



**Aerospace Human Factors Association**  
A Constituent Organization of the Aerospace Medical Association

# *NEWSLETTER*

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### **New Orleans AsHFA Luncheon Tickets**

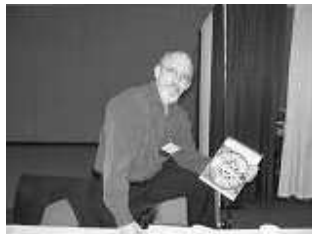
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### **AsMA Scientific Meeting Calendar**

New Orleans, LA	May 13-17, 2007
Boston, MA	May 11-15, 2008
Los Angeles, CA	May 3-7, 2009
Phoenix, AZ	May 8-13, 2010
Anchorage, AK	May 8-12, 2011

## *Letter from the Editor*



I wish to begin this newsletter with an apology to the AsHFA members. Quite simply, I forgot to publish our Fall newsletter. I began collecting material in October in hopes of getting the

newsletter out before our mid-year November meeting. Unfortunately that did not happen. Following the mid-year meeting one thing lead to another and before long I simply forgot that I had not published the newsletter. Interestingly enough, no one noticed, until recently. So here it is, an updated version of the Fall newsletter.

## *Letter from the President*



Greetings to all of members of AsHFA! As always, it seems like the yearly events of the AsMA Annual Scientific Meeting were just last month, but it is the end of October already and we're nearly six months removed. The mid-year

November meeting is only a couple of weeks away, and we'll be quickly moving to preparing for the May meeting in New Orleans.

The last several months have certainly held reminders of the importance of Human Factors in aviation. Perhaps the most high-profile of the tragic events was the death of New York Yankees pitcher Cory Lidle and his flight instructor in

## AsFHA Officers

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### *Letter from the President*

Manhattan, NY on October 11. Even a casual read of the newspaper reports on the accident certainly raise suspicions of human factors as the primary cause. I think all of us can easily surmise several likely scenarios, all involving the usual basic elements of overconfidence and crew coordination issues in the face of a deceptively challenging flight environment and lack of experience in the specific aircraft. A very nice layman's analysis of the mindset of general aviation pilots that contributes to many accidents, titled "Inside the Mind of a Weekend Pilot" by Scott McCartney, appeared in the Wall Street Journal on Tuesday, Oct 17. Well worth a read to refresh our recognition that the enjoyment of flying is the thing that is most top of mind for general aviation pilots, not all the things that could go wrong. One interesting observation is that for many, flying is the "perfect stress escape" because the small plane "transports you to a peaceful world" and there is "nothing... on the ground to match the calm and serenity of flying." True enough, perhaps, but also indicative of the paradox that the *thinking that attracts for many to general aviation is also the thinking that perfectly positions pilots for accidents.*

As a side note, since this event there have been five more fatal accidents in the US (12 deaths); and for 2006 thus far, some 246 fatal accidents (I didn't add up the fatalities). And if these statistics aren't enough to grab our attention, in the same issue of WSJ was an article about

the robustly emerging market for private jets!

I think that these sobering notes are actually an appropriate counterpoint to the state of AsHFA, which in my estimation is doing extremely well. It is gratifying to work in an organization where the officers, chairs and committee members are so truly talented and dedicated. Over the last couple of years, Dave Neri and then Ray King have led the organization well. Our membership numbers are strong, and our finances are in order. But the dedication of folks like Tom Nesthus, Carol Manning, Brian Self, Carla Hackworth, Dwight Holland, Arne Angelici, Larry Bailey, Fanancy Anzalone and or course Mal Cohen are the things that make the organization go. And we'll continue to be in good hands when Ron Hoffman takes the helm in May.

Heading towards our November mid-year meeting, I would frame my organizational goals as:

- Continuing the strong ongoing program development work for aerospace human factors sessions and panels for the upcoming year and through 2009.
- Enhancing our organization's recognition of achievements in aerospace human factors by increasing the number of nominees for awards.
- Furthering development of future leaders by identifying and involving more junior members in the activities of AsHFA.

- Bringing closure to a number of administrative issues that will clarify the business mechanics of AsHFA and simplify our semi-annual business meetings so we can focus the majority of our energies on the main goals of AsHFA.

We've already made important progress through compiling a consolidated list of 35 assigned action items, a number of which are already either completed or well on their way. We'll have a better idea of where we stand following the mid-year meeting on November 14, and our National agenda can be found further below.

I'll close out by thanking again all of your officers, committee chairs and committee members for their efforts. Everyone has multiple demands on their time, and I recognize the effort and devotion it takes to "get the job done" while balancing work, family, and numerous other obligations. My own personal situation has been disrupted by a job change, but in this case it is all for the better. Having just this month assumed the position of Manager, Medical Appeals Branch (AAM-240), Medical Specialties Division here at the Office of Aerospace Medicine in FAA headquarters here in Washington, DC, the change is consolidating my work and professional interests in aerospace medicine and human factors. It's exciting to be working directly with Dr. Fred Tilton, Dr. James Fraser, Dr. Nick Lomangino, Dr. Arleen Saenger... and starting now also welcoming Dr. Mike Berry as head of AAM-200. Being back in the thick of aerospace medicine action I hope will enhance my contributions as AsHFA President over the next 7 months. Please feel free to contact me directly on ideas to improve the organization or issues that we should be addressing at 202-493-5576 or [james.devoll@faa.gov](mailto:james.devoll@faa.gov).

Thanks, and a reminder that all members are welcome to the executive committee meetings in November and May, and I encourage all to come to our annual luncheon and business meeting in May. - Jim

## AsHFA Sponsored Panels



It is my pleasure to announce that three panels received AsHFA sponsorship and have been approved for presentation at the ASMA meeting.

Please join me in congratulating each of the panel presenters on their hard work. The

research presentations fit within the framework of aerospace human factors. Each of the panels will include outstanding research; I hope you will include them in your itinerary during AsMA in New Orleans. – Carla ([Carla.Hackworth@faa.gov](mailto:Carla.Hackworth@faa.gov))

### ***Technically Advanced Aircraft- C. Hackworth Panel Chair Thurs May 17th 10:30am-12noon***

Technically advanced aircraft are becoming more prevalent in the General Aviation fleet. Aside from technical challenges presented, these systems require acquiring a conceptual understanding of the functions offered by the avionics, developing system monitoring skills and habits, developing mode management and awareness skills, understanding when and when not to use automation, and maintaining manual flying skills. Operating an aircraft with advanced avionics differs from traditional analog instrumentation, simple autopilot functions, and reference to ground-based navigation. These systems require an additional set of knowledge elements and skills. This session will include several projects examining the various nuances of technically advanced aircraft.

### ***Safety Management Systems –Panel Chair David Schroeder Tuesday May 15th 2:00-3:30***

Historically, efforts to improve aviation safety were focused around implementation of recommendations developed from the examination of aircraft accidents. In recognition that there is

generally an organizational component to accident causation, efforts have recently shifted toward the development of safety management systems (SMSs). The SMS is designed to reduce the threats or risk in aviation safety that are present within an organization. By systematically identifying the risks within the organization, gathering data associated with those risks, developing implementation strategies designed to reduce or eliminate the most serious risks, and then observing the effects of those implementation strategies, organizations can reduce the likelihood of an accident. The goals for establishment of SMSs are evident in FAA regulations and ICAO guidelines and SMSs have been implemented in the US, Canada, the UK, and Australia. This panel was designed to provide a general introduction to SMS, identification of the potential benefits from SMSs, and illustration of some of the outcomes associated with their implementation.

***Information Sharing – Tom Chidester***

***Thursday May 17th 8:30-10:00am***

The Voluntary Aviation Safety Information-sharing Process (VASIP) is designed to provide a means for the commercial aviation industry and the Federal Aviation Administration (FAA) to collect, share safety-related information, and to use that information to proactively identify, analyze, and correct safety issues that affect commercial aviation. The key to VASIP is the development of a technical process to extract de-identified safety data from any participating airline Flight Operations Quality Assurance (FOQA) or Aviation Safety Action Program (ASAP), aggregate it through a distributed database, and make it accessible to appropriate industry stakeholders for analysis. In 2004, the ASAP and FOQA Aviation Rulemaking Committees (ARCs) identified the National Aeronautics and Space Administration (NASA) as having the institutional background, resources, and personnel capable of developing this technical aggregation framework, as well as the analytical tools to support the process. Beginning in June of 2004, NASA led a collaborative partnership of participating airlines, employee organizations, and FAA representatives to define key components of archives of FOQA and ASAP data. This defined a

set of functional requirements for archive development that were approved by the FOQA and ASAP ARCs. In October 2004, at the request of and with partial funding by the FAA, NASA initiated an Information Sharing Initiative under the Aviation Safety and Security Program to provide funds and oversight to develop distributed archiving and analysis. The basic infrastructure was deployed in January 2006, and data archiving began at participating airlines. In 2006, key members of the development team, FAA, airlines, and unions began to use the data to understand industry issues of national scope. Members of this panel will discuss implementation of the archives and the first products developed following implementation.

**Trip Report  
Department of Defense  
Human Factors Engineering Technical  
Advisory Group  
(DOD HFE TAG) Meeting #55  
15-18 May 2005  
Prepared by: Steve Merriman  
stephen.c.merriman@boeing.com**

The 55<sup>th</sup> meeting of the DoD HFE TAG was held in Las Vegas, NV. The meeting was chaired by Ms. Maureen Bergondy-Wilhelm, Naval Air Systems Command, Orlando, FL. The theme of the meeting was ***Enabling Decision superiority with HSI***. Approximately 125 people attended the meeting, representing the US Army, US Navy, US Air Force, DARPA, NASA, FAA, DoD Laboratories, Canadian DRDC, several human factors-related technical societies and industry associations. Several additional personnel representing industry and academia attended as invited speakers.

**Plenary Session Presentations**

The DoD HFE TAG Chair for the 55<sup>th</sup> meeting, Maureen Bergondy-Wilhelm, welcomed attendees to the meeting and introduced the first plenary session presenter.

**Air Force Host Welcome and Overview:** Mr. James S. “Odie” Davis, Air Force Research Laboratory Liaison to USAF Warfare Center, Nellis Air Force Base welcomed the TAG participants to Las Vegas ([james.davis@nellis.af.mil](mailto:james.davis@nellis.af.mil), (702) 652-8003). Nellis certifies most all USAF equipment and performs operational testing. It is the single source for tactics and doctrine development, provides graduate education and top adversary top graduates, hosts joint exercises and integrated training – in short, it provides solutions to combat problems. The Air Force Research Lab (AFRL) and Air Force Warfare Center (AFWC) have a partnership:

- ◆ The 98<sup>th</sup> range wing employs spatially-separated audio for range control.
- ◆ The USAF Weapons School performs performance evaluation in high stress environments.
- ◆ The Combined Air and Space Operations Center provides “ACMI for the CAOC.”
- ◆ The Joint Air-to-Ground Operations Group provides joint air to ground operational training.
- ◆ The Predator and UAV Battle Lab performs research on crew fatigue, manning and scheduling for Middle East operations.
- ◆ The Security Forces and Desert Warfare Training Center employs multi-spectral devices, etc.

Future priorities include: enhancing decision making as a process, capability performance enhancement and providing innovative solutions to urgent needs.

**Enabling Decision Superiority with HSI** - Major Peter Garretson, Chief, Future Technologies Branch, HQ USAF Future Concepts and Transformation ([peter.garretson@pentagon.af.mil](mailto:peter.garretson@pentagon.af.mil), (703) 692-4795) is a C-5 and C-9 pilot, currently at the Pentagon as a long-term planner for the Air Staff. He is an OODA loop advocate. The new scarcity in Air Force aviation is **human attention**. As the number of airmen is reduced, a high percentage of those remaining will be decision makers. HSI can help select the best decision makers, train them to higher standards, conserve

and protect decision makers, understand decision making and eliminate waste, and apply cognitive prostheses. A new thrust, AFSSO-21 is causing the Air Force to start over in the way it looks at decision making: investigation areas will include data visualization and augmented reality/augmented cognition, both of which are critical to making significant progress. A much closer working relationship will be needed between HSI and Information Technology (IT) disciplines.

**62<sup>nd</sup> Engineering CBT Battalion (H):** LTC Dave Weston, Engineering Officer, US Army Chief of Staff, 6<sup>th</sup> Recruiting Brigade. In Iraq, LTC Watson’s Battalion laid 225 miles of pipeline from Camp Virginia to Talil Airfield. This included:

- ◆ 60,000 pieces of pipe
- ◆ 18 pumping stations (800 gallons/minute)
- ◆ 6 tactical petroleum terminals
- ◆ 20 million gallon total capacity
- ◆ Weighing over 4,500 tons
- ◆ One heavy combat brigade for four months.

During this operation there was very little C2. Over the course of about 15 minutes, LTC Weston provided the audience with a graphics-based presentation illustrating the hardships faced by the Army in working in this environment. This provided many examples of where HSI could help.

**Operational Neuroscience and its Impact on Decision Superiority:** Dr. Amy Kruse, Program Manager, DARPA-DSO, provided several examples of how DARPA is investigating this relationship ([amy.kruse@darpa.mil](mailto:amy.kruse@darpa.mil) (571) 218-4338). The focus at DARPA is on the human in the loop – with the brain at the center of command and control. DARPA has explored several methods of sensing brain activity:

- ◆ EEG Electro-encephalography
- ◆ MEG Magneto-encephalography
- ◆ fMRI Functional Magnetic Resonance Imaging
- ◆ PET Positron Emission Tomography
- ◆ fNIR Functional Near Infrared

EEG (electrical activity) and fNIR (oxygenation) hold near-term promise. Their goal is to develop a closed-loop computational system where the computer adapts to the warfighter in order to improve performance. Three different DARPA research projects were briefly discussed:

- ◆ The Boeing Company (Dr. Rich Edwards, et al), in conjunction with Dr. Glenn Wilson at WPAFB has explored control of four UAVs at a time using fNIR and EEG to sense workload.
- ◆ The Neuro-technology for Intelligence Analysts (NIA) program has as its goal helping analysts move through imagery more quickly. They are exploring the question: “Are their brain signals associated with targets in satellite imagery?” In this study, EEG 200 msec after target presentation was determined to be associated with target detection. Different scanning techniques were explored to speed target detection. The methodologies being studied have potential application to TSA baggage screening and mammogram screening.
- ◆ Another program being conducted by Lockheed-Martin, involves Tomahawk Tactical Work Station (TTWS). L-M is attempting to use neuroscience measures to help Human-Computer Interface (HCI) designers identify more usable interfaces that make operators less error-prone. They are attempting to develop a tool to detect and distinguish work workload-induced errors. Primary indicators are EEG, heart rate, GSR and off-head eye tracking.
- ◆ Another area of investigation is in the training area, where the goal is to use the innate plasticity of the brain to accelerate learning in the operational environment, to accelerate the transition from novice to expert by inducing localized plasticity in the brain. It is thought that increased plasticity in sensory brain structures results in enhanced information processing (synesthesia).

**Human Performance Integration – Full Steam Ahead:** Mr. Rick Etheridge, Director Human

Performance and Systems Acquisition Branch, Chief of Naval Operations [OPNAV N173] discussed some of the initiatives underway in N173 ([Richard.etheridge@navy.mil](mailto:Richard.etheridge@navy.mil), (703) 602-5160). N173 is supporting warfighting capabilities by maximizing human performance and minimizing LCC through requirements development, resource sponsorship and acquisition guidance.

**The Role of Collaboration in Decision Superiority:** Ms. Laura Militello, a Senior Research Psychologist at the University of Dayton Research Institute ([militello@udri.udayton.edu](mailto:militello@udri.udayton.edu), (937-229-2287) summarized some of the work underway at UDIR; they are working with lots of different military teams to optimize decision-making; e.g., Emergency response teams, Tanker Airlift control teams, Logistics Readiness Centers. They are focusing on both human-human, human-human (computer-mediated) and human-technology collaboration. Human-Human (computer-mediated) collaboration may include phone, email VTC, Chat rooms, VOIP and collaborative spaces such as “Net Meeting” and webex. Human-Technology collaboration involves such things as avatars, decision support systems and RFID. Some of the challenges to collaboration are shown below, with associated UDRI projects:

- Delayed, more fragile trust
  - Lab studies of trust in logistics C2
- Reduced cohesion
  - Roles & functions workshops
- Natural fault lines
  - Computer-supported conflict mgmt
- More extreme decisions
  - Modeling and simulation technology
- Asymmetric Information Flow
  - Standing Joint Force HQ Knowledge Manager
- Clumsy automation
  - Avatars

Next steps for collaboration research include:

- ◆ Frameworks for evaluating collaborative technologies – working with AFRL (Logistics Branch) to study trust, cohesion, decision making, and information flow.
- ◆ Improved Human-Technology communications.
- ◆ Processes of computer-mediated communications

### **Resource Foraging Strategies in Uncertain, Event-Driven Environments** - Ms. Sandra Garrett, Purdue University

([garretsk@ecn.purdue.edu](mailto:garretsk@ecn.purdue.edu), (765) 464-8867) described some of the work being accomplished in optimal foraging theory – searching for and obtaining the most food while expending the least energy.

### **Sub-Group Meetings Attended at the DOD HFE TAG:**

**Human Factors Standardization (HFS)** The chair/chair select for the Human Factors Standardization SubTAG is Mr. Dave Britton ([david.britton@wpafb.af.mil](mailto:david.britton@wpafb.af.mil)). The HFS website is: <http://dtica.dtic.mil/hftag/hfs.html>

**MIL-STD-2525.** Dr. Jake Wetzel, BCI ([jake\\_wetzel@teambci.com](mailto:jake_wetzel@teambci.com)) reported that change 2 will be published in August 2006. There will be approximately 50 changes to Appendix A. MIL-STD-2525C will be a major change to the military standard. The goal is to replace all the appendices with rules or “draw rules” for the symbology. The Navy has been quite active in proposing changes for new platforms such as the Littoral Combat Ship (LCS), conducting evaluations of such things as symbol size and symbol color, and proposing new engagement symbology. BCI expects a report to be available in the near future.

**MIL-STD-1787.** Mr. Jim Kinzig ([james.kinzig@wpafb.af.mil](mailto:james.kinzig@wpafb.af.mil)) reported on status. Deviations to the Standard are now allowed if there are expected performance enhancements, Life Cycle Cost (LCC) reductions, development cost reductions or safety enhancements. Revision “d” updates include:

- ◆ New definitions added
- ◆ New rotary wing symbols (from Terry Turpin, Boeing)
- ◆ Missile launch zones and attack steering depictions
- ◆ UAV section (currently replicates the manned aircraft section)

Appendix A design guidance has been updated to address consistency issues and provide clarifications. Also, the 3-D Attitude Director Indicator (ADI) Ball display was removed. The future “F” version will include off-boresight Helmet-mounted display (HMD) symbology, widebody/heavy aircraft symbology and additional threat displays. In the future, the rotary wing section will be cleaned up and updated, tactical symbology will be added by subgroup and F-35 Head-up display (HUD) developments will be monitored for possible additions. It is expected that Revision “D” will be published in December 06.

**Crew Systems Integrity Process.** Ms. Jennifer Farrel reported on the status of the CrewSIP process in the Weapon system Integrity Guide, MIL-HDBK-515.

([jennifer.farrel@wpafb.af.mil](mailto:jennifer.farrel@wpafb.af.mil)). The CrewSIP process is to ensure integrity of crew systems through the operational life of the system. Emphasis is placed on cockpit integration, escape systems/crashworthiness systems, threat protection and human-system integration. CrewSIP tasks include:

- ◆ Task I: Preliminary planning
  - Supports SRR (System Requirements Review)
- ◆ Task II: Design Information
  - Supports SDR System Design Review)
- ◆ Task III: Design Analysis & Development Tests
  - Supports SSR (System SW Review)
  - Supports PDR (Prelim. Design Review)
  - Supports CDR (Critical Design Review)

- ◆ Task IV: Component Development & System Functional Test
  - Supports TRR (Test Readiness Review)
  - Supports FCA (Functional Configuration Audit)
- ◆ Task V: Force Management
  - Supports PRR (Production Readiness Review)
  - Supports PCA (Physical Configuration Audit)

**FAA Human Factors Design Standard:**

Ms. Vicki Ahlstrom ([Vicki.ahlstrom@faa.gov](mailto:Vicki.ahlstrom@faa.gov)) reported that the FAA is currently updating the Design Standard section on displays (e.g., plasma, LCD, OLED). Issues to be addressed include:

- Sunlight readability (ATC)
- Off-axis viewing (ATC)
- Reflections and glare (ATC/TRACON)
- Monitor placement
- Environments
- Options and technologies for various environments
- Projection displays
- Helmet-mounted, Head-up, small screen, near screen displays

The approach being followed is to compare the current standard to other standards, perform a literature search, evaluate relevance for FAA use, identify additional topic areas, convert information to “should” or “shall” statements, and organize and prepare for review.

**Joint Service Specification Guide:** Mr. Dave Britton indicated there is little progress in this area.

**MIL-STD-1472F:** Mr. Tom Cook ([Thomas.cook@amrdec.army.mil](mailto:Thomas.cook@amrdec.army.mil)) reported that he had spoken with Mr. Lee Gray about updating the standard. The Army wants another Service to help pay for the work.

**GEIA & HEB-1:** No update was available since Mr. Louis Adams, (Lockheed-Martin, [lou.adams@lmco.com](mailto:lou.adams@lmco.com)) was unavailable to attend the meeting.

**Data Item Descriptions (DID):** Mr. Dick Armstrong noted that a draft HSI Plan DID has been developed. The draft DID would be reviewed as part of the upcoming tri-service HSI workshop planned for June 2006 in Orlando. Following update of this DID, all six DIDs (Five HFE and one HSI) will be published.

**NASA Standard 3000.** As part of the new initiative for space exploration, HSI requirements are being authored. The MSIS handbook effort is slated to begin in June 2006.

**Technical Society/Industry.** The Technical Society/Industry (TS/I) Sub TAG met twice during the TAG meeting on Tuesday morning and afternoon. Mr. Bill Lytle ([William.b.lytle@lmco.com](mailto:William.b.lytle@lmco.com), (303) 971-8972) chaired the two meetings.

In the morning session, Dr. Kirby Gilliland ([Kirby@ou.edu](mailto:Kirby@ou.edu)) and Dr. Robert Schlegel ([schlegel@ou.edu](mailto:schlegel@ou.edu)) provided an *Overview of the Association for Aviation Psychology* (AAP). The AAP was founded in the 1960s. Its mission is to promote aviation psychology and related aerospace and environmental disciplines and to apply principles of aviation psychology to the study of aviation and flight. Applications include flight deck design, flight simulation, air traffic control, heads-up and heads-down displays. The web page is: [www.avpsych.org](http://www.avpsych.org). Dr. Gilliland also provided an *Overview of the Center for the Study of Human Operator Performance (C-SHOP)*, at the University of Oklahoma. The C-SHOP develops computer-based tests for assessing human performance across a broad range of military, industrial, educational, medical applications, with a neurophysiology focus. C-SHOP serves in the following roles;

- Clearinghouse for computerized test batteries
- Quality assurance assessment
- Software distribution to users
- Research community focal point
- Customized test batteries
- Data extraction
- Research

C-SHOP is working with the Army on the Automated Neuro-physiological Assessment Metrics (ANAM). ANAM is a large test battery, consisting of traditional, well known and validated tests. Univ. of OK is now the single source of ANAM – they’re the experts. C-SHOP is also working with NSA on operator performance metric development. They are developing metrics for “flying” the robotic manipulation arm on the Shuttle.

Dr. Jennifer Narkevicius ([jennifer.narkevicius@skillsnet.com](mailto:jennifer.narkevicius@skillsnet.com)) commented on some work being done under SEAWARRIOR. They are determining what work falls in scope of HSI, what types of work is currently being done, what the current skill base is and what additional training might be needed.

In the afternoon session, Mr. Terry Fullbright addressed the T/SI group to provide an update on the National Training & Simulation Association (NTSA). NTSA is the “voice” of the training and simulation community. It was established in 1988 and merged with the National Defense Industrial Association 1992, as an affiliate. NTSA strives to foster and facilitate communications between industry and the services. NTSA has a Modeling and Simulation Professional Certification Commission. The I/ITSEC conference is their best-know activity, with about 17,000 attendees and 500 exhibits. NTSA also hosts other national and international conferences. The website is: [www.trainingsystems.org](http://www.trainingsystems.org).

Dr Jennifer Narkevicius continued her presentation on Navy HSI with a focus on the question “What do we do in HSI?” She described the job task analysis activities currently underway to determine if a community of practice exists in the HSI area. HSI SMEs will use the Skillsnet<sup>®</sup> skillObject<sup>®</sup>. She stressed that HSI is not only the work that occurs within the seven or eight domains, but includes the tradeoffs and optimization that occurs between them.

**Design Tools and Techniques.** The first speaker was John S. Barnett, Army Research Institute ([john.barnett1@us.army.mil](mailto:john.barnett1@us.army.mil)), who spoke on

***Automated Feedback and Network C3 Research to Support Design.*** The focus of their work is on networked command, control and communications systems such as the Army’s FBCB2. More specifically, they are looking into benefits of providing immediate feedback or “during action reviews” (as opposed to after-action reviews). The research question is: How do automated alerts affect Situational Awareness under varying workload conditions? Their experimental set-up included FBCB2 and “SHIELD (that provides automated alerting). Some of the automated alerts included:

- “Friendlies” violate a pre-set boundary
- Friendly unit approaches CAS “kill box.”
- Spot report
- New Friendly
- Fire/Plan mismatch

The available options to the Soldier, upon receiving an alert, would be:

- Dismiss or defer
- Read information in a log entry
- Call up a map showing the affected unit
- Call up a Job Aid.

The experimental method involved ARI personnel working with students at the University of Central Florida (UCF) and West Point. FBCB2/SHIELD operated on a laptop in any of several company-level scenarios. The task was to remember “significant events” during the scenarios. Conditions were with or without SHIELD. SAGAT and NASA(TLX) were used to collect data.

The next presenters were USAF Lt. Brneda Bluggel ([Brenda.bluggel@mesa.afmc.af.mil](mailto:Brenda.bluggel@mesa.afmc.af.mil)) and Lt. Dulcinea Yabot ([dulcinea.yabot@mesa.afmc.af.mil](mailto:dulcinea.yabot@mesa.afmc.af.mil)) with the Air force Research Laboratory, Williams AFB. They spoke on ***Collaborative Planning, Briefing and After-Action Review (AAR) – An Agenda for Research and Practice.*** They are studying planning and after action reviews to identify issues. They are trying to maximize the impact of mission planning and AARs.

The next presenter was Ms. Jennifer Devilbiss ([devilbissj@saic.com](mailto:devilbissj@saic.com)) who spoke on *Computer Automated Requirements Testbed (CART) Virtual Warriors: Computer Generated, Synthetic Teammates for C2 Simulation*. Air Operations Center Crew Systems technologies are typically tested through large exercises such as JEFX. They are looking at the ability to test these technologies using synthetic and virtual players, with the synthetic players being driven by IMPRINT models. The next major task will involve tying a real Intelligence Surveillance Reconnaissance (ISR) operator to synthetic models in an operational scenario. It appears as though this type of an approach could have application to large system-of-system developments such as the Army's Future Combat System (FCS) program.

The last presenter was Dr. Ed Martin ([Edward.martin@wpafb.af.mil](mailto:Edward.martin@wpafb.af.mil)) who spoke on the Advanced Unmanned Aerial Vehicle (UAV) Testbed for Human Operator Research (AUTHOR). Dr. Martin is with the Human Effectiveness Directorate of AFRL. The main task of this project is to compare the predictive capabilities of Human Behavioral representation (HBR) models using different architectures, with a focus on UAV control. The USAF Scientific Advisory Board (SAB) study on UAVs, published in July 2003, pointed up several issues. The AFSERS simulator was selected for study – this simulator is capable of handling several UAV platforms simultaneously.

**Human Factors Test and Evaluation.** This Sub TAG meeting was chaired by Mr. John Rice, Navy Human Performance Center, Norfolk, VA ([ricej@cotf.navy.mil](mailto:ricej@cotf.navy.mil)). Mr. Rice spoke about some recent changes in acquisition strategy. The JCIDS requires mission capability base investment and mission gap analysis and analysis of alternatives. In the 5000 series, HSI is treated as an enabler of performance. The impact of HSI on DT&E and OT&E is:

- Attend to human mission task performance using the systems being tested
- Emphasize systems command technical authority roles

- Support the increasing complexities of operational testing, such as: meeting Title 10 independent OT requirements, perform early assessments to support “fit early”, and defining and finding “typical operators” for tests.

In order to better address Navy needs, NAVSEA is joining forces more closely with COMOPTEVFOR. Initial collaboration has involved semi-annual meetings of SEA-03 and COMOPTEVFOR to discuss HSI plans, testing and test criteria for the Littoral Combat Ship. Another involves the DDX Bridge COOPEX where an inexpensive mockup of the bridge was used along with good scenarios and hand-picked crews and metrics to identify many problems. The AEGIS (since 1982) team performed a reaction time experiment comparing monochrome and color symbology - the result was a choice to move ahead with color displays.

The second speaker was Dee Quashnock, Director of Architecture and Human Systems, Space and Warfare Systems Command, SPAWAR-052 ([diane.quashnock@navy.mil](mailto:diane.quashnock@navy.mil)). She discussed activities conducted as part of “TRIDENT WARRIOR 05” as part of the global war on terrorism. This involved joint/collaborative operations with fire departments, police departments, etc. under the SPAWAR working charter and an OPTEVFOR MOA. Goals were to improve commanders' situational awareness, collaborative information environment, and network visualization and management.

**Modeling and Simulation.** Lt. Jeff Grubb (NAVAIR, [jeff.grubb@navy.mil](mailto:jeff.grubb@navy.mil)) is the new Modeling and Simulation SubTAG chair.

**Controls and Displays.** The first presentation was by Jeffery McCandless, NASA Ames Research Center ([jmccandless@mail.arc.nasa.gov](mailto:jmccandless@mail.arc.nasa.gov)), who spoke on *Evaluation of Advanced Spacecraft Cockpit Displays*. The HSI Division at NASA Ames includes 100 scientists who specialize in:

- Vision science

- Crew Resource Management
- Training and Procedure design
- Virtual environments
- Human-centered automation
- Display design

The existing space shuttle displays are very structured and primitive, with relatively poor consolidation of information. Dr. McCandless described shuttle upgrades #1 and #2 that will be incorporated into the current shuttle's follow-on system. These upgrades consist of upgrades to cockpit avionics and Fault Management Support System. Error, time, eye movement and eye fixation data were collected and analyzed as a part of both these upgrade activities.

The second presenter was Mr. Eric C. Pierce, who spoke on Development of Computer Peripherals for High Speed craft ([eric.pierce@navy.mil](mailto:eric.pierce@navy.mil)).

The third presenter was Bryan Walter, PhD, The Boeing Company ([bryan.e.walter@boeing.com](mailto:bryan.e.walter@boeing.com)) who spoke on. *UAV Swarm Control – Calculating Visual Pheromone Fields with the GPU (Graphics Processor Unit)*. In order to control multiple Unmanned Aerial Vehicles (UAV) at one time, the concept of the “swarm” was developed. In a swarm, each UAV is programmed to fly itself to a position without colliding with others, and detect threats and targets through the use of artificial intelligence, sensory information and image processing. The UAVs also communicate with each other and the commander. Pheromones are chemical signals, ‘hints’ that influence and aid in controlling the behavior of animals. Pheromone chemical composition determines what messages are provided. The concept of “digital pheromones” was developed to aid in UAV swarm control. Digital pheromones:

- May be placed on a UAV control map to help influence flight behavior
- Strength propagates to neighboring cells
- Evaporate over time to ensure accurate data at all times
- Are computationally “expensive” because their strength and propagation must be frequently calculated or updated

Pheromones may be of several types:

- Threats (with adjustable sensitivity based on threat level)
- Targets (with adjustable sensitivity based on threat importance)
- Repulsion (e.g., for “keep out” zones)

The operator may input no fly zones (high repulsion) to clear areas so that manned aircraft can transit an area. High interest areas also may be created to bring all the UAVs to it. Each UAV needs only limited information for navigation. They just need to know values of adjacent cells to determine which way to go next.

The next presenter was Dr. Brett Walters ([bwalters@maad.com](mailto:bwalters@maad.com)), who described a recently completed Small Business Innovative Research (SBIR) project that was just completed for NAVAIR, entitled “*Multi-modal Interface Design Advisor*”. Factors considered in the design of the multi-mode advisor were:

- Environment
- Individual differences
- Operator tasks
- Parallel tasks
- Control and display components
- Stereotypes (conventions/standards)

Approach: Start with task network modeling with information about the users and the environment and compare to characteristics of each multi-modal technology and results of years of user interface design.

- 1) Enter the User Characteristics (such as age and visual capabilities), Environmental characteristics (such as light, visibility, noise, temperature) and HW characteristics (relevant technologies).
- 2) Enter task characteristics (such as standard task and VACP information about each task, mission criticality, time criticality, types of tasks, actions, decisions)
- 3) Enter Design guidance
- 4) Build the task network model
- 5) Run the task network model
- 6) Analyze results
- 7) Make design recommendations

Validation studies were conducted using 3 missile defense scenarios and a Navy tactical Tomahawk scenario.

The next presenter was Joycelyn Keillor, Ph.D. from the Defence Research and Development Center (DRDC) Toronto, Canada ([joceln.keillor@drdc-rddc.gc.ca](mailto:joceln.keillor@drdc-rddc.gc.ca)) who spoke on *Spatial Understanding of Views from Multiple Sensors*. Multiple sensors are desirable to increase situational awareness, but having multiple views does not always help. Investigation has used sensors with variable zoom, different fields of view, different angles of obliqueness, degraded operations etc. Field of view affects perception of distance or proximities of one thing to another. A SAR helicopter with a range-gated IR external gimballed sensor was used to investigate. It was determined that frame of reference was very difficult to maintain when different fields of view (FOV) were used; e.g., world FOV, aircraft oriented FOV, operator FOV, sensor FOV. So, it is important for the SAR operator to maintain a good frame of reference. Does exocentric terrain knowledge provide any help in maintaining situational awareness? Performance of two groups were compared, one with experience with the terrain databases and one without. Performance was better by the group with knowledge of the terrain. Having a map during search was not found to improve coverage effectiveness. Automated sensor sweeping was of no help either, since the auto control is not good enough yet. The conclusion drawn from the investigation thus far is that while multiple sensors are becoming more prevalent, the operator's 3-D representation of the scene must be supported.

**User-Computer Interface.** The Sub TAG meeting was co-chaired by Nausheen Momen, LT, MSC, USNR, Ph.D ([nmomen@namrl.navy.mil](mailto:nmomen@namrl.navy.mil)) and Stephen Merriman ([stephen.c.merriman@boeing.com](mailto:stephen.c.merriman@boeing.com)). There were 29 attendees. Five presentations were made relevant to the theme of "Enabling Decision Superiority with HSI."

The first presenter was Dr. Mica Endsley, SA Technologies ([mica@satechnologies.com](mailto:mica@satechnologies.com)), who spoke on *Warfighter-Machine Interface for FCS*. Dr. Endsley made a highly graphical presentation on the US Army's Future Combat System (FCS) program, emphasizing the user interfaces ("Soldier-Machine Interfaces, or SMI") being conceptualized, designed and built in support FCS. The Future Combat System program is the US Army's major modernization effort for the 21st century. It includes a highly integrated structure of 18 manned and unmanned systems, connected across a distributed network. The Battle Command software that operates across FCS integrates networked communications, networked operations, sensors, training and reconnaissance and surveillance capabilities to provide the opportunity for highly advanced levels of situation awareness and force synchronization. The network of distributed war-fighters operating across all of these systems will be connected by a common, consistent warfighter-machine interface (WMI) that has been tailored for each of the 113 unique warfighter roles involved. Using a Situation Awareness Oriented Design process, the WMI has been designed from the warfighter up to support the highest levels of situation awareness and minimize unnecessary workload. Information is integrated around the war-fighter's goals and decision requirements. There is explicit support for multi-tasking and the at-a-glance understanding of information that is critical for these highly dynamic and fatiguing operational conditions. Operations on the move are supported for a wide variety of collaborative tasks across the distributed warfighting team. The FCS WMI provides a significant advance in warfighter-centered design processes and in achieving a highly usable system for the Army's future war-fighters. [Approved for Public Release, Distribution Unlimited, TACOM 29 Sept 2005, case 05-229.]

The second presenter was Ms. Susan Archer, Micro Analysis and Design, Inc. ([sarcher@maad.com](mailto:sarcher@maad.com)), who spoke on *GRBIL – A Tool to Evaluate the Usability of Unmanned Vehicle Interfaces*. This software tool is being developed under the Army's Advanced Decision

Architectures (ADA) Collaborative Technology Alliance (CTA) basic research effort. GRBIL is a software tool that allows system developers to evaluate the efficiency and effectiveness of an interface design by simply sketching out the interface graphically – before the operator interfaces are actually developed. This capability is enabled through integration of a cognitive modeling framework with a traditional human-system integration modeling paradigm so that detailed predictions can be made about the possible cognitive errors that might result.

The tool, GRaph-Based Interface Language (GRBIL), takes a graphical description of an interface and automatically generates an Adaptive Control of Thought – Rational (ACT-R) cognitive model of the user interacting with an Improved Performance Research Integration Tool (IMPRINT) task network model of the system. This approach to interface evaluation is underpinned by the first-principle models of cognition implemented within the ACT-R architecture. The degree to which an interface supports the user is a matter of understanding the interplay of both general constraints on cognition and the expertise a user might possess. This is an effective method for evaluating system interfaces to detect potential errors and inefficiencies. In addition, researchers can use the models to identify alternative system designs.

Accomplishments to date include:

- Created an extended prototype GRBIL tool that can run multiple Experimental Unmanned Vehicles (XUVs) simultaneously
- Developed an integrated prototype that automatically generates IMPRINT and ACT-R models directly from user input
- Validated the functionality and output of the prototype tool
- Integrated with AVOCET, a tool to help determine the number of operators required to operate multiple unmanned vehicles

Benefits to Soldiers include:

- Identifies system designs that are easy to use, easy to learn, and are the most efficient interface

- Predicts the Soldier's ability to effectively control multiple unmanned vehicles
- Informs the design of human-computer interactions early in the design cycle, increasing the likelihood that information technology will actually support the Soldier

The third presentation was made by Dr. Jennifer Narkevicius of Skillsnet, Inc.

([Jennifer.narkevicius@skillsnet.com](mailto:Jennifer.narkevicius@skillsnet.com)), who spoke on *HSI Constraints on UCI Design*.

User Computer Interfaces have tended to be the province of Human Factors. As UCI has become more ubiquitous, the user populations continue to become less specific. This trend toward more general use, especially in work settings, increases the necessity to ensure the user requirements are appropriate and flexible. The Human Systems Integration (HSI) domains all have something to contribute to the requirements definition as well as the design and implementation of the software and hardware. This need is emphasized when the UCI is part of a decision superiority support system. Manpower, Personnel, Training and Human Factors all clearly have useful input to the engineering design trade space when systems are designed and implemented. HSI processes and tools can bring power and rigor to the design and enable to best performance from the UCI. Integration of the tools, especially through modeling will result in effective improvements for the systems and their UCI.

The next presentation was by Air Force Cadet Jenny Coker, USAF Academy

([c06jenny.coker@usafa.af.mil](mailto:c06jenny.coker@usafa.af.mil)), who spoke on *Eye-tracking Analysis of Usability Evaluation Videos*. Advances in technology have given researchers new methods for evaluating human computer interaction and error. Usability evaluation software such as TechSmith Morae provides the usability evaluator with the capability to record audio, video of the user, and desktop screen activity in a “picture-in-picture” (PIP) format, allowing the evaluator to observe the interface screen and the human user simultaneously. The research reported here examined how much attention is given to the PIP video when evaluators are observing results from

a usability evaluation session. Eighteen cadets at the Air Force Academy participated in this study. Half of the participants were considered experienced evaluators and half were novice evaluators. Evaluators watched two video recordings that differed in the quality level of the PIP video. Focus of attention was measured with eye-tracking equipment and software. The results showed a significant difference between experienced and novice usability evaluators in terms of the time spent viewing the PIP and number of problems reported. Experienced evaluators spent nearly double the amount of time looking at the PIP video and also found approximately one-third more usability problems. All evaluators spent more time looking at the PIP video when it was set to a higher quality. The results also showed that the quality of the PIP video had no significant effect on an evaluator's ability to recognize usability problems. Implications for usability evaluation were discussed in addition to follow-on research in this area.

The last presentation was by Air Force Lt Col Terence Andre, USAF Academy ([terence.andre@usafa.af.mil](mailto:terence.andre@usafa.af.mil)), who spoke on *Usability Methods for Undergraduate Education and Research*. For several years, usability has no longer required justification in most quarters. Because of the growing awareness of its importance, organizations have been expending resources for "doing usability" – building enviable usability laboratories, buying usability equipment, training developers in usability engineering methods and conducting usability testing. This push has created high-end laboratories with state-of-the-art recording equipment. The work at the Air Force Academy has led to the development of a flexible laboratory environment where recording can occur from a large observation room connected to existing research rooms over a local area network. No structural modifications were required to the existing laboratory space (e.g., no one-way mirrors). The large observation room allows for students in human factors, computer science, and systems engineering courses to observe usability recording sessions without any distractions to the participant. As a result,

usability evaluation objectives were integrated into the courses with both content and live demonstrations with the objective of making the lab a "teaching machine" for usability. This presentation highlighted the tools that are currently being used in the USAFA laboratory.

#### **Human Factors Engineering/Human Systems Integration: Management and Applications.**

Not attended.

#### **Personnel Selection and Classification.**

Not attended.

#### **Sustained/Continuous Operations (SUSOPS/CONOPS).**

Not attended.

#### **Workload and Stress.**

Not attended.

#### **Human Factors in Training.**

Not attended.

#### **System Safety/Health Hazards/Survivability.**

Not attended.

#### **DOD HFE TAG Operating Board Meeting:**

1. **MIL-STD-1472 Pocket Guide:** The Navy will provide the resources for reprinting this in the near future.
2. **Increased NASA Participation:** An effort must be made to reach out and encourage additional participation by NASA personnel, especially when meetings are held close to a major NASA facility.
3. **SubTAG Chair Replacements:** Ms. Barbara Palmer (BAH) will replace Dr. Michael Fineberg (SAIC) as co-chair of the System Safety/Health Hazards/Survivability SubTAG. Dr. Fineberg has had recent difficulties attending TAG meetings. Mirabon Whitmore will take over leadership of the Extreme Environments SubTAG.
4. **HSI Workshop:** There will be an HSI workshop for approximately 20 government and industry personnel. The workshop's

objectives are to begin identifying methods to improve government HSI guidance to industry. Results of the workshop will be reported at the next DoD HFE TAG meeting.

5. **HSI and Congress:** Mr. Paul Chatelier will address the next DoD HFE TAG on this subject.
6. **Human-Robotic Interaction and Integration Special Interest Group:** This new OSD sponsored group will meet in conjunction with the next DoD HFE TAG meeting.
7. **TAG-56:** The next TAG meeting will be in Monterey, CA, sponsored by the Navy and hosted by the Navy Postgraduate School (NPS). This location is in reasonably close proximity to NASA Ames Research Center.
8. **Next TAG Vice Chair:** Ms. Katrina Baker, US Army Aberdeen Proving Ground, will be the next TAG Vice Chair.
9. **Army Caucus Chair:** Pamela Savage-Knepshield will serve as the next Army Caucus chair.



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