

**5-year Plan: 2005--2010**  
**Thunderstorm and Lightning Program**  
**for NASA's New Mexico Space Grant Consortium**  
**William P. Winn, New Mexico Tech, 2004 July 23**

1. What the program is doing:
  - (a) The objective of this program is to develop instruments to understand thunderstorms and lightning and to deploy those instruments at Langmuir Laboratory for Atmospheric Research, whose primary focus is to study the thunderstorms that form over the Laboratory.
  - (b) Funding from the New Mexico Space Grant Consortium increases the number of college students who can participate in this program. The experience that students gain by doing field research on natural phenomena is an important complement to their formal education.
  
2. What we hope to accomplish:

During the next 5 years we will be constructing and perfecting instruments to find out what electrical charge is carried by branches of lightning that propagate inside thunderclouds. Two instruments are under development for this study:

  - (a) A balloon-borne instrument to measure rapid changes in the electric vectors that occur when lightning channels pass by the instrument.
  - (b) A Lightning Mapping Array (LMA) that shows where and when lightning propagates and branches inside thunderclouds.
  
3. How the program aligns with NASA's Strategic enterprises:
  - (a) On January 14 President Bush announced that NASA would be reoriented toward the exploration of the Moon, Mars, and other bodies in the solar system. Optical and radio-frequency sensors have led to reports of lightning on Venus, Jupiter, Saturn, and Uranus. In addition, arguments based on the presence of dust storms on Mars support the existence of lightning on Mars. [ J. C. Kolecki and G. A. Landis, Electrical Discharge on the Martian Surface, <http://powerweb.grc.nasa.gov/pvsee/publications/marslight.html> Thus it is likely that studies of lightning will be a part of the future explorations, and a better understanding of lightning on Earth will help interpret the results of measurements away from Earth.
  - (b) Lightning on earth continues to be a hazard to NASA operations on Earth, such as rocket launches at Kennedy Space Center in Florida. Instruments of the sort we build to detect the growth of electrical energy in thunderstorms will continue to be useful for advance warning of the lightning.

4. How the program aligns with NASA's education plan:  
In NASA's education plan [NASA document EP-1998-12-383-HQ, NASA Implementation Plan for Education 1999--2003], our contribution will be in the category of customers within the Earth Science Enterprise. Specifically, we will contribute in the education categories of Student Support and Research and Development.
  
5. How the program will be evaluated:  
The Thunderstorm and Lightning Program will be evaluated by
  - (a) the number of students participating in the program,
  - (b) the caliber and utility of the instruments developed, and
  - (c) the contribution of the Program to NASA's pursuit of the understanding of lightning on Earth, Moon, and other planets.