



AAR-100

Human Factors Newsletter # 04-15

July 24, 2004 – August 6, 2004

Technical Note: *TRACON Controller Weather Information Needs: II. Cognitive Work Analysis* (Ulf Ahlstrom, WHJTC. July 2004)

Executive Summary: This is the second in a two part study on weather information needs. The main purpose of the present study was to assess the Terminal Radar Approach Control (TRACON) weather information needs. An additional objective was to assess the flow of weather information within the TRACON environment and the impact on controller and pilot operations during adverse weather conditions.

The present study used the framework of Cognitive Work Analysis (CWA) (Vicente, 1999) where both environmental (terminal domain) and operational (controller - pilot) constraints are included in the analysis. This framework is as an ecological approach to human factors. An ecological approach begins with, and gives primary importance to, the environmental constraints (e.g., runway configuration and aircraft characteristics) that impose limitations on operators' behavior. Environmental constraints are of primary focus because they impose constraints on goal-directed behavior (i.e., they limit the achievement of certain job tasks). By identifying constraints, the CWA can point to instances where weather information is lacking or insufficiently distributed.

The Mission Need Statement for Aviation Weather (Federal Aviation Administration [FAA], 2002) served as the foundation for this weather needs analysis. This FAA document outlines the weather phenomena causing most of the safety and delay problems throughout the National Airspace System. Eight adverse weather phenomena are summarized in the FAA analysis: thunderstorms, in-flight icing, obstruction to visibility (low ceilings and poor visibility), wind shear (microbursts), non-convective turbulence and winds aloft (mountain wave), snow and ice, airport reconfiguration in response to wind changes, and wake vortex.

In July 2003, the Human Factors Group assembled a group with five TRACON controllers and six airline pilots for the collection of weather impact data. During the group sessions, they discussed weather phenomena and the impact on controller and pilot operations. Researchers encouraged group members to discuss specific real-life encounters and assessed the topics from

both the controller's and the pilot's perspective. The group also provided numeric (ordinal) ratings of impact from weather phenomena when appropriate. All ratings were consensus ratings (group ratings) that followed a detailed and complete discussion of each topic.

As expected, an analysis of the ratings showed that the degree of impact from adverse weather phenomena is contingent upon aircraft type. Light single engine and light twin aircraft have the highest impact rating, followed by turbo prop, small turbo jet, and, finally, commercial jets showing the least impact of all aircraft types. Regardless of aircraft type, the highest impact ratings are for thunderstorms, microbursts, snow, and ice. The group provided the highest impact ratings for pilot operations for thunderstorms, wind shear, microbursts, snow, and ice, and mountain wave. These two constraints (aircraft type and pilot operations) affect pilot decisions regarding flying in areas of adverse weather. Pilot ratings showed a trend where the go/no-go decision ratings for light single engine and light twin aircraft have fewer clear-cut go decisions compared to turbo prop, small turbo jet, and commercial jet. For controller operations, the highest impact ratings were for thunderstorms, snow and ice, and airport reconfiguration due to changing winds.

The present analysis also revealed several information needs for the TRACON controller. Specifically, there is a lack of a graphical display of weather areas with short-time forecast capabilities at the controller workstation. This information is especially important for the controller during thunderstorms. There is also a lack of weather information from adjacent airports. During conditions of low ceiling and poor visibility, controllers must often divert Visual Flight Rules flights to satellite airports. Without accessible information regarding the conditions at these airports, controllers experienced increased workload due to an increase in communications and poor weather situation awareness. For non-convective turbulence and adverse winds, there is a shortfall in the accuracy of available tools. Deployment of runway-specific sensors, winds aloft detection systems, and turbulence warning algorithms would mitigate these deficiencies.

Point of Contact: D. Piccione, ATOP-R&D

ATC Simulations: An Engineering Research Psychologist from the William J. Hughes Technical Center's NAS Human Factors Group conducted initial meetings with staff from the Airway Facilities Tower Integration Laboratory (AFTIL) to discuss use of the tower simulator for human-in-the-loop research. During the meetings, the researchers developed a basic understanding of the laboratory's capabilities and made preliminary determinations about infrastructure development that is needed to integrate prototype interfaces with the tower simulator. The NAS Human Factors Group is currently designing prototype electronic flight data interfaces for use in FAA air traffic control towers. They plan to use the AFTIL tower simulator as a platform for testing the prototypes and their effects on controllers' performance and workload. (T. Truitt, WJHTC)

Conducting Photometric Measurements: On July 22nd, Dr. William Krebs provided an instructional forum at FAA Headquarters on how to conduct photometric measurements for visual display devices. The scope of the presentation covered discussions of the following: differences between a cathode ray tube and flat panel displays; distinctions among radiometry, photometry, and colorimetry; procedures for measuring display photometry including

explanations of the equipment, configuration, and setup conditions; and, the definitions of and means to measure color, gamut-area metrics, gamma, luminance, color uniformity, viewing angle performance, and other metrics. Copies of the presentation as well as excerpts demonstrating the utility of the Video Electronics Standards Association *Standard for Display Measurements* (version 2.0, dated June 1, 2001) were provided. The presentation can be accessed at: <http://www.hf.faa.gov/krebs/download.htm> (W. Krebs, ATOP-R&D)

Human Performance Analysis for Tower Siting: Human factors researchers and Airport Facilities Terminal Integration Laboratory personnel refined the approach and methodology for an experiment related to evaluating human performance characteristics affecting ATC Tower siting and height decisions. The procedures “shake-out” session allowed researchers to revise the instructions for the participants, refine information requirements for data collection, and validate rating schemes. The session also provided preliminary information for two test subjects, demonstrating that the analyses generally reflected the expected results. The experiment is expected to be conducted during the month of August, with analyses and results prepared in subsequent weeks. (W. Krebs, G. Hewitt, ATOP-R&D)

Enroute Modernization: Tanya Yuditsky and several other research psychologists from the William J. Hughes Technical Center’s NAS Human Factors Group supported the En Route Automation Modernization (ERAM) Early User Involvement Event. This activity focused on the ERAM Monitor and Control interface. Five teams of specialists from the field and the Technical Center walked through scripted scenarios that allowed them to interact with a prototype of the interface. The researchers observed their interactions, noting any difficulties, and recorded user feedback. Participant comments were very consistent, in that they independently identified the same areas of difficulty or deficiencies in the design. Over 300 comments were collected which addressed approximately 40 issues. The issues will be reviewed by ERAM System Engineering. (E. Stein, WJHTC)

Telecommunications Infrastructure: A research psychologist from the William J. Hughes Technical Center’s NAS Human Factors Group supported a demonstration of the Federal Telecommunications Infrastructure Network Management Operations (NMO) user interface. An earlier demonstration addressed the NMO needs of the operational facilities in the field. This demonstration addressed the needs of the Regional Offices and System Management Offices. User representatives received an overview of the NMO user interface and its capabilities. They also observed an operational scenario and evaluated system reports. (T. Yuditsky, WJHTC)

Human Factors Portals:

FAA Human Factors Workbench:
<http://www.hf.faa.gov/Portal/default.aspx>

NASA's new Human Reliability site:
<http://humanreliability-pbma-kms.intranets.com/default.asp?link=>

*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)



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/>

August 16, 2004 – Deadline for papers - 13th Annual Symposium on Aviation Psychology (ISAP), Civil Aerospace Medical Institute (CAMI), Oklahoma City, OK, April 18-21, 2005.
<http://www.cami.jccbi.gov/>

August 16-19, 2004 - 6th Workshop on Risk Analysis and Safety Performance Measurements in Aviation, Crystal City, VA. <http://aar400.tc.faa.gov/AAR424/Workshop2004/>.

August 16-19, 2004 - [AIAA Modeling and Simulation Technologies Conference and Exhibit](#)
Rhode Island Convention Center, Providence, RI

August 22-27, 2004 – IFIP 13.5 Working Conference on Human Error, Safety, and Systems Development, Toulouse, France [Advance program](#)

August 23-27, 2004 - SAE G-10 Human Behavioral Performance Committee Semiannual Meeting, Seattle, WA <http://www.sae.org/standardsdev/aerospace/g10tag.htm>

August 23-27, 2004 – Aircraft Instruments Meeting, Bellvue, WA elizd@sae.org

September 1-3, 2004 – ICAO Aviation Language Symposium, Montreal, Canada
<http://www.icao.int/icao/en/anb/meetings/IALS/index.html>

September 5-9, 2004 - [52nd International Academy of Aviation and Space Medicine](#)
Sun City, South Africa

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

September 14-16, 2004 – Airbus Human Factors Symposium, New Delhi, India
<http://www.airbus.com/customer/events.asp>

September 14-17, 2004 – 22nd International Air Cargo Forum and Exposition, Basque Country, Spain <http://www.tiaca.org>

September 14-17, 2004 – National Cargo Security Council 2004 Conference & Exhibition, Riviera Hotel & Casino, Las Vegas, NV <http://www.cargosecurity.com>

September 16, 2004 – Aircraft Lighting Meeting, Nashville, TN elizd@sae.org

September 19-20, 2004 – Association for the Advancement of Medical Instrumentation AAMI/HE Human Factors Engineering Committee Meeting, New Orleans, LA ntongson@aami.org

September 20, 2004 – Nondestructive Methods and Processes Committee Meeting, Albuquerque, NM kerrir@sae.org

September 20-22, 2004 [AIAA 1st Intelligent Systems Technical Conference](#) Hilton Chicago, Chicago, IL

September 20-22, 2004 - [AIAA 4th Aviation Technology, Integration and Operations \(ATIO\) Forum](#) Hilton Chicago, Chicago, IL

September 20-23, 2004 - [AIAA 3rd "Unmanned Unlimited" Technical Conference, Workshop and Exhibit](#) Hilton Chicago, Chicago, IL

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 28 – October 8, 2004 – ICAO Assembly 35th Session, Montreal, Canada <http://www.icao.int/icao/en/assembl/a35/index.html>

September 28-30, 2004 - Seventh GAIN World Conference (Global Aviation Information Network), Montreal, Canada. <http://www.gainweb.org>.

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

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

October 5-7, 2004 – 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 11-14, 2004 – User Interface 9 Conference, Cambridge, MA uiconf@uie.com.

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 18-22, 2004 – AC-9 Aircraft Environmental Systems Meeting, Wichita, KS
mlemank@sae.org

October 19-20, 2004 – Aerospace Council Meeting, Toulouse, France
mlemank@sae.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 - [7th Annual Systems Engineering Conference](#) Dallas Marriott Quorum, Dallas, TX

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>

October 26-28, 2004 – ICAO Security Seminar, Merida, Mexico <http://www.icao.org>

October 27-29, 2004 – Human Factors and Ergonomics Society Europe Chapter Annual Meeting, Delft University, the Netherlands
http://utopia.ision.nl/users/hfesec/meeting/ec_meet.htm

October 27-29, 2004 – S-9 Cabin Safety Technical Committee Meeting, San Diego, CA
mlemank@sae.org

October 31, 2004 – ATCA Annual Conference and Exposition, Marriott Wardman Park Hotel, Wash., DC http://www.atca.org/event_items.asp#

November 1-4, 2004 – DOD Human Factors Engineering Technical Advisory Group Meeting, Holiday Inn Select, Alexandria, VA <http://hfetag.dtic.mil/meetschl.html>

November 2-4, 2004 – World Aviation Conference, Hilton Hotel, Reno, NV
<http://www.sae.org/events/wac/>

November 3-4, 2004 - Second ICAO-IATA LOSA & TEM Conference, Seattle, Wash
dmaurino@icao.int , curt.graeber@boeing.com

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 8-9, 2004 – European Aviation Training Symposium, Vienna, [Austria](#)
<http://www.at-events.com/eats/conference.asp>

November 12-17, 2004 – American Society for Information Science and Technology Annual Meeting, Providence, RI asis@asis.org

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>

November 15-18, 2004 – Fire and Cabin Safety Research Conference, Lisbon, Portugal
www.caa.co.uk/srg/intsd/event.asp?groupid=73

November 16, 2004 - FY04 General Aviation, Vertical Flight, and Aviation Maintenance Human Factors Program Review, FAA Headquarters Bessie Coleman Training Center, Wash, DC <mailto:william.krebs@faa.gov>.

November 18-19, 2004 – IT World Expo, Toronto, Canada richardp@WowGao.com

November 18-21, 2004 – 45th Annual Meeting of the Psychonomic Society, Hyatt Regency and Millenium Hotels, Minneapolis, MN [45th Annual Meeting of the Psychonomic Society](#)

January 9-12, 2005 – International Conference on Intelligent User Interfaces, San Diego, CA
<http://www.catamaranresort.com/>

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

January 10-13, 2005 - 43rd AIAA Aerospace Sciences Meeting and Exhibit, Reno Hilton, Reno, NV <http://www.aiaa.org/>

January 25-27, 2005 – AE-2 Aerospace Lighting Committee Meeting, New Orleans, LA
elizd@sae.org

January 28, 2005 – Deadline for papers - 6th USA/Europe ATM Seminar, Baltimore, MD, June 2005
<http://atmseminar.eurocontrol.fr/>

April 2-7, 2005 – CHI 2005, Portland, OR chi2005-chair@acm.org.

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

April 18-21, 2005 – 13th International Symposium on Aviation Psychology (ISAP), Civil Aerospace Medical Institute (CAMI), Oklahoma City, OK (note: call for papers deadline is August 16, 2004).
<http://www.cami.jccbi.gov/>, <http://www.wright.edu/isap/>

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

June 2005 – 6th USA/Europe ATM Seminar, Baltimore, MD (note: call for papers deadline is January 28, 2005)
<http://atmseminar.eurocontrol.fr/>

July 22-28, 2005 – HCI International 2005, 11th International Conference on Human-Computer Interaction, Caesars Palace, Las Vegas, NV
hci2005@ecn.purdue.edu

August 15-18, 2005 - 43rd AIAA Aerospace Sciences Meeting and Exhibit, Hyatt Regency San Francisco at Embarcadero Center, San Francisco, CA
<http://www.aiaa.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 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 26-30, 2005 – Human Factors and Ergonomics Society 49th Annual Meeting, Royal Pacific Resort at Universal Orlando, Orlando, FL <http://hfes.org/meetings/menu.html>

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

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/>

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

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

