# High Altitude Balloon Payload Program

## DemoSat

# *Origins: COSGC 1989 - 1996*

**- All projects were advanced**

**- Seniors/Graduate students**

**- Difficult for first-year students to get plugged in**

**- Sink or Swim**

# *Origins: Fall 1996*

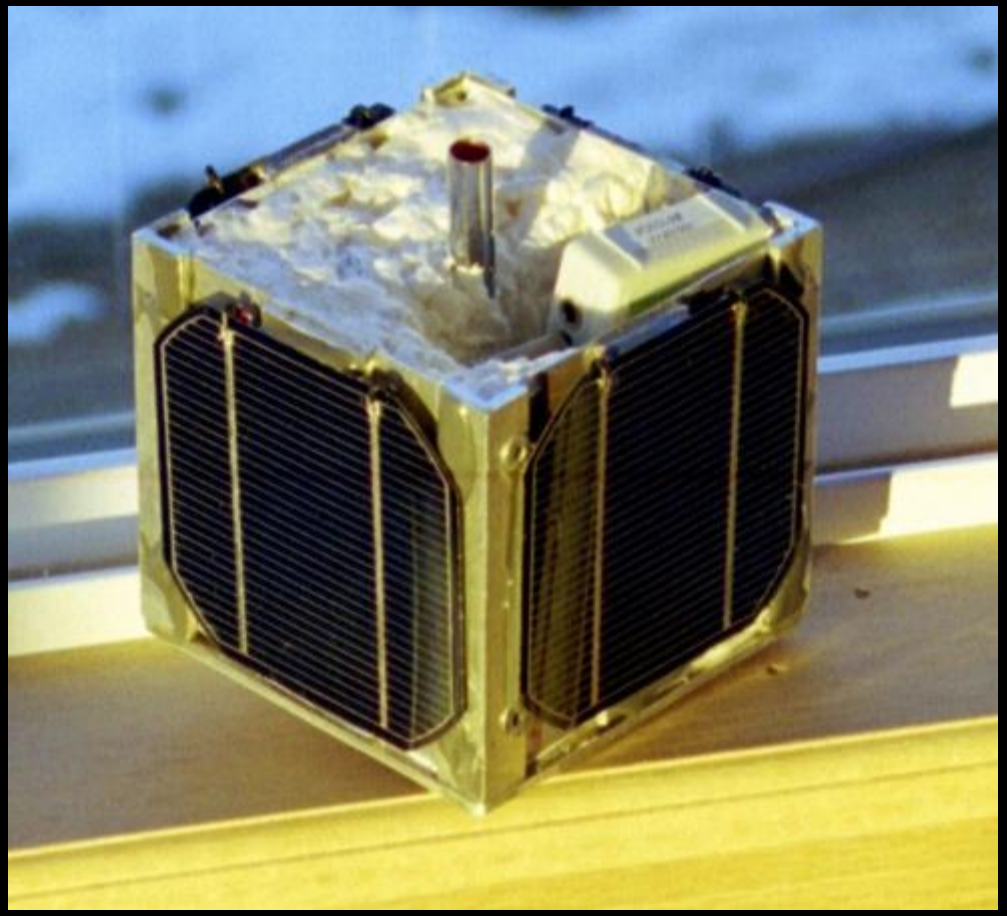
**Met Edge of Space Sciences (EOSS)**

# *Origins: Fall 1996*

- **Reach near space (~100,000 feet)**
- **Same day recovery nearly guaranteed**
- **Low Cost**
- **Multiple launches every year (Balloons can carry many payloads)**
- **Engineering challenges: -80 C, near vacuum, higher radiation, burst chaos**
- **No Microgravity = full Earth gravity**

# *Origins: 1996 – "BalloonSat" is born*

## High Altitude Balloon Payload



# *Edge of Space*

| SOME VISIBLE CHARACTERISTICS OF NEAR SPACE | | | | |
|---|---|---|---|---|
| **Altitude** | **Pressure** | **Horizon** | **Sky Color*** | **Cosmic Rays**** |
| Ground | 1013 millibars | 3 miles | Blue | 4 counts/min<br>All secondaries |
| 85,000 feet | 20 millibars | 350 miles | Black | 700 counts/ Min<br>Primaries and Secondaries |
| 300 miles | 0 millibars | 1500 miles | Black | ?<br>All Primaries |

*** Chapter Fourteen discusses the topic of sky color** **** Chapter Eight discusses the topic of cosmic rays**

# DemoSat Opportunity
# &
# HIBAL Kit Payloads (Practice)

# DemoSat

## Fly an experiment to 100,000ft:

- Mass limit: 800g
- Full review cycle (PDR,CDR, FRR)
- Requires strenuous testing (environmental, structural, system)
- 3 launches per year
- Teams from around the state

# *DemoSat Past Student Experiments:*

- **Radiation**
- **Sound**
- **Light**
- **Biology**
- **Solar cell efficiency**
- **Video/Still imaging**
- **Temperature studies**
- **Your great idea!!**

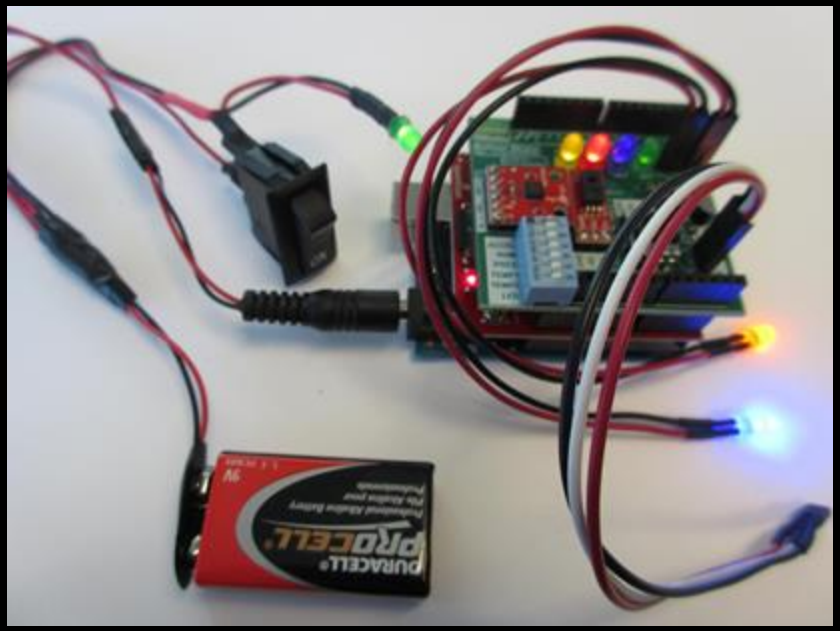
**Can Review Past Team Reports**

# *DemoSat Limitations:*

- **No insects or other living creatures**
- **In flight telemetry regulations (transmitting during flight)**
- **Nothing can separate from flight string**
- **Nothing that endangers flight string or payloads**

# HIBAL Kit Payloads (Practice)

# *HIBAL Kits: Basic Sensor System*

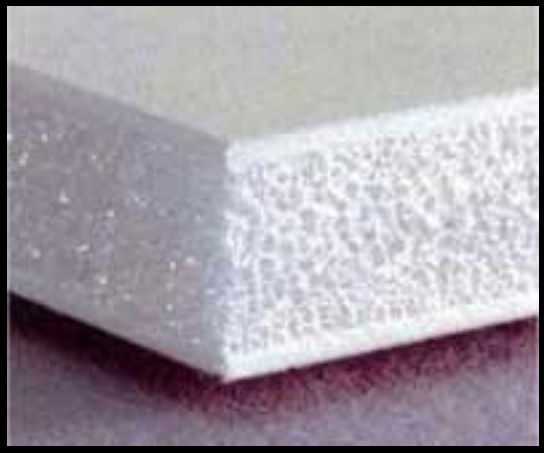


Practice:

Soldering
Programming
Sensor testing
Troubleshooting

# *HIBAL Kits: Pre-designed payload*


Batteries



Foam core & Pattern

Black Foam Insulation
¼ and ½ inch

**- Velcro & hot glue**
**- Aluminum tape**
**- Flight tube**
**- ID stickers**

# *HIBAL Kits: expectations*

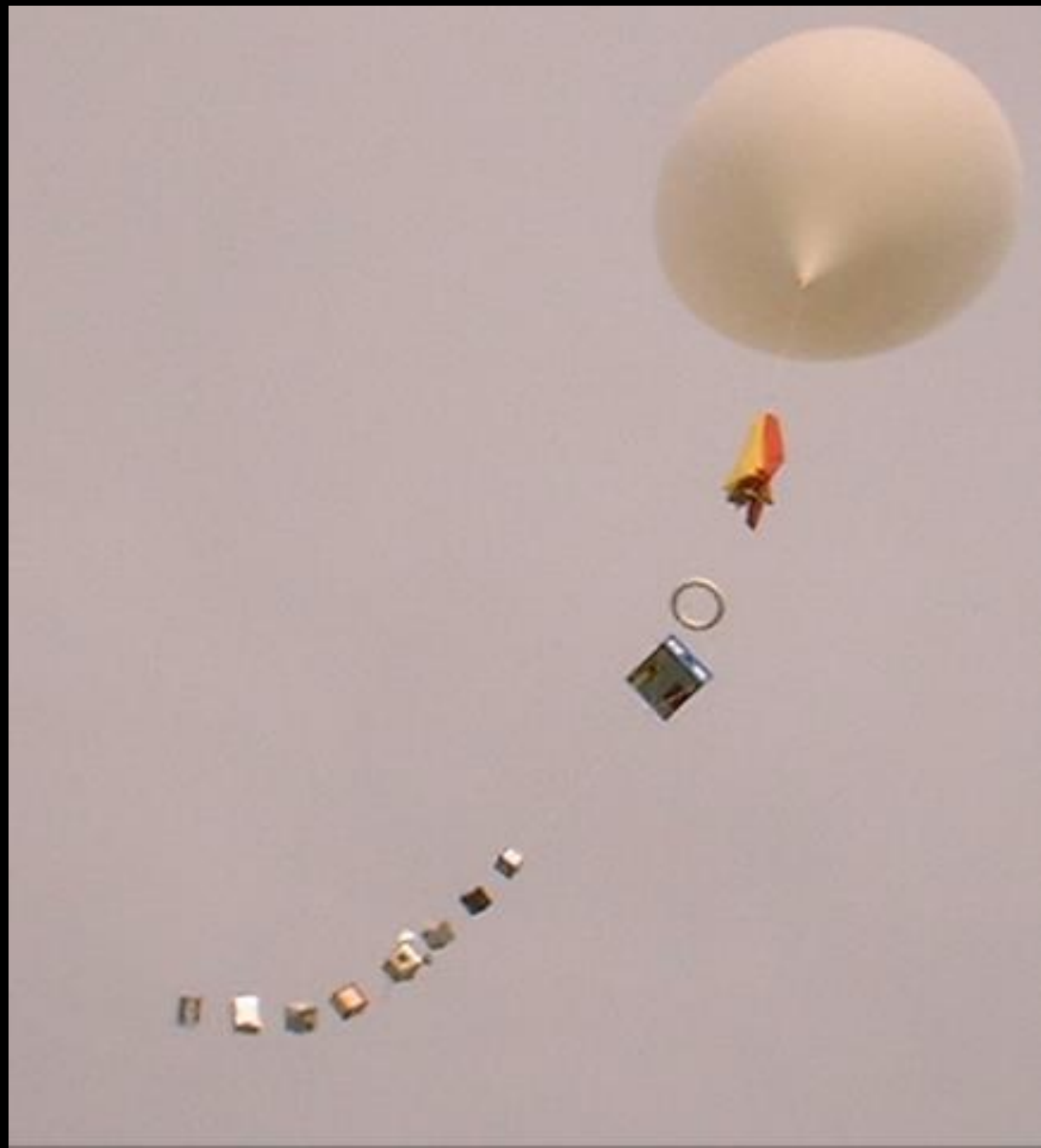
- Must not exceed 225g (lighter is better)
- Cannot add any additional items to payload
- Basic testing required (integration):
  - Shake
  - Whip

# *Flight Day:*

- Sites typically in eastern Colorado (I70)
- Liftoff is ~7:00 AM
- 90 minutes up, 45 minutes down

# *Launch/Flight: Supported by EOSS*

- 3000 gram latex balloon
- Gaseous Hydrogen
- Balloon filling system
- Radio Transceiver
- GPS
- Control Systems
- Parachute
- FAA notification
- ADSB Technology

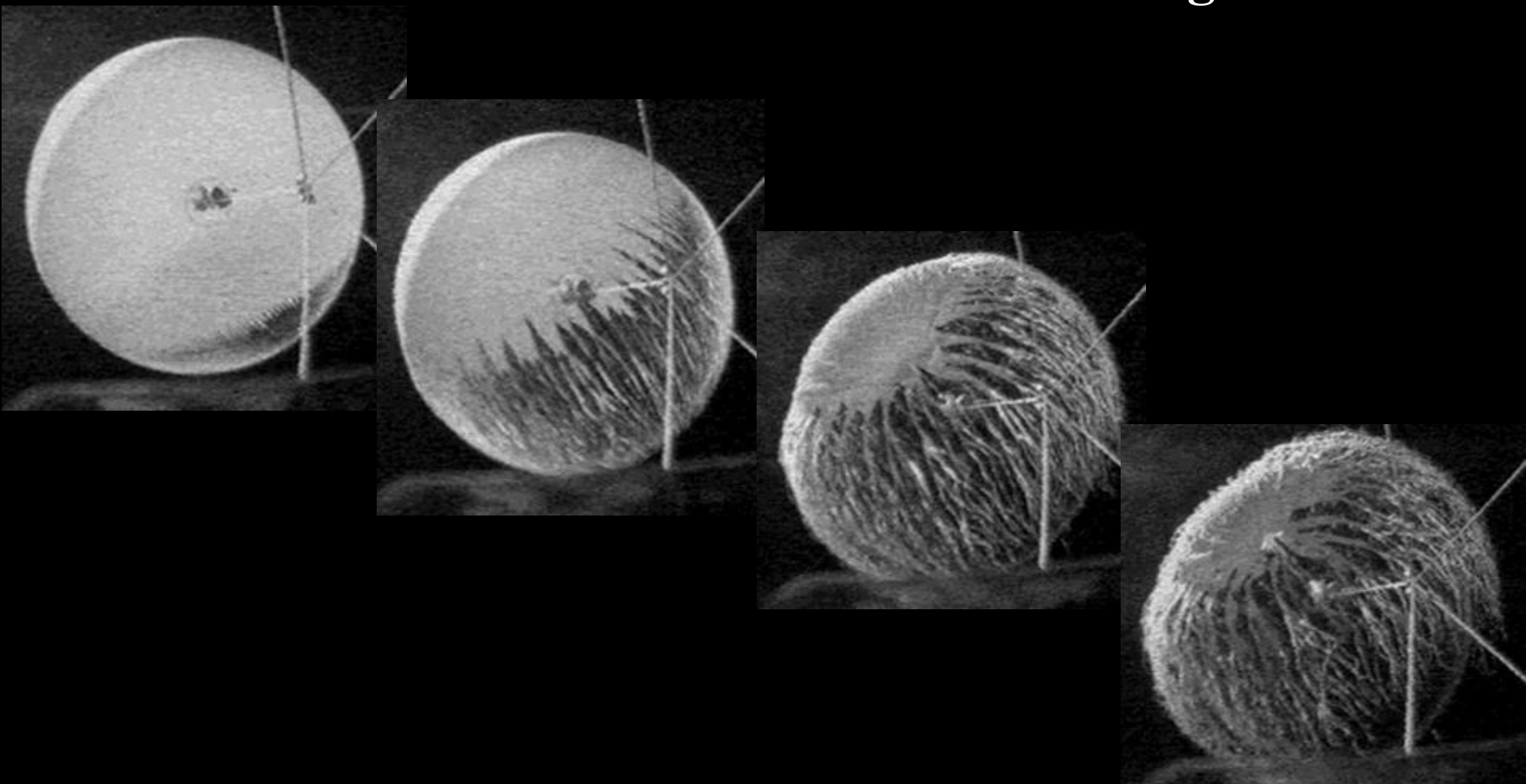


# *Tracking & Recovery:*

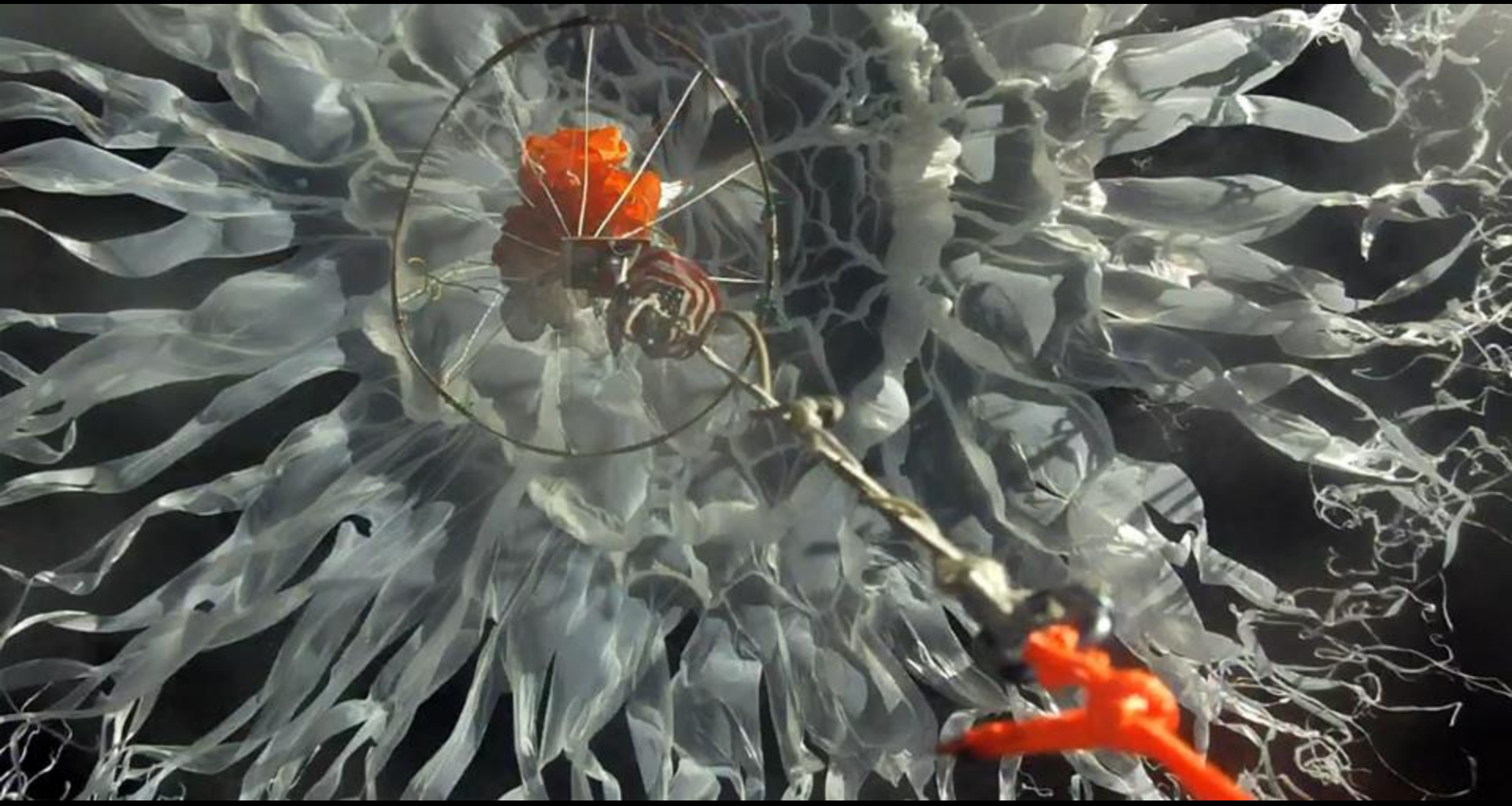
- Begins after launch
- Track real-time using phone
- Recovery completed same day

# *Burst:*

- Altitude variable
- One of the most violent moments of the flight



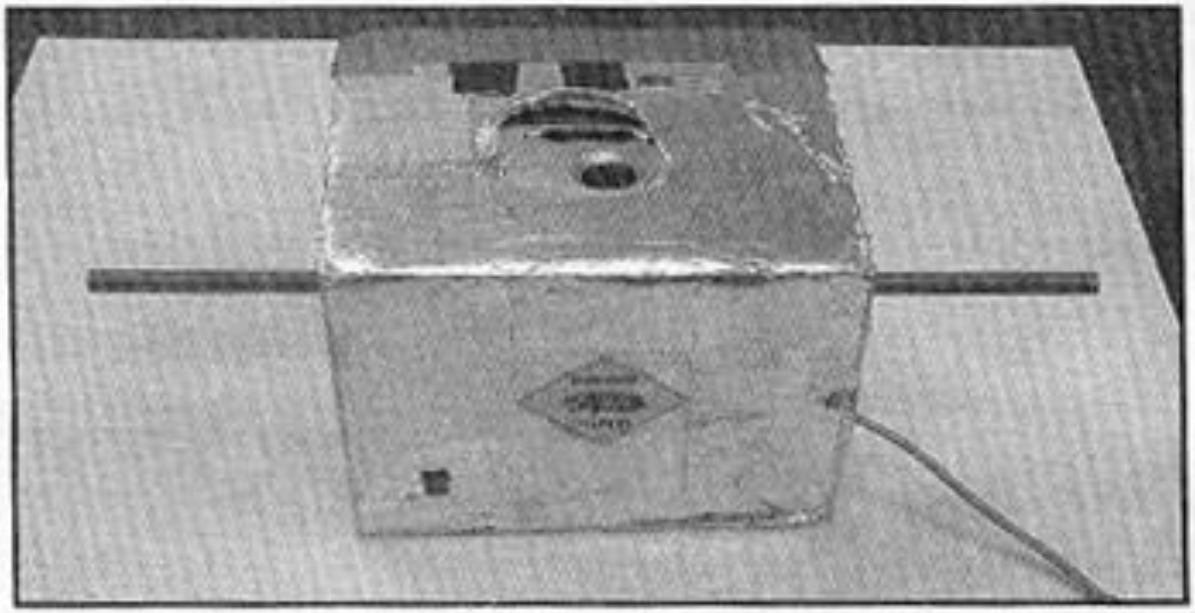
# *Balloon Payloads*



# *Recovery:*

Thursday, November 4, 2004

# What is it?



SIP photo by Trena Tegan

**Joe Nelson found this box on his Hazelton farm, and is at a loss as to what it is.**

HAZELTON — Joe Nelson of Hazelton made in interesting discovery in one of his fields recently while he was harvesting.

A silver box approximately 5 1/2 inches square with wires and bolts sticking out of it was laying among the vines in the field. It was near dark and difficult to see any details.

"My first thought was that it was a bomb," Nelson said.

The next morning after having a closer look, Nelson could see a hole cut in one side of the box with a camera in it. There is also what appears to be an antenna on one side and a switch on another. A long bolt appears to be running through the contraption, sticking out 3 inches on each side.

The box looks to be made of foam board held together by foil and duct tape. Several stickers of badgers and American flags decorate the box.

In another nearby field, he found a similar contraption. This one was white with stickers saying USA1 and a second box was connected to it by a cable.

Nelson said that the boxes may have been part of a school science experiment and someone may want to retrieve the cameras from the boxes.

For more information, call Trena at 677-4042, extension 600.


The StratoShuttle-1 student balloon, an educational project by the Quest for Stars group, captured NASA's shuttle Altantis soaring into orbit as seen from 89,000 feet on July 8, 2011. Tweeted @questforstars: "Atlantis, GO at Throttle up!"

CREDIT: Quest for Stars

View full size image

# Questions?