ATOP-R&D

Human Factors Newsletter # 05-16

August 20, 2005 – September 2, 2005

Articles in this newsletter:

Technical Note: The following report will be submitted for publication: Shantanu Pai & Kenneth Allendoerfer,(2005,August). *Conference Control System Computer-Human Interface Prototype Description and Design Rationale*._DOT/FAA CT05/06. Atlantic City: WJH Technical Center.

Abstract. The Federal Aviation Administration (FAA) Air Traffic Control System Command Center (ATCSCC) is responsible for the strategic aspects of the National Airspace System (NAS). The ATCSCC modifies traffic flow and rates when congestion, weather, equipment outages, runway closures, or other operational conditions affect the NAS. Controllers at the ATCSCC accomplish these tasks by communicating with NAS stakeholders like local FAA facilities, airlines, and other national civil aviation authorities. In 2004, the FAA deployed the Conference Control System (CCS) as part of infrastructure modernization to meet increased capacity demands. The CCS provides many new functions and a computer-human interface (CHI) based on touch-entry display (TED) technology. The NAS Human Factors Group conducted a user-centered design project to explore the CCS CHI requirements. In collaboration with the CCS User Team, we developed mouse- and TED-based CHI prototypes to demonstrate the potential CCS functionality. This report discusses the approach we took in designing the CCS prototype and the rationale for each of the important CHI elements. Many of the concepts developed in the prototype were implemented into the operational CCS. The report also discusses the role of iterative prototyping in increasing designers' and users' understanding of the tasks, requirements, and the CHI development process. Future programs can use the design

rationale to guide the creation of CHIs for new telecommunication systems. We believe that the design approach adopted in this project allowed for a better elicitation of the user requirements and helped educate the user team regarding human factors and usability issues.

This research activity supports the Administrator's Flight Plan Goal for Greater Capacity, Objective 3: Increase on-time performance of scheduled carriers.

Points of Contact: K. Allendoerfer, A. Clark, WJHTC

Technical Note: On August 16, 2005, Dr. Judith Bürki-Cohen presented a paper titled *The Effect of Simulator Motion Cues on Initial Training of Airline Pilots* at the American Institute of Aeronautics and Astronautics Modeling and Simulation Technologies Conference in San Francisco. Two earlier studies conducted in the framework of the Federal Aviation Administration/Volpe Flight Simulator Human Factors Program examining the effect of simulator motion on recurrent training and evaluation of airline pilots had found that in the presence of state-of-the-art visual systems, motion provided by a six-degree-of-freedom platform-motion system only minimally affected evaluation, and did not benefit training, of pilots that were familiar with the airplane. The paper gave preliminary results of a study on the effect of simulator platform motion on initial training of airline pilots that had never flown the simulated airplane. The four major findings of the study are summarized below:

First, the study confirmed the small but statistically significant alerting effect of motion found in an earlier study with enhanced motion, although for initial training, the effect was only marginally significant. Even forewarned of an engine failure, pilots without motion cues remained unable to respond to an engine failure on take-off (V1 cut) as fast as pilots with motion cues. It also showed, however, that like experienced pilots, pilots unfamiliar with the motion cues encountered in the airplane were able to catch up immediately once they receive motion cues. In other words, they did not have to be trained with motion to recognize the cues signaling the engine failure. When transfer of training was tested in the simulator with motion, all pilots responded equally fast for the V1 cut, regardless of the simulator configuration employed during training. With platform motion, the no-motion trained pilots improved significantly in response time, presumably because the motion cues alerted them to the engine failure.

Second, for the V1 cut only, motion appeared to help pilots keep the column steady, which in turn helped them with airspeed--but not pitch angle--control. Recurrent pilots in the simulator with enhanced motion controlled pitch angle better with motion, but only during the very first exposure to the V1 cut. Already with the second V1 cut, which was still flown without motion by the no-motion group, the difference between groups was gone. For both studies, the effects were small, and their operational relevance will need to be assessed by the operators themselves.

Third, although both groups improved on many variables for an ILS approach with shifting crosswinds between training and transfer of training, the only motion effect found was steadier pedal control for the no-motion group throughout. The recurrent study with enhanced motion also found an overall steadier control strategy for the no-motion group, but for the wheel, not for the pedal. Also, the improved flight precision without motion found for recurrent pilots was not replicated with initial pilots.

Fourth, participants' perceptions did not indicate a marked preference for either of the two conditions. Most importantly, again there was no evidence that the sensory conflict between eyes and vestibular apparatus induced discomfort in the no-motion condition.

Whether the overall statistical power of the experiment was sufficient to find all operationally relevant effects will need to be decided by the operators based on the smallest detectable effects listed in the paper. Moreover, a few additional analyses need to be performed before coming to final conclusions on this study. Nevertheless, it appears that this study of the effect of the motion provided by a Level D full flight simulator on initial airline training found interesting effects that fit in well with the program's previous research on the effects of simulator platform motion in recurrent training.

This research activity supports the Administrator's Flight Plan Goal for Increased Safety, Objective 1: Reduce the commercial fatal accident rate

Point of Contact: Judith Bürki-Cohen, Volpe NTSC

Laboratory Visit: On September 1, 2005, personnel from the William J. Hughes Technical Center's National Airspace System Human Factors Group met with Dr. Benisse Lester, an orthopedic surgeon with the Air Marshal's Service. Dr. Lester reviewed articles and discussed format requirements for American Psychological Association publications. A brief tour of the human factors laboratory was also be provided. Discussions of potential research collaboration were included. *This research activity supports the Administrator's Flight Plan Goal for International Leadership, Objective 1: Promote improved safety and regulatory oversight in cooperation with bilateral, regional, and multilateral aviation partners.* (U. Ahlstrom, A. Clark, WJHTC)

Optimum Design of Event Lists: In July and August, 2005, researchers from the William J. Hughes Technical Center Human Factors Group conducted familiarization visits to Technical Operations facilities at Boston ARTCC and Potomac TRACON. During these visits, the researchers used a semi-structured interview to collect data from Technical Operations specialists on their use of information presented in lists. The purpose of these visits is to familiarize the researchers with the tasks and processes associated with event and alarm lists. Participants were asked to describe scenarios for the use of alarm and event lists on different systems. They were asked how they used the lists (e.g., monitoring or troubleshooting) and how they found the information they needed in specific lists (e.g., which column did they look at first). Researchers also collected information based on observation of the current systems such as whether the most recent item appeared at the top or bottom of the list. They also documented environmental characteristics such as lighting levels. The researchers used this data to refine the Optimum Design of Event Lists (ODELs) study. Ambient lighting in the experiment was set to approximate the lighting data collected at Potomac TRACON. Additional conditions were added to cover list characteristics observed at Boston ARTCC, and tasks were structured to simulate tasks that would be accomplished using lists based on the feedback from actual end users. As the name suggests, the ODELs study looks at how to optimize the design of lists. Many different systems present information in the form of lists to Technical Operations specialists,

with no standardization of how this information is presented. The human factors researchers have been asked to look at list format and determine whether the list format has an impact on the user's ability to find information, and if so, to determine which format leads to the best performance. In the study, response time and accuracy are measured for each of the different lists to determine which event list characteristics elicit the quickest and most accurate search times. Optimized event lists should minimize search time and maximize accuracy. The study uses the oculometer to collect eye-tracking data. The researchers will use eye-tracking components such as dwell time, search path, and backtracking, to determine how list characteristics impact visual search. Data collection is beginning on the first phase of this study. *This research activity supports the Administrator's Flight Plan Goal for Greater Capacity, Objective 3: Increase on-time performance of scheduled carriers.* (V. Ahlstrom, A. Clark, WJHTC)

Unmanned Aerial Vehicles: Kevin Williams attended a NASA Access 5 Program Review in Washington DC, August 23-25, 2005. The Access 5 goal is to facilitate incorporation of unmanned aircraft systems into the National Airspace System. The program review provided an account of accomplishments to date on various work packages as well as a discussion of future plans for research. *This research activity supports the Administrator's Flight Plan Goal for Increased Safety, Objective 2: Reduce the number of fatal accidents in general aviation.* (K. Williams, CAMI)

Traffic Management: Research psychologists from the William J. Hughes Technical Center's NAS Human Factors Group will support operational testing of the National Traffic Management Log (NTML) Version 3.06. The NTML is designed to provide automated logging and dissemination of information about traffic management initiatives throughout the NAS. During this test, the researchers will observe specialists from the field as they exercise the system by performing common tasks and test new functions. All observed usability issues and design concerns that may lead to user error or inefficient use of the system will be recorded, and recommendations for issue resolution will be provided. *This research activity supports the Administrator's Flight Plan Goal for Greater Capacity, Objective 3: Increase on-time performance of scheduled carriers.* (T. Yuditsky, A, Clark, WJHTC)

More information on human factors research can be found at the FAA Human Factors (ATOP-R&D) web site: http://www.hf.faa.gov

Paul Krois
FAA (ATO-P R&D Human Factors)

September 5-9, 2005 – HCI 2005, Edinburgh, UK http://www.bcs-hci.org.uk/hci2005/

September 11-15, 2005 – International Conference on Fatigue Management in Transportation Operations, Seattle, WA http://scitech.dot.gov/research/human/

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

September 13-14, 2005 – Third ICAO-IATA LOSA TEM Conference, Kuala Lumpur, Malaysia DMaurino@icao.int

September 15-18, 2005 - Conjoint Meeting of the Australasian Society of Aerospace Medicine and the Asia Pacific Federation of Aerospace Medical Association, Gold Coast, Queensland, Australia. www.asam.org.au.

September 18-22, 2005 - XVIIth World Congress on Safety and Health at Work, Orlando, FL http://www.cdc.gov/niosh/exhibits.html

September 19-23, 2005 – ANA 2005 Aviation Conference and Exhibition, Connecticut Convention Center, Hartford. CN *http://www.aerospace-na.com/ace2005.asp*

September 20-21, 2005 - R,E&D Advisory Committee Meeting (joint meeting with NASA's Aerospace Research Advisory Committee), Bessie Coleman Auditorium, FAA Headquarters, Wash., DC Gloria.dunderman@faa.gov

September 20-22, 2005 – Second Safety Across High-Consequence Industries Conference, Saint Louis University, St. Louis, MO http://parks.slu.edu/msasm_conference/index.html.

September 20-24, 2005 - 1st Congress of the International Society for Cultural and Activity Research (ISCAR), Seville, Spain iscar2005@iscar.org

September 21-23, 2005 - Cargo Facts 2005- 11th Annual Aircraft Symposium, Sheraton Hotel & Towers, Seattle, Washington ashoemaker@cargofacts.com

September 25-28, 2005 - 11th Ka and Broadband Communications Conference and 23rd AIAA International Communications Satellite Systems Conference 2005 (organized by IIC), Aurelia Convention Center, Rome, Italy http://www.aiaa.org/

September 26-28, 2005 - AIAA 5th Aviation, Technology, Integration, and Operations Forum (ATIO), Hyatt Regency Crystal City, Arlington, VA http://www.aiaa.org/

September 26-28, 2005 - AIAA 2nd Intelligent Systems Conference (IS), Hyatt Regency Crystal City, Arlington, VA http://www.aiaa.org/

September 26-29, 2005 - Infotech@Aerospace, Hyatt Regency Crystal City, Arlington, VA http://www.aiaa.org/content.cfm?pageid=1

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*

September 27-30, 2005 - Analyzing Risk: Science, Assessment, and Management, Harvard School of Public Health, Boston, MA http://www.cdc.gov/niosh/exhibits.html

October 3-6, 2005 – SAE 2005 AeroTech Congress and Exhibition, Gaylord Texan Resort and Convention Center, Dallas/Fort Worth Airport Area, Texas
http://www.sae.org/events/conferences/aerospace/

October 4-5, 2005 - Aerospace Council, Grapevine, TX elizd@sae.org

October 6-9, 2005 – Aviation North Expo Conference, Fairbanks Princess Riverside Lodge, Fairbanks, AK *www.AviationNorth.org*

October 9-11, 2005 – Aviation Maintenance Star Symposium, Ritz-Carlton, Phoenix, AZ www.STARSymposium.com

October 10-13, 2005 - S-7 Flight Deck & Handling Qualities Standards for Transport Aircraft Toulouse, France mlemank@sae.org

October 17-21, 2005 - American Association for Aerosol Research 2005 Annual Conference, Hilton Austin, Austin, TX http://www.cdc.gov/niosh/exhibits.html

October 18-20, 2005 - S-9 Cabin Safety Technical Committee Meeting, Phoenix, AZ, mlemank@sae.org

October 18-21, 2005 - 2005 SAE Control & Guidance Systems Committee Meeting No. 96
Harbor Town Resorts, Hilton Head, South Carolina, USA

October 20-21, 2005 – 2nd Annual FAA International Safety Forum, Westfields Marriott, Chantilly, VA http://www.faa.gov/news/conferences/safetyforum/index.cfm?topic=6.

October 22-26, 2005 – American Medical Informatics Association Annual Symposium, Hilton Washington, Wash, DC http://www.amia.org/meetings/annual/current/

October 23-26, 2005 - UIST 2005, Eighteenth Annual ACM Symposium on User Interface Software and Technology, Seattle, WA http://www.acm.org/uist/index.html

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

October 24-26, 2005 – 43rd SAFE Symposium, Grand America Hotel, Salt Lake City, UT http://www.safeassociation.org/symposium.htm

October 24-27, 2005 - DoD Maintenance Symposium & Exhibition
Sheraton Birmingham Hotel and Birmingham-Jefferson Convention Complex, Birmingham, Alabama,

October 25-26, 2005 - 2005 International Symposium: Beyond Regulatory Compliance, Making Safety Second Nature, Reed Arena, Texas A&M University, College Station, TX http://www.cdc.gov/niosh/exhibits.html

October 26-28, 2005 – Air Cargo Americas, Radisson Centre, Miami, FL www.aircargoamericas.com

October 26-28, 2005 - A-10 Aircraft Oxygen Equipment Committee Meeting, Salt Lake City, UT, mlemank@sae.org

October 27-28, 2005 - Second International Conference on Knowledge Management ICKM2005, Westin Charlotte, Charlotte, NC http://www.asis.org/ICKMcall.htm

October 30-November 7, 2005 – ATCA 50th Annual Conference and Exposition, Dallas, TX http://www.atca.org/event_items.asp.

October 30—November 3, 2005 – 24th Digital Avionics Systems Conference, Hyatt Regency Crystal City, Wash., DC http://www.dasconline.org

November, 2005 – DoD TAG (Human Factors Engineering Technical Advisory Group) Meeting, Baltimore, MD http://hfetag.dtic.mil/meetschl.html

November 3-5, 2005 - AOPA Expo, Tampa, Florida www.aopa.org

November 3-5, 2005 - Conference on Designing for User Experience, Fort Mason, San Francisco, CA http://www.dux2005.org/

November 6-9, 2005 - ACI World / Pacific Conference and Exhibition, Auckland, New Zealand. www.auckland-airport.co.nz

November 7-9, 2005 – DoD TAG, Baltimore, MD http://hfetag.dtic.mil/meetschl.html

November 7-10, 2005 – Flight Safety Foundation 58th Annual International Air Safety Seminar, Moscow, Russia http://www.flightsafety.org/iass05_cfp.html

November 7-10, 2005 - Ergonomics and Human Factors: Applications in Occupational Safety and Health, Harvard School of Public Health, Cambridge, MA http://www.hsph.harvard.edu/ccpe/programs/EHF.shtml

November 8-10, 2005 – Aerospace Testing Expo, North America: Scientific Conference and Technology Forum, Long Beach Convention Center, Long Beach, CA http://www.aerospacetesting-expo.com/northamerica/conf+forum.html

November 8-10, 2005 – Maintenance, Repair & Overhaul Exhibition Asia, Suntec Convention Center, Singapore http://www.aviationnow.com/conferences/masmain.htm

November 10, 2005 - 34th Annual Meeting of the Society for Computers in Psychology, Toronto, Ontario, Canada http://www.scip.ws

November 10 - 13, 2005 - 46th Psychonomic Society Annual Meeting, Toronto, Ontario, Canada http://www.psychonomic.org/meet.htm

November 15-17, 2005 - National Business Aviation Association's 58th Annual Meeting & Convention, New Orleans, LA (TBD) www.nbaa.org

November 16-17, 2005 – IEE Human Factors Engineering Professional Network/MoD Human Factors Integration Defense Technology Center "People and Systems Symposium: Who Are We Designing For?", Grange City Hotel London, UK http://conferences.iee.org/pas2005

January 9-12, 2006 - 44th AIAA Aerospace Sciences Meeting and Exhibit, Reno Hilton, Reno, NV http://www.aiaa.org/

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

January 23-27, 2005 - S-18 Safety Assessment for Airborne Systems & Equipment San Antonio, TX, lemon@sae.org

February 9-10, 2006 - Swinburne University Symposium on Safety Management and Human Factors Symposium, Melbourne, Australia janca@groupwise.swin.edu.au http://www.swin.edu.au/aviation/forms/2006SwinburneSymposiumCallforPapers.pdf

February 21-26, 2006 – Asian Aerospace 2006, Changi Exhibition Centre, Singapore www.asianaerospace.com

March 13-15, 2006 – Flight Safety Foundation 18th Annual European Aviation Safety Seminar, Athens, Greece http://www.flightsafety.org/seminars.html#eass

March 20-23, 2006 – 16th Annual AAMI/FDA International Conference on Medical Device Standards and Regulation, Hyatt Regency, Reston, VA http://www.aami.org/meetings/isc/index.html

March 22 - 25, 2006 - Society for Behavioral Medicine Annual Meeting and Scientific Sessions, San Francisco, CA www.sbm.org/annualmeeting/index.html

March 23-25, 2006 - 17th Annual International Women in Aviation Conference, Opryland Hotel Nashville, TN http://www.wai.org/

March 23-27, 2005 – IA Summit 2006, Hyatt Regency, Vancouver, BC, Canada http://www.iasummit.org/

April 4-10, 2006 – Sun 'n Fun, Lakeland, FL http://www.sun-n-fun.org/content/

April 6-7, 2006 – National Human Capital Summit, Chicago Marriott Downtown, Chicago, IL http://www.humancapitalinstitute.net/conference_national.html

April 22-27, 2006 – CHI 2006, Montreal, Quebec, Canada
http://www.chi2006.org/call/hcioverviews.php

April 23-28, 2006 - Avionics Systems Division Meeting, New Orleans, LA (TBD) lemon@sae.org

April 25-27, 2006 – Maintenance, Repair & Overhaul (MRO) Conference & Exhibition, Phoenix Civic Plaza, Phoenix, AZ http://www.aviationnow.com/conferences/mromain.htm

May 1-4, 2006 - 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference; 14th AIAA/ASME/AHS Adaptive Structures Conference; 7th AIAA Gossamer Spacecraft Forum; 2nd AIAA Multidisciplinary Design Optimization Specialist Conference; 1st AIAA Non-Deterministic Approaches Conference, Hyatt Regency Newport, Newport, RI *http://www.aiaa.org/*

May 9-11, 2006 – Flight Safety Foundation 51st Annual Corporate Aviation Safety Seminar, Phoenix, AZ http://www.flightsafety.org/seminars.html#eass

May 14-18, 2006 - 77th Annual Scientific Meeting of the Aerospace Medical Association, Caribe Royale Hotel, Orlando, FL http://www.asma.org/

May 22-24, 2006 - 9th IFAC Symposium on Automated Systems Based on Human Skill And Knowledge, Nancy, France http://www.cdc.gov/niosh/exhibits.html

May 25-28, 2006 – American Psychological Society 18th Annual Convention, New York Marriott Marquis, New York City, NY http://www.psychologicalscience.org/convention/

June 11-14, 2006 – The American Society of Safety Engineers Safety 2006 Conference, Washington State Convention and Trade Center, Seattle, WA
http://www.asse.org/2006pdcallforpapers.pdf

June 12-16, 2006 – UPA 2006 – 15th Annual Conference, Broomfield, CO
http://www.usabilityprofessionals.org/conferences_and_events/upa_conference/2006/

June 24-26, 2006 – AAMI Conference & Exposition, Wash, DC
http://www.aami.org/proposals/index.html

June 26-29, 2006 - General Aviation Technology Conference , Hyatt Hotel, Wichita, Kansas,

July, 2006 - 26th International Congress of Applied Psychology, Athens, Greece
dgeorgas@dp.uoa.gr ,
http://www.erasmus.gr/dynamic/conventions.asp?conv_id=21r/dynamic/conventions.asp?conv_id=21

July 10-14, 2006 – IEA 2006, 16th World Congress on Ergonomics, Maastricht, The Netherlands *http://www.iea2006.org/*

July 24-30, 2006 – EAA AirVenture, Oshkosh, WI http://www.airventure.org/

August 10-13, 2006 – American Psychological Association Annual Meeting, New Orleans, LA http://www.apa.org/convention05/future.html

August 21-24, 2006 - AIAA Modeling and Simulation Technologies Conference and Exhibit. Keystone Resort and Conference Center, Keystone, CO http://www.aiaa.org/content.cfm?pageid=1

August 21-24, 2006 - AIAA Guidance, Navigation, and Control Conference and Exhibit, Keystone Resort and Conference Center, Keystone, CO http://www.aiaa.org/content.cfm?pageid=1

September 6-8, 2006 - 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Renaissance Portsmouth, Portsmouth, VA, http://www.aiaa.org/content.cfm?pageid=1

September 10-14, 2006 - 54th International Congress of Aviation and Space Medicine, Bangalore, India. A preliminary registration form may be found at http://www.isam-india.org/conference44/newreg.php.

September 25-27, 2006 - 6th AIAA Aviation Technology, Integration and Operations Forum, Hyatt Regency Wichita, Wichita, KS http://www.aiaa.org/content.cfm?pageid=1

October 23-25, 2006 – 44th Annual SAFE Symposium, Reno Hilton Hotel, Reno, NV http://www.safeassociation.org/symposium.htm

October 23-26, 2006 - DoD Maintenance Symposium & Exhibition, Reno Hilton, Reno, Nevada, USA *http://www.sae.org/events/conferences/aerospace/*

January 8-11, 2007 - 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno Hilton, Reno, NV http://www.aiaa.org/content.cfm?pageid=1

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

Comments or questions regarding this newsletter?
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or via e-mail at bill.ctr.berger @faa.gov