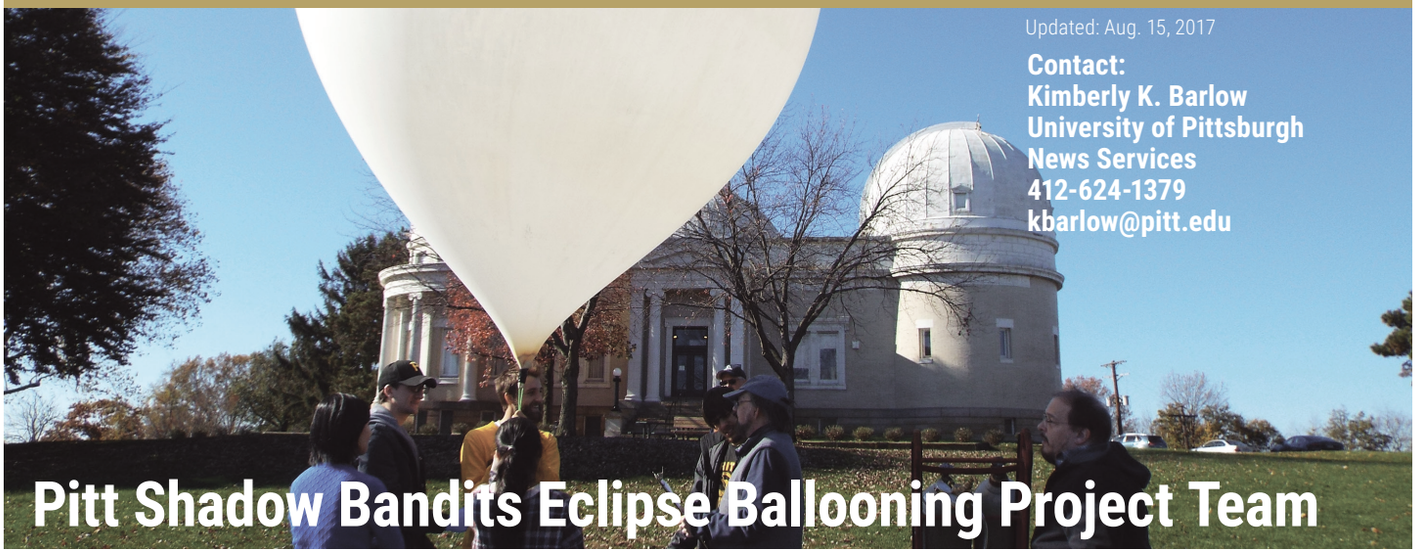

Updated: Aug. 15, 2017

Contact:
Kimberly K. Barlow
University of Pittsburgh
News Services
412-624-1379
kbarlow@pitt.edu

Pitt Shadow Bandits Eclipse Ballooning Project Team

The Pitt Shadow Bandits team is conducting research during the Aug. 21 Solar Eclipse Across America as part of NASA's Eclipse Ballooning Project. Nearly 60 teams of students across the nation are participating.

Teams will launch high-altitude balloons from locations in the path of the total eclipse. Cameras on the Eclipse Ballooning Project balloons will stream live video of the total solar eclipse from above 99 percent of the earth's atmosphere — available to anyone with internet access.

The project provides the first-ever opportunity to view the total solar eclipse live from the perspective of near-space as the path of totality moves across the North American continent.

The Pitt team, aptly named the Shadow Bandits, will also use light-sensitive photodiode arrays on the ground and aloft to investigate the nature of the phenomena known as shadow bands.

The project is sponsored by the NASA Science Mission Directorate and individual NASA Space Grant Consortia, including the NASA Pennsylvania Space Grant Consortium.

WHO ARE THE PITT SHADOW BANDITS?

Team members are:

Pitt faculty: Of the Dietrich School of Arts and Sciences Department of Physics and Astronomy: Dr. Russell Clark, Dr. Sandhya Rao and Dr. Dave Turnshek, director of the Allegheny Observatory. Of the Swanson School of Engineering Department of Mechanical Engineering: Dr. Jeffrey Vipperman.

Pitt staff: Louis Coban, Allegheny Observatory technician.

Pitt students: Sinjon Bartel of Allentown; Grace Chu of Newtown; Aimee Everett of Glenshaw; Marshall Hartman (spring 2017 Pitt mechanical engineering graduate) of Baldwin; Janvi Madhani of Allentown and Carlos Vazquez of Pembroke Pines, Florida.

Spring term only: Evan Becker of Doylestown and Emma Harvey of Scottsdale, Arizona.

WHERE IS THE PITT SHADOW BANDITS TEAM BALLOON LAUNCH SITE?

The team will launch its balloon from a location just north of Springfield, Tennessee, on Aug. 21.

WHAT HAPPENS DURING THE BALLOON FLIGHT?

The balloon will rise to the edge of the earth's atmosphere — reaching an altitude of between 85,000 and 105,000 feet. The payload will be cut from the balloon and parachute to earth. Using GPS, the Pitt Shadow Bandits team will retrieve the payload where it lands.

HOW LONG IS THE FLIGHT?

The balloon takes about 1.5 hours to rise to the edge of the earth's atmosphere. The payload takes approximately a half-hour to parachute to earth.

HOW BIG IS THE PAYLOAD?

It weighs approximately 12 pounds and the payload string extends about three stories long.

WHAT'S IN THE PAYLOAD?

The payload includes streaming video and still-frame cameras, temperature sensors and GPS tracking systems, controlled by lightweight Raspberry Pi computers.

In addition, the payload includes photodiode arrays that, in conjunction with arrays on the ground, will aid in the team's investigation of the phenomena known as shadow bands.

More specifically, the payload includes:

7 Raspberry Pi microcomputers

13 cameras (8 of which are on a horizontal ring for a 360-degree view of the sky)

4 photodiode light sensors with custom-built electronics to interface with the Raspberry Pi computer

1 balloon cut-away system that is triggered by altitude

1 balloon cut-away system that can be triggered remotely through the internet

1 Iridium internet modem

1 Ubiquity radio modem (which sends streaming video to the ground station dish antenna)

WHAT ARE SHADOW BANDS?

Pitt faculty member Russell J. Clark of the Department of Physics and Astronomy explains:

Shadow bands are phenomena that have been observed in previous total solar eclipses. They appear as ripples or changes in the light intensity that move across the landscape in the moments just before and after totality, when the moon completely covers the sun.

It's difficult to capture images of these shadow bands because changes in light intensity are estimated to only be about 1 percent, but they look very much like the turbulence that you see around a candle flame. Atmospheric turbulence is visible when you look at smaller sources of light like stars — which is why stars appear to twinkle. When the moon obscures most of the sun just before totality, leaving only a thin sliver, the turbulence becomes visible.

HOW WILL THE TEAM STUDY SHADOW BANDS?

Says Clark: The prevailing theory is that shadow bands are just atmospheric turbulence that is always present, but usually not visible due to the sun.

However, no one has yet confirmed this theory. We plan to place identical arrays of sensitive light detectors, called photodiodes, on the ground and on our balloon payload to sense the variations in light levels expected for shadow bands.

The balloon will be above 99 percent of the atmosphere at the time of the eclipse, so if the ground-based array "sees" shadow bands but the balloon array does not, that will support the theory that shadow bands are atmospheric in nature.

However, if the shadow bands are observed both on the ground and on the balloon, it will indicate that they are not just atmospheric turbulence.

HOW CAN I VIEW THE BALLOON LIVE STREAM?

The balloon flights (including test flights) will be live-streamed. To view go to: http://eclipse.stream.live/

Under "Meet the Teams" click on "Pitt Shadow Bandits."

Or: https://stream.live/-/embed/brand/7d82c723-b9dd-4827-9a31-1b6752d544dd/player/f96f808b-878e-4802-8e52-e968a668a461.

CAN THE ECLIPSE BE SEEN IN PITTSBURGH?

Only a partial solar eclipse will be visible. In Pittsburgh, the eclipse will begin at 1:10 p.m. It will reach its maximum, covering 81 percent of the sun, at 2:35 p.m. and will end at 3:55 p.m.

HELPFUL LINKS:

Pitt's Allegheny Observatory: http://www.pitt.edu/~aobsvtry/

Pennsylvania Space Grant Consortium: http://sites.psu.edu/paspacegrant/project-pages/solar-eclipse-2017/

NASA Eclipse site: https://eclipse2017.nasa.gov/

Eclipse Ballooning Project: http://eclipse.montana.edu/teams/