

SUBORBITAL AND SPECIAL ORBITAL PROJECTS DIRECTORATE

Overview of the NASA Balloon Program Office (BPO) and Potential Student Opportunities

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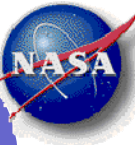
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National Council of Space Grant Directors Meeting

New York, NY

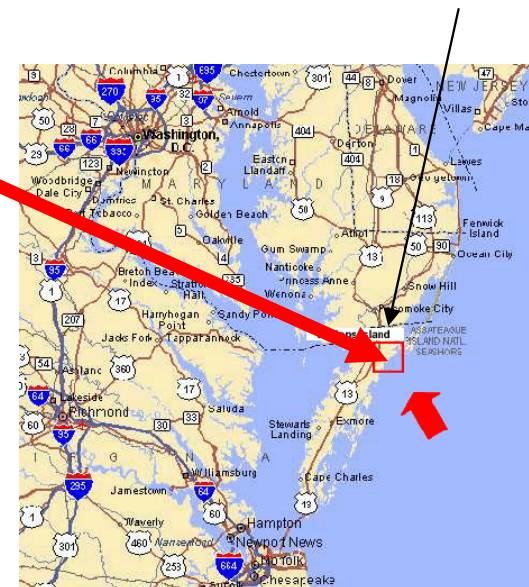
October 27-28, 2006

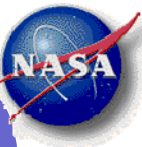


NASA Centers & Wallops Flight Facility ...



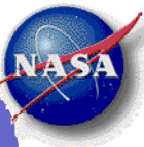
Wallops Flight Facility
Wallops Island, VA





Antarctica Balloon Launch



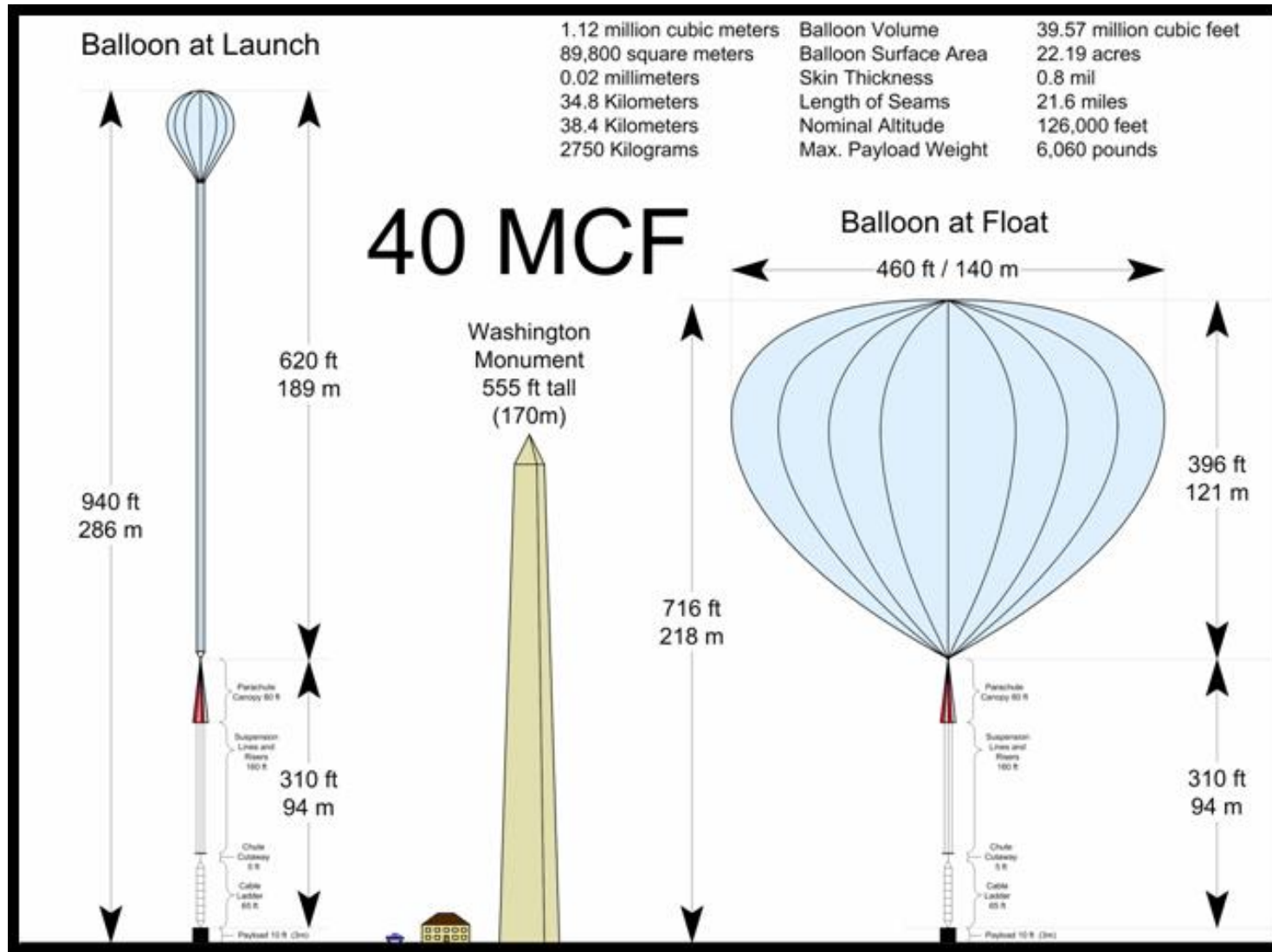


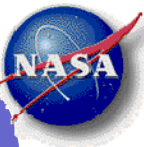
Balloon Launch Facilities in Antarctica



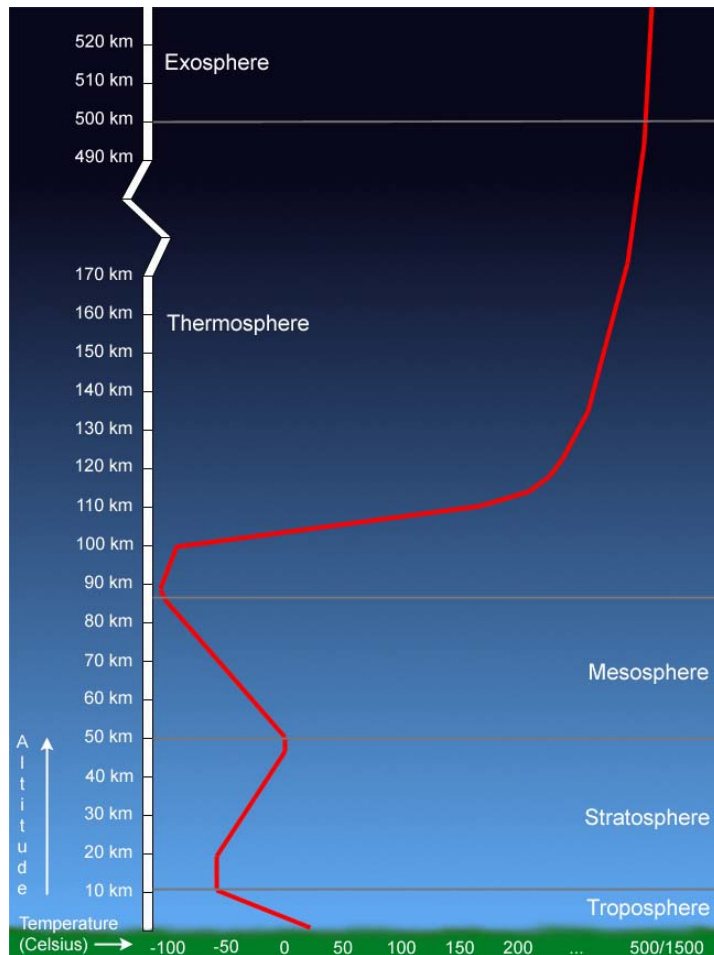


NASA's Scientific Balloons – Physical Dimensions & Size Comparison





The Earth's Atmosphere

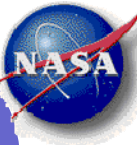


- Balloon Altitudes typically 30-35 km, corresponding to pressures of 5-10 milli-bar, residual atmosphere of 5-10 g/cm², i.e. above 99-99.5% of air mass.
- Ambient Temperatures -25 to +5 C
- Heat transfer primarily by Radiation
- Shielding effects on Cosmic Rays, X-rays, Gamma rays and UV nearly gone.

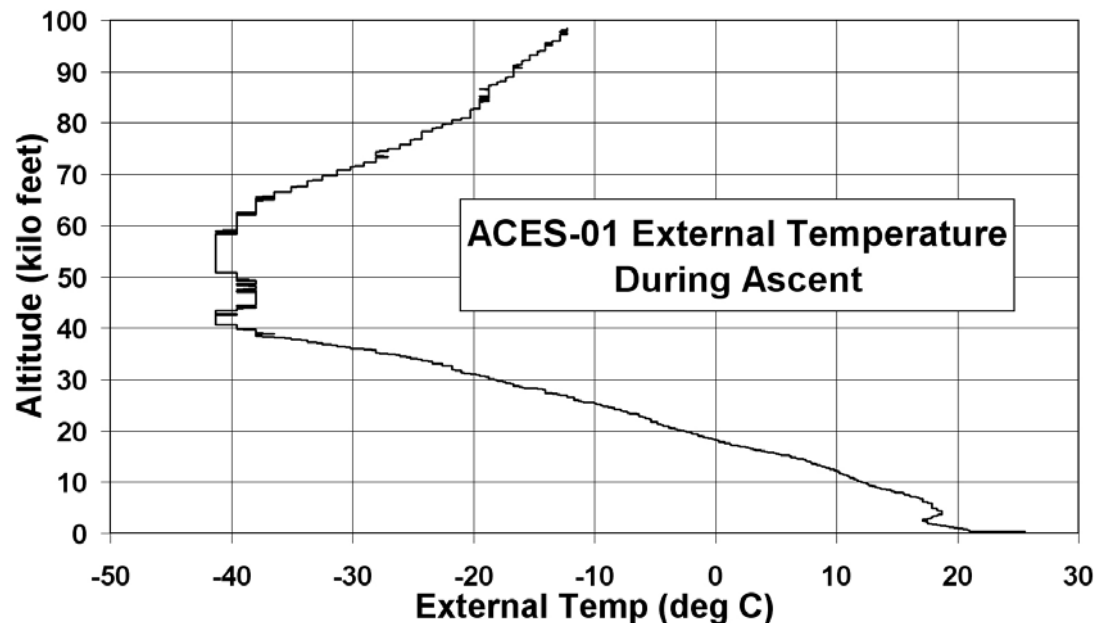
Really a Space Environment !!

Hence, ideal for use

As a test-bed for new Space Technologies
To enable important Science Observations
Other potential practical applications



Expected Flight Environment



- Gets cold at the tropopause ($\sim -50^{\circ}\text{C}$)
- Any water vapor will condense out and cause frost
- Good vacuum (< 0.02 atmosphere)
- Landing can be rough (shock, trees, rocks, dragging)
- High velocity during initial descent (~ 500 mph)



NASA's Balloon Program

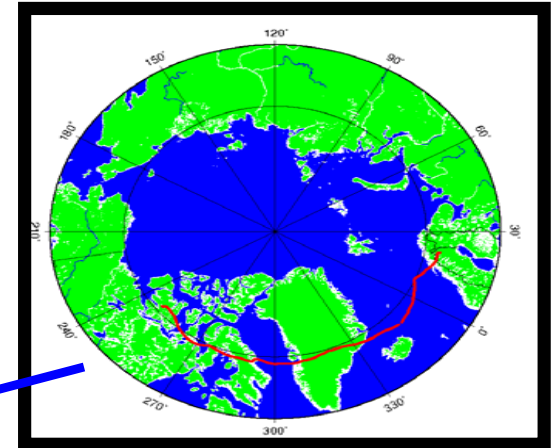
(Facts & Capabilities)

The Balloon Program provides low cost, high altitude platforms to facilitate scientific exploration

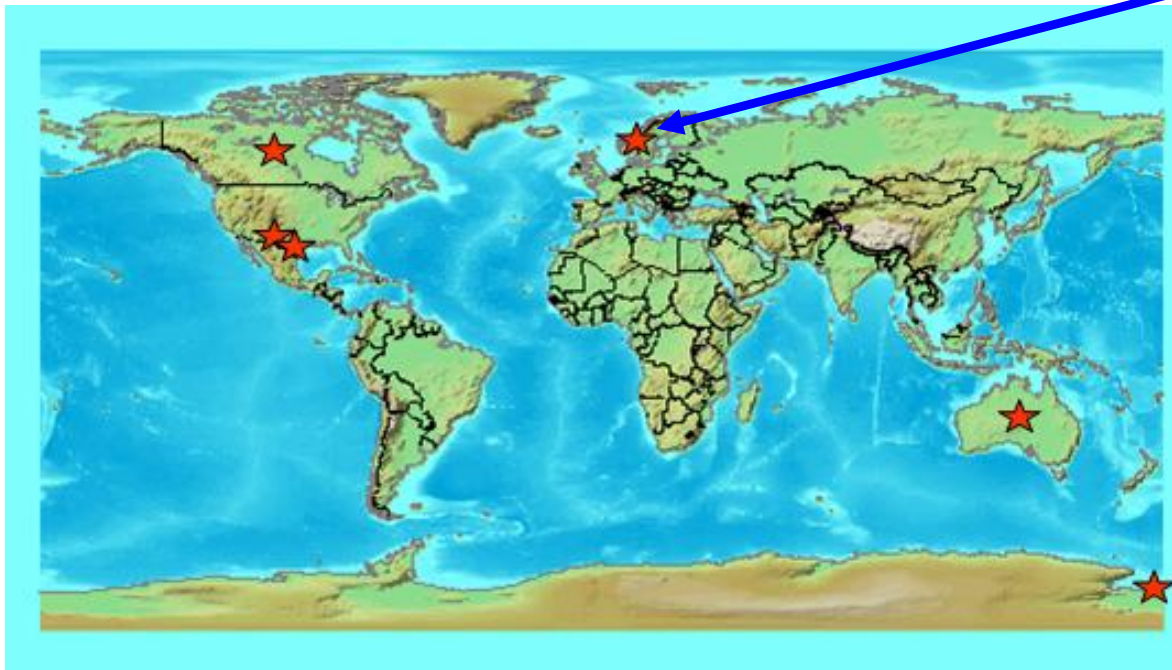
Largest balloon flown by NASA	59.6 MCF (1.7M m ³)
Highest altitude achieved by a NASA Balloon	160 k ft (4900 km)
Normal float altitude	110-130k ft (33.5-39.6 km).
Average number flown per year	20 balloons
Average duration (ZP)	12-36 hours
Longest Duration for ZP balloon (LDB)	42 days (Antarctica Dec/Jan 04)
Payload capacity	Up to 8000 Lbs. (3600 kg)

Balloon Launch Sites Around the World

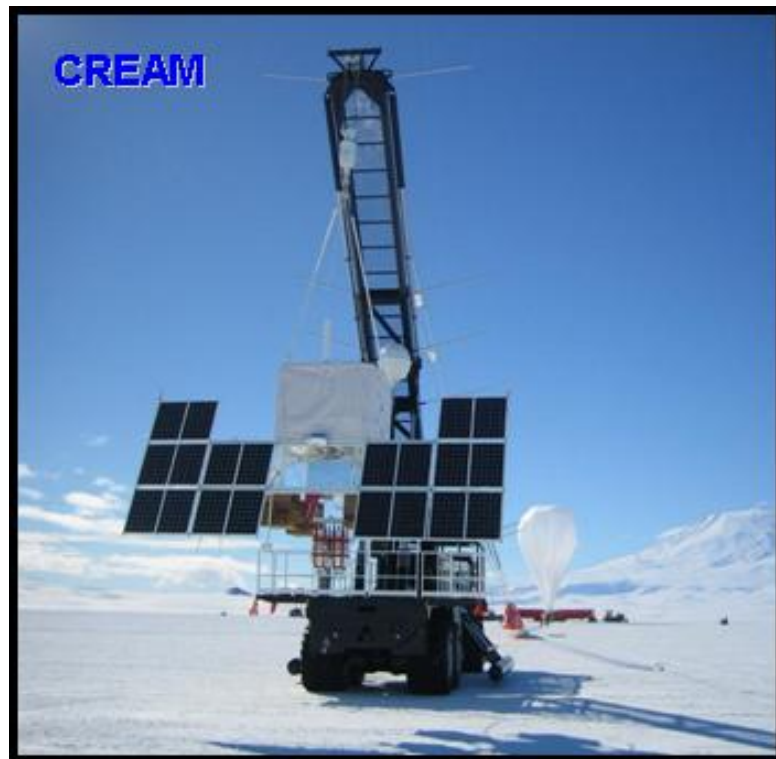
With International Overflight Approval,
Northern Hemisphere 21+ Day
Flights Could Be Achieved



**BLAST Sweden To Canada
Trajectory, June 12 to 16th, 2005**

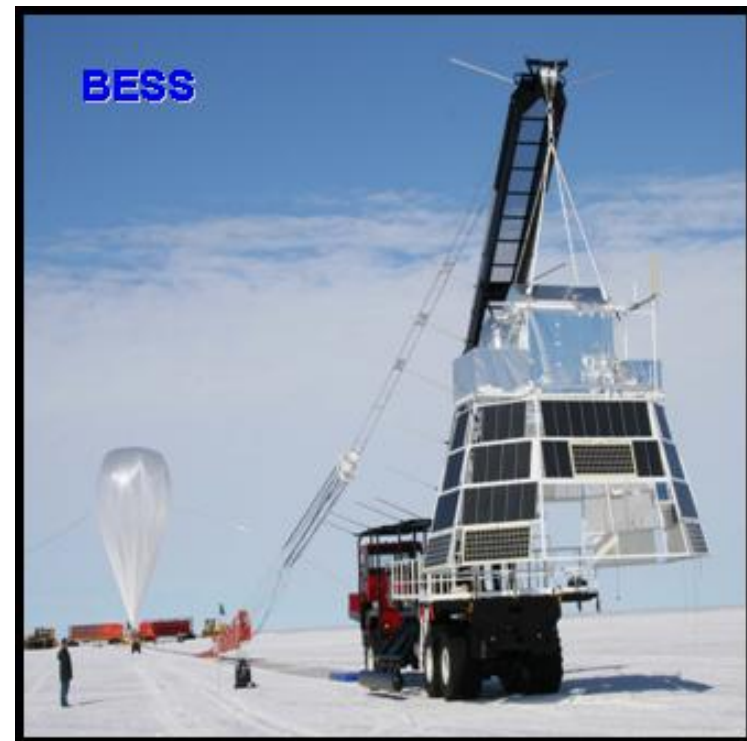


Typical Science Payloads



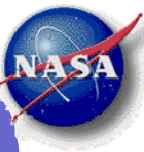
CREAM - Cosmic Ray Energetics And Mass

- Particle Astrophysics
- NASA LDB Flight Duration Record Of Over 41 Days
- Dec 16, 2004 – Jan 27, 2005

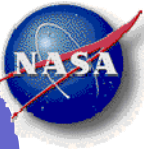


BESS – Balloon Experiment with Superconducting Spectrometer

- Particle Astrophysics
- Flown Over Antarctica
- Dec 13, 2004 – Dec 21, 2004

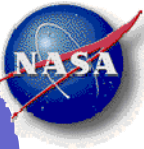


Student Opportunities



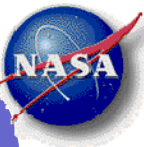
Student Access to Space

- Student access to testing in space is limited
- The Balloon Program will offer limited opportunities for space grant recipients without impact on normal operations
- Depending on need, HQ may elect to provide space grant funding for student dedicated flights
- Students will learn to prepare space qualified payloads
- Students will gain experience in space related technologies



Why Consider Balloons as an Educational Tool ?

- **Short project development cycle term (adequate for academic environment)**
- **Student involvement, education and training during all phases of a mission**
- **Fast Response to Scientific/Engineering Need**
- **Recoverable (“refurbish and re-fly”) - iterative learning**
- **Verification platform for Space Systems**
- **Affordable**



What are Students Expected to Learn ?

Technical

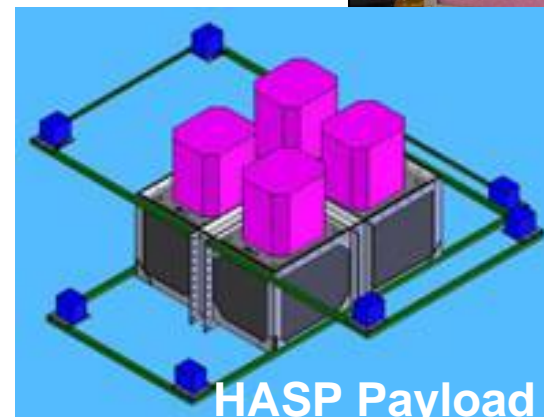
- Experiment development/design
- Fabrication
- Test and qualification for near space operations
- Troubleshooting
- Integration
- Launch/operation aspects
- Recovery and de-integration
- Data analysis
- Refurbish/Re-fly

Management

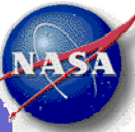
- Project management
- Project schedule and deadlines
- Milestones/Reviews
- Communication skills
- Systems engineering skills
- Documentation skills
- Presentation skills

Available Opportunities

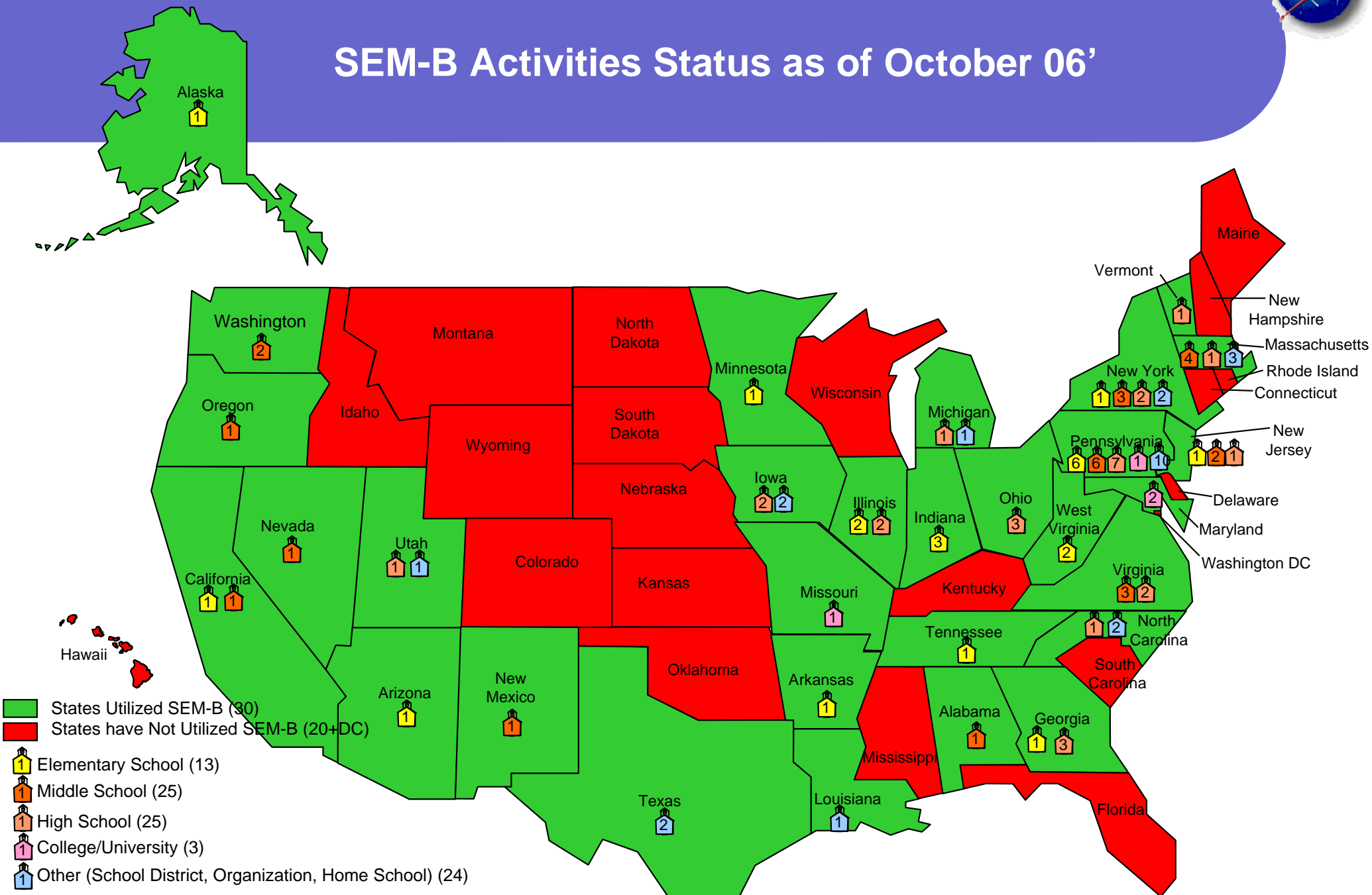
- Student Experiment*
Module (SEM-B)
- Piggy-Back*
- Cost Sharing - High
Altitude Student Platform
(HASP)
- Purchase your own flight
- **HQ Space Grant Funded**



* *Requires coordination with and approval of the Scientist (PI)*

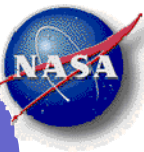


SEM-B Activities Status as of October 06'



National Council of Space
Grant Directors Meeting

October 27, 2006



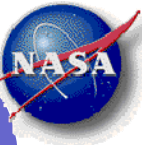
High Altitude Student Platform (HASP)

- Is a collaboration between BPO and LSU/other Louisiana organizations
 - Fully dedicated to student experiments
 - Experiment/payload funded by space grant
 - BPO provides balloon and launch support
- First flight was launched from Ft. Sumner, NM on September 4, 2006 aboard an 11.82 MCF balloon.
 - Payload weight was 1000 LBS
 - Four institutions (7 payloads) participated
 - Float altitude was 122 KFT
 - Total flight time was 18 HRS., 11 MIN.
 - Cosmo-Cam provided interactive video imaging throughout the flight.
 - The flight was an operations and science success. It exceeded all preflight minimum requirements.
- **Call for Payload for FY07 has been released, deadline is Dec. 15th, check HASP website.**

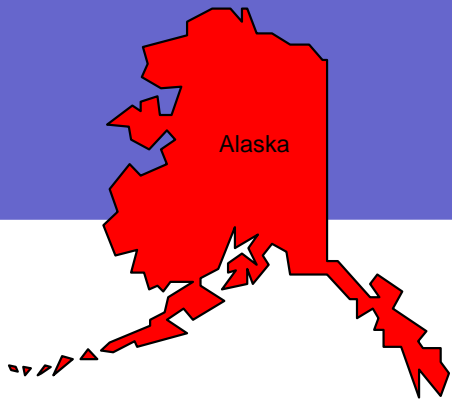


HASP Pre-launch





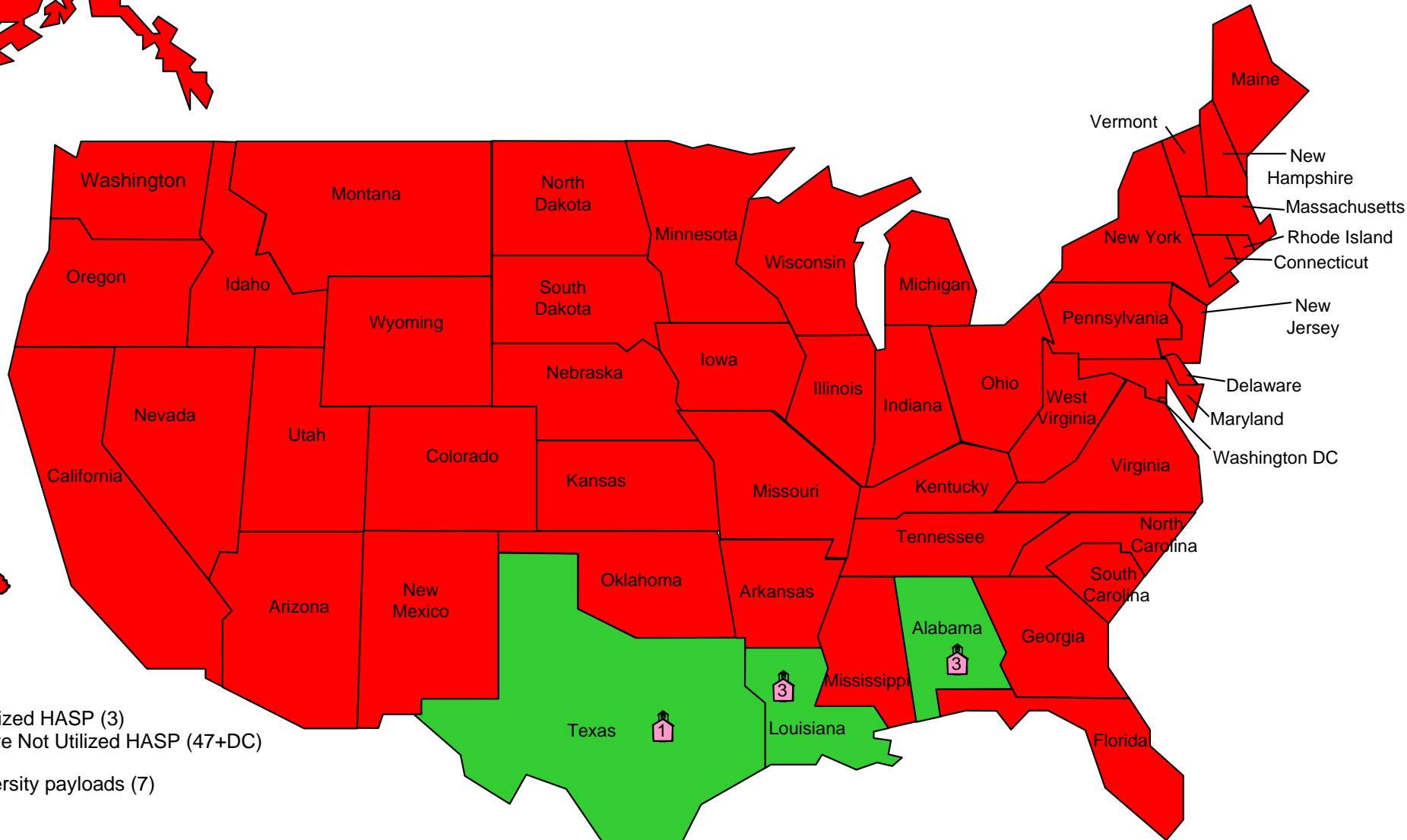
HASP Activities Status as of October 06'



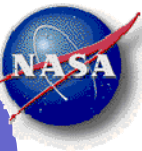
Alaska



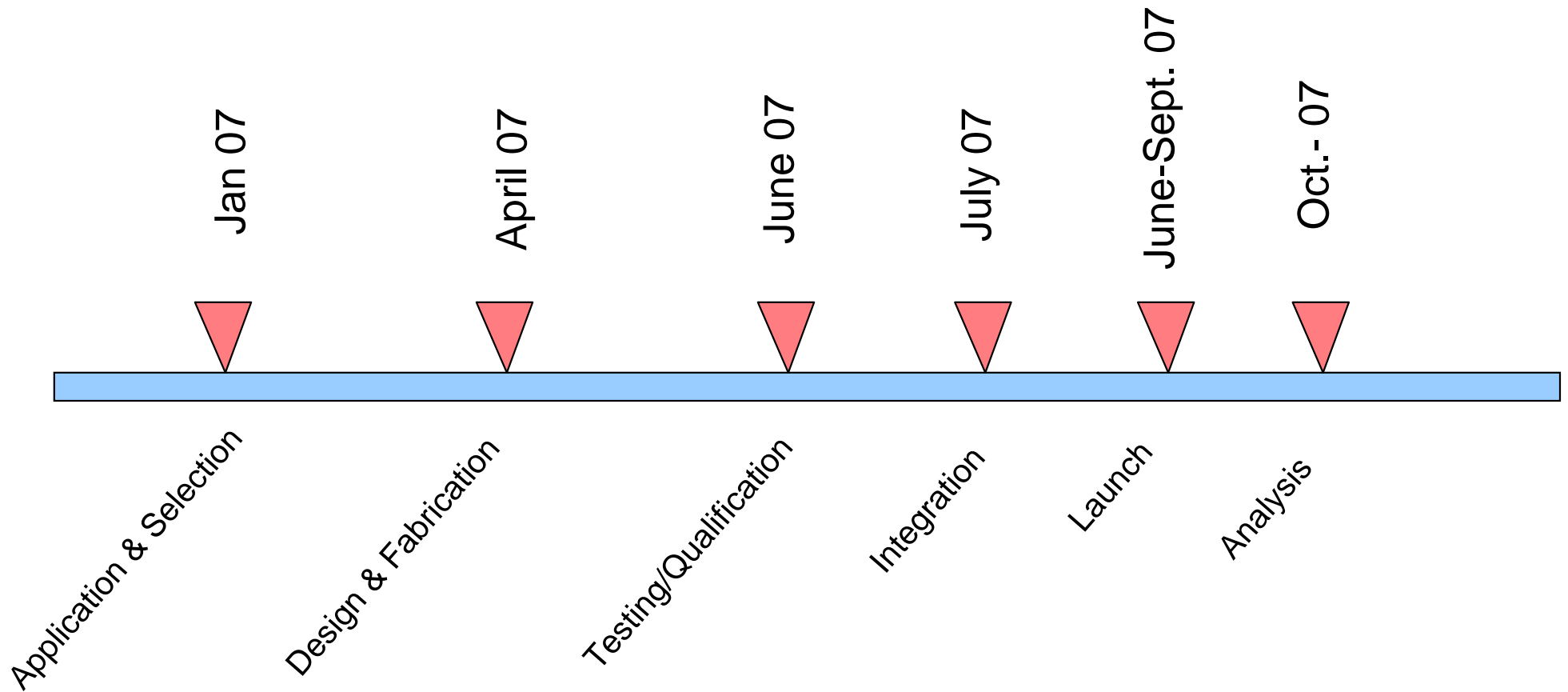
Hawaii



- States Utilized HASP (3)
- States have Not Utilized HASP (47+DC)
- College/University payloads (7)



Typical Student Payload Development & Flight Cycle





Expenses

- Participants are responsible for payload development cost and all associated logistics cost.
- Typically, payload development cost is paid for through the respective space grant program.
- Balloon Program will offer limited number of free rides (access to space) for the select participants.



How to Contact NASA's BPO ?

- Address: Wallops Flight Facility, Wallops Island, VA 23337 (Attention: Code 820)
- BPO Chief/Mr. David Pierce (757) 824-1453
- BPO Assistant Chief/Mr. David Gregory (757) 824-2367
- BPO Technologist/Outreach/ Dr. Magdi Said (757) 824-1386
- BPO Secretary/Ms. Rebecca Gramlich (757) 824-1480
- Office Fax Number (757) 824-2149
- BPO Website: www.wff.nasa.gov/balloons

For More info on HASP Contact:

- Professors T.G. Guzik and J.P. Wefel
- Dept. of Physics & Astronomy
- Louisiana State University
- Baton Rouge, LA U.S.A.

- (<http://laspaces.lsu.edu/hasp/>)
- http://laspaces.lsu.edu/hasp/documents/cfp/2006-2007/HASP_CFP_2006_v5.pdf (Application)