

Abstract Submitted  
for the 4CF10 Meeting of  
The American Physical Society

**Flight Dynamics of High Altitude Research Balloons** IAN SOHL,  
Weber State University — Dramatic motions have been observed by instrumentation loaded in payloads attached to high altitude weather balloons. Several HARBOR flights have been completed with six-axis attitude sensors and a high definition video camera that allowed us to analyze the balloon's motion. Turbulence in the atmosphere, especially near the jet stream, results in dramatic oscillations—sometimes swinging the payload above the balloon. Other unexpected motions include rapid spinning (as in a barrel roll) of the entire package. We are correlating these motions with observed atmospheric conditions and addressing issues related to payload safety, mission tracking, and recovery. Also of interest are the dynamics of balloon rupture at low atmospheric pressure and the response of the parachute recovery system to that environment. HARBOR (High Altitude Reconnaissance Balloon for Outreach and Research) is a program in which scientific payloads are designed, constructed, and flown by students using weather balloons to reach the edge of space. These flights are similar to the hundreds of weather balloons launched twice a day by the National Oceanic and Atmospheric Administration for which very little is actually known about the flight dynamics.

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Date submitted: 10 Sep 2010

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