



Air Force Institute of Technology CCMC Interaction

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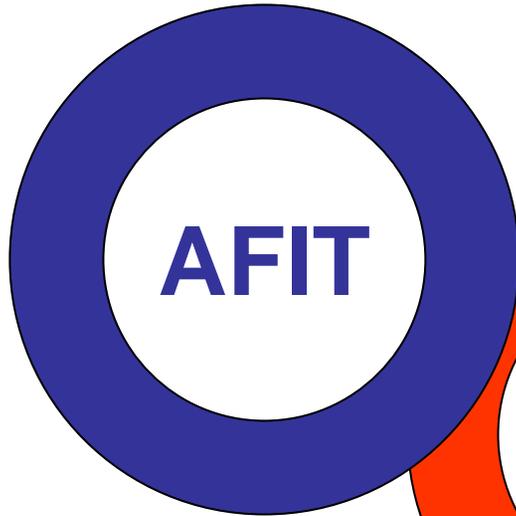
U.S. AIR FORCE



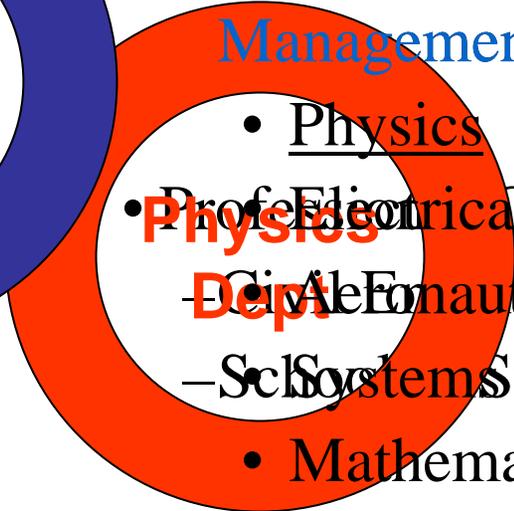
Educating the World's Best Air Force



AFIT Space Physics



- Resident Graduate Education
 - Graduate School of Engineering and Management



- Physics
 - Applied Physics
 - Nuclear Engineering
 - Electro-Optics
 - Materials Science

- Civil, Operational Sciences Programs

- Graduate and Continuing Education
- Health Care Education





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 | PHYS 655 Quantum Physics |
| MATH 511 Methods of Applied Math | PHYS 650 Plasma Physics |
| MATH 508 Applied Numerical Methods | 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!



AFIT

extra slides...

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Academic Programs

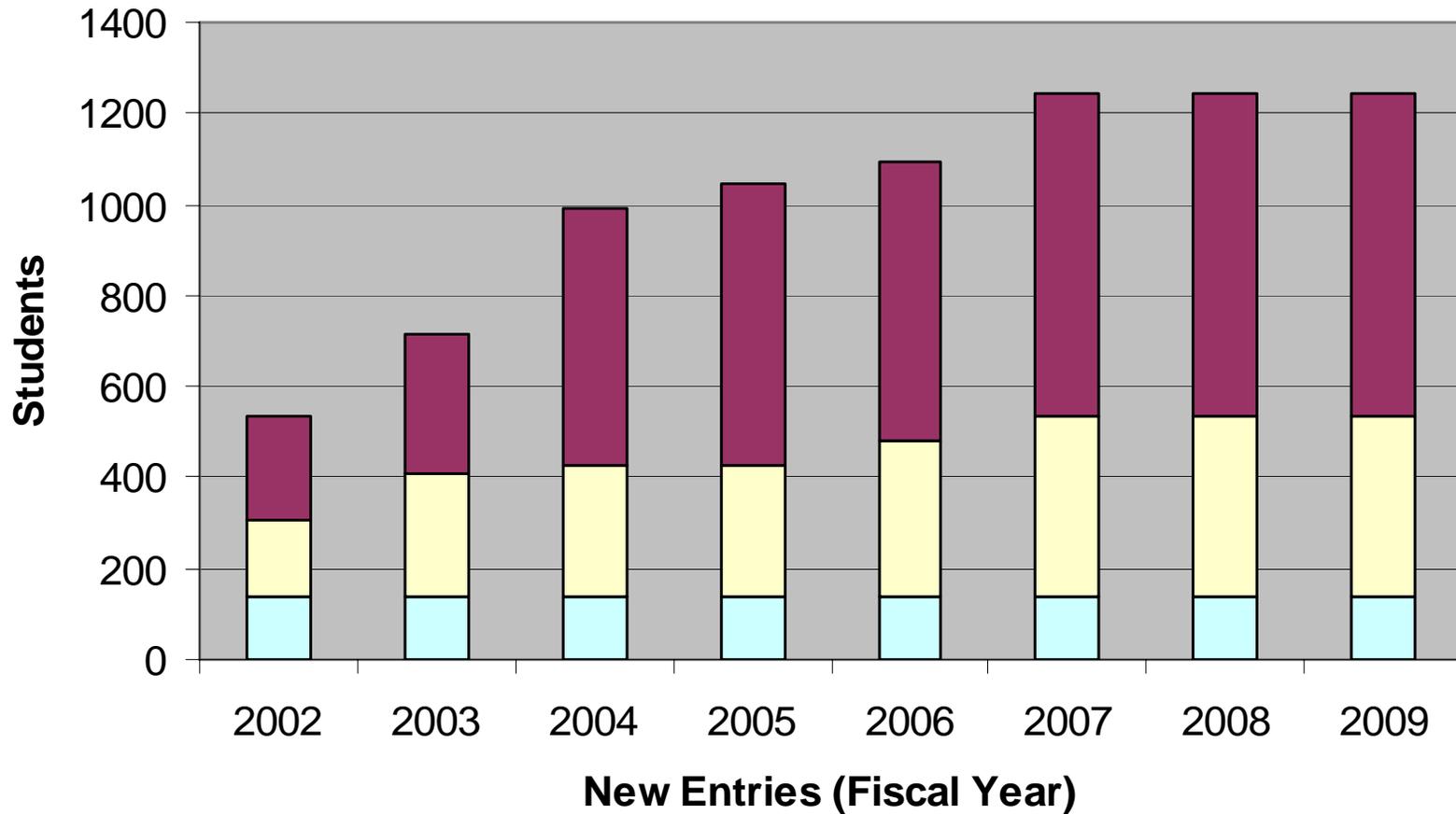


- **MS (18 Months) & PhD (36 Months)**
 - **Aeronautical Engineering**
 - **Astronautical Engineering**
 - **Electrical Engineering**
 - **Computer Engineering**
 - **Nuclear Engineering**
 - **Applied Physics**
 - **Applied Mathematics**
 - **Electro-Optics**
 - **Operations Research**
 - **Materials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



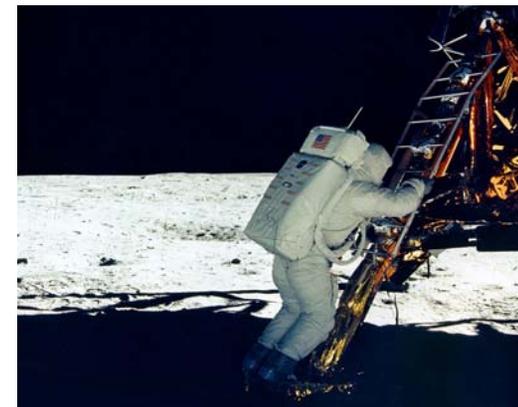
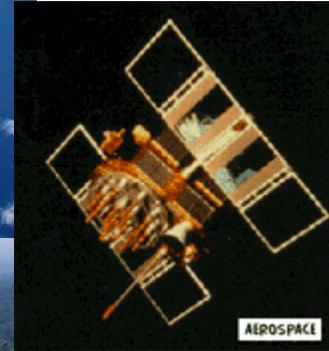
Other Civ Inst (incl NPS) Resident AF Students



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

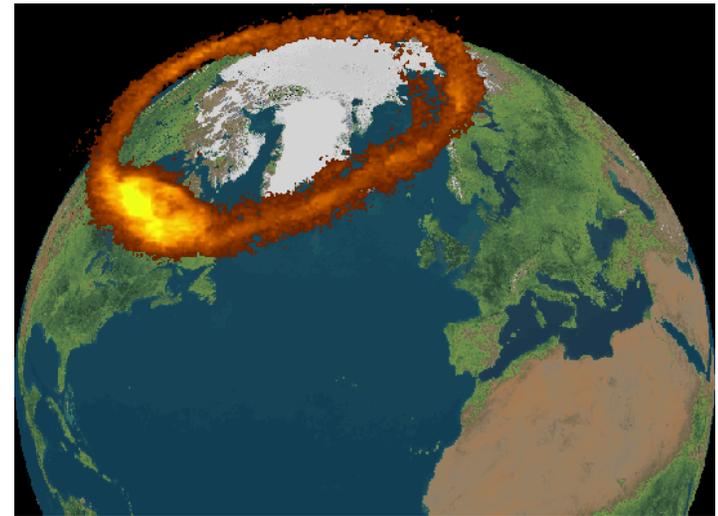




AFIT Space Physics History



- 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