Updates on the Purdue Sub-Orbital Student Experiment Program for 2013

Steven H. Collicott

School of Aeronautics and Astronautics, Purdue University,

701 W. Stadium Ave., West Lafayette, IN 47907-2045, collicott@purdue.edu.

Introduction:

An undergraduate design-build-test class, "AAE418 Zero-Gravity Flight Experiment" was created in the School of Aeronautics and Astronautics at Purdue University to maximize the benefits to students when they participate in the annual NASA RGSOP program. This class has now been expanded to include designing, building, and launching small automated undergraduate sub-orbital experiments. Experiments have been launched on numerous Armadillo test flights since December, 2009. An experiment for Masten test flights is revised and ready to fly. An experiment for XCOR is in development, on schedule.

Activities since February 2012:

In February 2011 an agreement was reached with XCOR for a small student-built atompsheric sampling experiment for one of the aft payload compartments. Size and mass limits are listed in XCOR's pPayload Users Guide. Students in the author's AAE 418, "Zero-Gravity Flight Experiment" class in the fall 2011 semester performed preliminary design work. Students in Aviation Technolgoy are fabricating a custom carbon-fiber experiment can as part of one of their classes. A functional experiment prototype was prepared in May 2013. Refinement, testing, and calibration will proceed then through flight testing.

Several Armadillo launches since February, 2012 carried our experiment. The latest is SPEAR-7 for "Students of Purdue Experimenting on Armadillo Rockets", the seventh launch. This experiment isroughly



Figure 1. The student-built SPEAR-7 mounted in the Armadillo SITG-2 rocket before the January, 2013 flight at the vertical launch facility at Spaceport America.

the size of a shoebox and approximately 6kg mass. SPEAR-8 is a slightly modified version of SPEAR-7 to permit use of trigger signals and power from the rocket. SPEAR-8 launch date is not set as of this writing.

In June, 2011 an expeirment was delivered to Masten Space Systems. IMPRESS-1 (Innovative Masten-Purdue Rocket Experiments by StudentS) is a riskreduction step for a possible third generation of the Vane Gap experiment presently in ISS. This device, shown in Fig. 2, awaits launch. It was returned to Purdue for camera updates while awaiting laucn and is now ready to launch again.

Purdue students in AAER418 are now contributing to the design and fabrication of a payload for NASA-FOP flights on the High Altitude Shuttle System (HASS) from Near Space Corporation. This is a glider, dropped at 100,000ft from a balloon, with which the ability to fly low-g parabolas in the upper stratosphere is being investigate.

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Figure 2. The student-built IMPRESS-1 experiment awaiting launch with Masten Space Systems. The fluid dynamics hardware in the foreground resides in the box that is visible in the background.