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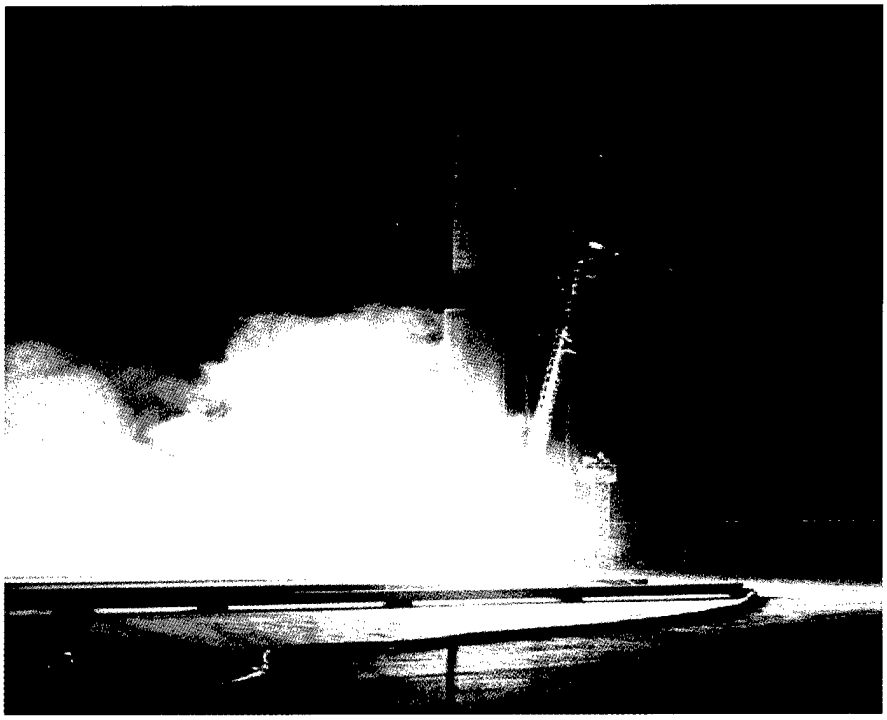
USAFA Discovery

#2000-01 (Jan-Mar 00)

*USAFA Discovery* is published quarterly by the faculty of the US Air Force Academy (USAFA). It contains reports on USAFA cadet and faculty research, a complete list of current USAFA research points of contact, and a summary of recent awards and publications. All written material contained within reflects the opinions of the authors and editors and does not necessarily reflect current US Air Force or USAFA policy.

# THE SWEET TASTE OF VICTORY

On the evening of 26 Jan 2000, 40 cadets and faculty crowded inside the Astronautics Museum in the Fairchild Annex building to watch the first launch of the Minotaur. Their eyes were glued to the telecast on the big screen in front of them. Outside, a snowstorm was brewing. The scene was reminiscent of one in October 1997 when Falcon Gold was being launched in sunny Florida while a blizzard was in full swing in Colorado. The Minotaur launch had been scrubbed several times since its original launch date of 15 Sep 1999 due to technical problems. Would it get delayed again? Would FalconSat-1 (FS-1) ever get delivered to its home in the heavens? Would cadets ever get the opportunity to operate USAFA's first free-flying satellite?



*Launch of Minotaur from the first commercial port at VAFB*

The countdown continued to T-minus-10 minutes. Next door, there was a continual buzz of activity in the USAF Academy Ground Station as hardware and procedures were checked yet again. C1C April Scott manned one of the phones listening intently. On the other end of the line at launch control was C1C Ryan Chmielewski. His role at Vandenberg AFB (VAFB) was to give the "go/no go" call for the FS-1 payload. The scenario gave us a glimpse of what these first-classmen might be like as future space operations officers. All checks at the launch site were good and word was the launch was still a go.

Finally, T-minus-10 seconds arrived. Five...four...three... two... one...Liftoff! As the Minotaur burst through clouds of smoke, cheering erupted in the museum. Handshakes and hugs were exchanged by all as the launch vehicle streaked through the night skies over VAFB. In the ground station, C1C Scott was getting the official launch time from the control center—10:03:06L. Soon it would be their turn to take over.

The cadet operations crews prepared for the first pass. FS-1 would be coming overhead at about 0400L. This first pass, like most to follow, would only last 10-15 minutes. Only two of the cadets had ever really seen the satellite they were going to fly. However, under the leadership and guidance of their program manger, C1C Lee Philley, and mentors, Maj Elsa Bruno, Mr. Jim White, and Prof. Emery Reeves, they would soon be making history. They would be receiving a signal from the USAF Academy's first free-flying satellite. Life at USAFA for this group of cadets for the next couple of weeks would be exciting and tiring as they commissioned FS-1 and slowly brought it on-line.

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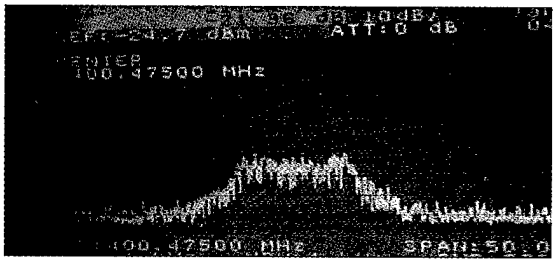
**At 0355L, Alpha Crew under, the direction of crew commander C1C Gunnar Hankins, began sending requests for beacons up to FS-1. Essentially, the crew was asking the satellite if it was there. In response, the satellite would transmit a signal containing identifiers for 5 seconds. Finally, after what felt like an eternity, FS-1 responded. The crew and observers were ecstatic.**

*Alpha crew from left to right: C1C Pat Doyle, C1C Gunnar Hankins, C1C Jim Ryan, and C1C Andy Stockman*

The spectrum analyzer registered a strong signal; equally good news was recorded by the oscilloscope, which showed that the spacecraft was sending intelligible data. During the remainder of the pass, the crew began to upload the satellite operational software. The process was not unlike sending data across a cable between two computers, except that it was done over radio frequencies.



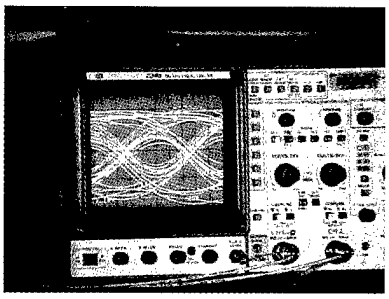

*FalconSat-1 first signal on spectrum analyzer*

FS-1 was launched with only a basic operating system and boot loader burned into ROM. The purpose was to initialize the satellite in a safe power mode and provide the functionality to load operational software. Should anything ever happen to the satellite resulting in a crash of the operational software, the CPU would reset and the satellite would once again return to its safe mode. The crew uploads placed higher-level programs in the RAM and commands from the ground station executed them.

These programs would be sent up in three stages. In all, there would be 6 separate programs loaded taking approximately 7 passes to complete.

By the end of pass one, Alpha Crew had successfully loaded most of the first program. But more than that, they had reached a major milestone for the Small Satellite Program-successful tracking, commanding, and control of a USAF Academy-built satellite by cadet operators.

From an educational standpoint, the cadets took advantage of a rare opportunity to apply classroom "book-learning" on a live spacecraft. It will be an experience that they will remember their entire lives regardless of the careers they enter. They had received their first taste of space operations, and it was sweet indeed.



*First packetized signal from FS-1*

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# Department Research News

## Department of Foreign Languages

### Facilitating Language Maintenance Via Email Distribution

This research builds on work recently completed by Lt Col Supinski, Lt Col Sutherland, and Capt Valentine entitled *Russian Language Development and Maintenance At a Distance: Methodology and Technology.* Following the recommendations of the previous study, this project will test the efficacy of automatically delivering foreign language maintenance materials to USAF linguists worldwide. Specifically, the study will automatically deliver short foreign language lessons daily to USAF linguists through an email distribution list. Following ten consecutive lessons, the researchers will survey the participants to determine their attitudes toward receiving such materials and to discover whether they feel automatic email distribution of such materials will provide an effective tool to assist them in maintaining their foreign language proficiency.

In support of the Global Engagement Strategy, the Air Force's goal, as stated in the DP Strategic Plan, is to have ten percent of all Air Force officers proficient at the 2 (reading)/ 2 (listening) level measured by the Defense Language Proficiency Test (DLPT). Language training for enlisted linguists and officers in Language Designated Positions (LDP) is very expensive and can take up to 64 weeks. Although these are among the longest (and most expensive) training programs in the Air Force, linguists following training have few systematic opportunities to maintain these valuable skills.

As creator, purchaser, and holder of state-of-the-art language materials used for cadet instruction, the Department of Foreign Languages seeks opportunities to share these materials with USAF linguists worldwide.

To that end, the Department is establishing the Air Force Language Link (AFLL) to provide one-stop shopping for language information, as well as language maintenance materials for the seven languages taught to cadets. AFLL will serve the needs of cadets, enlisted linguists, recruiters, and officers wishing to polish language skills. This study will investigate the feasibility of reaching out to these customers by providing language maintenance materials directly to his or her electronic mail box on a daily basis in an effort to make regular and beneficial contact with the target language available to every linguist.

Here are the objectives of this research:

1) To test the feasibility of implementing automatic email distribution lists Air Force wide to provide USAF linguists with daily lessons as an aid for foreign language maintenance.

2) To measure the attitudes of USAF linguists toward receiving automatically distributed language materials through email listservs.

3) To determine if USAF linguists feel the daily distribution of such lesson plans is a valuable tool to help them maintain their hard-won foreign language skills.

4) To gather feedback regarding lesson plan design from the linguists who use them in an effort to construct the most effective and useful lesson template possible. This template would then be used as a model for future distribution list-type language maintenance programs, including expansion of the program to the other languages supported by AFLL.

The primary purpose of this study is to test the feasibility and efficacy of delivering Russian language materials electronically through an email distribution list to all USAF Russian linguists world-wide in an effort to provide daily exposure to the target language as an aid for maintaining foreign language skills.

The results of this study will have broad applicability within the Air Force, as foreign language maintenance materials could potentially be distributed directly to all linguists regardless of remote locations, if this study proves such distribution to be feasible and effective. The coordination and counsel of the Distance Learning Office (AETC/AFDLO), the organization charged with examining the effectiveness and the implementation of distance learning programs, will be sought for this study, and the results/lessons learned may be used in developing other distance learning efforts. Based on the lessons learned from the previously mentioned study, the researchers have developed a template from which lessons using authentic language materials may be developed.

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**Facilitating Language Maintenance Via Email Distribution continued.**

Ten lessons will be created, five emphasizing listening skills and five emphasizing reading skills. These lessons will be distributed via email over the course of two workweeks, alternating between listening and reading lessons. Each lesson should take the linguist participant no longer than 10-15 minutes to complete. (A sample lesson developed from the template is available on request). The authentic materials will be gathered from various sources, including the excellent Russian program developed by the University of Arizona, Sierra Vista (UASV) that was used as the basis of the previous study. DFF has already acquired approval to use this program Air Force wide. (A description of this program and copies of the software are available on request).

The Air Force Personnel Center maintains a database of all linguists, regardless of rank, based on scores from the current Defense Language Proficiency Test cycle. These linguists include cryptologists and Foreign Area Officers, as well as personnel assigned across a broad range of career fields not related to their foreign language. The researchers will contact all of the approximately 900 Russian linguists Air Force-wide. Since this study focuses on language *maintenance*, as opposed to *development,* the primary target participants will be linguists at the 2 (listening)/ 2 (reading) skill levels and above. Although the lessons will be geared toward more proficient linguists, those with lower skill levels will be included in the distribution, and any improvement over their current proficiency levels will be considered a peripheral benefit.

This study is intended to be strictly qualitative in nature, investigating the attitudes of the recipients of foreign language maintenance lessons toward those materials and the recipients' perceptions of the usefulness of those materials. As such, the researchers will develop a short survey questionnaire to be distributed and collected via email. The questionnaire will include both Likert-scale questions regarding the linguists' attitudes and perceptions about the lessons, as well as a few open-ended response options for those participants who wish to provide more detailed feedback.

## 34th Education Group

**Night Vision Goggle Computer Based Training**

Major Michael Waggett, a Military Strategic Studies instructor for the 34th Education Squadron, has created a self-paced and interactive web-based introductory course on night vision goggles, called Night Vision Goggle Computer Based Training (NVG CBT). Drawing on his field experience and prior research at Air Command and Staff College, Major Waggett designed and developed the course for use by Air to Ground Range personnel of the US Air National Guard. It includes original graphics and user interfaces, sound, video, glossary of terms, review questions with feedback, and a final test allowing users and commanders to track results and certify personnel. The NVG CBT can save funds by eliminating some TDY for training and by reducing the scheduling time required for personnel to become NVG certified.

Major Waggett presented his research to the Air National Guard and Air Combat Command during the annual Airspace and Ranges Conference, held from 28 February - 2 March 2000 at Hurlburt Field, FL. A decision has already been made to distribute the course to 14 Air National Guard Air to Ground ranges along with units of ACC, PACAF, USAFE, USAFR, and USSOC. Plans are being made to offer the NVG CBT to the US Navy and Army was well.

The course took approximately 800 hours to develop and, based on industry CBT standards, saved the Air National Guard approximately $50,000. It is available on the USAFA Network N: drive at N:/Organizations/34TRW/34EDG/34ES/Night Vision Goggle Computer Based Training folder. Click on Setup and follow the instructions. Major Waggett was awarded the 34th Education Group's Allen E. Dorn Award for Outstanding Researcher of the Year for his initiative and research achievement.

## Department of Behavioral Science

LCDR Russell Shilling presented a talk on implementing spatialized sound in virtual environments (VE) at the NATO Research & Technology organization meeting "What is essential for virtual reality systems to meet military human performance goals" organized by the NATO Human Factors and Medicine Panel. VE experts from the U.S., Germany, Netherlands, France, Spain, Denmark, U.K., Sweden and Georgia met at the TNO Physics Laboratory (FEL) in the Hague from 13-15 April.

Topics included, "Pilot Debriefing," "Mine Clearance," "Skill Acquisition," "Stinger Missile Training," "Motion Sickness," "HCI in shared VE," "Haptics," "Tactile Displays," "Ergonomics," "Virtual Cockpits," "UAV," "Visualization of Geographic Data," "Education," & "Entertainment".

The group identified areas of interest where research needs to be conducted. Particularly, there is a need to conduct more psychological and perceptual research in VE. More data is needed to evaluate how subjects interact with VE's and the effectiveness of new haptic, auditory, and visual interfaces. Also discussed was the lack of standardization in VE development tools, which is detrimental to VE efforts in all countries.

**34th Education Group**

**Publications:**

CHUN, C. K. S. "Thor's Hammer Strikes: Program 437." *Quest*, Winter 99.

KRUPNICK, C. A. Book review of Geoffrey Parker, *Geopolitics: Past, Present and Future* (London: Pinter, 1998). *European Security*, Autumn 99.

WATT, C. G. "Pilots of the Former Soviet Union: Threats, Allies, or Forgotten Memories?" *Aerospace Power Journal*, Spring 2000.

**Presentations:**

KRUPNICK, C. A. and Carol Atkinson. "Slovakia and Changing Concepts of Security in Europe." International Studies Association annual conference, Los Angeles CA, 15-18 Mar, 2000.

WAGGETT, M. L. "Night Vision Goggle Computer Based Training." Annual Air Combat Command Airspace and Ranges Council, Ft. Walton Beach, FL, 28 Feb 2 Mar 2000.

**Department of Aeronautics**

**Publications:**

BOWERSOX, R., K. Tucker, & C. Whitcomb. "Two-Dimensional Nonadiabatic Injection into a Supersonic Freestream." Journal of Propulsion & Power, Vol 16, #2, Mar 00.

FALK, E., E. Jumper, A. Sekularac, and B. Haven. "A Conformal Mapping Analysis of Cascade Trailing-Edge Flows." 38th AIAA Aerospace Sciences Meeting and Exhibit, AIAA-2000-0229, Jan 2000.

GUY, Y., T. McLaughlin, and J. Morrow. "Effects of Canard Shape on the Center of Pressure of a Generic Missile Configuration." 38th AIAA Aerospace Sciences Meeting and Exhibit, 2000-0264, Jan 2000.

GUY, Y., J. Morrow, T. McLaughlin, and I. Wygnanski. "Parametric Investigation of the Effects of Active Flow Control on the Normal Force of a Delta Wing." 38th AIAA Aerospace Sciences Meeting and Exhibit, 2000-0549, Jan 2000.

GUY, Y., T. McLaughlin, E. Jones, and S. Townsend. "Reduction of the Wave Drag of a Blunt Body by means of a Standoff Spike."

GUY, Y., J. Morrow, T. McLaughlin, and I. Wygnanski. "Velocity Measurements on a Delta Wing with Periodic Blowing and Suction." 38th AIAA Aerospace Sciences Meeting and Exhibit, 2000-0550, Jan 2000.

PESEK, T., J. Bertin, J. Forsythe, and S. Pluntze. "Supersonic Flowfield for a Slender, Power-Law Elliptic-Section (PLES) Projectile." 38th AIAA Aerospace Sciences Meeting and Exhibit, AIAA Paper 2000-0120, Jan 2000.

WILLIAMS, D., D. Fabris, K. Iwanski, and J. Morrow. "Closed Loop Control in Cavities with Unsteady Bleed Forcing." 38th AIAA Aerospace Sciences Meeting and Exhibit, AIAA Paper 2000-0470, Jan 2000.

**Presentations:**

BYERLEY, A., H. Newton, and J. Tuite. "Introducing Gas Turbine Cycle Optimization with Spreadsheets and Math Applications Packages." ASEE Rocky Mountain Regional Conference, Colorado School of Mines, Golden, CO, Mar 2000.

YECHOUT, T., E. Melendez, S. Chadsey, and N. Rutgers. "AC-130H Drag Reduction Program." USAFA, CO, Feb 2000.

YECHOUT, T. and J. Dowty. "AC-130H Drag Reduction Program." AFSOC/WRALC, Hurlburt Field, FL/WRALC, GA, Jan 2000.

YECHOUT, T. "X-38 Rudder Control Effectiveness and Speedbrake Evaluation." NASA X-38 Aerodynamics Group Meeting, NASA Johnson, Houston, TX, Jan 2000.

**Department of Behavioral Science**

**Publications:**

BROCKWAY, J.H., & Bryant, F.B. (2000). "You can't judge a measure by its label: Teaching the process of instrumentation." In M. E. Ware & D. E. Johnson (Eds.). Handbook of demonstrations and activities in the Teaching of Psychology (2nd ed., Vols. 1-3), 271-274. Mahwah, NJ: Lawrence Earlbaum Associates, Inc.

BRYANT, F.B., & Brockway, J.H. (2000). "Hindsight bias in reaction to the verdict in the O.J. Simpson criminal trial." In W. A. Lesko (Ed.), Readings in social psychology: General, classic, and contemporary selections (4th ed.), 84-95. Boston: Allyn & Bacon.

HARDING, L.J., Hamilton, K.A., Jones, S.K., and Carlson, K.A. (Jun 99) "The effect of matching decision strategy and task. A presentation at the American Psychological Society," Denver CO.

HARMON, A.T., Brockway, J.H., Jones, S.K. and Carlson K.A. (Jun 99) "Measuring student cynicism in a military academy. American Psychological Society," Denver CO.

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NEAL-WALDEN, T. A., Thompson, E. Y., and Case, L. "Sexual Assault Awareness: Increasing Empathy and Understanding thru Education. Workshop presented at the Ninth International Conference on Sexual Assault and Harrassment on Campus," Oct 1999.

NJUS, D. M., and Brockway, J.H. (1999). "Perceptions of competence and locus of control for positive and negative outcomes: Predicting depression and adjustment to college." Personality and Individual Differences, 26, 531-548.

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SHILLING, R.D. (2000). Spatial Auditory Displays. "What is essential for Virtual Reality to meet military performance goals", NATO Workshop, The Hague, The Netherlands, Apr 2000.

**Department of Biology**

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BLACK, S. "Review of Best Selling Diet Books." AFMOA Web Site for Aerospace Medicine, Mar 2000.

OLSON, K., R. Seabaugh, and et al.. "Development of a *Sindbis* Virus Expression System that Efficiently Expresses Green Fluorescent Protein in Midguts of *Aedes aegypti* Following per Os Infection." Insect Molec. Biol., 9, Mar 2000.

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SMITH, L., D. Hale, & I. Greenbaum, "Systematic implications of chromosomal data from two insular species of *Peromyscus* from the Gulf of California". Journal of Heredity 91:162-165.

VANTUINEN, P., A. Mootnick, S. Kingswood, D. Hale, & A Kumamoto. "Complex, compound inversion/ translocation polymorphism in an ape: presumptive inter-mediate stage in the karyotypic evolution of the agile gibbon *Hylobates agilis*". American Journal of Physical Anthropology 110:129-142.

WILCOX., M, M. Barad, C. Wilcox, E. Peebles,& M. Minckler. "Performance of a new, low-volume, high surface-area aqueous-shunt in normal rabbit eyes," Journal of Glaucoma, 9: 74-82, 2000.

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DEFUSCO, R. "United States Air Force Bird Avoidance Model (BAM) to the Bird Aircraft Strike Hazard (BASH) Steering Committee" meeting in Albuquerque (Kirtland AFB).

WATSON, A. (Cadet), "Analysis of Monocyte Functionality by Flow Cytometry" Davis Grant Medical Center, Travis AFB, CA.

**Patents**:

WILCOX, M. "Low-Volume, High Surface-Area Implant for treatment of Ocular Hyper-tension," Wright Patterson AFB, Division of Intellectual Property, Patent Pending.

**Department of Chemistry**

**Presentations:**

RACICOT, R. "Electrochemical Impedance Spectroscopy Studies of a Double Strand Polyaniline Coating on Aluminum Alloys in Acidic Environments." AFOSR Corrosion Review, Key West, FL, Jan 2000.

WILKES, J. "Chemistry & Energy." Faculty Forum, USAFA, CO, February 2000.

WILKES, J. "How To Do the Search in Research." Dept. of Chemistry, USAFA, CO Mar 2000.

WILKES, J. "Hydrogen Storage And Generation By Light Metal Chemical Hydrides." Dept Chemistry, Univ. Colo. At Denver, Denver, CO, Feb 2000.

WILKES, J., R. Schoske, P. Castle, & F. Cody J. Humphrey. "Polymer Extractions By Room Temperature Chloroaluminate Molten Salts." 196th Meeting of the Electrochemical Society, Honolulu, HI, Oct 1999.

WILKES, J. "The Chemistry Research Center at the US Air Force Academy." AFRL/SV, Kirtland AFB, NM, Feb 2000.

**Department of History**

**Publications:**

ASTORE, B. "Observing God: Thomas Dick, Evangelicalism, and Popular Science in Victorian Britain and Antebellum America." Accepted for publication by Ashgate Press.

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ASTORE, W. "The Reception Of Thomas Dick's Works in British Periodicals." Science in the 19th Century Conference, Leeds, England, Apr 2000.

HEIDLER, J. "The Day of the Radical: Southern Fire Eaters and The 1860 Charleston Convention." The Citadel Conference, Charleston, South Carolina, Apr 2000.

**Department of Management**

**Publications:**

BARKER, J. and K. Domenici. "Mediation Practices for Knowledge-Based Teams." Advances in the Interdisciplinary Study of Teamwork, 5, Jan 2000.

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BARKER, J. "Core Values: What? How?" National Association of Purchasing Managers. Green Bay, WI, Feb 2000.

BARKER, J. "Modeling Entrepreneurial Teams." Distinguished Professor Series, University of Colorado, Boulder, CO, Mar 2000.

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GREEN, S. "Thinking Strategically by Acting Like a Business." Association of Jesuit Colleges and Universities, Denver, CO, Mar 2000.

HORNYAK, M. and E. Holt. "Management Curriculum Integration: Small Steps to Bringing it all Together." 7th Annual American Society of Business and Behavioral Sciences (ASBBS), Las Vegas, NV, Feb 2000.

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HADFIELD, S. "IITA Operational Testbank Application 2.0." Jan 2000.

WISNOWSKI, J., D. Montgomery, and G. Runger. "Analyzing data from designed experiments: a regression tree approach." Quality Engineering, 12(2), Jan 2000.

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CLASEN, R. "Using History and Technology to Teach Math." Graduate Teaching Program Conference, UC-Boulder, Jan 2000.

SCHAUBROECK, B. "Affine and linear invariant families." 2nd Int'l Workshop on Planar Harmonic Mappin, Haifa (Israel), Jan 2000.

**Department of Physics**

**Publications:**

C.A. SZUBERLA, J.V. Olson, M. J. Engebretson, and M. Mcharg. "Spatiotemporal Characteristics of CUSP Spectra." Journal of Geophysical Research, Vol 105/No A4, Apr 2000.

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Y.F. GAO, P.J. Chi, C.T. Russell, and F. Chun. "Sino-Magnetic Array at Low Latitudes (SMALL) Including initial Results from Sister Sites in the United States." Advanced Space Research, 25/7, Apr 2000.

Y.F. GAO, P.J. CHI, G.LE, and F. CHUN. "Plasmaspheric Depletion and Refilling Associated with the September 25, 1998 magnetic Storm observed aby Ground Magnetometers at L=2." Geophysical Research Letters, 27/5, Mar 2000.

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ANDERSEN, G. and R. Knize. "Holograph ically Corrected Telescopes with Temporal Update." SPIE Astronomical Tele scopes and Instrum. 2000, Munich, GE, Mar 2000.

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**Publications:**

KNOTT, S. "The Great Republican Transformation on Oversight." International Journal of Intelligence and Counter-intelligence, 13/1, Spring 2000.

PILCH, F. "The Crime of Rape in International Humanitarian Law." Journal of Legal Studies, 9, Spring 2000.

**Presentations:**

BOLT, P. "US Policy toward China." Colorado Springs World Affairs Council Meeting, Colorado Springs, CO, Feb 00.

BOLT, P. "A Capitalist Selling Rope to a Hangman? Taiwan's Security and Cross-Strait Relations at the Turn of the Century." International Studies Association annual meeting, Los Angeles, CA, Mar 2000.

CAMPBELL, A. "Unintended Consequences of the Single Subject Rule for Ballot Initiatives: The Judiciary's Influence Over a Legislative Power." Western Political Science Association annual meeting, San Jose, CA, Mar 2000.

MURRAY, D. "Leading Change: A Framework for Strategic Planning and Curriculum Development." Academic Chair persons Conference, Orlando, FL, Feb 2000.

PILCH, F. "Negotiating for Refugees in Failed States." International Studies Association annual meeting, Los Angeles, CA, Mar 2000.

TALBOT, B. "Collective Security After the Gulf War." International Studies Association annual meeting, Los Angeles, CA, Mar 2000.

**CWC**

**Publications:**

MALMSTROM, F. V. "The psychological autopsy: Profiling the mind of a dead copilot." *Flying Safety*, Mar 2000.

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**Presentations:**

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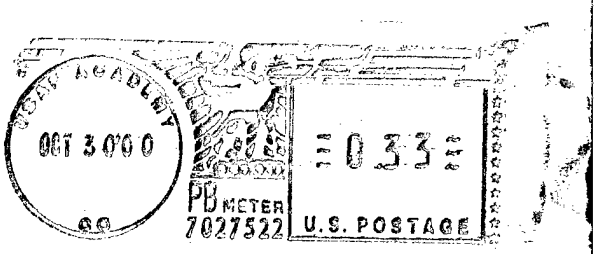


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