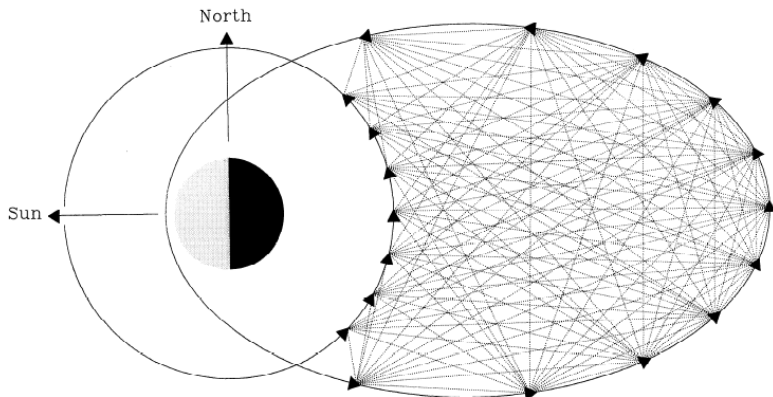


NSF and small satellites



Dedicated nanosats and cubesats, especially in swarms, have the potential to make critical global atmospheric and space weather measurements (plasma density, magnetic and electric fields, and neutral



One example:

Tomographic imaging of the magnetosphere would be a revolutionary technique for providing the data needed for data assimilative space weather models

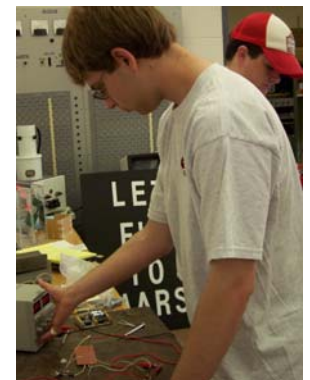
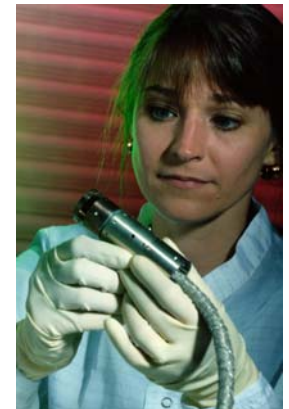


Learning



Students at the summer 2006 CubeSat Workshop at USU

- The educational element of a small satellite program is extremely compelling
 - There is a critical need for a means to train the next generation of space scientists and engineers involving hands-on experience with space hardware - in a reasonable time frame (within the interval of a college education)
- One example of student interest in building satellites is the CubeSat (10 cm on a side)
 - over 60 universities and one high school (the Thomas Jefferson School of Science and Technology in Annandale, Virginia) participate in the CubeSat program
- More than a dozen universities are interested in building scientific instruments that can be flown on more powerful nanosats (10 – 20kg)



Infrastructure

- Until recently the cheapest “ride” into space on a US rocket was the Pegasus (\$27M) or a Minotaur (formerly an ICBM known as the Minuteman – about \$20M).
- SpaceX is testing a rocket, the Falcon 1, which can carry 500 kg into LEO. The cost is \$6.7M per launch. There are 2 or 3 additional competitors trying to achieve a similar capability at the same or lower cost.
 - Each Falcon launch vehicle can carry multiple nanosats (2) and cubesats (30 to 50).
- The DoD Space Test Program can help schedule very low cost “rides” as secondary payloads.
- Many other secondary payload opportunities exist.



Falcon 1

The way ahead

- **Partnerships**
 - **ONR is very interested. AFOSR and DARPA are also possible partners**
- **NSF (ATM) will sponsored a workshop in 2007 to investigate the scientific potential and cost of launching, operating and accessing the data from cubesats, nanosats, and other small satellites**
- **NSF share of a vibrant program would be about \$5M to \$10M**
- **Disciplines other than atmospheric science (earth science, ocean science) would be welcome.**
- **Iridium replacement – needs definition of instruments.**

