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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.

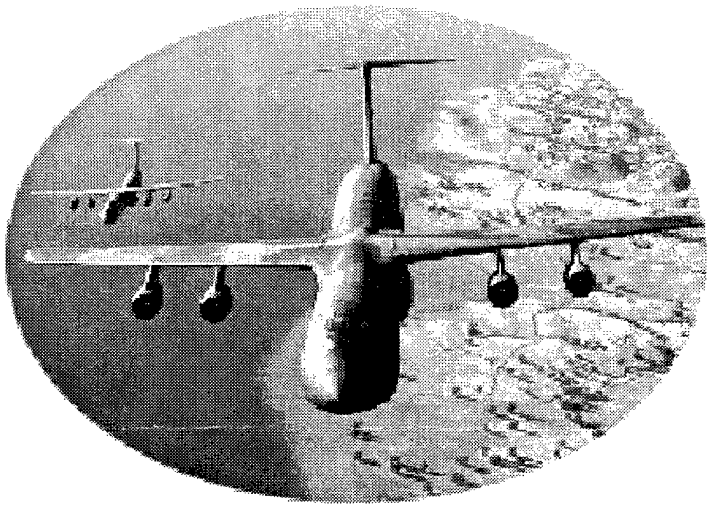
BONDED REPAIRS FOR THE UNITED STATES AIR FORCE'S FLEET OF AGING AIRCRAFT

THE EFFECT OF PRE-LOADING ON THE PERFORMANCE OF BONDED REPAIRS

The Center for Aircraft Structural Life Extension, CAStLE, is one of the seven research centers at the United States Air Force Academy and has been conducting research in the field of aging aircraft over the past 6 years. The U.S. Air Force operates the largest fleet of aging aircraft in the world and the center's research supports the structural maintenance related to operating these aircraft. The center is mainly focusing on the application of bonded repairs, using state-of-the-art composite materials such as Glare (a fiber-metal laminate made of alternating layers of aluminum and fiberglass) and boron-epoxy composite as repair materials, and high-temperature curing adhesives.

CAStLE is currently working on several projects, both basic research and projects with more near-term applications. The project highlighted in this article focuses on the effect of static loads that can already be present in an aircraft structure while it is being repaired. When applying a bonded repair to a fatigue crack on a pre-loaded structure, these loads are "captured" in the repair after the adhesive has cured, and it is believed that these loads can have a large influence, either beneficial (for compressive loads) or not (for tensile loads), on fatigue crack growth after application of the repair, since they are additional to the operational loads that act on the aircraft.

A good example of a structure that is pre-loaded in tension during the application of repair patches is the aft-crown section (the top of the fuselage) of the C-5A Galaxy. Perhaps surprisingly, the cracks in this section of the aircraft are not caused by flight loads, but by the sheer weight of the large tail section when the aircraft is parked. These same loads that are causing the cracks are present in the structure while it is being repaired. Another example, where compressive loads play a role during patching, is that of the lower wing skin panels of the C-141 Starlifter. Teardown inspections of these aircraft showed evidence of widespread fatigue damage in the fuel drain holes in the integral stiffeners in the lower wing skins. Due to the load of the wing itself and of the engines, the lower wing skin is in compression while on the ground. Patching the skin and stiffeners under these conditions can add beneficial compressive stresses on the crack, which will cause it to grow more slowly. A better understanding of the effects of these loads could lead to the decision to change the pre-load in the structure by, for example, jacking up the tail section of the C-5A and so relieving the tensile stresses during the cure. In the case of the C-141, perhaps prohibiting patches from being bonded to the lower wing skin while the engines have been removed for maintenance (and the favorable compressive stresses are reduced) would be desirable.



The C-5A (foreground) and C-141 (background) are two aging aircraft using bonded repair technology.

In this issue:

- ***Lead article***: Bonded Repairs for USAF's Fleet of Aging Aircraft (pages 1 - 2)
- Department Research News (pages 2-3)
- Publications and Presentations (pages 4 – 7)

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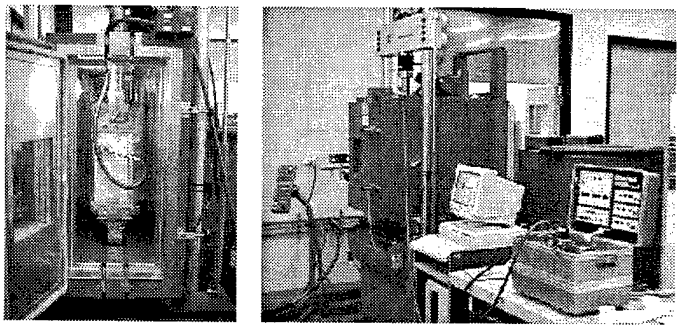
To simulate the worst-case scenario in the lab, cracks in 1.0 mm thick aluminum panels were repaired while the panels were in tension. Both boron-epoxy and Glare patches were used and the panels were pre-loaded at two different stress levels: 60 and 120 MPa. Panels without a pre-load were also tested as a reference. In order to apply the repairs while the test panels are in tension, the set-up is somewhat more complex than for the standard repair test specimen. The panels are pre-loaded in a tensile machine while a thermal chamber is fitted around the tensile machine to heat up the panels to the required 250°F to allow the adhesive to cure. The photos top right show a panel in the tensile machine while the thermal chamber is fitted around the setup. A vacuum bag on the panel is used to evacuate all air so that pressure is applied to the bond line between the patch and the panel.

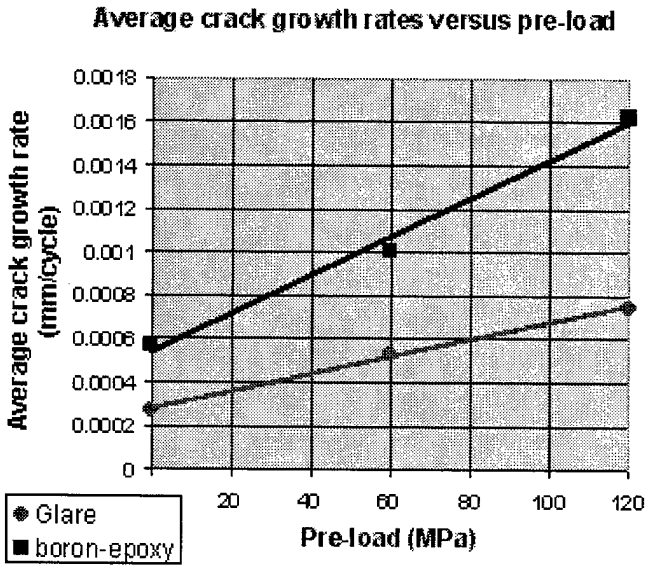
After the patches were bonded to the panels, the specimens were tested in fatigue under constant amplitude loading with a maximum stress of 120 MPa and a minimum stress of 6 MPa to compare the performance of the repairs with the different pre-loads.

It was found that the pre-loads have significant effects on the performance of the repairs. The graph below right shows the average crack growth versus the pre-load for specimens with boron-epoxy and Glare repairs. As can be seen, the influence of the pre-load is very significant, and a pre-load of 120 MPa almost tripled the crack growth rate compared to the no-pre-load case. It was also found that the influence of the pre-load is larger for the specimens repaired with boron-epoxy patches, which is due to the greater difference in thermal properties between boron-epoxy and aluminum versus Glare and aluminum.

Work is currently being done in analyzing the results and modeling the effects of the pre-loads on patch performance so that effects of pre-loads can be predicted for repairs to real aircraft structures. These results, along with the results of future tests, will be used as part of a comprehensive approach to extending the lives of USAF aging aircraft. By understanding the effects of pre-loads on bonded repairs, more effective repairs can be made, leading to economical aircraft life-extension.



A patch is being bonded to an aluminum panel while the specimen is in tension.



Department Research News

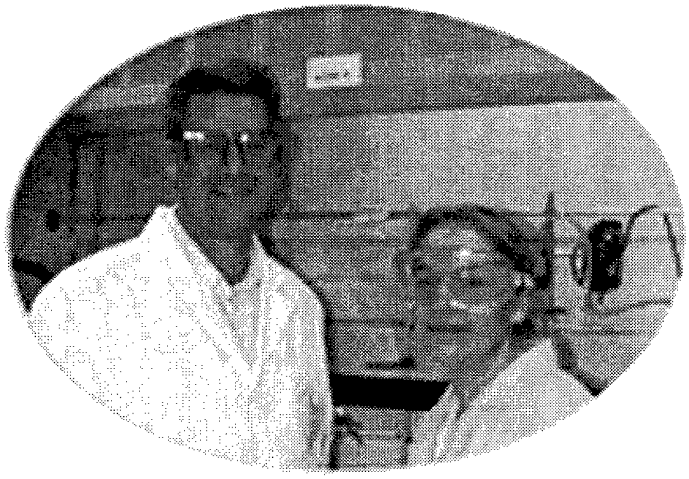
Department of Behavioral Sciences and Leadership

THE 1999-2000 RHR INTERNATIONAL OUTSTANDING DOCTORAL DISSERTATION AWARD

The Consulting Psychology Division of the American Psychological Association awarded the 1999-2000 RHR International Outstanding Doctoral Dissertation Award to Lt Col Tanoff of DFBL. The award included $1000 and an invitation to present his research at the 2001 Annual American Psychological Association Conference in San Francisco. The dissertation was titled, "The Utility of the Five Factor Model of Personality." Lt Col Tanoff completed his dissertation at the University of Oregon in March of 1999.

Department of Chemistry

Cadets in the Chemistry Department under the direction of Major Mace Golden are investigating the use of a DNA-based analytical method, which can bind with high specificity and sensitivity analyte molecules.



Major Mace Golden and C2C Mary Cunningham

C2C Rob McGill

In essence, they are using DNA outside the body like the immune system uses protein-based combinatorial systems within the body. This begins by generating a staggering number of possible solutions to a binding problem using a solid-phase DNA synthesizer. The size of this 'library' (and the size of the number of different DNA molecules) depends on the length of the random region of the various single stranded DNA molecules—called aptamers. The trick is to then isolate those very few aptamers with the desired properties from all the others in the original library by gel partitioning and polymerase chain reaction amplification.

A new spin to this process is to modify the bases (the individual molecular subunits) which make up the DNA molecules. C2C Mary Cunningham is currently synthesizing a modified uridine molecule, which can form a strong bond to protein targets when excited by UV or even visible light. This is done by including special light-absorbing units called chromophores at key locations on the base, which absorb light but do not inhibit enzymatic replication. This technology may revolutionize diagnostic science and permit the ready determination of many different types of ailments from a single, small sample of patient serum. C2C Rob McGill is taking this technology one step further. He is synthesizing a uridine base, which can form an amide bond to a target protein in an aqueous environment. If he can get sufficient specificity, this technology may be used to shut down proteins which supply growing cancers with a blood supply and thereby halt them

Department of Astronautics

Small Satellite Program

C1C Stuart Stanton (representing the Department of Astronautics) presented the proposed Charging Hazard and Wake Studies-Long Duration (CHAWS-LD) and Miniature Electrostatic Analyzer (MESA) payloads to the AF Space Experiments Review Board (SERB) in August.

Department of Behavioral Sciences and Leadership

LCDR Russell Shilling completed a certification course for designing and building THX theater systems offered by the THX Division of Lucasfilm in San Rafael, CA. This course is directly applicable to his ongoing research in auditory displays in virtual environments. While there, he initiated contacts that will allow him to tap into the expertise of the film industry to improve audio systems in simulations and VE. LCDR Shilling will be departing USAFA in December for a teaching assignment at the Naval Postgraduate School where he will be dual-hatted in Operations Research and the Modeling, Virtual Environments, and Simulation (MOVES) program. He has received a $72k research grant for developing an efficient audiometric test of sound localization ability and $20k for designing a high-end audio system for a virtual environments testbed. LCDR Shilling would like to continue contacts and collaboration at USAFA.

Publications and Presentations

34th Education Group

Publications:

ANDERSON, B. A. "The United States Air Force, B. 1947 -- D. 2025" *Airman-Scholar,* Spring 2000.

DAINS, R. N. "Force Support for the Expeditionary Air Force: A Function of Logistics Capability." *Air Force Journal of Logistics,* Summer 2000.

SMITH, J. M. ed. *Spacepower for a New Millennium: Space and U.S. National Security*, New York: McGraw-Hill, 2000.

Presentations:

KRUPNICK, C. A. "Amity and Enmity in the US-EU Security Relationship." "EU-US Relations: A Partnership in Transition" Conference sponsored by the European Union Center of the Sam Nunn School of International Affairs, Georgia Institute of Technology, Atlanta, GA, 14 April 2000.

SMITH, J. M. "Culture Change and Innovation in the USAF," CSAF Developing Aerospace Leaders Program Office, 3 April 2000.

SMITH, J. M. "USAFA's Contribution to Aerospace Leadership," CSAF Developing Aerospace Leaders Action Committee, Washington DC, 1 May 2000.

Department of Aeronautics

Publications:

GUY, Y., S. Morton, and J. Morrow. "Numerical Investigation of the Flow Field on a Delta Wingwith Periodic Blowing and Suction." AIAA Fluids 2000, AIAA 2000-2321, June 2000.

VAN TREUREN, K. and B. Haven. "Undergraduate Gas Turbine Engine Design Using Spreadsheets and Commercial Software." Gas Turbine and Aeroengine Congress and Exhibit, 2000-GT-587, May 2000.

WAGEMANN, J. and T. Colella. "V-Tail Stability and Control." Aero 471 Report, May 2000.

WILLIAMS, D., D. Fabris, and J. Morrow. "Experiments on Controlling Multiple Acoustic Modes in Cavities." AIAA Aeroacoustics Conference, June 2000.

YECHOUT, T. and E. Melendez. "Drag Reduction Approaches for the AC-130 Gunship Wing Pylons and Gun Barrels." DFAN TR 00-01, June 2000.

Presentations:

FORSYTHE, J., K. Hoffmann, and J. Dietiker. "Detached-Eddy Simulation of a Supersonic Axisymmetric Base Flow with an Unstructured Solver." Fluids 2000, Denver CO USA, June 2000.

FORSYTHE, J., W. Strang, and K. Hoffmann. "Validation of Several Reynolds-Averaged Turbulence Models in a 3-D Unstructured Grid Code." Fluids 2000, Denver Co, USA, June 2000.

SCHURICHT, P., J. Forsythe, J. Bertin, and G. Abate. "Comparison Between Measurements and Computations for Power-Law Elliptic section Bodies." Fluids 2000, Denver, CO, June 2000.

WOLF, J. "Development Of Radiant Heating Experimental Method For The Investigation of Convective Turbine Cooling." AIAA Conference Proceedings, Kansas (USA), April 2000.

YECHOUT, T., E. Melendez, S. Chadsey, and N. Rutgers. "AC-130H Drag Reduction Program." Presentation to AFSOC /16th SOS, Hurlburt AFB, FL, Hurlburt Field, FL, May 2000.

YECHOUT, T., T. Nettleblad, and C. Johnston. "X-38 'Mid-Rudder' Evaluation." NASA JSC, NASA JSC, Houston, TX, May 2000.

Department of Astronautics

Publications:

CHMIELEWSKI, R. "MERITT Research Discussion and Analysis of Topic VII: Spinning Tether Payload." AIAA Student Conference, April 2000.

Presentations:

BELLE, G. "Falconsat-1 Design Overview." Small Satellite Design & Technology Course, Col Spr, CO, May 2000.

GENTILE, C., A. Martin, T. Burton, and et al. "Development of a Hybrid Propulsion System for Sounding Rocket Applications." AIAA Student Conference, Wichita, Kansas, April 2000.

GENTILE, C., B. Marbach, and J. Dean. "Mars Ascent Vehicle Preliminary Design." AIAA Student Conference, Wichita, Kansas, April 2000.

LEE, K. "Modeling and Analysis of Launch Vehicle Thermal Protective System (TPS) Concepts." AIAA Student Conference, Wichita, Kansas, April 2000.

MCKAY, B. "Optimal Trajectories for Secondary Payloads from a Geosynchronous Transfer Orbit to the Moon." AIAA Student Conference, Wichita, Kansas, April 2000.

Department of Biology

Publications:

DEFUSCO, R. "Current status of the USAF Bird Avoidance Model (BAM)." International Bird Strike Meetings, 25:51-55, April 2000.

OBRINGER, J., S Phipps, and M Johnson. "DNA Microarray gene expression profiling of cultured human retinal pigment epithelial cells after high energy pulsed laser-light exposure." Proc. of SWARM/AAAS Mtg., 40/1, April 2000.

OBRINGER, J., S Phipps, and M Jojnson. "DNA Microarray Differential Gene Expression Profiling of Cultured RPE Cells after High Energy Pulsed Laser-Light Exposure." Proc. of CHI, April 2000.

REED, R. and R. Enger. "Team Building: Key to a Successful Self-Study and Team Visit." North Central Assoc., A Collection of Papers., April 2000.

REED, R. and R. Enger. "A Multi-Dimensional Approach to Student Assessment." North Central Assoc., A Collection of Papers., April 2000.

ROSS, M. and L. Maher. "The General Health Status of Young Adult Male Subjects Following Knee Surgery." Colorado Wyoming Academy of Science, XXXII, #1, April 2000.

ROSS, M. and S. Hooten. "Calf Muscle Girth and Performance Following Knee Surgery in Young Adult Male Subjects." Colorado Wyoming Academy of Science (2000), April 2000.

UNANGST, E., L. Merkley, and B. Coleman. "Effects of Lipid Deposition Site on Non-invasive Estimates of Body Composition." Colorado Wyoming Academy of Science, XXXII, #1, April 2000.

UNANGST, E., M. Blair, and M. Granger. "A Non-invasive Model for Estimating Body Composition in Wild Deer Mice." Colorado Wyoming Academy of Science, XXXII, #1, April 2000.

WUNDER, B. and E. Unangst. "Use of EM-SCAN to Determine Body Composition in Previously Frozen Specimens." IN: Life in the Cold, G. Heldmaier & M. Klingenspor (eds), Springer-Verlag Publishers.

Presentations:

BLAIR, M., M. Granger, and E. Unangst. "A Non-invasive Model for Estimating Body Composition in Wild Deer Mice." Colorado Wyoming Academy of Science, Pueblo, Colorado, April 2000.

DEFUSCO, R. "Current status of the USAF Bird Avoidance Model." International Bird Strike Meeting, Belgium, April 2000.

DEFUSCO, R. and T. Kelly. "The Avian hazard Advisory System." International Bird Strike Meetings, Netherlands, April 2000.

HOOTEN, S. and M. Ross. "Calf Muscle Girth and Performance Following Knee Surgery in Young Adult Male Subjects." Colorado Wyoming Academy of Science, Pueblo, Colorado, April 2000.

MAHER, L. and M. Ross. "The General Health Status of Young Adult Male Subjects Following Knee Surgery." Colorado Wyoming Academy of Science, Pueblo, Colorado, April 2000.

MERKLEY, L., B. Coleman, and E. Unangst. "Effects of Lipid Deposition Site on Non-invasive Estimates of Body Composition." Colorado Wyoming Academy of Science, Pueblo, Colorado, April 2000.

WILCOX, M., C. Tinianow, and T. Tinianow. "Hyperbaric Oxygen Treatment for Focal Brain Contusion." Rocky Mountain Bioengineering Symposium, USAFA, CO, April 2000.

Department of Behavioral Sciences and Leadership

Publications:

LEREW, D. R., Schmidt, N. B., Santiago, H.T., Trakowski, J.H., & Staab, J.P. (in press). Effects of heart rate feedback on estimated cardiovascular fitness in patients with panic disorder. Depression and Anxiety.

LEREW, D. R., Joiner, T. E., Jr., Schmidt, N. B., Cook, J. H., Gencoz, T., & Gencoz, F. (2000). The differential roles of depressive and anxious symptoms and of gender in defensiveness. Journal of Personality Assessment, 75, 200-211.

STAAL, M.A., Cigrang, J.A., & Fiedler, E.R.. Disposition decisions in Air Force basic trainees assessed during mental health evaluations. Military Psychology, 12(3), 187-203, 2000.

STAAL, M.A.. The cities of south central and eastern Cilicia: An ancient numismatist's paradise. The Celator: Journal of Ancient and Medieval Art and Artifacts, 14(12), 2000.

Presentations:

CARLSON, K. A. & Smith, K., Relationships among Implicit Learning Tasks. Paper presented at 12th Annual American Psychological Society , June 8-11, Miami, FL, 2000.

PRINGLE, H.L., Kramer, A.F. & Irwin, D.E. ;Eye movements, age and the representation of complex real-world scenes. Paper presented at 5th International Conference on Human Interaction with Complex Systems, 1-2 May, Champaign-Urbana, IL, 2000.

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

Proceedings:

SHILLING, R.D. , Letowski, T., & Storms R. (2000). Spatial Auditory Displays for use within Attack Rotary Wing Aircraft. Proceedings of the International Conference on Auditory Displays, April 2000, Atlanta, Ga.

Department of Chemistry

Publications:

WILKES, J., Margaret L. Mutch, Frank Lynch, and Jeff Schmidt. "Hydrogen Storage And Generation By Light Metal Chemical Hydrides." Proceedings of the 39th Power Sources Conference, 39, June 2000.

Presentations:

ALLEN, J. "Site Directed Mutagenesis of the FepA Ligand Binding Domain." Dept. of Chemistry, USAFA, USAFA, April 2000.

FURSTENAU, R. "The Energy-Environment Simulator." NW/Rocky Mtn Regional ACS Meeting, Idaho Falls, ID, June 2000.

MADLAND, A., John Wilkes, and R. Schoske. "Polystyrene Extractions By Room Temperature Acidic Chloroaluminate Molten Salt." 4th Ann Mtg S Colo Undergrad Research Symp, Pueblo, CO, April 2000.

RITTENHOUSE, T. "Single Crystal Growth and Characterization of Silicon Germanium Alloys." Dept. of Chemistry, USAFA, April 2000.

WILKES, J. "An Ammonia – Lithium Aluminum Hydride Hydrogen Genera-tor." Wkshp on Fuel Processors for PEM Fuel Cells, Detroit, MI, June 2000.

WILKES, J., Margaret Mutch, Frank Lynch, and Jeff Schmidt. "Hydrogen Storage And Generation By Light Metal Chemical Hydrides." 39th Power Sources Conference, Cherry Hill, NJ, June 2000.

WILKES, J. "The Past, Present and Future of Ionic Liquids as Battery Electrolytes." NATO Adv Res Wkshp Green Indust Appl Ionic Liquids, Heraklion, Greece, April 2000.

Department of Education

Publications:

REVAK, M.A., "If Technology is the Hammer, Where's the Nail?" Journal of Cooperation and Collaboration in College Teaching, 10(1), 21-23, 2000.

Presentations:

REVAK, M.A. and HUGHES, C.W., "Creating Focus Groups with Structure and Flexibility: A New Model." (with D. Fitzkee). Presented at the American Association of Higher Education Assessment Conference; Charlotte, NC, June 2000.

Department of Electrical Engineering

Publications:

DE GRAAF, P., S. Barrett, and C. Wright. "Deriving Irradiation Control Parameters for Laser Photocoagulation on the Retina." 37th Annual Rocky Mtn Bioengineering Symposium, Volume 36, April 2000.

ROYER, E., C. Wright, and D. Peterson. "Assessment for Electrical Engineering Programs: Processes Implemented at the United States Air Force Academy." IEEE Transactions on Education, vol 43, no 2, May 2000.

WELCH, T., C. Wright, and M. Morrow. "Poles, zeros, and MATLAB, oh my!." ASEE Computers in Education Journal, X, 2, April 2000.

Presentations:

PETERSON, D., C. Wright, and E. Royer. "Assessment Processes for Engineering Programs." ASEE 2000 Annual Conference, St Louis, MO, USA, June 2000.

Department of History

Publications:

FARQUHAR, J. T. "A Need to Know: The Role of Air Force Reconnaissance in War Planning, 1945-1953" accepted by Air University Press; publication in 2001.

Presentations:

FARQUHAR, J. T., "David Irving, Holocaust Denial, and Kosovo: Implications forToday's Officer." At the Reserve Officers Association's Colorado State Convention, April 2000.

FARQUHAR, J. T., "Richard I. Bong: American Hero and Class Exemplar," Air Force Academy Class of 2003 Class Exemplar Address, USAFA, May 00.

SHAW, J.M., "The Continuing Relevance of Limited War," Ridgway Center- Army War College's "The Korean War at 50 Years" conference, April 2000.

TUCCI, J.M., "*Terra Marique*: the Roman Invasion of Africa in the First Punic War." Missouri Valley History Conference, University of Nebraska-Omaha, May 2000.

Conferences:

ABADI, J., Model Arab League, Washington DC, April 2000.

ASTORE, W., History of Technology Conference, Leeds, UK, April 2000.

HEIDLER, J.T., Southern Historical Conference, Charleston SC, April 2000.

MAGNUSSON, W.P., Model Organization of American States, Washington DC, April 2000.

WELLS, M.K. and GROTELUESCHEN, M., Society for Military History annual conference, Quantico, VA, April 2000.

Department of Management

Publications:

CHESLEY, J. and J. Sellers. "Space Operations: Mission Management and Operations." Understanding Space: An Introduction to Astronautics, April 2000.

KING, D., C. Strbiak, and W. Jennings. "College Student Pedagogy: What Works (Best) With Personal Finance?" Journal of Business Education, June 2000.

Presentations:

BARKER, J., B. Wright, and J. Cordery. "The Ideal Participative State: A Prelude to Work Group Effectiveness." Society for Industrial and Organizational Psycholo, New Orleans, LA, April 2000.

GREEN, S. "Stop Just Acting Like a Business: Innovative Business Tools of the Private Sector." DoD Economic Analysis Workshop, Colorado Springs, CO, May 2000.

KING, D., S. Green, and N. Rappaport. "Bringing Acquisition Reform in Focus Through the Prism of Past Practice." Society of Cost Estimating and Analysis, Manhattan Beach, CA USA, June 2000.

MCKINNEY, E., J. Barker, and K. Davis. "Strangers on the Flight Deck." Western Academy of Management, Honolulu, HI, April 2000.

STRBIAK, C., J. Paul, and N. Landrum. "Trainer-Consultant Organizational Diagnosis." 7th Annual International Conf on Advances in Mgt, Colorado Springs, CO, May 2000.

Department of Mathematical Sciences

Publications:

GILCHRIST, R., G. Sjoden, D. Hall, and Nusser. "Modeling A Radiographic X-Ray Imaging Facility with the Pentran Parallel Sn Code." Proc of the 2000 International Topical Meeting, May 2000.

HADFIELD, S. "USAFA Research Tracking Ver 1.12." April 2000.

MAWHINNEY, S. and B. Warner. "Identification of Risk Factors for Increased Cost, Charges and Length of Stay for Cardiac Patients." Annals of Thoracic Surgery, 70, March 2000.

SCHAUBROECK, B. "Subordination of Planar Harmonic Functions." Complex Variables. Theory and Application, Vol. 41, May 2000.

WARNER, B. "Introducing Descriptive Statistics and Graphical Summaries." Statistics Teacher Network, Num 54 Spring 2000, April 2000.

WILSON, F. "Mathemania Template." May 2000.

WARNER, B. and J. Anderson. "Trees, Nets, Matches and Mushrooms." DFMS TR, 00-02, June 2000.

Presentations:

BURNS, K. and A. Seila. "Well-Behaved Estimators in the M/G/1 Queue." INFORMS National Meeting, Salt Lake City, Utah, USA, May 2000.

PARKER, M. and J. Lowe. "Undergraduate OR/MS Project Showcase." INFORMS National Meeting, Salt Lake City, UT, May 2000.

SCHOOFF, R. "The Consideration of Multiple Objectives in US Engagement Strategies." Int'l Conf on Systems Engr in Decision Making, Charlottesville, VA, June 2000.

WARNER, B. and M. Revak. "A Statistics Sampler." NCTM Annual Meeting, Chicago, Illinois, April 2000.

Department of Physics

Publications:

BRASSEUR, J., P.A. Roos, K.S. Repasky, and J.L. Carlsten, "Coherent Anti-Stokes Emission in a Continuous Wave Raman Laser in H2." Journal of the Optical Society of America B, Vol No, April 2000.

BRASSEUR, J., P.A. Roos, L.S. Meng, and J.L. Carlsten. "Frequency Tuning Characteristics of a Continuous Wave Raman laser in H2." Journal of the Optical Society of America B, Vol No, April 2000.

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, April 2000.

KNIZE, R., W. White, and B. Zhdanov. "Optical modulators Laboratory." American Journal of Physics, Vol No, May 2000.

NOVAK, G. and E. Patterson. "The Best of Both Worlds: World Wide Web Enhanced In-Class Instruction." Computers and Advanced Tech in Education, Code 311-075 pg 83, May 2000.

P.A. ROOS, J. Brasseur, and J.L. Carlsten. "Intensity dependent refractive index in a non-resonant cw Raman laser due to thermal heating of the Raman-active gas." Journal of the Optical Society of America B, Vol No, April 2000.

PATTERSON, E. "Just-in-Time Teaching (JiTT)." TYC Physics Workshop Project Web Connected Physics, June 2000.

TEEHAN, R. "Power scaling and frequency stabilization of an injection-locked Nd:YAG rod laser." Applied Optics, Vol No, April 2000.

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." Advances in Space Research, Vol 25 No 7/8 p 1343, April 2000.

Presentations:

BRASSEUR, J., P.A. Roos, L.S. Meng, and J.L. Carlsten. "Co-linear anti-Stokes generation from a cw Raman Laser." CLEO, San Francisco, CA, May 2000.

BRASSEUR, J., P.A. Roos, L.S. Meng, and J.L.Carlsten. "Continuous frequency tuning of cw Raman lasers." CLEO, San Francisco, CA, May 2000.

BRASSEUR, J., G. Andersen, P. Haris, and R. Knize. "Daytime Holographic Raman Lidar System." SPIE Aerosense, Orlando, FL, April 2000.

HAWKS, M., I. Dajani, C. Kutsche, and F. Ghebremichael. "Modeling and Prototyping of Polymer Fiber Based Chemical and Biological Agent Sensors." SPIE Proceedings V4036, Orlando, FL, April 2000.

KNIPP, D. and L. Krause. "A statistical Survey of the Effects of Solar Wind Structures on the Ionosphere and Magnetosphere." Coupling, Energetics and Dynamics of Atm Region, Boulder, CO, June 2000.

KNIPP, D. and L. Krause. "A Statistical Survey of the Effects of Solar Wind Structures on the Ionosphere and Magneto-sphere." Geospace Environmental Modeling Meeting, Snowmass, CO, June 2000.

KRAUSE, L. "A New MeV Electron Auroral Model." Geospace Environmental Modeling Meeting, Snowmass, CO, June 2000.

PATTERSON, E. "Using the Web for Teaching and Learning Physics: Just-in-Time Teaching (JiTT)." U. Wisconsin-Stout Science Ed Conference, Madison, WI, May 2000.

Department of Political Science

Publications:

CARRESE, P. and R. Faulkner, eds. "The Life of George Washington." April 2000.

TALBOT, B. and J. Hicks. "Led by a Lion: The U.S. Role in Preserving Gulf Security." Aerospace Power Journal, 14/2, June 2000.

VALLANCE, B. The Rule of Law and Russian Military Reform: The Role of Soldiers' Mothers in Russian Society. The Carl Beck Papers, June 2000.

Presentations:

LANCE ROBINSON "Theodore Roosevelt: Consistent Progressive." Progressivism and American Liberalism, Claremont, CA, April 2000.

RICHARDSON, S. and J. Joseph S. Bermudez. "A North Korean View of the Development and Production of Strategic Weapon Systems." NPEC Conference: Planning for a Peaceful Korea, Arlington, VA, June 2000.

USAFA Research Points Of Contact

To learn more about research at the United States Air Force Academy, we encourage you to visit our Web site at www.usafa.af.mil/dfe. If you want to focus on a particular department or effort you might want to contact the associated Department Research Director. Each phone extension is preceded by (719)-333 commercial or 333 DSN. Each e-mail is followed by @usafa.af.mil

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