National Aerospace Initiative (NAI) and National Security Workforce

National Space Symposium

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Overview

- U.S. Science and Engineering Workforce
- Summary

National Security Workforce

DoD S&E as % of Fed Workforce

	1994	1995	1996	1997	1998
Total S&Es	48.0%	47.6%	47.6%	46.6%	45.8%
All sci	28.8%	28.6%	28.8%	28.0%	27.4%
Comp/Math sci	54.0%	51.6%	50.4%	48.8%	47.6%
Life sci	10.8%	11.7%	12.0%	12.2%	12.0%
Physical sci	29.4%	29.2%	30.2%	28.2%	27.5%
Social sci	21.2%	21.6%	21.7%	21.9%	21.4%
All eng	67.1%	67.2%	67.7%	67.3%	67.0%
Aerospace	46.3%	45.5%	46.7%	46.7%	45.2%
Chemical	59.5%	59.6%	62.1%	61.3%	60.8%
Civil	59.7%	61.3%	62.1%	62.1%	61.8%
EE&Comp	79.0%	79.4%	79.9%	79.4%	79.4%
Industrial	86.0%	85.2%	84.8%	83.8%	82.4%
Mechanical	88.1%	88.2%	88.5%	88.2%	88.2%
Other eng	54.3%	54.0%	54.5%	54.5%	54.7%

Source: Pre-release - OPM data for NSF pub, Table B-14. Federal scientists and engineers, by agency and major occupational group: 1994-1998

DoD Percent of Federal Research

Basic and Applied Research (FY00)

	Fed Total	Univ. Research	Univ. Basic	Univ. Applied
Aeronautical	38%	52%	37%	71%
Astronautical	14%	28%	90%	3%
Electrical Engineering	81%	68%	69%	68%
Mechanical Engineering	71%	67%	67%	72%
Metallurgy & Materials	36%	37%	33%	59%
Civil Engineering	35%	14%	11%	20%
All Engineering	39%	33%	32%	36%
Mathematics	15%	14%	14%	15%
Computer Science	35%	37%	12%	88%
All Fields of Research	13%	7%	7%	8%

Source: Federal Funds for R&D, NSF Report #02-321

updated 8/02/02, KT

Overall S&E Demand Projections 2000-2010

From "Occupational Outlook Handbook" Bureau of Labor Statistics

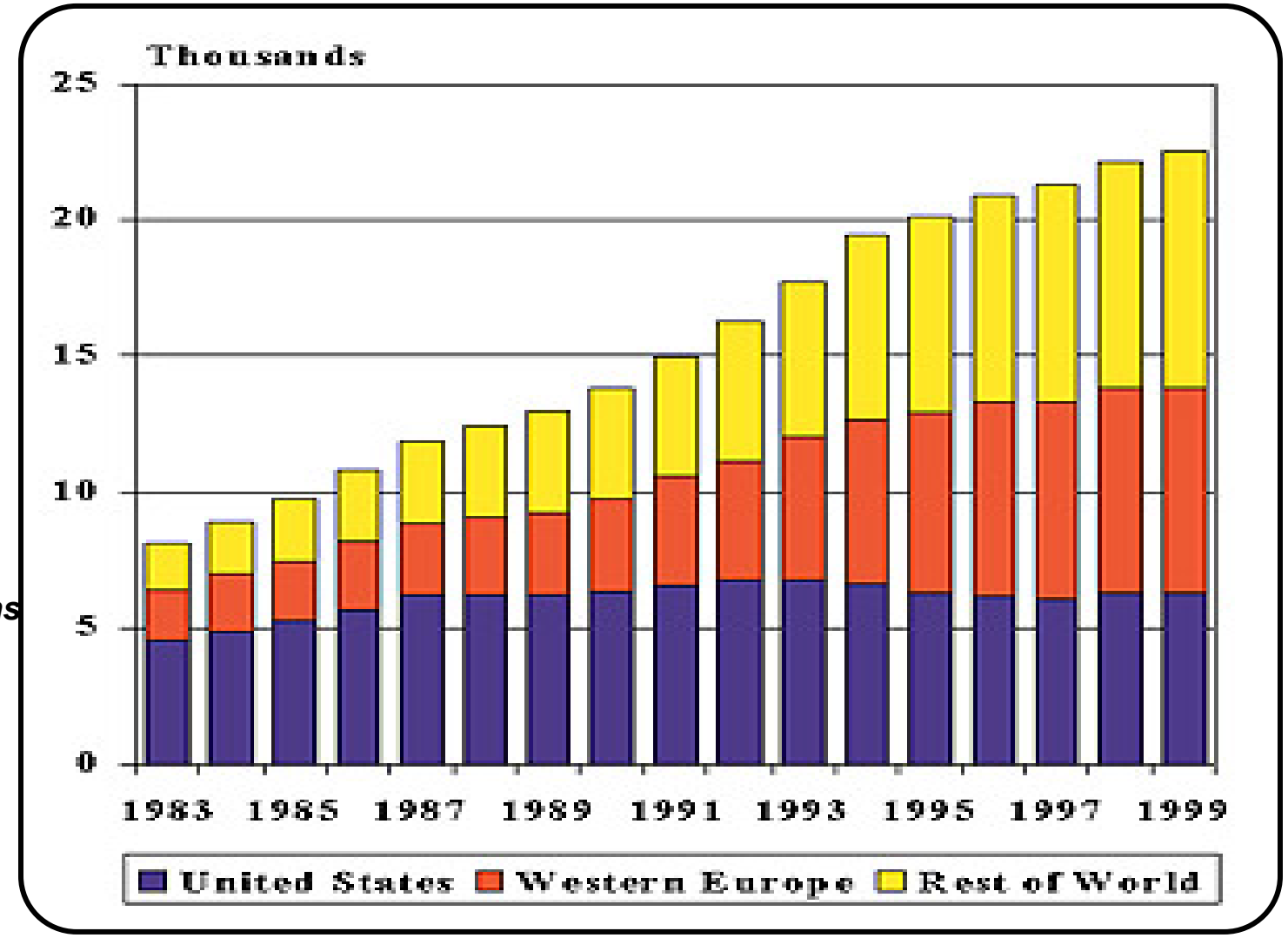
DoD Defense-Related Disciplines	Projected growth in S&E Demand
Aerospace Engineering	10-20%
Chemical Engineering	3-9%
Computer Hardware Engineering	21-35%
Computer Software Engineering	36%
Electrical & Electronic Engineering	10-20%
Industrial Engineering	3-9%
Materials Engineering	3-9%
Mechanical Engineering	10-20%
Nuclear Engineering	0-2%
Mathematics	-1%
Chemistry/Materials Science	10-20%
Physics	10%

Table VII

Physical Review Trends

Physical Review & Physical Review Letters

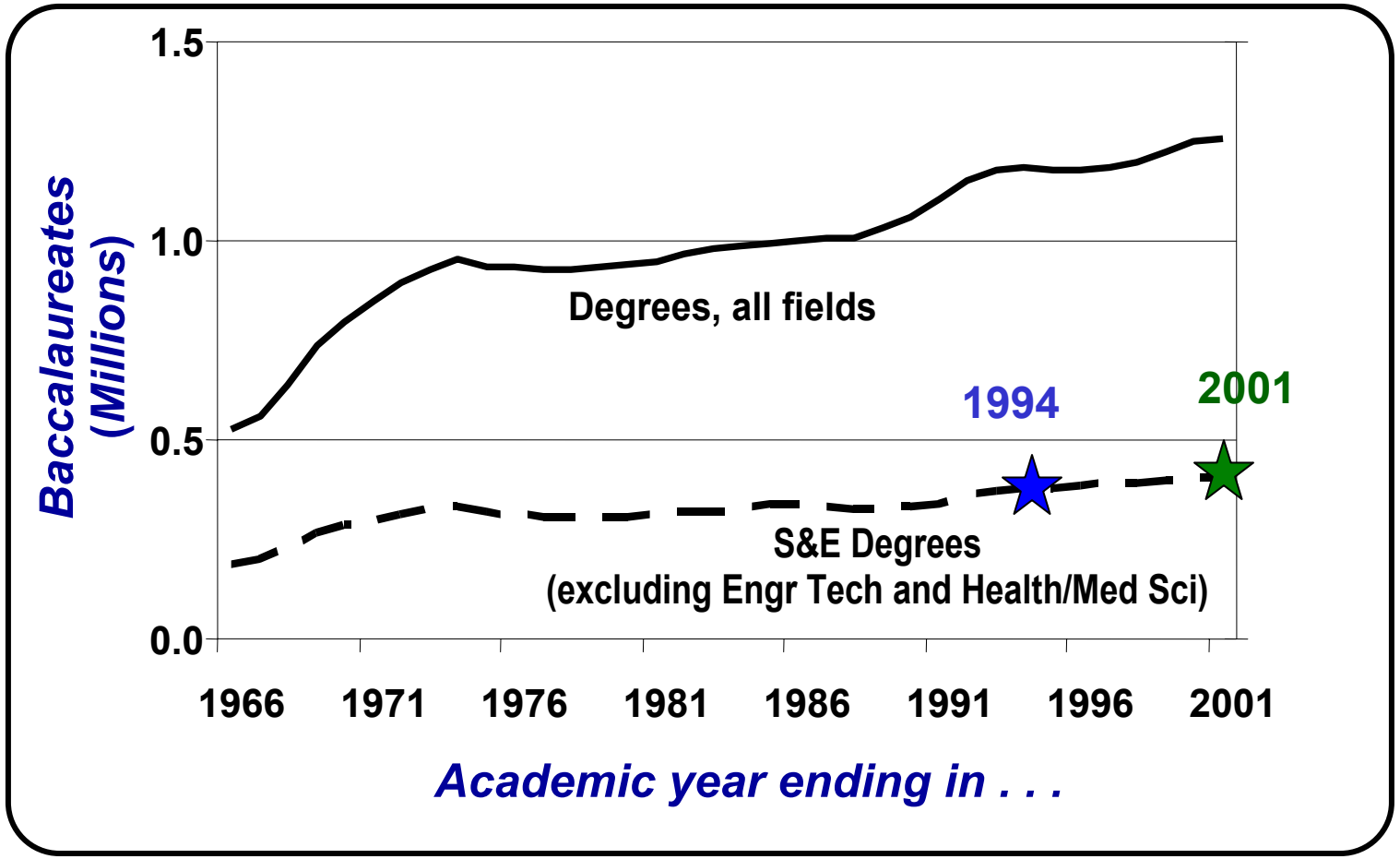
Total Submissions



Source: American Physical Society - *APS News August/September 2000* -

U.S. Production of S&E Graduates*

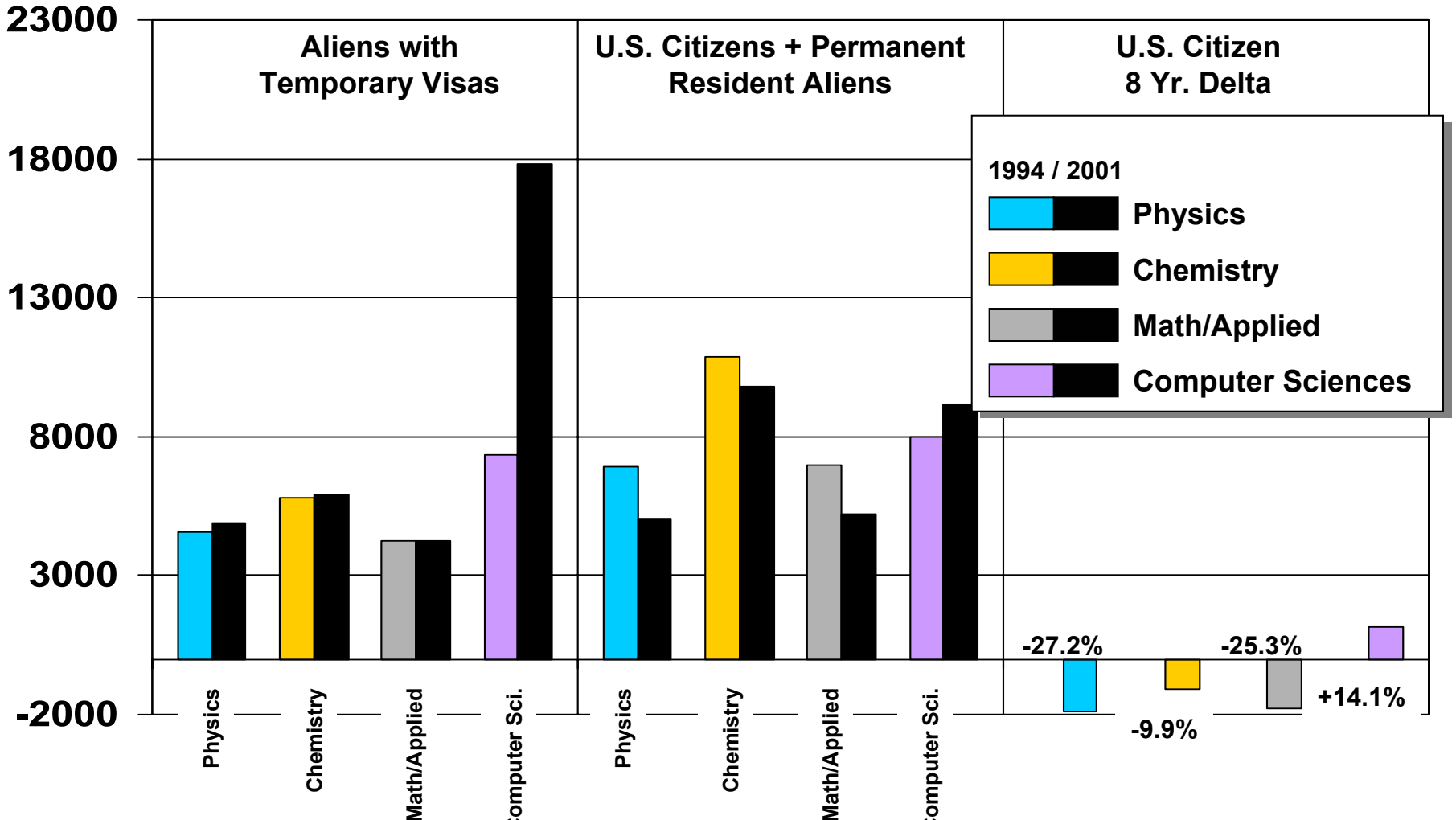
U.S. College and University Graduates, 1966-2001



*Source: Data provided by the NSF, September 2003

U.S. University Trends in Defense-Related S&E Graduate Student Enrollment (1994-2001)

Science Disciplines



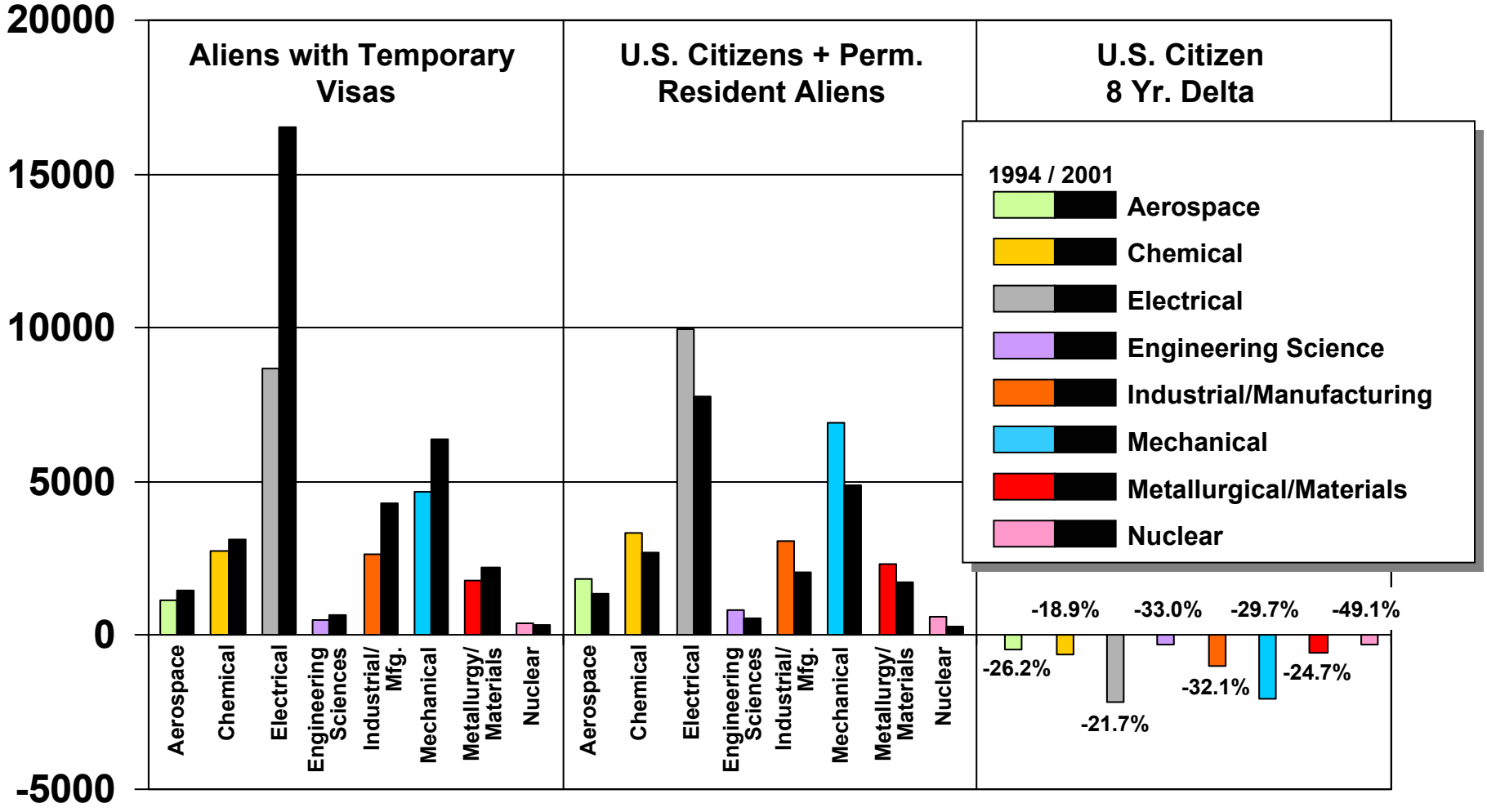
*Source: National Science Foundation – *Graduate Students and Post Doctorates in Science and Engineering:* Fall 2001

Table I-2

U.S. University Trends in Defense-Related S&E

Graduate Student Enrollment (1994-2001)

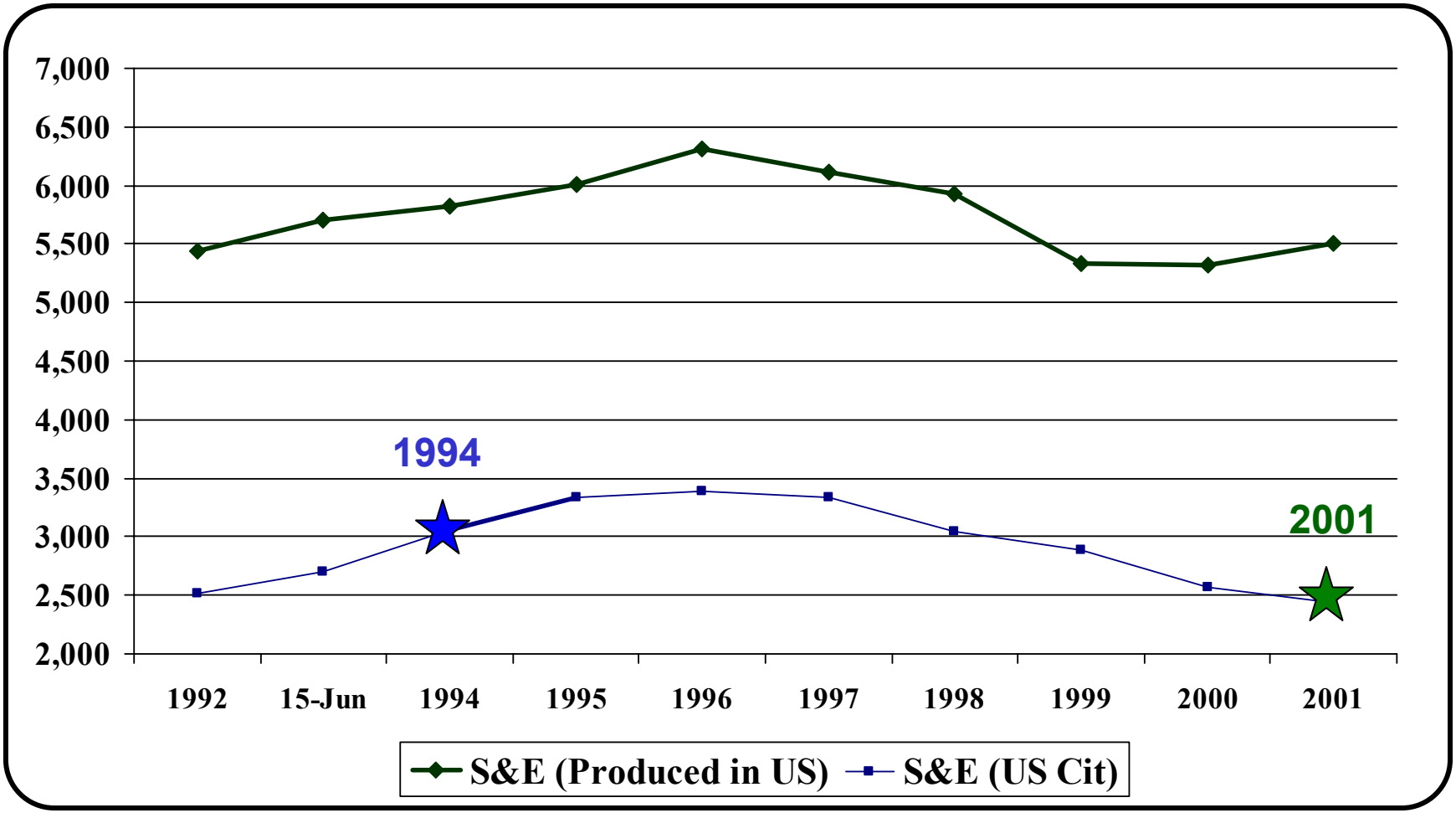
Engineering Disciplines



*Source: National Science Foundation – *Graduate Students and Post Doctorates in Science and Engineering:* Fall 2001

Table III

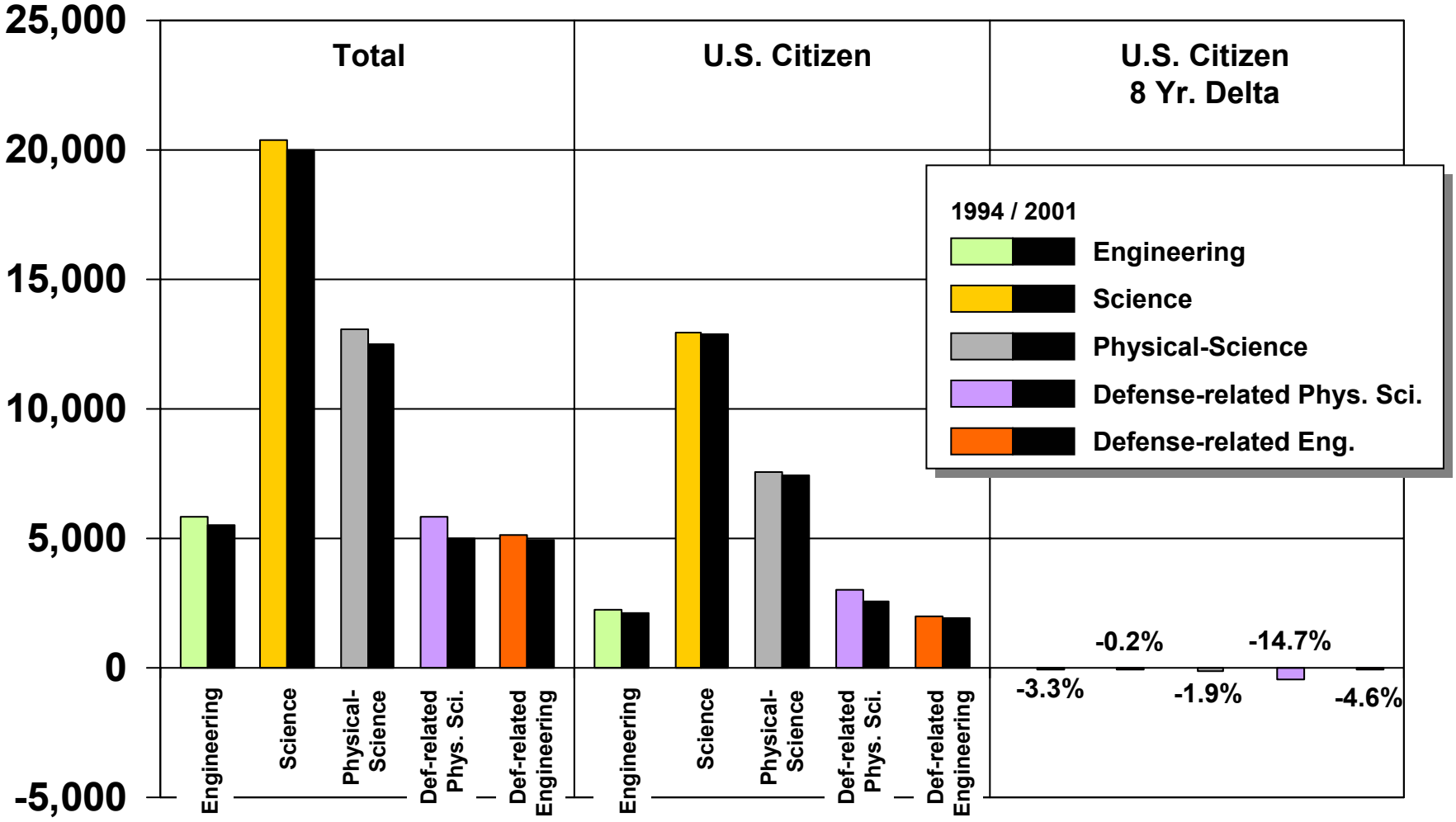
U.S. Engineering PhD's Awarded



*Source: Data provided by the NSF, September 2002

U.S. S&E Ph.D Production Trends (1994-2001)

All U.S. S&E Discipline Doctoral Production

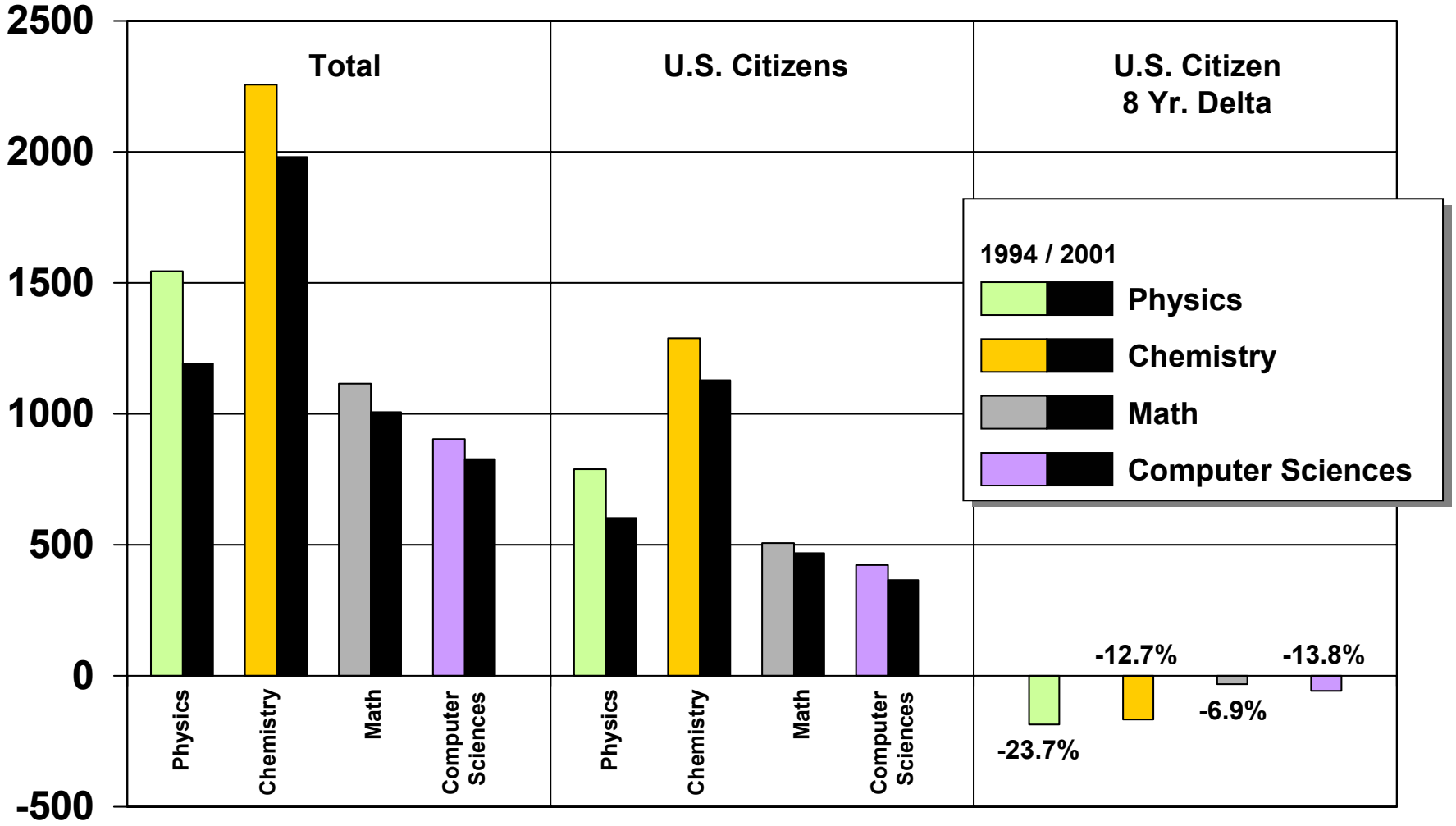


*Source: National Science Foundation – *Science and Engineering Doctorate Awards,* 2002

Table IV

U.S. S&E Ph.D. Production Trends (1994-2001)

Annual U.S. Defense-Related Physical Science Production

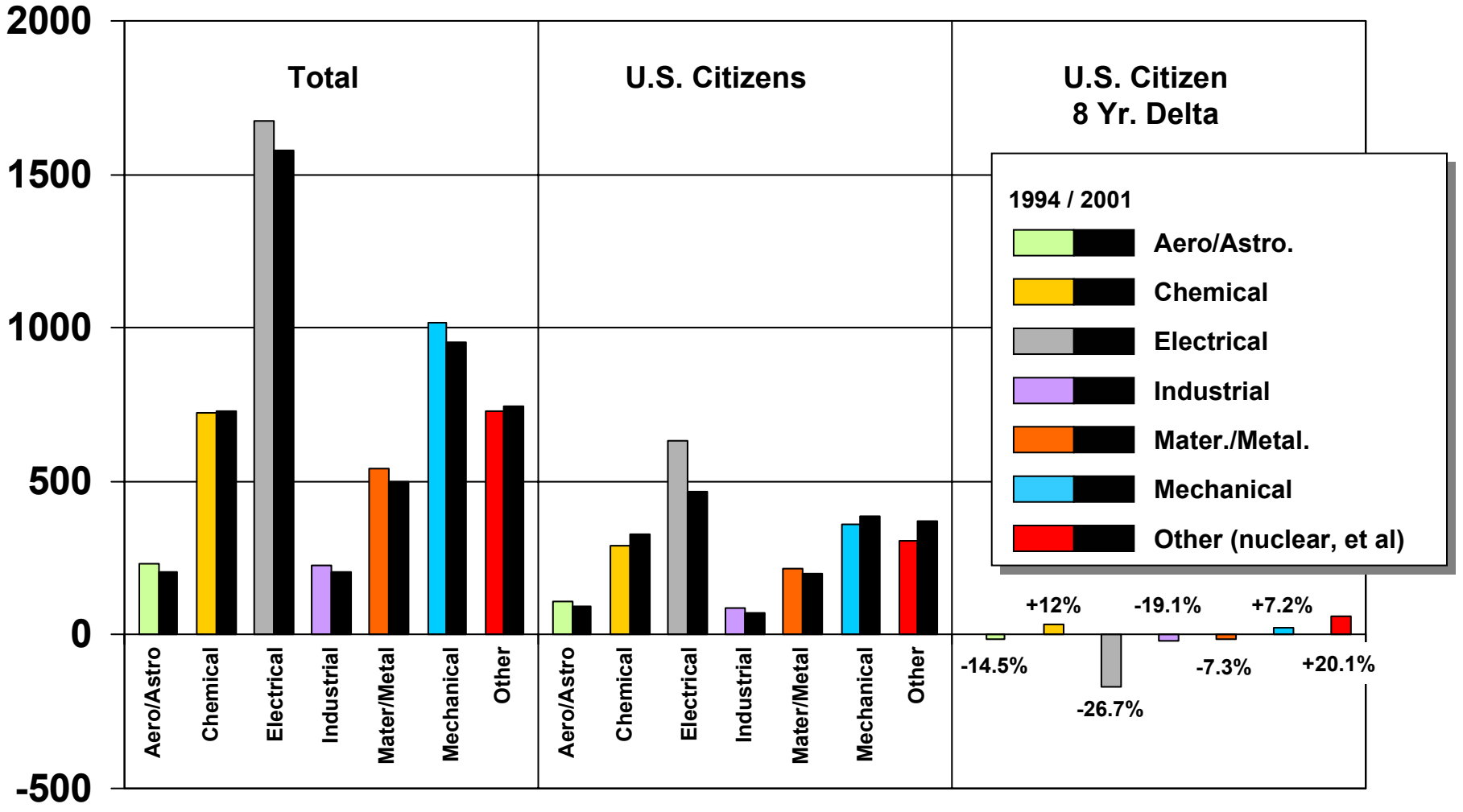


*Source: National Science Foundation – *Science and Engineering Doctorate Awards*, 2002

Table V

U.S. S&E Ph.D. Production Trends (1994-2001)

U.S. Defense-Related Engineering Disciplines Doctoral Production



*Source: National Science Foundation – *Science and Engineering Doctorate Awards*, 2002

Table VI

Math, Science & Engineering: National Security and the Workforce

No Child Left Behind

Existing DoD Outreach and Education Programs

DoD Education Initiatives

Elementary School Level	Middle School Level	Secondary School Level	Undergrad Level	Graduate Level
• STARBASE • Mentor/Volunteer • Summer Camps • Others	• STARBASE • e-Cybermission • Others	• Materials World Modules (MWM) • Service Progs. • **Modeling & Simulation-Based Math* • **Others TBD (BEST)* • **DoD Secondary School Interns (TBD)*	• Undergrad Research • Freshman Science Experience • Service Progs. • **Modeling & Simulation-Based Math* • **DoD Undergrad Interns (TBD)*	• National Defense Science and Engineering Graduate Fellowships • Service Progs. • **Graduate Research Traineeships* • **DoD Graduate Interns (TBD)*

**Exploring*

Math, Science & Engineering: National Security and the Workforce

Materials World Module Content

"Integrated" multidisciplinary approach to Physics, Chemistry, Biology, Environmental Science and Geoscience using "materials as a paradigm"

Kindles interest in science and engineering and instills passion for discovery

- Ceramics
- Polymers
- Smart Sensors
- Nanotechnology
- Surfaces and Membranes
- Biodegradable Materials
- Biosensors
- Food Packaging Materials
- Environmental Catalysis
- Metals and Alloys
- Composites
- Concrete
- Sports Materials

- *Modules in use*
- *Modules in test*
- *Modules in design*

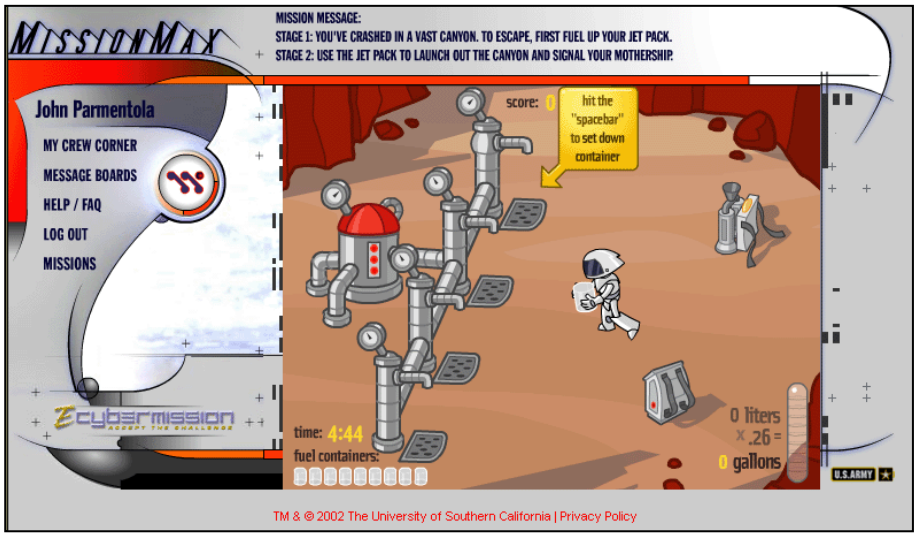
Deployment Based Considerations of MWM Use:

- ***Adopted by DoD Education Activity in 13 overseas school districts in Fall '00***
- ***Adopted in over 500 US schools in 14 states***

eCYBERMISSION

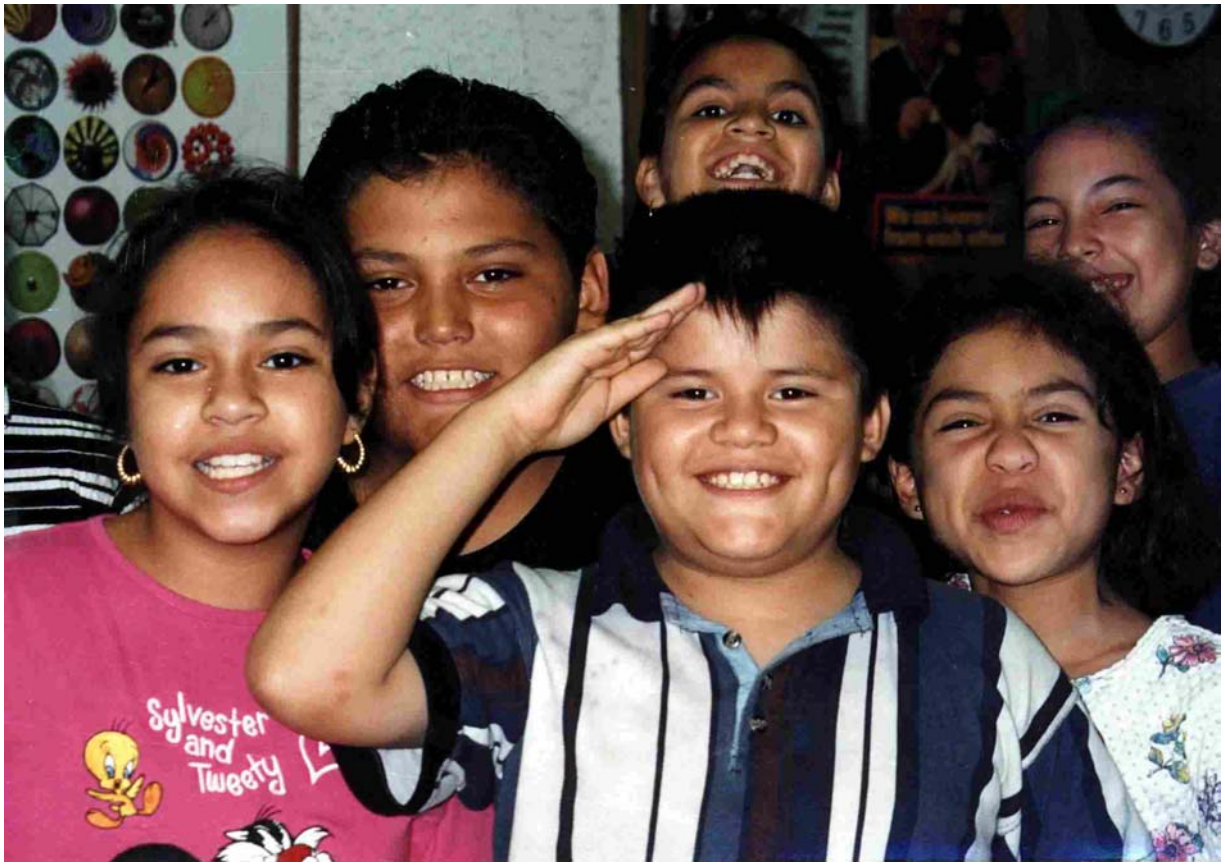
Shows Students that Math, Science and Technology can be interesting and exciting

- Supports Army's intent "to give back to the Nation"
  - Attracts an audience of children beyond math/science "stars"
  - Web-based adventure: team competition activities, games, puzzles with solid learning points
- Overview
  - Web Based Competition – Team Effort
  - 6-9th Grade, 3-4 Student Teams + 1 Advisor
  - $500K in Prizes, ($2K-$5K/Team Member) Regional and National



STARBASE

- Primarily At-Risk kids
- 20 Classroom Hour experience at DoD bases
- 45+ sites in 28 states
- Engaging Science and Mathematics
- Grades 5-8



Summary

- U.S. Science and Engineering (S&E) is critical for Defense Transformation
  - Significant reduction in DoD S&Es over the last decade
  - More DoD S&Es nearing retirement
  - U.S. citizens are required in many DoD applications
- U.S. S&E workforce is an issue of National Security