



AAR-100

Human Factors Newsletter # 04-07

March 27, 2004 – April 9, 2004

Technical Information: The Human Factors Acquisition Engineering (HFAE) Program.

The HFAE supports the strategic goal for **enhancing the safety of FAA's air traffic systems** by focusing on the application and integration of human factors engineering in system acquisitions. HFAE program activities contribute to the definition, procurement, design, development, testing, and implementation of diverse systems within the National Airspace System (NAS) and supporting the FAA. The program conducts activities associated with building a human factors engineering program within the FAA and its systems engineering community. It addresses the application of human factors engineering during mission and requirements analysis and development; investment analysis; product analysis, design, development, and testing; source selection package preparation and evaluation; and post-deployment data collection and analysis. The objectives affiliated with the HFAE Program relate to identifying and defining system-specific human factors requirements, assessing human factors risks, providing technical solutions to mitigate risks, advising on policy and process decisions related to human factors engineering, conducting human factors training, acquiring and supporting human factors tools and technologies, and implementing human factors plans. Technical support to system acquisition programs encompasses areas of study related to human-computer interface, staffing and training, workload, procedures, documentation, communications, and other salient human-system interface issues. Connectivity between the application of human factors engineering in system acquisitions and the necessary supporting human factors research is enhanced through collocation with management of the human factors research program.

The HFAE Program supports or directly provides products and services essential to the integration of human factors engineering in system acquisitions and to the mitigation of human-system performance risks. Products and services include policy, processes, plans, technical training, professional development, tools, databases, studies, analyses, reports, and FAA Acquisition Management System program documentation. These products and services are provided to and used by FAA acquisition organizations including Integrated Product Teams, Integrated Requirements Teams, and Investment Analysis Teams; FAA support contractors; and vendors and outside agencies. Products and services provided by this program involve a centralized core of human factors expertise and support from the larger FAA human factors

community of practice which includes approximately 20 FAA personnel and 20 contract support personnel.

A key component of the HFAE program entails conducting Human Factors Reviews as part of the ARA Implementation Plan to provide a cooperative exchange of information about the status of, and opportunities to improve, human factors integration in system acquisitions. In concert with the FY04-08 Flight Plan and the FY04 ARA Goals, Flight Plan Safety Goal Objective 8 (Activity 9) entails conducting Human Factors Reviews between representatives of the Human Factors Research and Engineering Division (AAR-100) and the service areas IPTs. The annual reviews are scheduled by designated HF practitioners in the IPTs and consist of the IPT HF practitioners presenting: 1) the acquisition program's approach to human factors; 2) risks and mitigation activities of the programs, systems, and projects; and 3) identification of opportunities for potential enhancements to the FAA or systems' human factors program. The HF Review criteria focus on human factors technical best practices and are tailored to the appropriate level of system need. In this way, the community of practice works collaboratively to ensure program managers and team leaders have the best information on HF issues that may impact their programs by:

- Providing information on risks identified (or likely to be identified)
- Offering recommendations on potential means to mitigate HF risks
- Identifying and resolving obstacles to accomplishing HF research and engineering
- Receiving feedback and/or requests for assistance

During FY03, the Human Factors Reviews identified 38 recommendations and action items to be addressed by activities starting as early as FY04, including:

- Changes to the HF Review process with feedback and consultation with IPT HFCs (13 items), such as addressing human capital management planning considerations in the HF Review, or such as seeking to apply human factors integration processes to major information management systems.
- HF research and engineering technical tasks to be conducted in coordination with appropriate HF community members (17 items), such as increasing the availability of research and engineering reports and studies, or conducting additional "collocation" research on systems and application in development.
- Actions recommended to ARA Management Team subject to ATO implementation (8 items), such as establishing guidelines for source selection criteria to offer a suggested or possible weighting relative to HSI considerations.

During FY04, the Human Factors Reviews will capitalize on the previous results and continue to be conducted to provide a collaborative HFEA process for achieving agency objectives for human factors research and development.

Point of Contact: Glen Hewitt, AAR-100

Air Traffic Controller Performance: On March 24th, Earl Stein presented a paper at the Biannual Conference on Human Performance, Situation Awareness and Automation Technology in Daytona Beach, Florida. The paper was titled *Air Traffic Controller Performance: Constructs and Concepts Can Be Confusing*.

Abstract: Air traffic controllers do a demanding job under dynamic conditions. Over the years, researchers have built numerous performance models that often blur the lines between the contributions of the operator and those of the system itself. We find it difficult to separate the people from their machines and supporting technology. Performance measurement has cycled between individual controller metrics and other variables over which the controller may or may not have any impact. In ATC, we have carried on the tradition of the flight check using checklists and rating scales administered by subject matter experts or supervisors. These tools have face validity but may or may not be reliable and valid against realistic criteria, the nature of which is often debated.

The advent of high-fidelity person-in-the-loop simulation created the possibility that we could collect a host of objective measures using automated recording. This generates a high volume of data, which we can analyze with menu-driven statistical software. If we look at the variables and how they correlate, there is a lot of redundancy in the matrix. Some of the variables do focus on safety, and in aviation, safety is everything. Keeping aircraft separated by the requisite minimum distance or altitude is the gold standard. However, controllers are good at what they do, so systems errors, a loss of separation, are relatively rare events. This means that generally they are not good performance indicators, especially for research, where the goal is often to tease out subtle differences induced by changes in procedure or technology.

Other metrics are gaining influence. Efficiency is becoming the platinum standard for justification of new technology and procedures. It is not always clear that this is the sole end product of controller behavior, but could be the result of a combination of the controller's efforts and whatever technology is currently on center stage. Efficiency generally means using airspace more effectively by moving aircraft closer together on the intuitive belief that technology will allow for a safe operation without overloading or under loading the operator.

We have, in some respects, come full circle. We have both research metrics and the ability to break down air traffic events from taped recordings along the same or similar parameters. Yet for training and periodic evaluation of the controllers themselves, we still use simple over-the-shoulder ratings with 3-point scales administered by managers that to keep themselves current must work traffic eight hours a month. As applied researchers, we need to use all the tools available to us to ensure that the performance implications of new technology are identified. Further, we need to be sure we know what we mean by performance and whether it is the system or the operator's contributions we are measuring.

Point of Contact: E. Stein, WJHTC

ATC Automation Displays: On March 31st, Jing Xing made a trip to Texas Tech University to meet with several human factors research groups, tour a vision research laboratory, and present a seminar on CAMI human factors research. Below is the abstract of her talk.

Title: Information Complexity and Visual Factors in ATC Automation Displays

Abstract: This talk will cover two topics. The first part of the talk is about "information

complexity in automation displays for air traffic control". In order to help controllers manage the increasing volume of air traffic, many automation tools are being developed. While the automation tools are designed with the objectives of increasing capacity and reducing the workload, using the tools may actually increase the complexity of the task. Moreover, if the information provided by the tools overwhelms controllers' cognitive capacities, the information can be either missed or misinterpreted. This study is to understand the impact of information complexity on controllers' task performance and to develop measures of information complexity in automation displays. I will introduce a framework of evaluating complexity. The framework proposes that information complexity is the combination of three basic factors: numeric size, variation and relation. Each of these factors is evaluated by three stages of information processing in the brain: perception, cognition and action. I will then focus the talk on potential methods and experiments that measure perceptual complexity.

In the second part of the talk, I will introduce the current situation of color use in air traffic control displays and the problems related to color vision. Color-coding is being extensively used for various purposes such as drawing attention, separating information, and enhancing search efficiency. However, those benefits are often accompanied with drawbacks that affect controllers' job performance. We observed many cases of improper use of color in air traffic control displays. The concerns on color use are leading to several lines of color-vision related studies by the FAA.

Point of Contact: Jing Xing, CAMI

IDS: In April, research psychologists from ACB-220 will conduct structured interviews with Air Traffic Control Specialists from New York Air Route Traffic Control Center (ARTCC) to gather information about Information Display System (IDS) requirements. The interviews will focus on oceanic operations. The information gathered through these interviews will be used to develop a set of IDS design standards for future systems. Recently, ACB-220 visited Terminal Radar Approach Control facilities and Air Traffic Control Towers, as well as other ARTCCs, to gather information on IDS use and requirements. (E. Stein, WJHTC)

Time-Stamped Data: Nelda Milburn traveled to Chicago to attend a 3-day course entitled Time Series Analysis Forecasting with SPSS Trends. The course was designed to teach a variety of techniques applicable to time-stamped data for the purpose of predicting future rates or data values while accounting for cycle fluctuations in addition to upward or downward trends. The technique is also useful for determining the effect of interruptions (such as policy changes) on the variable of interest. One of the classroom data examples examined the effect the new seatbelt law had on automobile fatalities. The statistical technique and software may be useful for analyzing time-dated air traffic data. (N. Milburn, CAMI)

Job Aid Update: The FAA Human Factors Acquisition Job Aid has been revised and added as a pdf-file to the AAR-100 website at <http://www.hf.faa.gov/docs/508/docs/jobaid.pdf>. In addition to updating several components of the document, it provides a listing of the 24 study areas (Appendix E), new format for the Integrated Human Factors Plan (Chapter 3), and new chapters (4 & 5) on Investment Analysis and on Mission Analysis and Requirements Development. (G. Hewitt, AAR-100)

Ground/Airborne Surveillance: A representative from the NAS Human Factors Group at the William J. Hughes Technical Center participated in the US-European Requirements Focus Group Application Definition Subgroup meeting at MITRE (McLean, VA). The purpose of the subgroup is to develop the initial package of new ground and airborne surveillance operational applications. The ground applications include the use of Automatic Dependent Surveillance-Broadcast (ADS-B) data to supplement current en route and terminal radars, and to provide surveillance coverage in non-radar airspace. The airborne applications include using ADS-B and Traffic Information Service-Broadcast data for enhanced traffic situation awareness on the airport surface and in the air; enhancements to visual acquisition for see and avoid, successive visual approaches, sequencing and merging operations, and crossing and passing operations; and in-trail procedures in oceanic airspace. (E. Stein, WJHTC)

VCWS: A representative from the NAS Human Factors Group attended a meeting held by members of the ATO technical operations organization on Virtual Collaborative Work Space (VCWS). VCWS is intended to enhance Operational Support Directorate communication through methods such as screen sharing, streaming instant messaging, and document sharing. Meeting discussions focused on defining the VCWS toolset, describing how the toolset has already been used in the field, and identifying potential broader uses for this technology. (V. Ahlstrom, WJHTC)

Portal Usability Study; Engineering research psychologists from the NAS Human Factor Group (ACB-220) completed a report describing a human factors usability study on a prototype portal conducted March 12-17, 2004. The report identified human factors issues and provided recommended solutions. This report will be delivered to the Enterprise Information Portal Prototype Strategy/Planning Working Group. (V. Ahlstrom, WJHTC)

*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)



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

April 13-19, 2004 – Sun ‘n Fun, Lakeland Linder Regional Airport, Lakeland, FL
<http://www.sun-n-fun.org/content/>

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

April 20-22, 2004 – SAE General Aviation Technology Conference and Exhibition, Century 21 Convention Center, Wichita, KS <http://www.sae.org/calendar/aeromtgs.htm>

April 20-22, 2004 – Air Transport Association MRO Conference and Exhibition, Cobb Galleria, Atlanta, GA <http://www.AviationNow.com/conferences>

April 20-22, 2004 – General Aviation Technology Conference & Exhibition, Century Two Convention Center, Wichita, KS [General Aviation Technology Conference & Exhibition](http://www.GeneralAviationTechnologyConference.com)

April 21-23, 2004 – Phoenix Sky harbor International Aviation Symposium 2004, J.W. Marriott Desert Ridge Resort, Phoenix, AZ <http://www.phxskyharbor.com>

April 22-23, 2004 – 4th Air Cargo Economics Conference, Prague, Czech Republic
<http://euroavia.com>

April 24-29, 2004 – CHI 2004, Conference on Human Factors in Computing Systems, Vienna, Austria <http://www.acm.org/sigchi/chi2004/>

April 25-28, 2004 – SAE Cabin Safety Technical Committee Meeting, Oklahoma City, OK
mlemank@sae.org

April 27-29, 2004 – 49th Annual Corporate Aviation Safety Seminar, Tucson, AZ
http://www.flightsafety.org/cass04_cfp.html

May 3-6, 2004 – SAE Aircraft Oxygen Equipment Committee, Anchorage, AK
mlemank@sae.org

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 10-13, 2004 – DOD TAG-51, Atlantic City, NJ <http://hfetag.dtic.mil/meetschl.html>

May 11-13, 2004 – SAE SEAT – Aircraft Seat Committee, Savannah, GA
mlemank@sae.org

May 17-18, 2004 - The Technical Cooperation Program, Human Resources and Performance Group (HUM)-TP9, Human Systems Integration Workshop, Ottawa, Ontario, Canada
<http://hfetag.dtic.mil/news.html>

May 18-20, 2004 – Aviation Industry Week, Las Vegas Convention Center, Las Vegas, NV
<http://www.AviationIndustryWeek.com>

May 23-26, 2004 – Tenth International Conference on Mobility and Transport for Elderly and Disabled People, Hamamatsu, Japan <http://trb.org/calendar/>

May 25, 2004 - Human Factors Integration Symposium, MoD, Abbey Wood, Bristol, UK
<http://hfetag.dtic.mil/docs/HFI-Symposium-Flyer.doc>

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

June 7-11, 2004 – 2004 US/Europe International Aviation Safety Conference (FAA/JAA), Philadelphia, PA <http://www.jaa.nl/conference/20th/closing.html>

June 15-17, 2004 – SAE Digital Human Modeling for Design and Engineering Meeting, Oakland University, Rochester, Michigan <http://www.sae.org/calendar/aeromtg.htm>

July 8, 2004 - Human Factors Tool Symposium, Orlando, Florida
<http://hfetag.dtic.mil/docs/NASA-Tools-Workshop.doc>

July 19-25, 2004 – Farnborough International 2004, Farnborough Aerodrome, England
<http://www.farnborough.com/>

July 22-August 2, 2004 – 52nd Annual EAA AirVenture Fly-In, Wittman Field, Oshkosh, WI
[EAA AirVenture Oshkosh 2004](http://www.eaa.org/airventure/oshkosh/2004/)

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/>

August 8-12, 2004 – 31st International Conference on Computer Graphics and Interactive Techniques, Los Angeles Convention Center, Los Angeles, CA
<http://www.vr.clemson.edu/eyetracking/etra/2004/>

September 8-9, 2004 – Civil Aviation Safety Symposium 2004, Westin Hotel Galleria, Dallas, TX <http://www.asdnet.org/cass/default.htm>

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

September 27-29, 2004 – SAFE Association 42nd Annual Symposium, Grand America Hotel, Salt Lake City, UT <http://www.safeassociation.com/symposium.htm>

September 29 – October 1, 2004 – 2004 International Conference on Human Computer Interaction (HCI-Aero), Toulouse, France
<http://www.eurisco-international.com/hci-aero2004>.

October, 2004 – 18th Airbus/JetBlue Human Factors Symposium, New York City, NY
<http://www.airbus.com/customer/events.asp>

October 4-7, 2004 – SAE SEAT – Aircraft Seat Committee Meeting, Albuquerque, NM
mlemank@sae.org

October 10-16, 2004 – ACM Multi-Media 2004, New York, NY <http://www.mm2004.org/>

October 12-14, 2004 – Shared Vision of Aviation Safety Conference, San Diego, CA
<http://www.aviationsafetyconference.com/index2.html>

October 12-14, 2004 – 57th Annual Business Aviation Association Meeting and Convention, Las Vegas County Convention Center, Las Vegas, NV <http://web.nbaa.org/public/cs/amc/>

October 13-15, 2004 – Sixth International Conference on Multimodal Interfaces, Penn State University, State College, PA <http://www.icmiplace.org/>

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

October 21-23, 2004 – Aircraft Owners and Pilots Association Expo 2004, Long Beach Convention and Entertainment Center, Long Beach, CA <http://www.aopa.org/expo/2003/virtual/>

October 23-27, 2004 – NordiCHI 2004, Tampere, Finland <http://www.cs.uta.fi/nordichi2004/>

October 24-27, 2004 – UIST 2004, 17th Annual ACM Symposium on User Interface Software and Technology, Santa Fe, NM <http://www.acm.org/uist/>

October 25-28, 2004 – SAE S-9 Cabin Safety Technical Committee Meeting, San Diego, CA
mlemank@sae.org

October 25-28, 2004 – DoD Maintenance Seminar and Exhibition, Hilton Americas, Houston, TX <http://www.sae.org/calendar/aeromtgs.htm>

November 4-5, 2004 – Royal Aeronautical Society Seminar Human Factors Training in Aviation Maintenance, RAF Bentley Priory, Stanmore, near Watford, North London <http://www.raes-hfg.com/xmhftraining.htm>

November 15-18, 2004 – 57th Annual International Air Safety Seminar (“Sharing Knowledge to Improve Safety”), Pudong Shangri-La Hotel, Shanghai, China
<http://www.flightsafety.org/seminars.html>

January 9-13, 2005 – TRB 84th Annual Meeting, Washington, DC <http://trb.org/calendar/>

April 11-15, 2005 – SAE 100th Anniversary World Congress, Cobo Hall, Detroit, MI
<http://www.sae.org/congress/about/news/congressdates.htm>

April 17-22, 2005 – International Federation of Air Traffic Controller’s Associations, Melbourne, Australia http://www.ifatca.org/conferences/annual_conference.htm

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>

September 12-16, 2005 – Interact 2005, Tenth IFIP TC13 International Conference on Human-Computer Interaction, Rome, Italy <http://www.interact2005.org/>

September 26-30, 2005 – Human Factors and Ergonomics Society 49th Annual Meeting, Royal Pacific Resort at Universal Orlando, Orlando, FL <http://hfes.org/meetings/menu.html>

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

January 22-26, 2006 – TRB 85th Annual Meeting, Washington, DC <http://trb.org/calendar/>

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