LOUISIANA AEROSPACE CATALYST EXPERIENCES FOR STUDENTS (La ACES)

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OUTLINE

- FIRST HALF (*Kevin Stokes*)
  - What is La ACES?
  - How does it work at UNO?

- SECOND HALF (*Nick Studer*)
  - La ACES Student Project 2012-2013

INTRODUCTION

- LaACES – Scientific ballooning program for undergraduates
- Funded by Louisiana's NASA Space Grant Consortium (LA SPACE)
- Students design, build, test and fly an experiment of their choice on a high-altitude weather balloon.
- Project spans two semesters.
- Includes undergraduates across all STEM fields of study.

HIGH ALTITUDE BALLOON-BASED MEASUREMENTS

NASA (and others) have used high-altitude sounding balloons for decades

- Weather and atmosphere-related measurements
  Identification and monitoring of CFC and chlorine monoxide radicals in the stratosphere, CO_2, O_3
- Astrophysical observations
  Early maps of anisotropies in the Cosmic Microwave Background, first identification of antiprotons in cosmic rays, detection of γ rays from supernova 1987A, blackhole x-ray transients.
- Test and certify space-flight hardware
  Compton Gamma Ray Observatory (CGRO) , Ramaty High Energy Solar Spectroscopic Imager (RHESSI) , Cosmic Ray, Isotope Spectrometer on the Advanced Composition Explorer (ACE) , Wilkinson Microwave Anisotropy Probe (WMAP)

LaACES OBJECTIVES

- The primary objective is to give students the opportunity to engage in a practical scientific investigation involving design, construction, project management, testing, calibration, data analysis, documentation and presentation of results.

STUDENT LEARNING OUTCOMES

- Understand the procedures for designing a scientific experiment.
- Analyze data with appropriate treatment of errors and uncertainties, and form conclusions based on the data and analysis.
- Develop a project management plan and adhere to deadlines.
- Use the tools and techniques of electronics with a basic level of proficiency.
- Locate and use scientific and technical information.
- Document research and development and write technical reports.

IMPLEMENTATION

La ACES is a two-semester program:

- First semester
  - Instruction lecture/activities (Experiment design, scheduling, project management, electronics, programming, sensors, atmospheric science, heat transfer, etc…)

- Second semester
  - Design
  - Build
  - Test
  - Fly

STUDENTS

- Open to any STEM major
- Team size 3-5 students (limited by funding)

PROJECTS

- Science driven
- Student led

PROJECT EXAMPLES

EXPERIMENTS TO MEASURE

- Pressure, temperature, and relative humidity
- Earth's magnetic field
- Ozone as a function of altitude
- Speed of sound
- Electrical conductivity of the atmosphere
- Electric field
- NOx gases
- Cosmic ray intensity
- Efficiency of thin film and flat panel solar cells
- UV radiation
- Acceleration due to gravity
- Neutron flux

BALLOON PROJECT

- Project run like a NASA project
- Plans, milestones, deliverables, etc..
- A lot of NASA-like documentation
  - Preliminary Design Review (PDR)
  - Critical Design Review (CDR)
  - Flight Readiness Report (FRR)
  - Flight Readiness Presentation
  - Science Presentation

RELATED PROGRAMS

- HASP – High Altitude Student Platform
- HASP includes a standard mechanical, power and communication interface for the student payload, based upon a flight tested design.
- 36 kilometers with flight durations of 15 to 20 hours
- Competitive: student teams write a proposal