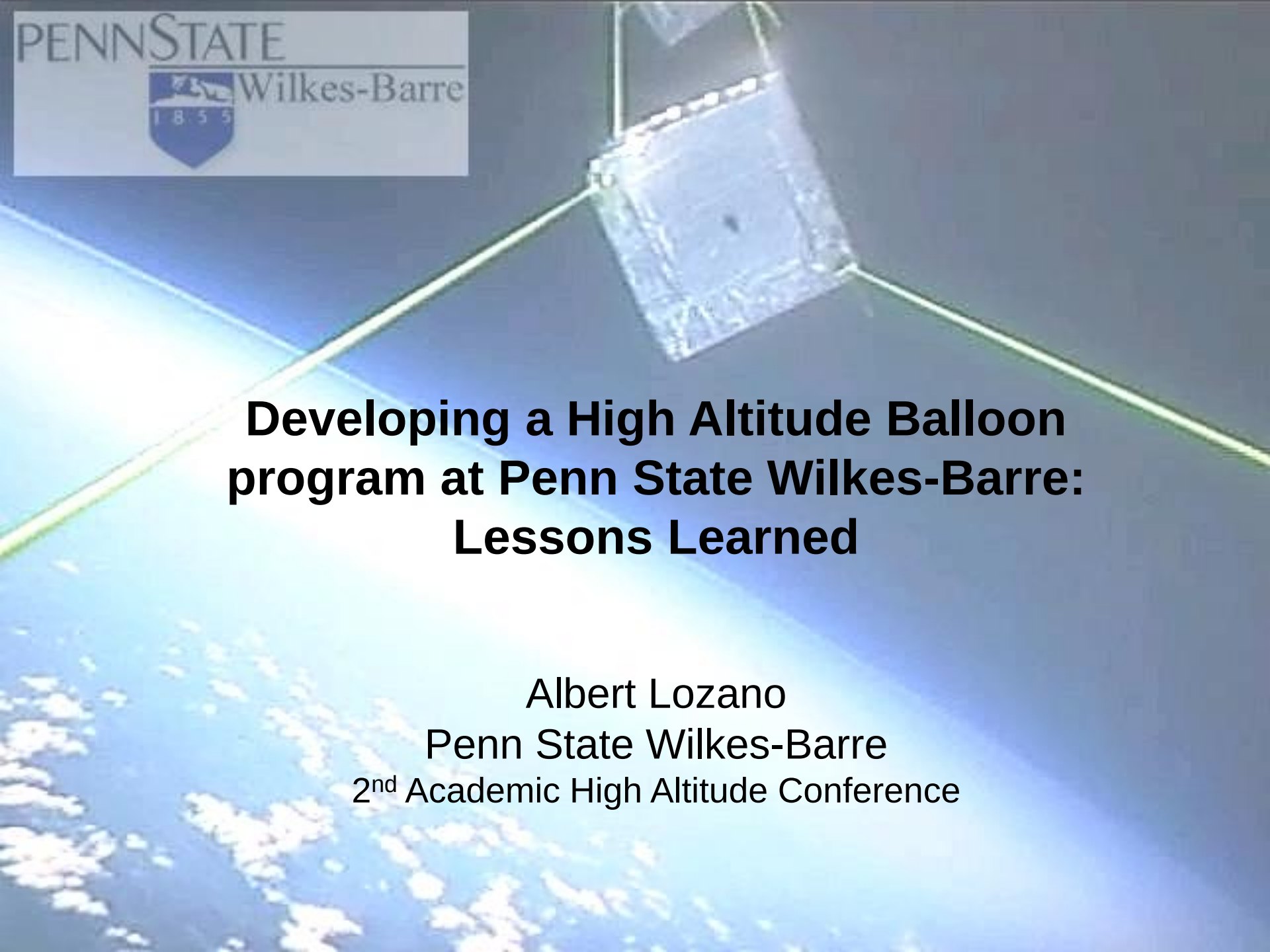
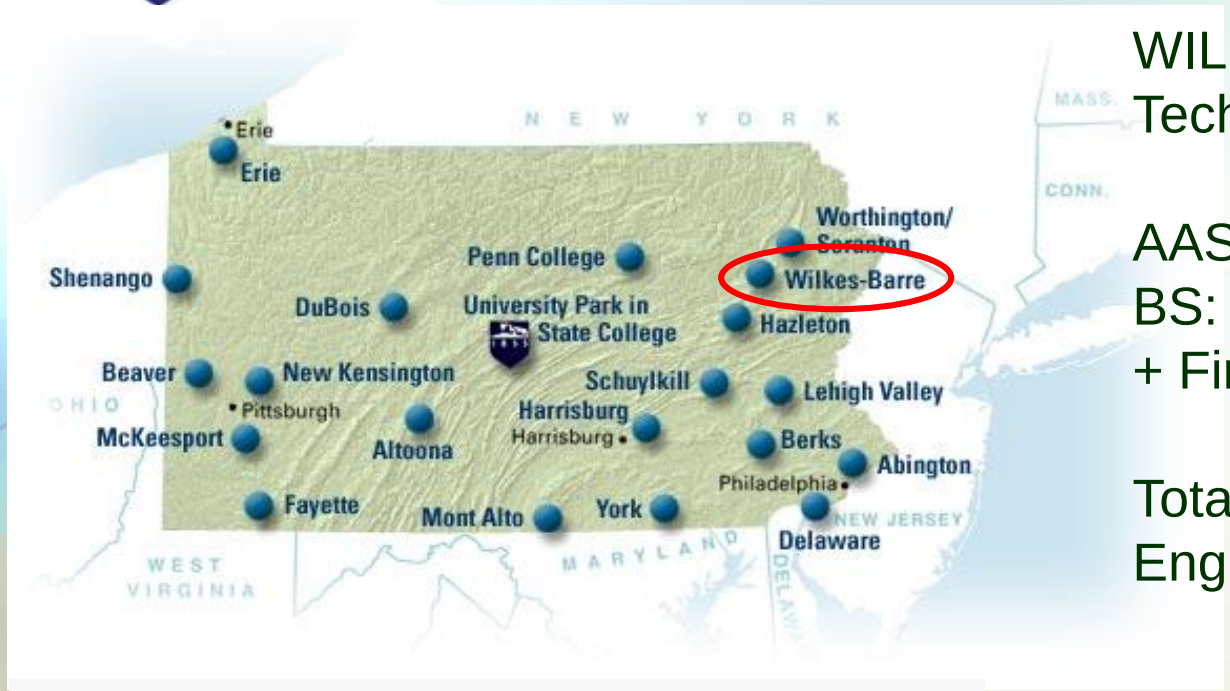


Developing a High Altitude Balloon program at Penn State Wilkes-Barre: Lessons Learned

Albert Lozano
Penn State Wilkes-Barre
2nd Academic High Altitude Conference

Penn State Wilkes-Barre



WILKES-BARRE CAMPUS
Technology Programs

AAS: EET, SRT
BS: EET, SUR
+ First 2 years Engineering

Total students ~ 780
Eng / Tech students ~ 250

Background

- July 2009: Attended Workshops on High Altitude Balloons at Taylor University

- AY 2009-10: Groundwork for High Altitude Balloon Activities at Penn State Wilkes- Barre. Major funding from Pennsylvania Space Grant. StratoStar System

- Goals: Engage faculty and students.
  Have first launch in Spring 2010

Develop High Impact Activities for our current students

Student engagement.
Undergraduate Research
Classroom/ extracurricular activities

Recruit future students

Engage / Involve primary and secondary educator and students

Outreach

Showcase PSU-WB to our local community.
Media. Publicity

PENNSTATE Wilkes-Barre 1855

Challenges - prior to first flight

- **Funding:**
  - Find sources
  - Correct budgeting
  - Secure funding: time
- **Campus Participation:**
  - Only 1 additional engineering faculty
  - No interest by science faculty members
  - 10 to 15 students attended meetings
- **Time to have first flight in Spring 2010**
- **Weather conditions Spring 2010**

PENNSTATE Wilkes-Barre 1855

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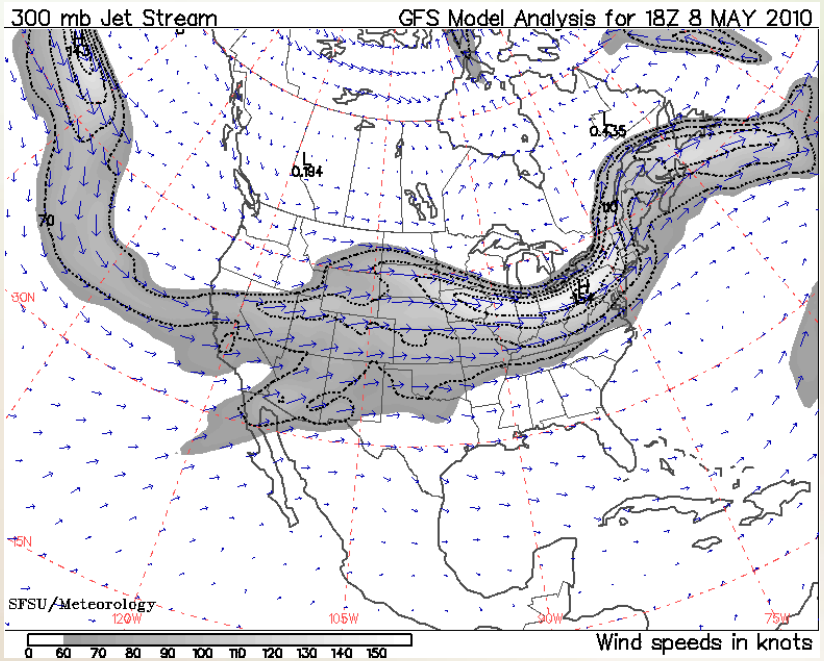
Weekend after final exams
Postpone launch until Fall 2010



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Challenges - prior to first flight

- **Fall 2010: Ready to launch (again)**

  But … Some students had already graduated and left us
  Some other students had transfer to University Park

University's Office of Risk Management

Extremely concerned about liability issues
Asked to refrain from launching until their evaluation
Initially different interpretation of FAR 101
Did not accept "it will be fine" … "other universities do it…"

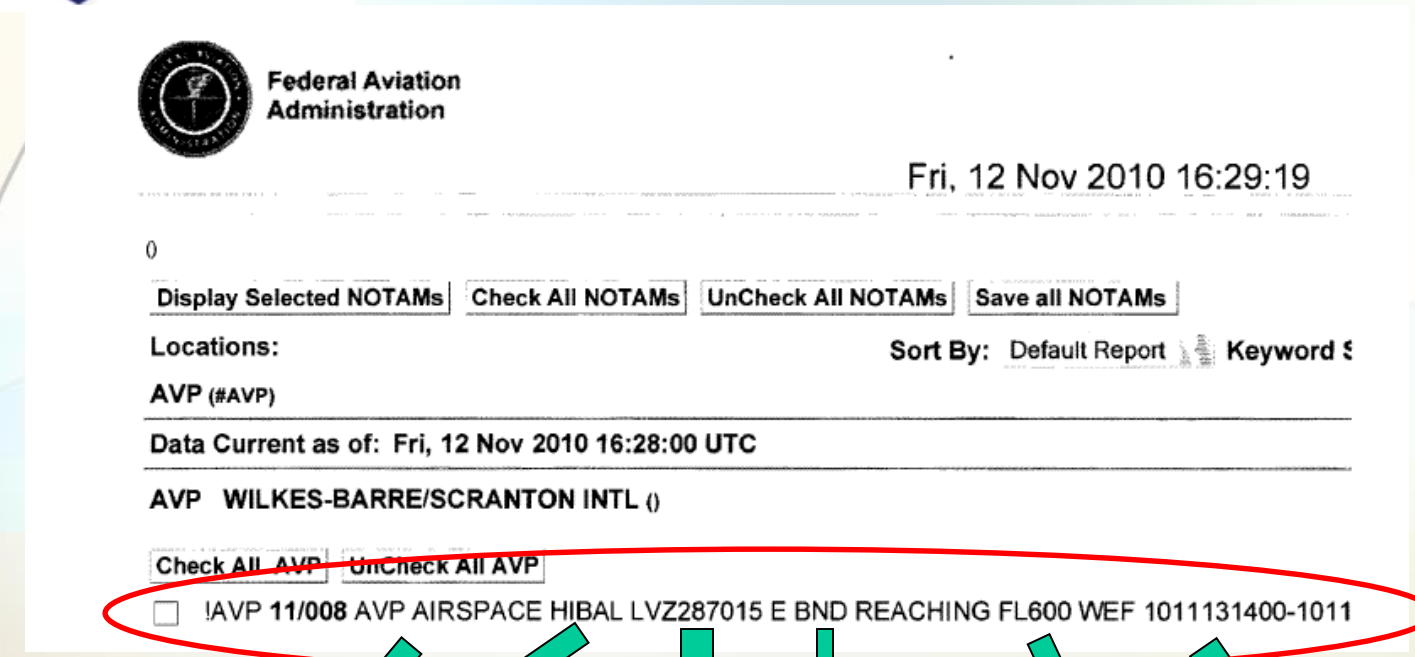
Developed "Safety Plan"

Same rules that we would follow, just in writing

Determining factor: Penn State had accepted the grant from Pennsylvania Space Grant
→ Penn State Project

Asked us to file a NOTAM before each flight

Challenges - prior to first flight NOTAM



Federal Aviation Administration

Fri, 12 Nov 2010 16:29:19

0

Display Selected NOTAMs | Check All NOTAMs | UnCheck All NOTAMs | Save all NOTAMs

Locations: Sort By: Default Report Keyword

AVP (#AVP)

Data Current as of: Fri, 12 Nov 2010 16:28:00 UTC

AVP WILKES-BARRE/SCRANTON INTL ()

Check All AVP | UnCheck All AVP

!AVP **11/008** AVP AIRSPACE HIBAL LVZ287015 E BND REACHING FL600 WEF 1011131400-1011

Affects airspace Local airport (AVP)

Sounding Balloon (Hiball)

Launch site: 015 nm in radial 287 from closest Navaid VOR LVZ

East bound from launch site

Will reach 60,000 ft (FL 600)

Will be effective Nov 13, 2011 from 1400 UTC to 1800 UTC

Thanks to Professor Glen Kissell, University Southern Indiana for his help with filing NOTAMs

Challenges - during flight

- **Rate of Ascent:** - Digital scale to measure lift inoperative
  - Half way during the filling process balloon looked full
  - Decided to terminate filling by looks of balloon

  → Not a good idea

  - After release, balloon rose much slower than I remembered
  - Landing predictions severely affected

  Actual Rate of Ascent: 440 fpm
  Ground trajectory twice as long as predicted

- **Changed direction chase vehicle**

- **Loss of signal during descent closer to ground:**
  - Expected
  - But did not understand format GPS coordinates for last known position

Recovered payloads after 2 ½ hours searching
Clear area on dense woods

PENNSTATE Wilkes-Barre 1855

First High Altitude Balloon Flight

- Test and develop Operation Procedures
- “Wow! factor
  - 3 video cameras + Temp., pressure, humidity
- Learn from our mistakes
- Refine Operation Procedures
- Keep students engaged and excited
- Goal to repeat for Spring 2011
  - Same weather situation as Sp 2010 with
  - Jet stream activity
  - Schedule for early Fall 2011

PENNSTATE Wilkes-Barre 1855

First High Altitude Balloon Flight Nov. 13, 2011

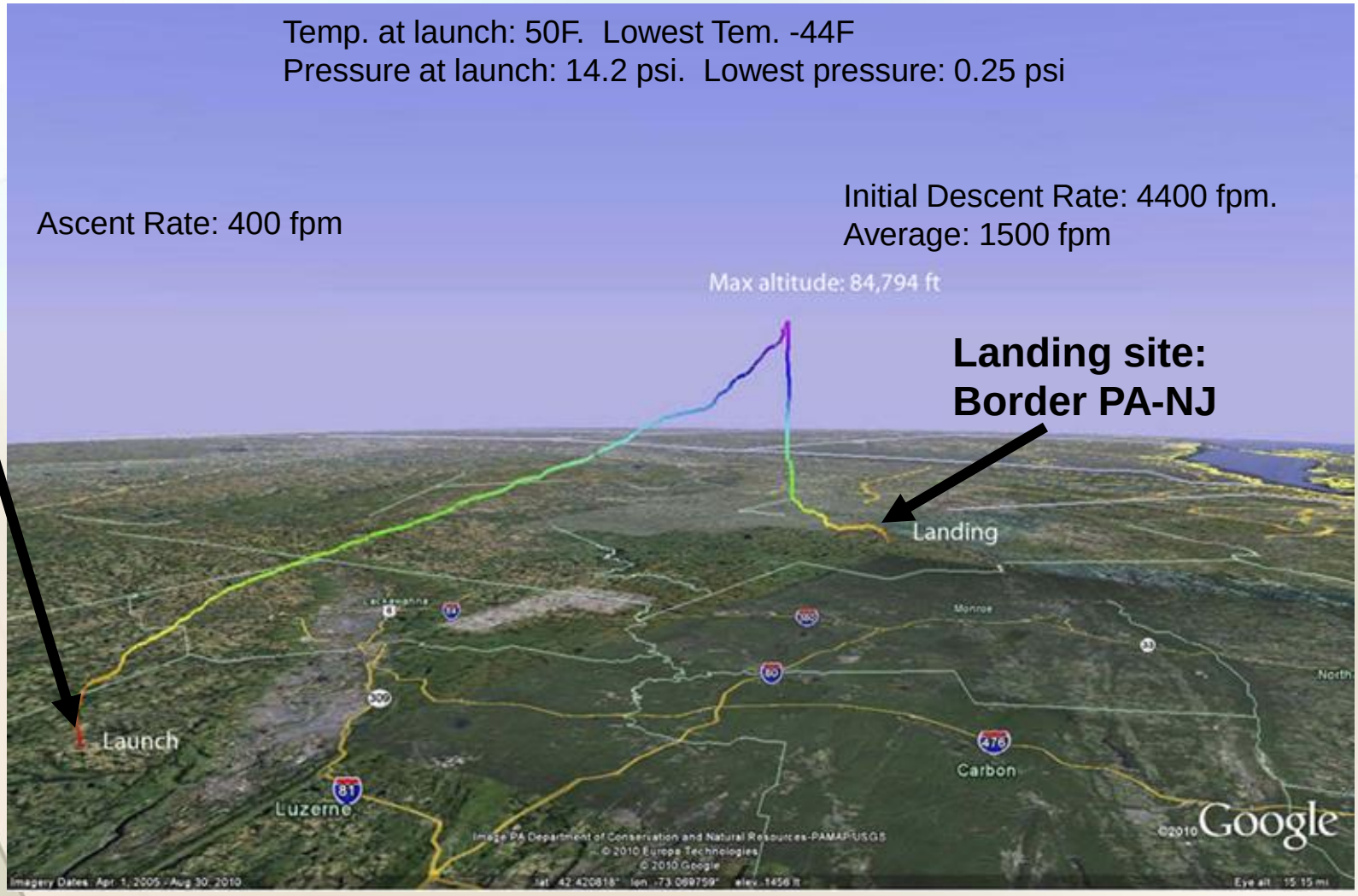
Launch: 9:32 AM
Landing: Approx. 12:15 PM
Recovery: 3:40 PM

Temp. at launch: 50F. Lowest Tem. -44F
Pressure at launch: 14.2 psi. Lowest pressure: 0.25 psi

Ascent Rate: 400 fpm

Initial Descent Rate: 4400 fpm.
Average: 1500 fpm

Launch: PSU-WB



Landing site: Border PA-NJ

PENNSTATE Wilkes-Barre 1855

Future High Altitude Balloon Activities

- **Platform for undergraduate research activities**

  - Framed within senior design project in Electrical Engineering Technology
  - One project in AY 2010-11. Could not fly. Invite back
  -Continue similar projects AY 2011-12

- **2 flights Fall semester**
- **Continue trying to fly end of Spring semester**

- **Try to involve more students and faculty members**

PENNSTATE Wilkes-Barre 1855

High Altitude Balloon Activities