



*Air Force Association  
Los Angeles  
National Symposium*

**General Bruce Carlson  
18 November 2005**

*Integrity - Service - Excellence*

# Global Battlespace



**Khobar Towers**

**1996**



**US Embassies**

**1998**



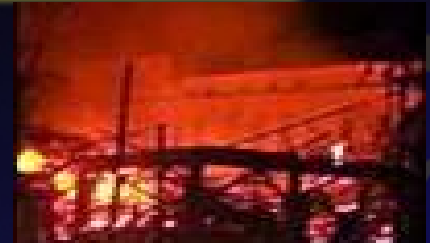
**USS Cole**

**2000**



**WTC/Pentagon**

**2001**



**Bali**

**2002**



**Madrid**

**2004**



**London**

**2005**



**Jordan**

**2005**



# Warfighters In The Battlespace

## U.S. Warfighters...



# Space Scholars Program

- *The Best and Brightest* Science and Engineering Students from the United States
- Performing *Cutting-Edge Research* at AFRL Laboratory Facilities
- *Summer Laboratory Internship* Geared to Current and Future Air Force Technology Needs
- *Mentored* by World-Renowned AFRL Researchers

***Train, Nurture, and Mentor the Nation's Future Scientists & Engineers While Performing Research of Significance and Value to the Air Force***

# Scholars Summer Seminar Series



**Mr. Elon Musk, founder of  
Paypal, CEO and CTO,  
Space-X Corp (2005)**



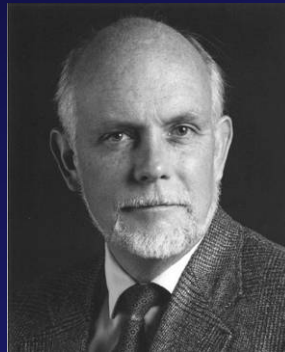
**Prof. Steven Chu,  
Stanford, Nobel  
Laureate Winner in  
Physics (2003)**



**Prof. Neal Lane, Rice  
University, former director  
of NSF, former Science  
Advisor to President Bill  
Clinton (2005)**



**Prof. Daniel Hastings, MIT,  
Former Chief Scientist of  
USAF, Current Chair of USAF  
Scientific Advisory Board  
(2005)**



**Prof. Richard Smalley,  
Rice University, Nobel  
Laureate Winner in  
Physics (2003)**



**Prof. C. C. Yang, National  
Taiwan University (2005)**

# Space Scholars Program History

Year	Total # Students	Graduate Students	# Universities	# Hired to Date (civ/on-site ktr)
2000	22	5 (22%)	20	2/1
2001	20	2 (10%)	11	0
2002	29	17 (58%)	25	2
2003	30	19 (63%)	19	1
2004	26	19 (73%)	24	1/1
2005	41	28 (68%)	33	1*

\* = co-op



2001



2002



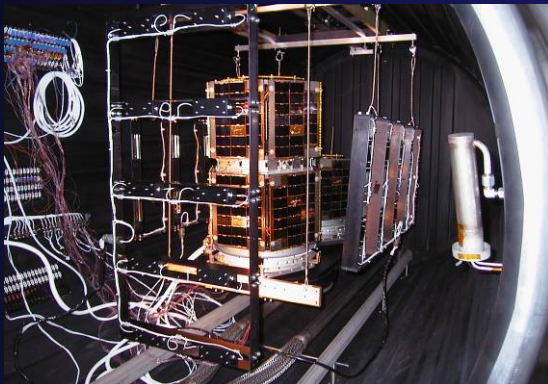
2003



2005

# University NanoSat Program

- **College Undergrads and Grads at Multiple Universities**
- **Satellite Design and Fabrication Competition**
- **Objectives:**
  - **Develop the Next Generation of Space Professionals with Hands-On Training and Experience**
  - **Develop Small Satellite Technologies**
  - **Provide Insertion Opportunities for Space-Demonstration of Innovative New Technologies**



# NanoSat Participating Universities

Utah State University (UT)

Worcester Polytechnic Institute (MA)

Michigan State University (MI)

Washington State University (WA)

New Mexico State University (NM)

University of Colorado at Boulder (CO)

Arizona State University (AZ)

Taylor University (IN)

University of Hawaii (HI)

University of Texas – Austin (TX)

Michigan Tech (MI)

Pennsylvania State University (PA)



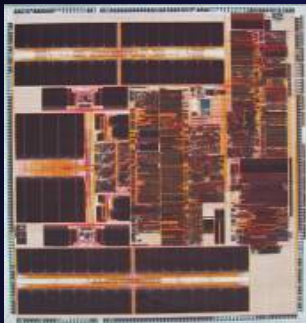
# Military Educational Institutions

- **Air Force Institute of Technology**
  - Two Research Projects Funded in Reconfigurable Space Electronics and Responsive Space
- **Naval Postgraduate School**
  - Sponsored Space Control Satellite Design Project
- **Air Force Academy**
  - Funding Provided to Support Physics and Astronautics Department to Build Space Qualified Environmental Sensors for FalconSAT 2, 3, and 4
  - Collaboration Allows for Ride-Share Opportunities for AFRL Space Vehicles' Technology /Payloads



# Improved Space Computer Program

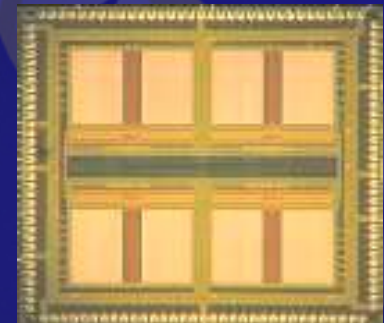
- Provide Next Generation of High Performance On-Board Space Electronics
  - Decreasing Size, Weight, and Power Requirement
  - Improving Scalability
  - Maintaining Radiation Hardness Levels
- Significant Improvements in Space Computing Capabilities...Now!



**RAD750**



**Next Generation Space Processor**



**C-RAM NV Memory**

# Improved Space Computer Program

## Space Computer Insertions

### Contracted

	<u>Launch Date</u>
• <i>Deep Impact</i>	<i>Jan 2005</i>
• DUO	'05-'06
• EO-3 Gifts	'05-'06
• Mars 05 MRO	'05-'06
• NextSat	'05-'06
• N-FIRE	'05-'06
• NPP	'05-'06
• ST-7	'05-'06
• Stereo / SECCHI	'05-'06
• Wise	'05-'06
• XSS-11	'05-'06
• AEHF (Payload)	'06-'08
• AMS - Bus	'06-'08
• GLAST, GIFTS	'06-'08
• HST	'06-'08
• JWST	'06-'08
• Kepler	'06-'08
• NPP, NextView	'06-'08
• Orbital Express	'06-'08
• SDO, SIM	'06-'08
• ST-3, 7	'06-'08
• NPOESS VIIRS	'07
• Military Support Program	Restricted

• LYNX	Restricted
• ST-8 NMP	'07-'08
• NPOESS/ABI	'12-'22
• Classified ( <i>7 Programs</i> )	'06-'08

### In Planning

	<u>Launch Date</u>
• AEHF 4/5	'06-'08
• CloudSat, Discovery	'06-'08
• GPS-III	'06-'08
• MKV	'06-'08
• NPOESS, JWST	'06-'08
• STSS (SBIRS Low)	'06-'08
• Trident	'08-'12
• GPS III	'07-'10
• SBIRS High Block Upgrade	'08-'13
• NextGen	'08-'10
• GSP(Generic Space Processor)	'08
• Commercial SATS	'08-'10
• SBR	'08-'12
• TSAT	'10-'14
• Classified ( <i>4 Programs</i> )	'06-'12

# XSS-11

- **Deliver Operationally Responsive Space Capabilities to the Warfighter** - General Jumper
- **AFRL Developed Many of the Capabilities on the XSS-11**
  - Electronic Components, Sensors
  - Thrust and Guidance
- **Significant Test Successes**
  - Team Approach With Det 12
  - AFRL Engineers' Hands on the Stick



**XSS-11**



**Minotaur Launch**

# Way Ahead

**Realize Vulnerabilities in our Space Capabilities  
and the Potential Impacts to the Warfighter**

**Cultivate the Next Generation  
of Space Professionals**

**Enable Our Warfighters...**

**Deliver Space Capabilities**

LEADING EDGE TECHNOLOGY

WAR-WINNING SYSTEMS

LEADING EDGE TECHNOLOGY

WAR-WINNING SYSTEMS

WORLD CLASS SUSTAINMENT

WORLD-CLASS SUSTAINMENT

