



AAR-100

Human Factors Newsletter # 03-14

August 9, 2003 – August 26, 2003

FAA Research Grant to Clemson University: Development of Industry Standardized Web-based Auditing/Surveillance Tool to Minimize Maintenance Prior to Dispatch by Airlines

Background. For the FAA to provide the public with continuing safe, reliable air transportation, it is important to have a sound aircraft inspection and maintenance system. This system is complex, with many interrelated machine and human components. Recognizing the importance of the human in this process, the FAA has pursued human factors research, placing continuing emphasis on developing interventions to make the inspection/maintenance system more reliable and/or more error tolerant. A key objective has been to reduce errors and to conduct research that provides the aircraft maintenance community with interventions/tools that will help in the identification of factors resulting in maintenance errors. Knowing which factors contribute to these errors can lead to strategies minimizing their effects. A potential area for the application of such an approach is in the area of dispatching aircraft following service. In response to this need, the research team will focus on developing a Web-based surveillance tool to minimize maintenance errors prior to dispatch by airlines. It is anticipated that the use of this tool will facilitate the standardization of data collection on surveillance activity. To ensure that the tool addresses the needs of the aircraft maintenance community, this research will be pursued with an industry partner.

Objective. The general objective of this research is to develop and implement an application tool to perform surveillance activities. This will ensure that a consistent level of supervision is maintained over maintenance operations. The system will promote a standardized format for data collection, reduction, and analysis to identify proactively contributing factors of improper maintenance. The research will be pursued over three years, employing an integrated task analytic and user-centered software lifecycle development methodology with the following specific objectives: (1) identify an exhaustive list of impact variables that affect aviation safety and transcend across various aircraft maintenance organizations; (2) develop a data collection/reduction and analysis protocol to analyze errors for the identified set of impact variables; and, (3) using the results of the aforementioned activity, develop and implement an application tool in performing surveillance/monitoring which ensures that a consistent level of oversight is maintained.

Impact. The development of a standardized Web-based surveillance tool will benefit the FAA and the aviation maintenance industry in the following areas:

- Identification of potential factors causing maintenance errors. Eliminating the effects of these factors will help reduce maintenance errors, ultimately improving the safety and reliability of aircraft inspection and maintenance operations.
- Standardization of the data collection process supporting the analysis of maintenance errors prior to aircraft dispatch. This standardization will facilitate analysis across airlines.
- Alleviation of the problems inherent to on-the-job-training. This Web-based tool can be combined with existing training programs to facilitate consistency in inspection training, providing adaptive training and supporting record keeping and performance monitoring.
- In addition, this research will directly support FAA requirements and the mandate for reducing maintenance accidents by conducting guidelines-based human factors research through identifying and implementing intervention strategies.

Grant Technical Monitor: Kip Krebs, AAR-100

ADS-B: Kenneth Allendoerfer (ACB-220) traveled to the Lockheed Martin facility in Eagan, MN to observe a demonstration of an issue that the Surveillance Integration Team (SIT) is working on regarding the use of ADS-B by terminal controllers. The issue is that today, using short-range radar, all traffic that an individual controller is working typically updates (nearly) simultaneously. When ADS-B is brought into the mix, the updating is not synchronized with radar, so the targets update at different times (controllers have called it "the accordion effect"). This could be a problem when working tightly spaced arrival patterns. Lockheed Martin demonstrated the issue using their Common ARTS system, and then demonstrated a potential technical solution. The design that Lockheed Martin demonstrated seemed to be effective. Basically, the system waits for the "preferred radar" to update, and then redraws the ADS-B targets simultaneously, using the most recently received ADS-B position. It re-creates the synchronized updates of radar and seems more familiar to controllers. (E. Stein, WJHTC)

NATPRO: In August, a briefing was provided to AAT-1 on results of the first National Air Traffic Professionalism (NATPRO) Program that was conducted at Miami ARTCC during June and July 2003. The NATPRO program, developed by controllers for controllers, was led by AAT-20 with input from the Southern Region Learning Council in concert with AAT-200. Mr. Randy Breedlove is the NATPRO Program Manager.

Key objectives of the NATPRO program are: (a) to increase controller understanding of mental processes and influences that may affect an individual's performance, (b) to develop personal performance improvement programs to supplement existing knowledge-based training, and, (c) to test utility of interactive computer programs as tools for increasing this awareness and improving mental skills.

Controllers were given the opportunity to volunteer for the program, which consisted of a seminar with 15 computer practicum sessions. The program was administered "in-house" by Miami ARTCC personnel. CAMI assisted the team in conducting the program evaluation. A pretest was administered prior to the seminar and re-administered as a post-test upon conclusion of the practicum. The tests employed were different than those used during the practicum but

conceptually similar. Two groups of participants were tested: the NATPRO group that volunteered to complete the seminar and practicum, and a control group that completed only the pretest and post-test.

Results showed that, compared to the control group, NATPRO participants improved their scores in performing two simultaneous tasks on a multitasking game with distractions an average of 35% on a memory task and 16% on a mental calculation task. This compares favorably with other studies where controllers showed less than a 1% gain over a control group on similar tasks that also did not require simultaneous performance. On seminar effectiveness, NATPRO participants rated themselves as having gained more in knowledge about their mental skills compared to the control group. NATPRO participants also responded that they would benefit from further knowledge and skills practice, compared to the control group. With regard to practicum effectiveness, examination of scores from the practice computer exercises (“games”) demonstrated that NATPRO participants engaged with the goal of the program. Data showed a general increase in performance over the three weeks of practice. The data also showed that the controllers were able to quickly adapt to changes in levels of difficulty in the practicum “games” and continued to improve their performance with practice.

Expansion of this NATPRO series to more ATC facilities is currently being planned. Additional series for development under the NATPRO program umbrella are in review. (J. Pounds, CAMI)

Awards for CAMI's Researchers: The Aerospace Medical Association (AsMa) recently honored six CAMI researchers at its Annual Scientific Meeting. Dave Schroeder, Ph.D., is AsMa's newly elected president. Dr. Schroeder manages the FAA's Aerospace Human Factors Research Division. AsMa elected Tom Nesthus, Ph.D., and Alex Wolbrink, M.D., as Fellows – only 1% of all active members are recognized as Fellows. Scott Shappell, Ph.D., received the Harry G. Moseley Award for his outstanding contributions to flight safety. Dr. Shappell and his collaborator, Dr. Douglas Wiegmann of the University of Illinois, developed the Human Factors Analysis and Classification System. Raymond King, Ph.D., received the Raymond F. Lonacre Award for his outstanding work in the psychological and psychiatric aspects of aerospace medicine. Dr. King currently is conducting research involving air traffic controller selection and training. CAMI Director Melchor J. Antuñano, M.D., received the Eric Liljencrantz Award, given annually for excellence in aerospace medicine education. Dr. Antuñano, was recognized for his outstanding accomplishments in the promotion of aviation safety in the U.S. and abroad through his leadership as an educator. (T. Kraus, AAR-200)

AAR-100 Annual Report/Project Database: We are currently collecting information from all of our researchers for the Annual Report and Project Reporting Database. Instructions and format information were dispatched earlier. For examples of completed reports, you can go to the following Web site: <http://www.hf.faa.gov/FY03%20Program%20Review.htm>
If you have not provided this information, please do so as soon as possible, as we are under a hard deadline for publication in the first quarter of FY04.

ETMS: On August 20-21, Tanya Yuditski from the NAS Human Factors Group (ACB-220) at the William J. Hughes Technical Center supported Operational Testing of the Enhanced Traffic Management System (ETMS) Version 7.7. The Traffic Flow Management User Team (TUT)

exercised the system by completing scripted as well as *ad hoc* procedures. Researchers made observations and captured user comments, which were later discussed and prioritized with the TUT. In addition, the group reviewed the functions planned for the next release of ETMS, Version 7.8. Together with a software developer from Volpe NTSC, prototypes of displays were presented and questions were outlined that address display design. The TUT members provided operational input about how they do their jobs today and identified areas that currently present usability problems. (E. Stein, WJHTC)

Effect of Simulator Motion on Airline Training and Evaluation: On August 13, 2003, a paper titled "The Effects of Enhanced Hexapod Motion on Airline Pilot Recurrent Training and Evaluation," coauthored by Research and Special Programs Administration's Volpe Center and NASA-Ames Research Center researchers was delivered at the American Institute of Aeronautics and Astronautics Modeling and Simulation Technologies Conference in Austin, Texas.

Under an interagency agreement between the Volpe Center and NASA-Ames, the NASA/FAA Level D Boeing 747 simulator was reengineered to provide better motion cues than the ones provided in an earlier study. This earlier study found no operationally relevant effect of the motion cues provided by an unmodified Level C motion system on recurrent evaluation and training of airline pilots. The current study showed that enhanced platform motion does make a difference in recurrent evaluation, but was not found to be of benefit in recurrent training. Results of this study and the previous hexapod motion research should assist the FAA in determining future research directions in the effort to develop motion requirements for today's airline evaluation and training needs. (J. Bürki Cohen, Volpe Center; E. Edens, AFS-230)

American Psychological Association Convention: CAMI personnel participated in a panel presentation entitled *Selection for Safety Sensitive Positions in the Federal Aviation Administration* during the American Psychological Association Annual Convention in Toronto, Canada. The presentations included: *The FAA's History of Matching Human Capabilities to Job Requirements* (D. Broach, AAM-520), *Selection for the Present and Future: The AT-SAT Battery* (C. Detwiler, AAM-520), and *Contribution of a Non-Cognitive Task to ATCS Selection* (R. King, AAM-520). Dave Schroeder (AAM-500) served as the panel discussant. A number of comments were provided by attendees concerning issues associated with employee selection in other safety-critical occupations.

In other convention activities:

Dana Broach and Ray King participated in a workshop on cognitive ability and personality testing for employment decision-making. Scott Shappell (AAM-510), as the chair of the Division of Applied Experimental and Engineering Psychology program committee, coordinated the numerous division sessions during the four-day meeting. Scott also presented a paper during one of the scientific sessions entitled "*Human Error Comparison of Military and Civilian Aviation Accidents using HFACS.*"

Dave Schroeder, president of Division 21, presided over the executive committee and business meetings. He also provided the presidential address entitled "*Air Traffic Control: A Bit of History*

and the Characteristics of Those Who Keep the Sky Safe." A second presentation, to a group from the American Psychological Association of Graduate Students, was focused on aviation-related careers in applied experimental and engineering psychology.

During the convention, CAMI scientists had an opportunity to confer with professional colleagues and attend sessions related to employee selection, leadership, human computer interaction, and aging, attention, and memory. (R. King, CAMI)

More information on human factors research can be found at the FAA Human Factors (AAR-100) web site: <http://www.hf.faa.gov>

Mark D. Rodgers
FAA (AAR-100)



September 3-10, 2003 – EUROCONTROL 11th Air Navigation Conference and Exhibition, Montreal, Canada <http://www.eurocontrol.be/newsroom/events/index.html>

September 8-12, 2003 – EUROCONTROL 9th Global TRAINAIR Conference and Training Symposium, <http://www.eurocontrol.be/newsroom/events/index.html>

September 8-12, 2003 – SAE Aerospace Congress and Exhibition, Palais des Congrès, Montreal, Quebec, Canada <http://www.sae.org/calendar/aeromtgs.htm>

September 8-12, 2003 – 17th Annual HCI Conference, Bath England <http://www.bcs-hci.org.uk/hci2003/>

September 15-17, 2003 – FAA/TCA/CAA Safety Management in Aviation Maintenance Symposium, Toronto, Canada

September 16 – 18, 2003 - 29th European Rotorcraft Forum, Friedrichshafen, Germany. Contact B. Gmelin at bernd.gmelin@dir.de

September 16-18, 2003 – MRO Europe, Cardiff International Arena, Cardiff, Wales <http://www.awgnet.com/conferences/meumain.htm>

September 16-19, 2003 – Investigation and Reporting of Incidents and Accidents (IRIA), Williamsburg, VA <http://shemesh.larc.nasa.gov/iria03/>

September 17-18, 2003 – FAA Research, Engineering and Development Advisory Committee (REDAC) Meeting, Washington, DC <mailto:gloria.dunderman@faa.gov>

September 17-19, 2003 – 3rd Air Cargo Economics Conference, Sheraton Amsterdam Airport Hotel & Conference Center, Netherlands
<http://www.euroavia.com/conf/default.html>

September 17-21, 2003 - Institute of Electrical and Electronics Engineers (IEEE) 25th Annual Engineering in Medical and Biology Society International Conference, Cancun, Mexico
<http://itzamna.uam.mx/cancun/>

September 18-19, 2003 – National Academy of Engineering 2003 Frontiers of Engineering Symposium, Irvine, CA [*Welcome to the National Academy of Engineering \(NAE\)*](#)

September 22-24, 2003 - 41st Annual SAFE Symposium, Jacksonville, FL
<http://www.safeassociation.org/2003symposium1.htm>

September 22 – October 3, 2003 – ICAO 11th Air Navigation Conference, Montreal, Canada
<http://www.icao.int/icao/en/anb/meetings/anconf11/index.html>

September 24-25, 2003 –IATA/ICAO/Flight Safety Foundation ICARUS Committee/University of Texas LOSA Meeting, Montreal, Canada <mailto:helmreich@mail.utexas.edu>

September 24-26, 2003 - Institute of Electrical and Electronics Engineers (IEEE) International Symposium on Technology and Society, Amsterdam, The Netherlands
<http://radburn.rutgers.edu/andrews/projects/ssit/istas03.pdf>

October 5-8, 2003 - Institute of Electrical and Electronics Engineers (IEEE) International Conference on Intelligent Control, Houston, TX <http://vlab.ee.nus.edu.sg/~isic2003/>

October 5-8, 2003 - 2003 IEEE International Conference on Systems, Man, and Cybernetics, Washington, DC http://becat.engr.uconn.edu/IEEE_CSMC_2003/

October 6 – 9, 2003 - NATO Research and Technology Agency, Applied Vehicle Technology Panel (AVT) will present "The Vehicle Propulsion Integration Symposium" in Poland. For more information contact cheynes@rta.nato.int

October 7 – 9, 2003 - National Business Aviation Association Annual Meeting & Convention, Orlando, Florida. Contact: www.nbaa.org

October 13-17, 2003 – Human Factors and Ergonomics Society 47th Annual Meeting, Adams Mark Denver Hotel, Denver, CO <http://www.hfes.org/>

October 15, 2003 – Royal Aeronautical Society Conference on Mitigating Human Error, London UK <http://www.aerosociety.com/homepage.asp>

October 17-19, 2003 – EUROCONTROL IFATCA European Regional Meeting, Porto
<http://www.eurocontrol.be/newsroom/events/index.html>

October 19-21, 2003 – IEEE Symposium on Information Visualization, Doubletree Hotel, Seattle Airport, WA <http://infovis.org/infovis2003/>

October 21-23, 2003 – 7th IEEE International Symposium on Wearable Computers, Crowne Plaza Hotel, White Plains, NY <http://www.cc.gatech.edu/ccg/iswc03/>

October 26-30, 2003 – ATCA 48th Annual International Technical Program and Exhibits, Marriott Wardman Park Hotel, Wash, DC http://www.atca.org/static2_item.asp?item_ID=19

October 27-28, 2003 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington, DC <http://wwwsearch.nationalacademies.org/>

October 27-30, 2003 – SAE DoD Maintenance Symposium and Exposition, Valley Forge Convention Center, King of Prussia, PA <http://www.sae.org/calendar/aeromtgs.htm>

November, 2003(tentative) – DOD TAG-50, Fall 2003, Phoenix, AZ
<http://hfetag.dtic.mil/meetschl.html>

November 4-5, 2003 – NASA/FAA Operating Documents Workshop VI: Updating your Data – The Future of Revisions. Orlando Airport Marriott Hotel, Orlando FL. <http://human-factors.arc.nasa.gov/opdoc-workshopV/>

November 5-6, 2003 – Royal Aeronautical Society Flight Simulation Group Conference on “Simulation of the Environment”, London, UK <http://www.raes.org.uk/homepage.asp>

November 5-7, 2003 – FAA Centers of Excellence 3rd Joint Annual Meeting, Daytona Beach Hilton Oceanside Resort, Daytona Beach, FL
http://www.embryriddle.edu/research/FAA_COE_Meeting/index.html

November 5-7, 2003 – 5th International Conference on Multi-Modal Interfaces, Marriott Vancouver Pinnacle Hotel, Vancouver, British Columbia, Canada <http://www.acm.org/uist/>

November 17-20, 2003 – 56th Annual Air Safety Seminar, A Joint Meeting of Flight Safety Foundation, International Federation of Airworthiness, and International Air Transport Association, Bangkok, Thailand <http://www.flightsafety.org/seminars.html>

December 2-4, 2003: National Training Systems Association Inter-Service/Industry Training, Simulation and Education Conference (I/ITSEC), Orlando, FL <http://www.trainingsystems.org>

December 3-5, 2003 – FAA System Engineering Annual Workshop with Information Systems Security – Meeting Real World Challenges, Holiday Inn, Atlantic City, NJ <http://se-iss.tc.faa.gov>

December 9-12, 2003 - Institute of Electrical and Electronics Engineers (IEEE) Decision and Control Conference, Maui, HI <http://www2.acae.cuhk.edu.hk/~ycliu/cdc03/>

January 11-15, 2004 – Transportation Research Board Annual Meeting, Washington, DC <http://www4.trb.org/trb/annual.nsf>

January 18-22, 2004 – Conference on Visualization and Data Analysis, San Jose Marriott and San Jose Convention Center, San Jose, CA <http://vw.indiana.edu/vda2004/>

January 21 – 23, 2004 - AHS 4th Decennial Specialists' Meeting on Aeromechanics, Fisherman's Wharf, San Francisco, CA. For more information contact the Technical Chairman, Tom Maier at tmaier@mail.acr.nasa.gov

March 22-24, 2004 – Eye Tracking Research and Applications Symposium, Menger Hotel, San Antonio, TX <http://www.e-t-r-a.org/>

March 22-25, 2004 – HPSAA II Conference, Human Performance, Situation Awareness, and Automation Technology, hosted by Embry-Riddle Aeronautical University and the University of Central Florida, Hilton Oceanfront Resort, Daytona Beach, FL <http://faculty.erau.edu/vincenzd/hpsaa>

March 23-26, 2004 – 4th International Workshop on Smart Appliances and Wearable Computers, Tokyo, Japan <http://www.unl.im.dendai.ac.jp/IWSAWC/>

April, 2004 – SAE General Aviation Technology Conference and Exhibition, Century II Convention Center, Wichita, KS <http://www/sae.org/calendar/aeromtgs.htm>

April 18-21, 2004 – FAA Worldwide Airport Technology Transfer Conference, Hilton Atlantic City Hotel, Atlantic City, NJ <http://www.airtech.tc.faa.gov/att04/>

May 3-6, 2004 – 75th Annual Scientific Meeting of the Aerospace Medical Association, Egan Convention Center, Anchorage, AK <http://www.asma.org/>

May 6-8, 2004 - AHS International 60th Annual Forum and Technology Display, Virginia Beach, VA. Contact Staff@vtol.org

May 10-12, 2004 – Royal Aeronautical Society 10th AIAA CEAS Aeroacoustics Conference, Manchester Town Hall, UK <http://www.aerosociety.com/homepage.asp>

May 26-27, 2004 – Royal Aeronautical Society Conference – Flight Simulation 1929-2029, A Centennial Perspective, London, UK <http://www.aerosociety.com/homepage.asp>

July 27-August 2, 2004 – 52nd Annual AirVenture, Oshkosh, WI <http://airventure.org/>

July 28 – August 1, 2004 – 112th Convention of the American Psychological Association. Honolulu, Hawaii <http://www.apa.org/convention>

August 1-4, 2004 – Designing Interactive Systems, Cambridge, MA
<http://www.sigchi.org/DIS2004/>

September 20-24, 2004 – Human Factors and Ergonomics Society 48th Annual Meeting,
Sheraton New Orleans Hotel, New Orleans, LA <http://www.hfes.org/>

October 18-19, 2004 – National Academies Institute of Medicine Annual Meeting, National
Academy of Sciences, Washington, DC <http://wwwsearch.nationalacademies.org/>

May 9-12, 2005 - 76th Annual Scientific Meeting of the Aerospace Medical Association, Kansas
City, MO <http://www.asma.org/>

August 18-21, 2005 - 113th Convention of the American Psychological Association, Wash, DC
<http://www.apa.org/convention>

October 24-25, 2005 – National Academies Institute of Medicine Annual Meeting, National
Academy of Sciences, Washington, DC <http://wwwsearch.nationalacademies.org/>

Note: Calendar events in Italics are new since the last Newsletter



Comments or questions regarding this newsletter?
Please contact Bill Berger at (334) 271-2928
or via e-mail at bill.ctr.berger@faa.gov