AAR-100

Human Factors Newsletter # 04-03

January 24, 2004 – February 6, 2004

Technical Information: *Phoenix Deer Valley (DVT) Tower Height Justification*

[1]Mr. Steve Murrill, [1]Dr. Ron Driggers, [2]Dr. William Krebs, and [3]Dr. Michael Crognale ([1]Army Research Laboratory, Adelphi Maryland; [2]AAR-100, and [3]University of Nevada, Reno) assisted the Federal Aviation Administration Western Pacific Region's Requirements Branch (AWP-510) in quantifying what improvement can be gained by increasing the Deer Valley air traffic control tower (DVT map can be found at http://www.hf.faa.gov/docs/508/docs/DVTmap.pdf) height from 110' to 130' or 150'? Specific analyses included: (1) what improvement in visibility (detection, recognition, identification) can be gained by increasing the DVT tower height from 110' to 130' or 150', and (2) what improvement in discriminating two spatially disparate points can be gained by increasing the DVT tower height from 110' to 130' or 150'?

Mr. Murrill and Dr. Driggers conducted a quantitative analysis using the U.S. Army Night Vision Laboratory's model, Kopeika's turbulence model, and Tatarski height scaling model to calculate an air traffic controller's detection, recognition, and identification of a Cessna 172, Lear 60, and Convair 580 while positioned 110', 130' or 150' above ground on a hot sunny day in a dry arid climate. Methods can be found at http://www.hf.faa.gov/docs/508/docs/DVT_ARL.ppt. Results showed that a change in tower height from 110' to 150' had a minimal increase in performance on observers' visual detection of a Cessna 172 (~6.9%), Lear 60 (~7.9%), and Convair 580 (~8.8%). At 4500' (~1.4km), the probabilities of identification for the Cessna 172 are all just below the 90% level; the maximum change in visibility is less than 2% among the three tower heights analyzed.

Drs. Krebs and Crognale calculated an observers' perceived visual angle in detecting an aircraft located at the runway 7L or 7R threshold while positioned 110', 130' or 150' above ground. Specifically, will the proposed DVT tower site 4A or 4B inhibit tower air traffic controllers' ability to determine if an aircraft is located on runway 7L or 7R? The analysis was divided into two parts, lateral separation and vertical separation. The lateral separation analysis investigated what effects occur when an observer's distance increases laterally from runway 7L. The results showed visual angle difference between 7L and 7R threshold viewed from site 4A and 4B were 0.01 degrees and 5.1 degrees, respectively. The current DVT tower's location visual angle difference between 7L and 7R threshold was 19.2 degrees. While the current tower location

offers a much greater two-point discrimination, the researchers recommended selecting site 4B if the tower has to be positioned on that section of the airfield. The vertical separation analysis investigated the effects of increasing proposed tower height. The results showed that for an observer positioned 110', 130', or 150' above ground on the proposed DVT tower site 4A, the vertical separation between runway 7L and 7R threshold would be 1.5, 1.7, and 2.0 degrees visual angle, respectively. For the proposed DVT tower site 4B, the vertical separation between runway 7L and 7R threshold would be 1.3, 1.5, and 1.8 degrees visual angle, respectively. With the current tower location, the vertical separation between runway 7L and 7R threshold would be 0.9, 1.1, and 1.2 degrees visual angle, respectively (assuming tower heights of 110', 130', or 150'). The difference between extreme tower heights, 110' and 150', yield a vertical spatial visual angle difference of 0.53, 0.47, and 0.33 for tower site 4A, 4B, and current tower, respectively. Thus, the vertical separation of the two proposed tower locations and the current tower location are above visual threshold.

In summary, *based on the information made available and the analyses conducted,* the results of the visual detection, recognition, and identification study and the two point spatial discrimination calculations suggest minimal gain from increasing tower height from 110' to 150'. However, the proposed DVT tower site 4B will yield a higher lateral spatial two-point discrimination than the proposed DVT tower site 4A. Increasing height will not increase tower air traffic controller's ability to discriminate whether an aircraft is located on 7L or 7R, however, moving the tower's lateral position will increase visual angle two point separation.

The analyses performed may assist air traffic requirements in determining future air traffic control tower heights. To assist the decision team, the analyses could be plotted to illustrate percent improvement of air traffic controllers' recognition or identification of an aircraft by tower height expressed in dollars per linear foot. Of course, there are many factors that determine tower height and location, but the analyses described above may provide air traffic requirements additional quantitative data to assist in their decision. (W. Krebs, AAR-100)

KSN Award: Congratulations to Ron Simmons for his hard work on KSN. On January 15th**,** AAR-100's Knowledge Services Network (KSN) received an award for "Government Productive Solutions" at the Microsoft Government CIO Summit. From 80 entries submitted, the Microsoft Public CIO made the selection of the top five recipients. This was the third award of recognition for KSN. In 2003, KSN received the "e-Gov Knowledge Management" award, and in 2000, KSN received the MEC 2000 award for "Best Collaborative Solution".

The FAA's KSN is a virtual workspace which supports a community of about 8,000 government staff employees, contractors, and partners who are fundamentally altering the way knowledge work is done in their organization. The network is currently growing at over 500 users per month. Its success and continued growth is directly attributable to an adoption strategy that integrates people, processes, technology and learning to gain business efficiencies, collaborative advantages, and virtual workspace expansion.

Ron was invited to discuss KSN on February 2nd, 2004, at the "First Monday Executive Forum". First Monday is a forum designed to bring executives in government technology and

management together with senior congressional staff and select industry leaders. The limited attendance forum is held the first Monday of each month in appropriate venues. "First Monday" focuses on current and emerging technology issues and trends of interest to government in both the Executive and Legislative branches. (P. Krois, AAR-100)

New REDAC Chair Announced: The Department announced selection of Dr. John J. Hamre, President and Chief Executive Officer of the Center for Strategic and International Studies (CSIS), to serve a two-year term as chairman of the FAA's Research, Engineering and Development Advisory Committee (REDAC). Known for his experience and deep background in a broad range of defense, congressional and security issues, Dr. Hamre served in several top-level positions at the Department of Defense. He was a professional staff member for the Senate Armed Services Committee, and was a deputy assistant director for national security and international affairs at the Congressional Budget Office before moving to CSIS in January 2000. As Under Secretary of Defense (Comptroller) from 1993 to 1997, he was the principal assistant to the Secretary for preparation and execution of defense budget and management improvement programs. He then served as Deputy Secretary of Defense from 1997 to 1999. Dr. Hamre also served as a member of the Commission on the Future of the U.S. Aerospace Industry, and is considered an expert on DOD, the congressional authorization and appropriation process, missile defense, export control reform and cyber-security. He received a Ph.D. with distinction from the School of Advanced International Studies at Johns Hopkins University and a B.A. with distinction from Augustana College in South Dakota. He also studied as a Rockefeller Fellow at the Harvard Divinity School. For more info go to http://www.dot.gov/affairs/dot0504.htm.

Secretary Mineta Announces JPDO Establishment: In a speech to the Aero Club, Secretary Mineta warned, "without immediate and bold action, the bright dream that began at Kitty Hawk could soon become a nightmare of congested skies and frustrated travelers. That is why we are acting now to modernize and transform our air transportation and assure that this second century of aviation is one of promise and prosperity and continued leadership for America." To assure aviation's continued prosperity, Secretary Mineta announced the Next Generation Air Transportation System initiative, a multi-year, multi-agency effort to develop the air transportation system for the year 2025 and beyond. The FAA, in partnership with the Department of Transportation, NASA, the Departments of Defense, Homeland Security, and Commerce, the White house Office of Science and Technology Policy, and other experts from the public and private sectors, is leading the transformation. This collaboration, which will result in the *National Plan for the Transformation of Air Transportation*, represents a unified public/private sector commitment to shape the policy and research necessary to ensure our air transportation system results in more jobs, a strong economy, and a more positive balance of trade. A Senior Policy Committee, led by Secretary Mineta and comprising the heads of the other agencies, oversees this initiative. To coordinate this critical work, Secretary Mineta has established a Joint Planning and Development Office (JPDO) based at the FAA. This office includes participation from all interested agencies. As Secretary Mineta explains, the JPDO's role is to develop "the ideas and technologies that will take us to the aviation system of the future." John Kern serves as the office director. The JPDO reports to the Senior Policy Committee through the FAA Administrator. You can read the Secretary's entire speech on-line at http://www.dot.gov/affairs/minetasp012704.htm.

FAA/JAA/TCCA Research & Development Joint Coordinating Committee: On January 21-22, researchers participated in a meeting of the FAA/European Joint Aviation Authorities (JAA)/Transport Canada Civil Aviation (TCCA) Research & Development Joint Coordinating Committee (JCC) held at the FAA Center for Management Development. Participants included aviation authority representatives from Canada, France, The United Kingdom, Germany, The Netherlands, and the United States. The JCC is responsible for coordinating governmental aviation safety research in the areas of cabin and fire safety, aircraft icing, and human factors. The JCC established two new Research Technical Groups, one for advanced materials and one for cabin air quality and passenger health. During the meeting, the Research Technical Groups gave updates on the coordinated and cooperative research projects performed during the past year. This information will be used to prepare for the biennial Aircraft Safety R&D Workshop during the annual JAA/FAA conference, which will be held in Philadelphia in June. (T. McCloy, AAR-100)

Acquisition Human Factors: Mike McAnulty presented an overview of human factors methods in FAA acquisition programs as part of the Technical Center speaker series. The briefing included a description of the human factors discipline (scientific research to discover information about human abilities, limitations, and other characteristics, and then to applying that information to the design of tools, machines, systems, tasks, jobs, and environments to ensure that they can be used safely and effectively), and a description of methods and tools used by engineering research psychologists in the National Airspace System Human Factors Group (ACB-220) in support of the FAA acquisition process. The methods include task analyses, specification development, virtual reality modeling, usability assessments, ergonomic evaluations, human-in-the-loop simulations, and operational field evaluations. (E. Stein, WJHTC)

Weather Displays: Vicki Ahlstrom/ACB-220 led a Weather Work Group meeting at the Research Development and Human Factors Laboratory January 27th-28th. The work group evaluated generic TRACON scenarios and ITWS weather scenarios for use in a future human-in-the-loop simulation study being proposed as part of the 2004 research program The group gave feedback to ACB-220 TRACON subject matter experts on refinements of traffic flows, sector map details, and possible ways to acquire additional real-time recordings of ITWS weather data. The group also evaluated an early version of an ACB-220 weather display prototype for terminal controllers. Group members provided feedback regarding the potential use of different color themes, text layouts, and interface designs. They discussed this with simulation programmers for future display developments. Dr. Larry Arend, NASA Ames Research Center, provided feedback on weather displays and was recognized as a resource for the group in the future. In addition to the evaluation of weather and traffic scenarios, the group initiated development of experimental procedures for the tactical use of advanced weather information. The group's Air Traffic Procedure specialist (ATP-120), terminal weather specialist (ATB-421), and the NATCA weather liaison will lead this effort. (E. Stein, WJHTC)

IDS: The NAS Human Factors Group (ACB-220) hosted a workshop on Information Display Systems (IDSs) at the William J. Hughes Technical Center January 28th-29th. The focus of the workshop was on sharing information about existing IDSs such as IDS4, ACE-IDS, and ERIDS, and discussing an approach to developing design standards for future IDSs. The workshop

included a presentation about FAADDS, a future terminal IDS, and a demonstration of IDS4 and ACE-IDS at the ACB-630 laboratories. Organizations participating in the workshop included ARQ-1, ARQ-300, ATB-210, ATB-260, ACB-630, and ACB-610. (T. Yuditsky, WJHTC; A. Smith, ARQ-200)

REDAC: The Research, Engineering and Development Advisory Committee (REDAC) Human Factors Subcommittee will meet at the William J. Hughes Technical Center March 2-3, 2004. Established in 1989, the REDAC advises the Administrator on research and development issues and coordinates the FAA's research, engineering and development activities with industry and other government agencies. The Subcommittee considers aviation research needs in human factors when making its recommendations to the full committee.

Human Factors Subcommittee Member	Affiliation
Dr. Deborah A. Boehm-Davis	Professor of Psychology, George Mason University
Dr. Kevin Corker	Professor of Engineering, San Jose State University
Mr. William Edmunds	Human Performance Specialist, ALPA
Dr. R. Curtis Graeber	Chief Engineering Human Factors, Boeing
Dr. John Hansman	Professor of Aeronautics & Astronautics, Massachusetts Institute of Technology
Dr. William L. Rankin	Technical Fellow, The Boeing Company
Dr. Chris Wickens	Head, Aviation Human Factors Division, University of Illinois
Ms. Sarah P. Dalton	Director, Flight Operations Technology Development, Alaska Airlines
Dr. Colin G. Drury	Professor, Industrial Engineering, University of Buffalo
Dr. Mica R. Endsley	President, SA Technologies
Dr. Andres G. Zellweger	Associate Provost for Graduate Programs & Research, NASA Headquarters

Point of Contact: E. Stein, WJHTC

ETMS: Tanya Yuditsky/ACB-220 attended a January 26-27 meeting of the Domestic Reduced Vertical Separation Minima (DRVSM) Collaborative Decision-Making Working Group to present design concepts for monitoring and displaying noncompliant aircraft in the Enhanced Traffic Management System (ETMS). DRVSM allows reduced vertical separation of 1000 ft for properly equipped aircraft flying at or above flight level 290. If an aircraft is within that altitude range but does not have the proper equipment, it will be considered to be noncompliant and will require 2000 ft vertical separation. Based on the working group's requirements, FAA and Volpe National Transportation Systems Center researchers developed design concepts for how noncompliant aircraft will be displayed and monitored in ETMS. DRVSM is scheduled to be in effect operationally in January, 2005. (E. Stein, WJHTC)

NEXCOM: Personnel from the NAS Human Factors Group (ACB-220) and the R&D Laboratory Group (ACB-840) hosted a January 28-29 meeting of the Next Generation Air-Ground Communications (NEXCOM) Human Factors Working Group (HFWG). Researchers presented demonstrations and collected data about the detectability of alternative Transmit Status Indicators (TSIs) for the NEXCOM system. They also tested intelligibility of the incoming

audio messages while TSIs were activated at different duty cycles and volumes relative to the voice. These activities were conducted in the audiometric booth in the Research, Development, and Human Factors Laboratory in high levels of ambient jet or prop noise. The HFWG agreed on TSI recommendations to industry on the basis of these activities. (E. Stein, WJHTC)

ATC Operational Errors: Dr. Julia Pounds (CAMI) presented a paper authored by her and Anthony Ferrante (AAT) titled "Operational Errors as a NAS Safety Metric: Reducing the Numbers" at the NEXTOR Conference on "Moving Metrics: A Performance-Oriented View of the Aviation Infrastructure," held in Pacific Grove, CA, January 27 – 30, 2004. **Abstract.** Operational errors (OEs) have long been an important metric for understanding safety trends in the National Airspace System and to evaluate and track the quality of ATS service. Because the air traffic system relies on a workforce of highly trained air traffic control specialists, the FAA has increasingly focused on human performance as an important part of a comprehensive quality assurance program. The FAA undertook this program of research to improve its understanding of the role of human performance in OEs, and to ensure that better information about causal factors could be developed and data driven decisions about intervention strategies could be made. Preliminary results from the field activities conducted to date suggest that data from the JANUS technique will be useful, and that information provided by the new JANUS technique will help improve safety management through more effective identification of human factors associated with OEs. (J. Pounds, CAMI)

GAIN: Dr. Boquet (CAMI) participated in the Global Aviation Information Network (GAIN) workgroup meeting in Denver, CO during the week of January 26th. He shared results from recent Human Factors Analysis and Classification System analyses of the general aviation human factors research database. (D. Schroeder, 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)

February, 2004 – Call for proposals (workshops, lecture papers, symposia, panels, debates, special-format sessions, and posters), Human Factors and Ergonomics Society 48th Annual Meeting to be held September 20-24, 2004, New Orleans, LA
http://www.hfes.org/meetings/2004menu.html

March 2-3, 2004 – REDAC Human Factors Subcommittee, Washington, DC
http://research.faa.gov/aar/redac.asp

March 3-4, 2004 – 5th European Technology Summit, Amsterdam Marriott Hotel, The Netherlands *http://www.eyefortransport.com/technology/brochure.shtml*

March 4-5, 2004 - Divisions 19 and 21, in conjunction with the Potomac Chapter of the Human Factors and Ergonomics Society, will be hosting the Annual Mid-year Symposium March 4th and 5th, 2004 at the Fort Belvoir Officer's Club, Fort Belvoir, Virginia. jruffner@dcscorp.com

March 4-5, 2004 - American Psychological Association Divisions 19 and 21 *Midyear Symposium*, Fort Belvoir, VA *http://hfetag.dtic.mil/docs/APA-2004-Midyear-Symposium.pdf*

March 8-11, 2004 – SAE World Congress, Cobo Hall, Detroit, MI
http://www.sae.org/congress/index.htm

March 11-13, 2004 – International Women in Aviation Conference, Reno Hilton Hotel, Reno, NV
http://www.wai.org

March 15-17, 2004 – HAI Heli-Expo 2004, Las Vegas, NV *http://www.heliexpo.com*

March 15-17, 2004 – 16th Annual European Aviation Safety Seminar, Barcelona, Spain
http://www.flightsafety.org/eass04_cfp.html

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 – DOD TAG-51, Atlantic City, NJ *http://hfetag.dtic.mil/meetschl.html*

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

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, Michi*gan* *http://www.sae.org/calendar/aeromtgs.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 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 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 12-14, 2004 – 57th Annual Business Aviation Association Meeting and Convention, Las Vega County Convention Center, Las Vegas, NV http://web.nbaa.org/public/cs/amc/

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 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*

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*

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 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