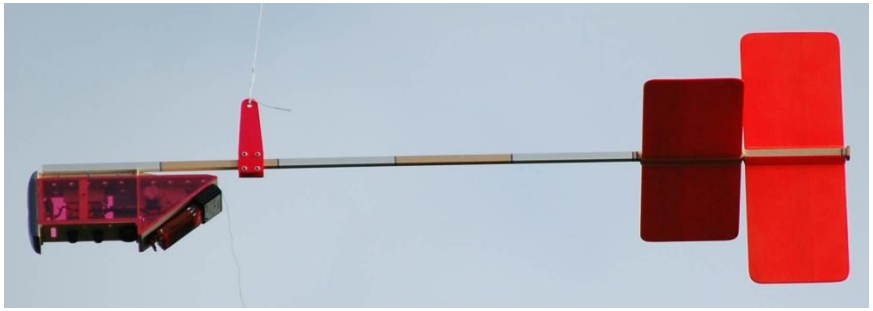


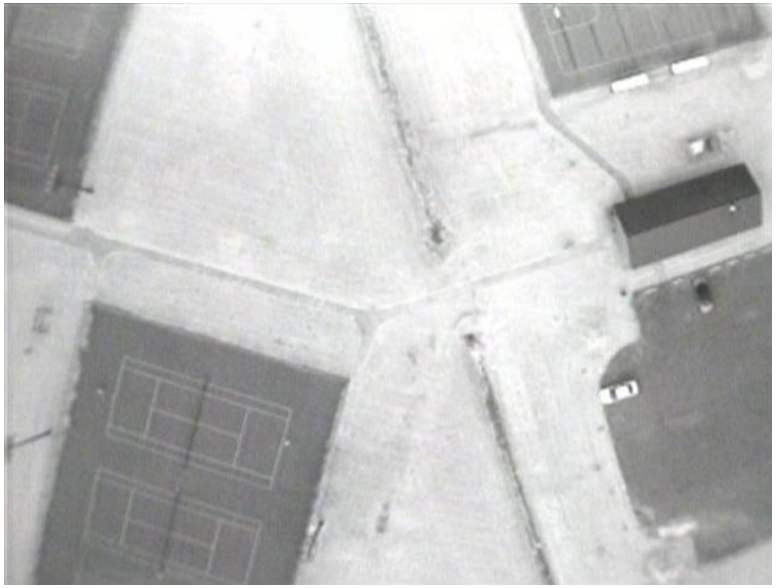


Profiler

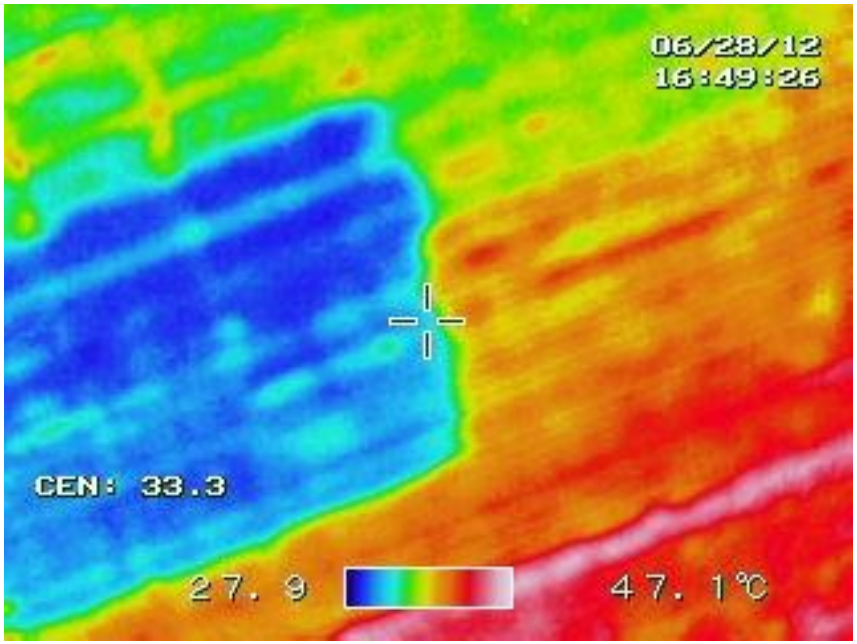

Wind mph v Alt Ft - Beach
Wind mph v Alt ft - Field
Temp F v Alt Ft - Beach
Temp F v Alt ft - Field
300
250
200
150
100
50
0
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
AEROKATS
AEROKATS

ThermoPod





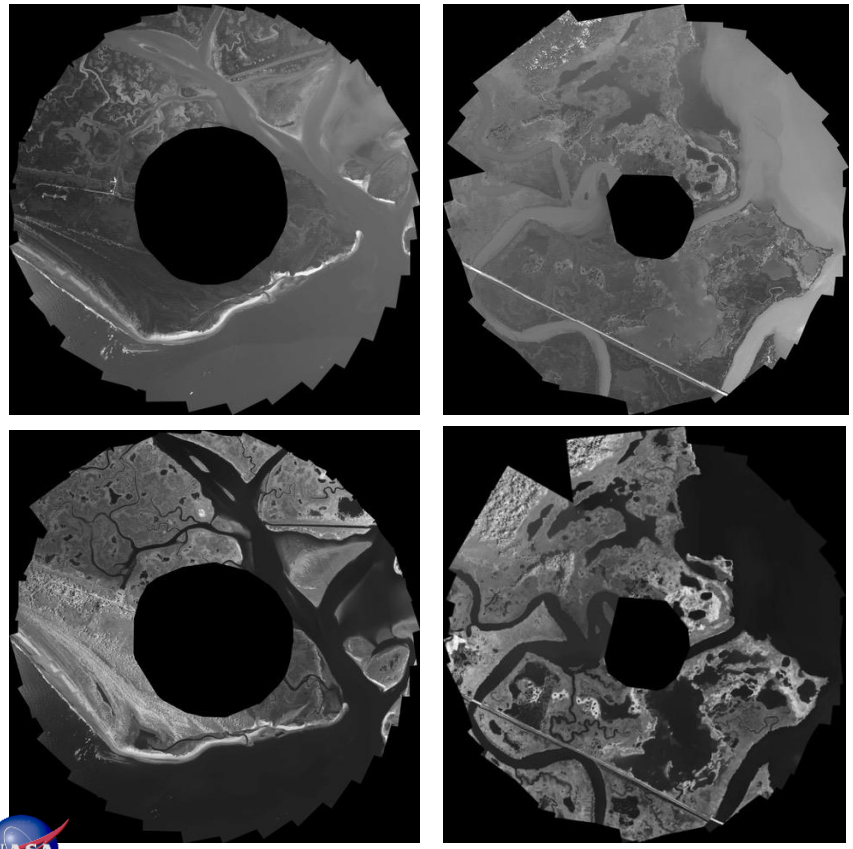
ThermoPod



Piloting with Pilots

https://www.globe.gov/web/aren-project/overview/aerokats/-safety

Vanilla Aircraft 5 Day UAV Mission



Schmidt Ocean Institute R/V *Falcor*

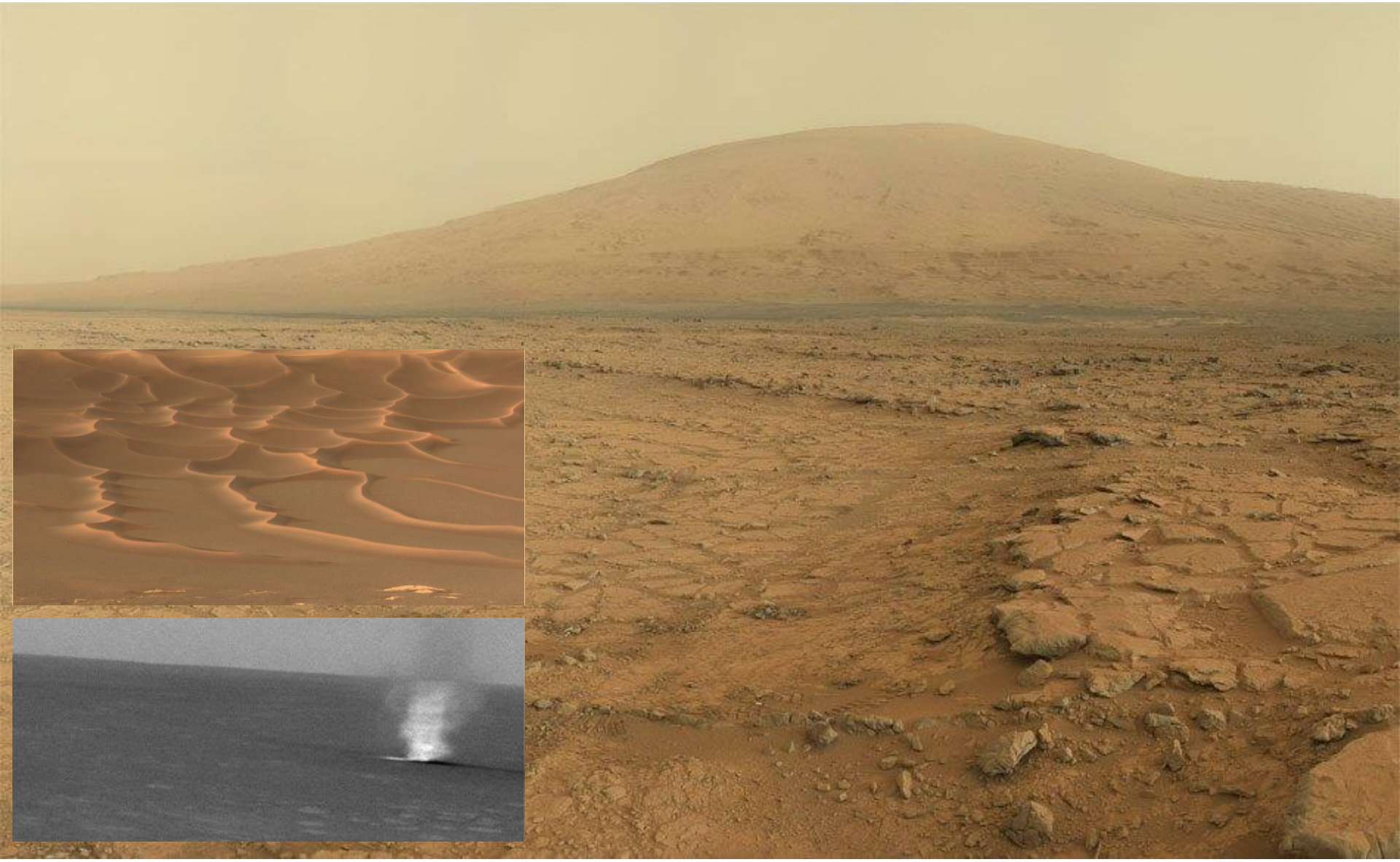
Images by Stephanie Uz (NASA/GSFC)

Thanks – Things are Lookin' Up!

- Kristen Erickson
- Mary Sladek
- Lin Chambers
- Ming-Ying Wei
- Dave Bydlowski
- Andy Henry
- Anil Aranha
- Suzi Taylor
- Kelly Boyce
- Kim Obbink
- John Bognar
- Jeff Warren
- Liz Barry
- Becki Chall
- Mathew Lippincott
- Doug Levin
- Jemima Clark
- Chris Hartman
- Willie Brown
- Xavier Henry
- Abhijit Nagchaudhuri
- Judy Wink
- Alissa Quinton
- Eileen Friedman
- Hanna Spongberg
- Jonathan Gaines
- Sallie Smith
- Patrick Coronado
- Ted Miles
- Kay Rufty
- Brian Campbell
- Tony Murphy
- *IntotheWind*
- *TerraKite Productions*

https://www.globe.gov/web/aren-project/overview

Waaaaay UP!



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- Session Title: ED13E. Amazing Technologies and Capabilities That Contribute to STEM ll
- Day/Time: Monday, 11 December 2017: 13:40 - 15:40, Morial, 242
- Abstract Title: A New Dimension for Earth Science Learning
- Presentation Type: Oral
- Final Paper Number: ED13E-04
- 14:33 – 14:49 ED13E-04 A New Dimension for Earth Science Learning **Geoff Bland**[1], Andy Henry[2], David Bydlowski[2] and AREN Team, (1)NASA Goddard Space Flight Center, Greenbelt, MD, United States, (2)Wayne County Regional Educational Service Agency, Wayne, MI, United States