Program Mission

BioLaunch is a partnership between the Space and Systems Development Laboratory at Stanford University, Astronautical Development LLC and Dr. Lynn Rothschild at NASA Ames. Stanford science students from an astrobiology class are partnered with Stanford engineering graduate students to develop near-space, high altitude balloon experiments. Since it began in February of 2007, BioLaunch has flown eight balloon missions in northern California. Flights reached altitudes from 80K – 107K feet. All were safely recovered with no payload damage. The program is looking to expand to include sounding rocket and low-earth orbit missions.

NASA Spectrometer/Live DNA Samples

Dr. Rothschild flew a spectrometer to develop an ultraviolet radiation penetration profile with respect to altitude in the atmosphere. The long-term goal is to determine the height of the biosphere. She and her students also flew a variety of biological samples to characterize whether the incident radiation is sufficient to incite DNA damage.

CubeSat Near Space Testbed

BioLaunch missions allow us to test technology in a near space environment, enabling communications from the ground to altitudes exceeding 100,000 feet. The environmental effects of near space, including substantial thermal cycling and near vacuum (~.01 atm), allow us to test the overall effectiveness and robustness of our systems. BioLaunch has proven to be a valuable testbed for the SNAP-1 and Katysat programs. SNAP-1 is a modular CubeSat bus system occupying a 1U structure and providing power, communication, C&DH and a standardized payload interface. It experienced its maiden flight on B08A in March. Katysat is a payload system which has been designed to bring interactive space into K-12 classrooms. Katysat will take pictures in space, transmit data and telemetry, and. Katysat has flown on 3 BioLaunch missions.

B08A Payloads

- Ftu/GPS Logger Alpha
- NASA Payload
- Beeline (2m)
- Beeline (70cm)
- SNAP
- Minicam/Beeline
- PearlSats
- APRS
- GPS Logger Beta

B08A Flight Profile

- Launch Site: 38°17'23.89"N, 121°20'12.42"W
- Average Ascent Rate
  Predicted: 1000 fpm
  Actual: 1400 fpm
- Burst Altitude
  Predicted: 107,000 ft
  Actual: 106,952 ft
- Landing Site: 37°20'26.30"N, 120°28'36.07"W

B08A flight trajectory plotted on Google Earth with onboard GPS Data

Live Streaming HD Video

- The HD Camera System is designed to record both HD video and high-resolution still images. In addition it is designed to stream live HD video to the mobile ground station. The HD video system has flown on two BioLaunch missions, and is currently in a redesign phase in preparation for our next flight.

Closed Loop Tracking

One of the problems that has been encountered in the development of the HD Streaming Video system has been maintaining a closed communications link throughout flight. Due to the narrow beam properties of the high gain receiving antennas used, the flight package must be closely tracked throughout flight. Early auto-tracking systems we have developed were based on GPS location beacons, and lacked a sufficient refresh rate to maintain the required pointing accuracy. Currently we are developing a closed loop tracking system which makes use of a low power microwave beacon on board the flight package. The tracking system then uses a system of horn antennas, signal strength indicators, and comparators to optimally point towards the beacon, thus driving the Az-EI controller. This eliminates the need to accurately point and calibrate the rotor system in the field, as necessary for GPS location tracking.

Departmental Collaborations

- Solar Sail
- GPS Research
- Stanford High Altitude Glider Group
- Youth Educational Outreach in partnership with CSA and Professor Bob Twiggs.

Current Development

- Dynamic Stabilization
- Auto Tracking
- Internet data distribution
- Black Rock Launch
- Stanford High Altitude Glider
- Stanford Lunar X Rover

Acknowledgments

Many special thanks to Matt Munizquez and Kevin Brown for their countless hours of volunteer support for this program. Also thanks toStratfox for their continued tracking and communications support for our missions.

Further Information

Further information can be found online at http://biolaunch.stanford.edu

B08A Predicted (blue) and actual (green) Flight Trajectory

Picture of San Francisco and Point Reyes from 80K ft.

Our 7th balloon flight launched from Galt, CA in March of 2008

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