



Air Force Institute of Technology CCMC Interaction

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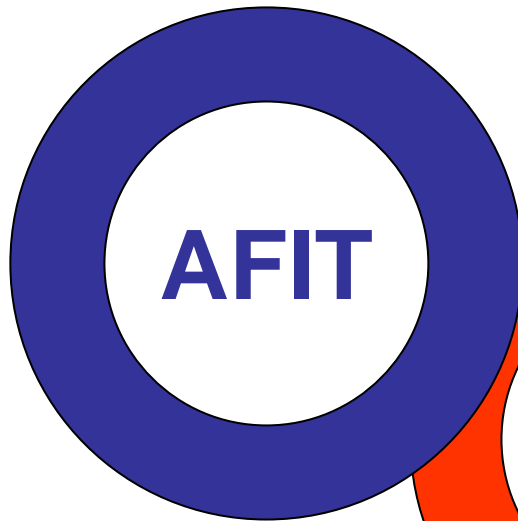
U.S. AIR FORCE



Educating the World's Best Air Force



AFIT Space Physics



- Resident Graduate Education
 - Graduate School of Engineering and Management

- Physics

- **Physics**

- Dept of Elect

- School Systems

- Mathematics

- Applied Physics

- Nuclear Engineering

- Electro-Optics

- Materials Science

- Civil and Operational Sciences

- Graduate and Continuing Education

- Health Care Education

Physics



Space Physics Curriculum



- AFIT mission differentiates it from other schools
- Primary mission to educate future space wx officers
 - Breadth of coverage
 - Ops focus to courses & research
 - Faculty field experience
- Also serve cross-over students and civilians



Space Physics Curriculum



PHYS 792

- Space physics tracks also available to other programs (e.g. aero-, astro-, and electrical engineering)

PHYS 777 Solar Atmosphere
PHYS 776 Magnetospheric Physics
PHYS 775 Ionospheric Electrodynamics
CHEM 675 Upper Atmospheric Chemistry

PHYS 519 Intro to Space Environment

MATH 511 Methods of Applied Math

**MATH 508 Applied Numerical
Methods**

PHYS 655 Quantum Physics

PHYS 650 Plasma Physics

PHYS 635 Thermal Physics

PHYS 601 Electrodynamics



Current Research Guidelines



- Research topics chosen from prioritized list
 - Generated by XOO-W each year; solicited from users
- Samples
 - Improve high-altitude radiation support
 - Evaluation of HAF solar wind model
 - Investigation of ionospheric response to solar flares
 - Ray-tracing applications using GAIM model
- Emphasis on funded research



Traditional Research Areas



Historically, most research in conjunction with AFRL

- V&V new computer models (e.g. PRISM, MSM)
- Validation, assessment, exploitation of new data
- Improve Diagnostics & Forecasting for
 - Spacecraft Hazards
 - HF Comm Outages
 - Scintillation



Previous Thesis Topics



- “A Correlation of Geosynchronous Orbit (GEO) and Low Earth Orbit (LEO) Energetic Electron Events Using Data from the Compact Environmental Anomaly Sensor (CEASE) Instrument
- “A Derivation of the Dst Index from the SSM Magnetometer on board the Defense Meteorological Satellite Program (DMSP)”
- “Estimating Equatorial, F-Region Vertical $E \times B$ Drift Velocities from Ground-Based Magnetometer Measurements in the Philippine Sector”
- “Derivation of a Self-Consistent Auroral Oval Model using the Auroral Boundary Index”
- “Spacecraft Charging at Geosynchronous Altitudes: Critical Temperature Analysis for Non-Maxwellian Distributions”
- “Validation and Assessment of DMSP Electron Temperatures in the Topside Ionosphere”
- “Validation and Characterization of Ionospheric Densities measured by DMSP”
- “GPS Vulnerability to High-Latitude Scintillation at Solar Maximum”
- “Testing the New USGS K Index Algorithm at Bear Lake Observatory”
- “Penetration of Magnetospheric Storm & Substorm Effects to Mid-Latitudes”



AFIT/CCMC Collaboration



- Existing runs useful as canned classroom examples
- Classroom/laboratory open-ended projects
- Research Opportunities
- Soliciting material/ideas from community
 - An opportunity to influence future AF decision makers!



extra slides...

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Academic Programs

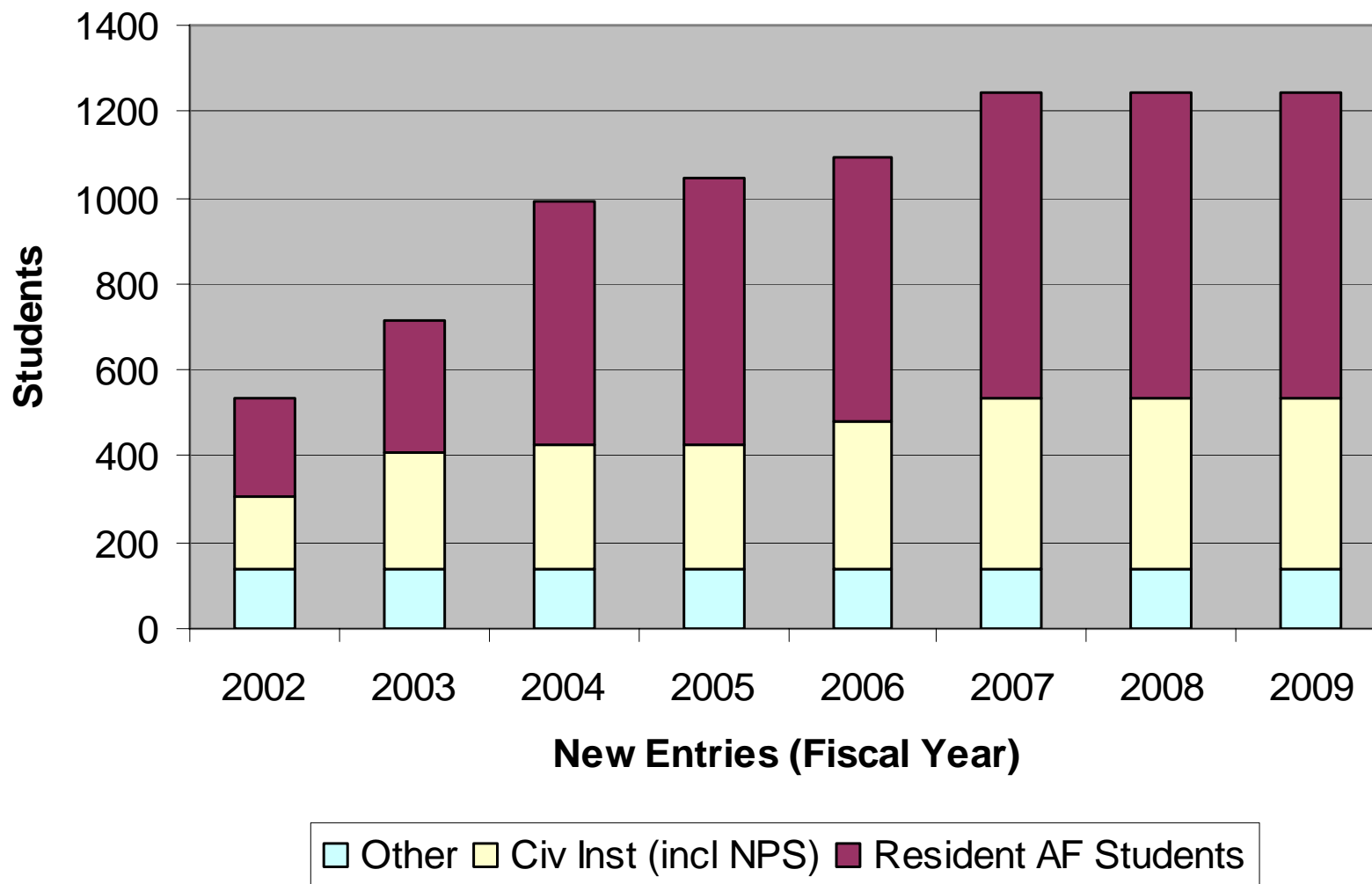


- **MS (18 Months) & PhD (36 Months)**
 - **Aeronautical Engineering**
 - **Astronautical Engineering**
 - **Electrical Engineering**
 - **Computer Engineering**
 - **Nuclear Engineering**
 - **Applied Physics**
 - **Applied Mathematics**
 - **Electro-Optics**
 - **Operations Research**
 - **Materials Science**

- **MS (18 Months)**
 - **Acquisition Management**
 - **Cost Analysis**
 - **Logistics Management**
 - **Information Resource Management**
 - **Information Systems Management**
 - **Engineering & Environmental Management**
 - **Environmental Science and Engineering**
 - **Aerospace and Information Operations**
 - **Space Operations**
 - **Systems Engineering**
 - **Computer Science**
 - **Computer Systems**



Projected AFIT Growth

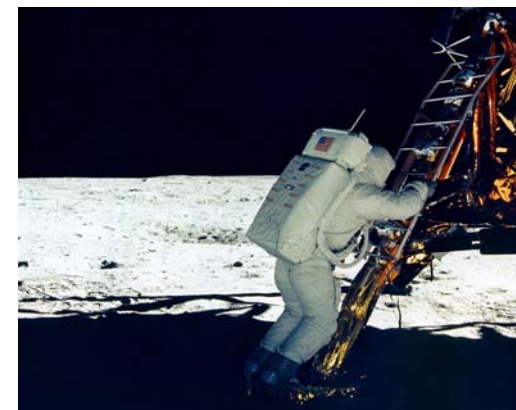
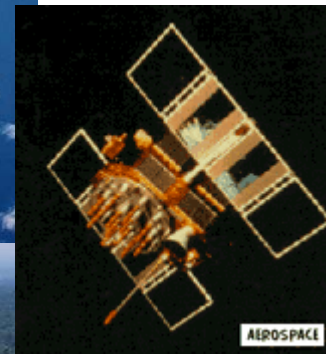




Space Physics Program



- AFIT educates all space weather officers
 - MS: in-residence
 - PhD: AFIT/CI or in-residence
- Operational requirement
 - HQ/AF XOO-W provides space weather support for DoD (Joint Pub 3-59)
 - Also assist Space Environment Center (SEC) in support of manned space flight program

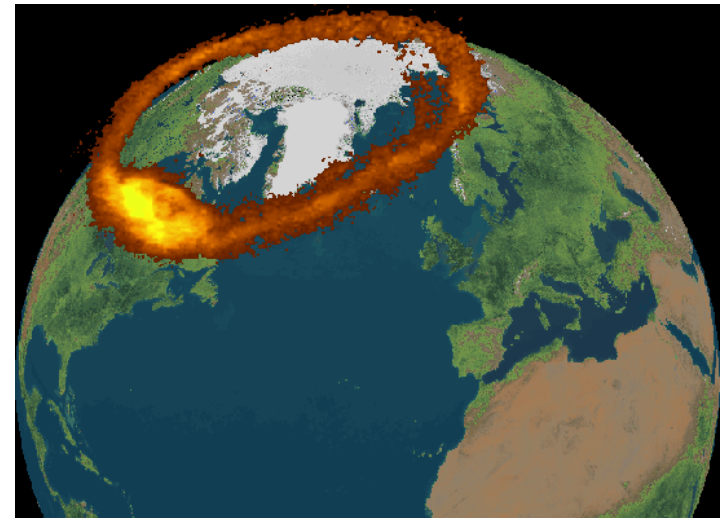




AFIT Space Physics History



- 1993-1994 – Coordination and in-residence program development
- Jun 1994 – First space physics class enrolls
- Dec 1995 – 1st class graduates
- Sep 2004 – 1st IDE student graduates
- Jun 2004 – 1st civilian student graduates
- Apr 2005 – 1st in-residence Ph.D. student begins





Follow-on Assignments



- Duty location history / numbers:
 - Space Weather Ops Center (AFWA / Schriever): 17
 - 21st Space Wing OSW (Peterson AFB): 3
 - Space Environment Center (SEC): 2
 - Space & Missile Support: 2
 - NASIC: 1
 - HQ AFWA / DN: 1 (civilian)



Space Physics Program Growth



- 21-month program \Rightarrow boost 15W student numbers
- AF physicists (61S) also in program
 - Follow-on tour examples: AFRL, USAFA Faculty, AFWA
- Intermediate Developmental Education (IDE) Program
 - SECAF initiative; 12-month non-thesis MS degree for portion of in-residence IDE officers
 - Space physics IDE degree in place; first graduate in Sept 04
 - Growth: 77 students in 1st class, over 400 by 4th class
- NASA: New emphasis on manned missions to Moon and Mars
 - AFIT selected as collaborative institution for education and research