

## Summary Report

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# Starting Student Hardware Programs Workshop

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## Workshop Highlights

The workshop was attended from June 12-14, 2003 on the campus of the University of Colorado, Boulder, CO. The primary function of the workshop was to introduce attendees to the possibilities of starting a student program aimed at building and flying low-cost satellites from helium balloons into near space (~90,000 to 100,000 feet elevation). Attendees formed teams consisting of 3 persons and each team constructed a small, 10 cm x 10 cm x 10 cm cube that contained the following sensors/equipment:

- Internal and external temperature probes
- External atmospheric pressure (corrected to read altitude)
- 2 solar cells providing voltage readings
- 1 camera

The balloon I flew on developed a hole at 46,000 feet and was a failure from the standpoint of reaching near space. Other balloons flew up to 101,000 feet.

My intension is to take information learned at the workshop and develop a freshman engineering design project to be run in GE 115, Professionalism in Engineering and Science, during the upcoming academic year. Student teams, consisting of 5 members, will design a smaller version of the balloon sats that were flown at the workshop and fly them at about the 2/3rds point of the semester, analyze the data, and prepare a technical report describing the design methods used, the flight, and the data analyses. For AY 2004, the satellites will focus primarily on acquisition of a temperature profile (due to cost). The balloon will also fly 1 pressure probe, solar cells, and camera, with the data to be distributed to all teams.

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Equipment required for this includes:

- Acquisition of ham radio equipment for tracking balloon location during and after the flight
- Acquisition of a ham radio operators license
- GPS to feed lat-lon to ham radio and send signal to ground receiving station
- Balloons, fill kit, and supporting equipment
- Hardware for the satellite construction (potential of 80 total teams over 2 semesters)

GE 115 lab fees, paid by students, will be able to cover most of these costs (cost analysis yet to be performed).

It is our intension of developing a sustained balloon sat effort at SDSM&T for the purpose of flying scientific experiments such as basic temperature, pressure sensors, cameras (moving to digital cameras), solar cells, panels, etc. Potential exists for flying other types of instruments such as IR probes, IR cameras, various RS probes, gravitation equipment, atmospheric chemistry probes, etc. Other uses of these projects could, and should, include local K-12 schools.

Any interest and/or support from SD Space Grant Consortium would be welcomed. I am available for any future discussions about launching such a program at SDSM&T.

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