

16 May 2010

**Trip Report**  
**Department of Defense**  
**Human Factors Engineering Technical Advisory Group**  
**(DOD HFE TAG) Meeting #65 – Natick, MA**  
**02-05 May 2011**

The 65<sup>th</sup> meeting of the DoD HFE TAG was held in Natick, MA and hosted by the US Army Natick Soldier Research, Development and Engineering Center. The meeting was chaired by Dr. Pamela Savage-Knepshield ([pam.savagekenpshield@us.army.mil](mailto:pam.savagekenpshield@us.army.mil)). The theme of the meeting was *Human Dimension as a Starting Point*. Approximately 70 people attended the meeting, representing Office of the Secretary of Defense (OSD), Army, Navy, Air Force, NASA, FAA, US Coast Guard, academia, several human factors-related technical societies and industry associations. Additional personnel representing industry and academia attended as invited speakers. Selected briefings from TAG-65 will be available on the DoD HFE Tag website: <http://www.hfetag.com/>.

Five items are attached:

- DoD HFE TAG Background, attachment (1)
- TAG-65 Theme, Attachment (2)
- Program Summary, attachment (3)
- DoD HFE TAG Operating Board, attachment (4),
- TAG attendees, attachment (5) <to be provided when available>
- DoD HFE TAG Policies, attachment (6)

**Monday 02 May 2011 Plenary Session Presentations**

The DoD HFE TAG Chair for the 65<sup>th</sup> meeting, Dr. Pamela Savage-Knepshield welcomed attendees to the meeting, elaborated briefly on the meeting theme Human Dimension as a Starting Point) and reviewed the week's agenda. She thanked the US Army Natick Soldier Research, Development and Engineering Center for hosting the TAG meeting and the tour. The keynote speaker was then introduced.

**Dr. John (Jack) Obusek, Director, Natick Soldier Research, Development and Engineering Center (NSRDEC).** Dr. Obusek welcomed the TAG participants and provided a brief overview of the NSRDEC, the mission of which is to maximize Soldier survivability, mobility, combat effectiveness and field quality of life by treating the Warfighter as a system. The science areas supporting NSRDEC are airdrop/aerial delivery technologies, clothing and personal equipment, Human Systems Integration, contingency basing (expeditionary), Soldier/Small Combat Unit (SCU) technology maturation and demonstration, and Joint services combat feeding. The activities at the center range from basic research to technology generation, to soldier system

technology integration and transition, to solving field problems rapidly. Areas needing the most help are:

- Occupant-centric design (new for the Army)
- Distributed capabilities – smaller combat units are now more critical (including robotics)
- Operationally-relevant measures of performance
- Human modeling and simulation – Individual and small combat unit simulations, including the feedback of data from experiments and field trials to the modeling community.

**Ms. Diane St. Jean, Acting Associate Director, NSRDEC.** Ms. St. Jean spoke on the “*Soldier Systems Integration Domain and the Human Dimension*,” emphasizing three areas:

- Soldier as a Decisive Weapon
- Human Systems Integration Challenges

**Soldier as a decisive weapon:** Emphasis is on designing for the individual Soldier and the small tactical unit. One area of emphasis is on minimizing the total Soldier’s load. She compared the typical soldier load (pack plus equipment) on the battlefield:

<u>WW2</u>	<u>Vietnam</u>	<u>Now</u>	
26 Lbs.	35 Lbs.	75 Lbs.	

Somehow, the Army seems to have lost its focus on soldier agility and has burdened the Soldier with protection and technologies to the extent that agility has been severely compromised. The Board on Army Science and Technology and the RAND Arroyo Center are currently studying this issue. As a decisive weapon, the NSRDEC tries to:

- **Empower** the Soldier to preemptively influence enemy will, power and ability to act.
- **Unburden** the Soldier so he can perform missions
- **Protect** the Soldier so he can conduct missions under all environmental conditions

The science and technology community is now being asked to lead the transition, more than just reacting to needs expressed by other communities.

**Soldier System Integration Domain Challenges:** The key challenges are Soldier load, contingency basing, force application at the tactical small unit, Soldier situational awareness and the Human Dimension, manned-unmanned system teaming. One of the areas being emphasized in the “human Dimension” area is the transition that Soldiers must repeatedly make between kinetic and non-kinetic ops. For example, after surviving a fire fight, a Soldier may need to negotiate with a family for compensation of their two goats that had been killed. Soldier multi-tasking, fatigue, stress and the need to cope with a host of new technologies is very difficult. Soldier/Small Combat Unit Load includes protection, power/batteries, mission command performance, lethality, and sustainability (reliable supply). There are currently over 400 different programs of record developing/fielding clothing and equipment for the Soldier. How could all those items possibly be carried and integrated in to a Soldier-borne ensemble?

**Dr. Pamela Savage-Knepshield, DOD HFE TAG Chair, Chief of the ARL-HRED Human Effectiveness Directorate.** Dr. Savage-Knepshield spoke on “*HSI in the Trenches: On Assignment in Iraq.*” Dr. Pam, as she was called in Iraq, spent 6+ months working

with small units, learning about Soldier HSI problems in theatre, reporting them, identifying candidate solutions to problems and getting them corrected as expeditiously as possible. While there she developed and submitted 52 requests for information on identified problems. She conducted many product evaluations anywhere from 30 to 60 days after implementation.

Dr. Savage-Knepshield related some human factors-related results of her assessments. She was impressed with the lack of training that Soldiers receive for the new equipment that shows up in Iraq every week. The new systems are, by and large, not intuitive and the new systems are often rejected in favor of the old systems that they can already operate! Medics don't get refresher training. Roll-over trainers need to be much more realistic...the current ones aren't doing the job they should. Gun mounts in vehicles require the muzzles to be oriented up, but TTPs call for the Soldiers to mount them muzzle-down. Seats are too upright and there is insufficient space for Soldiers to sit with their gear. Seat belts are not long enough to accommodate Soldiers with armor and all the other things (ammo, water, etc) that they must take with them; so the seatbelts go unused in violation of safety protocol. Power doors on vehicles break down and are unusable. Steps are too narrow to use. And, head clearance in many vehicles is insufficient. Soldiers in theater don't know how to get parts so there are long delays in getting systems repaired. Some systems have unprotected power switches in vulnerable places (like under seats) so critical systems can be inadvertently shut down (and Soldiers must then wait 30 or more minutes for systems to re-boot). Also, lights on vehicles (MRAPs, etc) are inadequate so Soldiers splice in addition lights...but some vehicles have insufficient reserve electricity to fully power them.

**Mr. Jack Blackhurst, Director, Human Effectiveness Directorate, 711<sup>th</sup> Human Performance Wing.** Mr. Blackhurst (Colonel, retired) spoke on “*Air Force and the Human Dimension*”. His main points, which were elaborated in his main talk, were:

- This is a great time to be in the HSI business! There is a very high level of support and recognition that HSI's time is due.
- The Human Effectiveness Directorate is a very different place than it was 10 years ago. It used to be cockpit oriented and almost exclusively concerned with HFE. Now, the focus is broader and on Intelligence Surveillance Reconnaissance (ISR), Robotic Vehicles, etc.
- In 1997, the Air Force basically got out of the manpower and personnel (M&P) business. Now that remotely piloted vehicles, special operations, space, directed energy, cyber ops have emerged as major focus areas, the Air Force has recognized M&P as an area of need.

The Air Force has focused on hardware and software at the expense of human integration. For example, one Predator UAV requires over 150 people to operate and maintain it. There was very little HFE on that program. The new vision is to integrate biological and cognitive technologies to optimize and protect the airman's ability to carry out his/her tasks. One goal is to reduce the number of operators it takes to fly remotely piloted aircraft; this is being emphasized now. Another area being pursued is Forecasting and Human Threat Visualization. This includes human signatures, patterns of life, human analyst integration. Because of the high level of emphasis and funding, advanced sensors have become awesome! However, there hasn't been enough emphasis on how to best use sensor data. For example sensors/algorithms can now automatically recognize human behaviors such as swinging a pick-axe...but the best use of that information is not well-defined. Another area being investigated is “Agile training” in real time.

**LCDR Joseph Cohn, PhD, Office of Naval Research, Division Deputy, Human and Bio-engineered Systems Division.** LCDR Cohn spoke on “*Enabling the Human Dimension Through Cognitive Neuroscience.*” The Human Dimension just doesn’t get into the original requirements for systems. We haven’t been able to answer Admiral Kidd’s question “What is a pound of training worth?” IN ONR 341, they are working on how human cognition may be represented. Cognition is viewed as how the brain transforms sensed information into action. The problem with cognitive models is that we don’t know what is going on in the brain. ONR is trying to fill in the data gaps. The Navy is exploring fundamentals of learning. For example if you can use games to increase IQ prior to training maybe the training would be more effective. Personalized Adaptive Training is the goal. This type of training would be instructorless but offer the richness and individuality needed to optimize learning. The area of “trust” is also being investigated.

**Dr. Patrick Mason, Director, Human Performance, Training and Bio-systems Research Directorate, DDR&E.** Dr. Mason provided an “*OSD Perspective on Human Systems Integration.*” Dr. Mason provided an overview of his responsibilities within OSD, including environmental and energy technology, medical research, human use, animal RDT&E protection, strategic environmental initiatives, human/cultural/social/behavioral technologies, and human performance. Dr. Mason serves as a sponsor for the Joint HSI Steering Committee and Working Group and as the proponent for the DOD HFE TAG. He recognizes the importance of HFE early on in system development. He wants to energize the Human Systems community of practice and increase collaboration. Dr. Mason sits in on Technology Readiness Assessments and has the authority to stop the progression of R&D programs. He is very interested in HSI success stories and Hot Issues. The important thing is what difference was made for the Warfighter. Dr. Mason will be looking for assistance from military, civilian and industry TAG members.

**Tuesday-Wednesday, 3-5 May 2010**

**SubTAG Meetings Attended at the DOD HFE TAG:**

**Technical Society/Industry SubTAG.** The Technical Society/Industry (TS/I) Sub TAG met twice during the TAG meeting on Tuesday morning and Thursday afternoon. Ms. Barbara Palmer (Booz Allen Hamilton, [barbara\\_palmer@bah.com](mailto:barbara_palmer@bah.com)) and Mr. Stephen C. Merriman ([stephen.c.merriman@boeing.com](mailto:stephen.c.merriman@boeing.com)) served as the TS/I SubTAG co-chairs. The topics addressed at the last meeting were:

- \* TS/I could assist in authoring the new DoD HFE TAG "memorandum for record." The original 1976 memo probably did not describe the support currently provided by the technical society and industry sub group.
- \* TS/I could increase its role vis-à-vis participation by academia in DOD HFE TAG meetings and activities. The TS/I could contact local universities in advance of TAG meetings to encourage participation by key faculty and students.
- \* The TS/I could continue its advocacy of increased DOD guidance to industry in the HSI area (a 2005 Dr. Foster initiative). With a Data Item Description (DID) approved and in use for HSI Program Plans and another DID for HSI Reports in preparation, the last remaining issue is development of a DOD HSI Handbook. The USAF effort to translate UK DEF STAN 00-250 to an Air Force Handbook provides an opportunity to encourage Army and Navy HSI proponents to

expand the effort to include ships, ground vehicles and other systems. This DOD handbook would be much appreciated by industry at large.

\* The TS/I could make DoD HFE TAG Plenary session presentations as requested by the Executive Committee and Operating Board.

\* The TS/I could survey its member technical societies and industry organizations on topics of interest to the Executive Committee and Operating Board.

\* The TS/I would appreciate the opportunity to participate as appropriate in DOD Joint HSI Working Group meetings (and present to HSI Steering Group) in order to provide a "voice" from industry representatives.

\* TS/I members could also be available to participate as requested in international HE/HSI forums such as TTCP, NATO.

During the morning TS/I meeting, members discussed some of the above initiatives with Dr. Mason, notably assisting with development of a DOD Handbook on HSI for practitioners, providing industry with consistent HSI requirements from contract to contract, and inclusion of HSI Key Performance Parameters (KPP) and Key System Attributes (KSA) as appropriate.

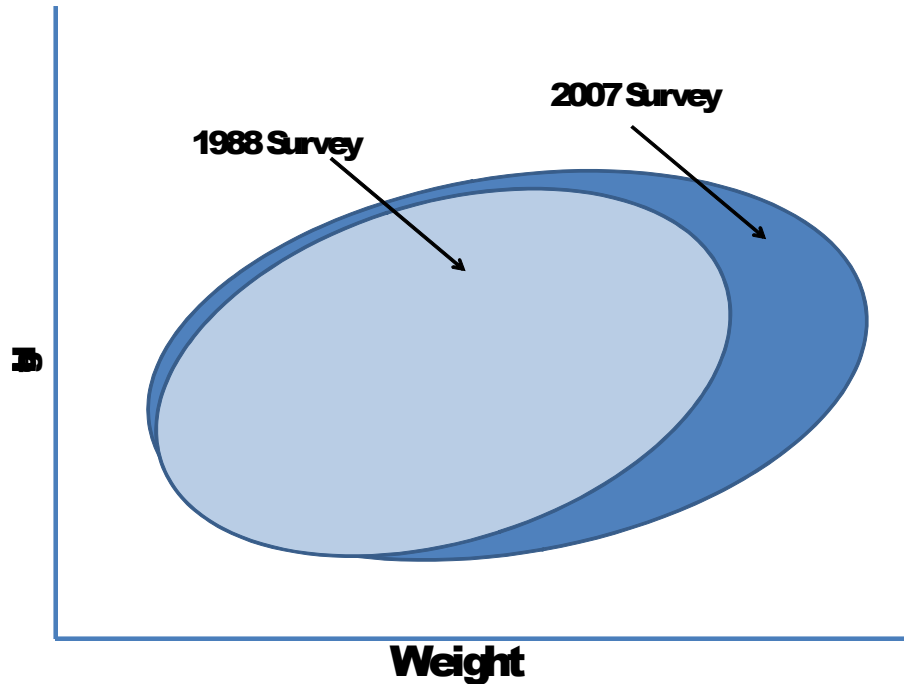
During the Wednesday afternoon TS/I meeting, Al Poston mentioned that he had invited the HFES New England chapter president to speak at the HFS SubTAG meeting. He suggested that the local HFES Chapter President should present a short (10 minute) talk at future TAG Plenary sessions. He also suggested that the TS/I SubTAG should connect with local Universities (e.g., George Mason University for TAG-66 in Virginia).

Steve Merriman brought up an issue for discussion: Is HSI really part of Systems Engineering? Is it part of systems engineering on the Government side? What is specified in industry standards and handbooks? Is there a requirement that HSI be addressed in the SEP? Is it required that HSI be addressed in the SEMP? HSI is currently excluded from the Systems Engineering enclosure to DODI 5000.2. The point is that policy should be consistent "on both sides of the contract."

**Human Factors Standardization (HFS) SubTAG:** The Human Factors Standardization SubTAG meeting was chaired by Mr. Alan Poston ([aposton86@comcast.net](mailto:aposton86@comcast.net)).

- **MIL-STD-1472:** Daniel Wallace reported that there have been challenges with the "G" revision to MIL-STD-1472 and many months were lost due to required re-formatting. The final draft is now in review and Rev G should be printed in the next few weeks. Revision "G" is about 400 pages long, as compared to the 200 page Rev "F". Revision "H" will kick off shortly. It will address hand-led devices, unmanned systems and other recent advances in technology. Revision "H" should be ready for release in two to three years.
- **AR 602-2** (Army regulation on HSI/MANPRINT): Dr. John Warner reported that an update to the regulation is "at the printer." It updates Army organization and contains stronger language ("shall statements").
- **MIL-STD-2525D:** The new revision is in the final stages of coordination and approval. The objective is to reorganize the document and significantly shorten it. Jake Wetzel at NAVSURWEPCEN Dahlgren is the primary point of contact.
- **NASA Standard 3001:** NASA Space Flight Human Systems Standard Volume 1 (3/3/07) and Volume 2 (1/10/10), in conjunction with the Human Integration Design Handbook (1/27/10) totally replace NASA STD-3000. <http://msis.jsc.nasa.gov>
- **FAA Standards:** Nothing new.

- **MIL-STD-46855:** Interest has been expressed in resurrecting MIL-STD-46855. The plan is to roll anthropometry information in DOD-HDBK-763 into the Standard and then cancel the handbook. This must first be approved by the Defense Standardization Council (Mr. Welby), and that appears very likely since a business case was submitted to him and accepted. Al Poston has briefed the DEPSO on this and received a positive response. Approval of conversion to a Military Standard is expected by 1 June 2011.
- **HFE/HSI DIDs:** The US Navy is currently custodian of the HEPP and HSIPP DIDs. Army is custodian for the remaining DIDs. TechAmerica G45 Human Systems Integration committee has drafted an update to the HSIPP DID and has authored a new DID on HSI Report. Both DIDs have now been approved for use and are available from DOD ASSIST.
- **Index of Government Standards:** The latest update by Mr. Poston is available on the TAG website, under Products.
- **UK Defence Standard DEF STAN 00 250 Conversion to USAF Reference Document:** William Kosnic (711<sup>th</sup> HPW) reported that DEF STAN 00 250, released in May 2008 is still in the process of being converted into guideline document under contract to SURVIAC (Booz Allen Hamilton). It should be published as a 711<sup>th</sup> HPW guideline by July 2011. Following publication, the USAF may pursue conversion to a DOD or international standard. The USAF still needs to “beef-up” topics of survivability, habitability and environmental protection.
- **New Army Occupant-centric Survivability Project:** Dawn Woods reported that she is working on a new effort to improve protection to Soldiers. Occupant-centric survivability begins with the Soldier and designs outwards to optimize protection. Dawn sent a short list to TARDEC for possible funding of improvements and she is now looking for help! Her effort would begin in October 11. Blast and roll-over protection are the initial focus areas. White papers would probably be accepted (S. Merriman comment).
- **ANSUR II:** Dr. Claire Gordon, Senior scientist and anthropologist at the Soldier Systems Center, has embarked on a major effort to update the Army’s anthropometry data base. The first US Army anthropometry data cover Soldiers in the Army from 1861 to 1865! The 1988 database is the most recent, but there have been problems with the tariffs generated from those data...in OIF, there were critical shortages in large JLIST and Interceptor body armor. Generally, OIF body sizes exceeded existing accommodation envelopes, resulting in tariff shortages. A pilot study was conducted using 1500 Active Duty Soldiers, 771 Reservists and 565 National Guard troops. There was a significant difference between the existing (1988) survey and the latest pilot study.



Relationship of 1988 and 2007 Army Anthropometry Data

Significant differences exist between the 1988 data and the pilot data taken in 2007. While average height remained constant, average weight has increased significantly:

	<u>1988</u>	<u>2007</u>
Weight Average:	172 Lbs	184 Lbs.
Height Average:	69.1 inches	69.3 inches

The ANSUR II survey will collect the same data as the 1988 survey, and will add 3D scans (head, foot and body). The schedule for this activity is as follows:

FY09	Secure Project Funding (\$10 million)
FY10	Research Design
FY11-12	Collect Data
FY12	Develop Summary Statistics
FY 12-13	Develop Accommodation Boundaries
FY 12-13	Design Digital Models
FY12-14	Develop CIE models (for Clothing and Equipment)

Ninety-four direct measurements will be taken plus demographic data and scans. So far, they are getting 90% participation from the Army and a 60 % participation rate from the USMC (In the Army there was an EXORD compelling participation). Following this presentation, Steve Merriman asked Dr. Gordon how practitioners can determine the percent of the population that is disaccommodated when boundary layer mannequins are not totally accommodated by a design. She indicated that the Army has not provided this data to date. She indicated that families of boundary layer mannequins are needed; these should be a product of the ANSUR II survey.

- **Standards in Modeling and Simulation:** Andrew Collins, PhD (Old Dominion University, Virginia Modeling and Simulation Center) made a general presentation on standards. Types of standards range from de facto to voluntary, to De Dejure (laws, regulations). Standards may be implicit or explicit. Workshops are being hosted to explore standards as tools and objects.
- **Human Factors and Ergonomics Society/New England Chapter:** Mr. Erick Jones, President of the New England Chapter, provided a presentation on the chapter. The chapter mission is to “connect students with professionals in human factors, psychology, and engineering disciplines throughout New England.” The chapter was reinstated in 2000. Events are held every 1-2 months, with technical speakers, site visits and social events topping the list of topics. The last event was at Tufts University where 12 students presented their work at 5 minutes each and all brought resumés to the meeting. The chapter has provided help finding positions for several of these students. There is an annual student conference where, on average 80 professionals and 20 students participate. The chapter provides sponsorship for events at Aptima, Microsoft and other companies in the region. Contacts: [ejones@aptima.com](mailto:ejones@aptima.com), [nechfes@gmail.com](mailto:nechfes@gmail.com), <http://nechfes.org>
- **Human Engineering CDRL Item Evaluation Tool:** Suzanne Dawes (The Aerospace Corporation, [Suzanne.m.dawes@aero.org](mailto:Suzanne.m.dawes@aero.org)) provided a briefing on a straightforward, excel-based tool for evaluating compliance with Human Engineering Data Item Description requirements. [S. Merriman has requested additional information on these tools – Please contact him if interested.]
- **US Navy/SPAWAR HSI guideline document:** Dr. Bob Smillie has developed a guideline document emphasizing Navy-specific areas of HSI. He derived most of the information from UK DEF STAN 00-250. SMAWARSYSCOM has also promulgated SPAWARINST 5238.5 covering HSI responsibilities within SPAWAR. [S. Merriman to email Dr. Smillie to establish status of this effort.]
- **Impact of Acquisition Reform on HF Standardization:** Al Poston summarized the recent history of standardization, with emphasis on Human Factors. A coopers & Lybrand study concluded that HE adds about 0.5% to total system R&D costs. A later RAND study concluded that HE may add only 16<sup>th</sup> that amount, or less than 0.1%. Prior to the Secretary of Defense Perry Memo, Human Factors had 21 standardization documents. Afterwards, the standards documents were as follows:
  - 11 cancelled documents
  - 4 Handbooks
  - E converted to Handbooks
  - 2 designated as Design Standards (MIL-STD-1472 and MIL-STD-1474 (noise))
  - 2 interface standards (MIL-STD-1787 (aircraft symbology) and MIL-STD-1477 (air defense symbology))

When HF standards were weakened, there was less visibility into problems. In 2003, policy was revised and Human Systems Integration was added to DODD 5000.1 and DODI 5000.2. The realization within DOD was that acquisition goals cannot be met without an HSI effort. In 2004, the Defense Acquisition Guidebook did away with the requirement to get waivers to require compliance with HF standards. IN 2010, DOD (DSPO) announced plans to convert MIL-HDBK0-46855 (unenforceable) to MIL-STD-46855 (enforceable).

## **Human Factors Engineering/Human Systems Integration: Management and Applications (Part II):**

The meeting was chaired by Dr. John Warner (US Army MANPRINT Directorate). The first speaker was Mr. Stephen Merriman, The Boeing Company ([Stephen.c.merriman@boeing.com](mailto:Stephen.c.merriman@boeing.com)) who provided an update from the Technical Society/Industry SubTAG. Dr. Warner suggested that the HFE/HSI Management and Applications SubTAG should be working more closely with the TS/I SubTAG. Steve represents AsMA, SAFE and TechAmerica to the TS//I SubTAG; at TechAmerica, he is the chair of the G45 Human Systems Integration Technical Committee. He focused on what Government and Industry have accomplished in response to the 2003 Department of Defense policy requiring Human Systems Integration as part of ACAT programs. Specifically, he identified the DOD Data Item Descriptions (DID) that TechAmerica has either authored or co-authored with the DOD.

- **DI-HFAC-81743 (HSI Program Plan):** This DID was co-authored by DOD and TS/I personnel and approved for use in April 2007. Revision A was authored by TechAmerica and released by DOD for use on 21 April 2011.
- **DI-HFAC-8833 (HSI Report):** This DID was authored by TechAmerica and approved by the DOD for use on 02 March 2011.

Steve summarized recent DOD initiatives to further improve HSI guidance to industry, including a USAF/711<sup>th</sup> HPW report on HSI contract language guidelines, a USAF/711<sup>th</sup>HPW guideline document for HSI practitioners based on UK Defence Standard 00-250, and a Navy/SPAWAR guidance document on Navy-selected topics drawn from UK Defence Standard 00-250. From the TS/I perspective, HSI guidance to practitioners (mostly in industry) should be authored in collaboration with industry Subject Matter Experts (SME) and should be released as DOD guidance, rather than as lower level documents. Steve identified 10 topics that the TS/I SubTAG recommend including in any DOD Handbook on HSI. He concluded his presentation with seven recommendations on planning, coordinating and executing a project to develop a DOD-level HSI Handbook. So, in summary, there appears to be many opportunity for the HFE/HSI Management and Applications and SubTAG to work with the TS/I SubTAG on HSI implementation issues.

The second presenter was Mr. Glenn Hewitt representing the FAA ([glen.hewitt@faa.gov](mailto:glen.hewitt@faa.gov)) who spoke on “*Applying HSI to Enterprise Architecture Development: A Discussion.*” In 2005, the FAA adopted a modified DOD Acquisition Framework (DODAF). Parallel activities included NATO development of the “Human View” and MODAF (UK) adopted the same type of construct. The FAA is embarking upon a major update to Air Traffic Control systems in the US. Single European Sky ATM Research (SESAR) is Europe’s “Next GEN” system for air traffic control. There are currently 60+ different systems in large control towers...multiple human-computer interface styles. That wouldn’t happen if the FAA started with a common architecture and flowed it down. You are invited to explore: <https://nasea.faa.gov> (National Air Space System) and <https://www2.hf.faa.gov/HFPortalnew/> (Current HSI Roadmap).

**Design Tools and Techniques SubTAG:** Mr. Steve Merriman (The Boeing Company, [stephen.c.merriman@boeing.com](mailto:stephen.c.merriman@boeing.com)) and Dr. Michael Feary (NASA Ames Research Center, [michael.s.feary@nasa.gov](mailto:michael.s.feary@nasa.gov)) co-chaired the DTT SubTAG meeting on 04 May 2011. The meeting was attended by 22 participants. No changes were made in SubTAG leadership and there were no changes made to the SubTAG charter. Two technical presentations were made. The first

presentation was by Dr. Feary on “*Human Systems Research in NASA’s Aviation Safety Program.*” Currently NASA Aeronautics includes the following major segments:

- Fundamental Aeronautics Program
- Airspace Systems Program
- Aviation Safety Program
- Aeronautics Test Program
- Integrated Systems Research Program

The Aviation Safety program was reorganized a year ago to assure system-wide safety, maintain and improve safety, and deal with atmospheric risks. Human System solutions represent one of four safety thrusts. The focus of the Human Systems area is to develop analysis tools that incorporate known limitations of human performance and enable design of robust human automation systems. This thrust is expected to be resourced through FY20.

There is a new regulation coming this year (CS § 25.1302): “controls and information needs to be accessible and usable by the flight crew in a manner consistent with the urgency, frequency and duration of their tasks.” [This regulation has been in development for the past 15 years.]

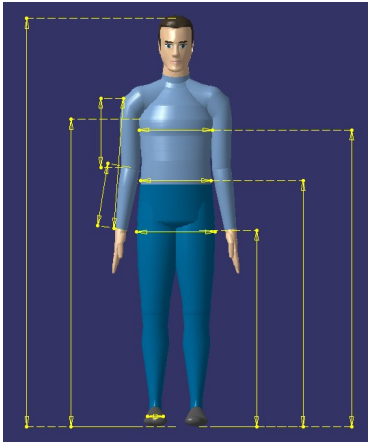
Dr. Feary went on to list and briefly describe a number of tools and approaches being exercised at NASA as part of the Safety program (contact Dr. Feary for details).

- Automation Design Advisor Tool (ADAT): Developed by the University of Michigan and Alion Science and Technology, Inc.
- Human-Automation Analysis Tool (ADEPT): Allows designers to build a simulation without knowing how to program. Allows the designer to take the next step beyond PowerPoint. [John Rice suggested making this available to the STEM program]
- Cognitively Bound Rational Analysis (CoBRA): This is an attention model that allows the designer to set up simulations to assess if the subject is attending to cues as predicted by attention models.
- Enhanced GOMS Model (eGOMSL)
- Human Computer Interaction Analysis (method)
- Computational Situation Awareness Design Tool (MIDAS)
- Multi-attribute Task Battery (MATB): For monitoring performance (a tool for experimenters)
- SIMOC (an oculometer for improved eye tracking performance)
- Verification Method for Automation

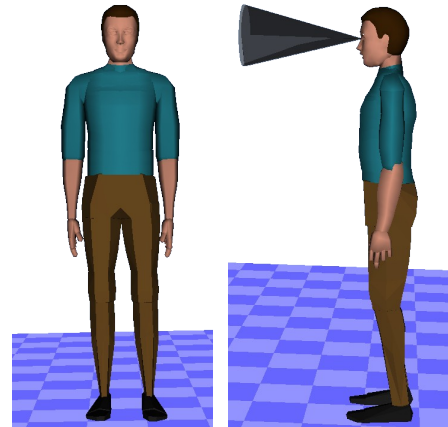
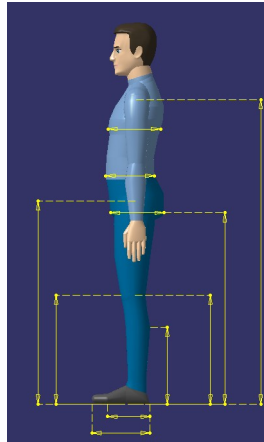
The second presentation was by Mr. Stephen C. Merriman, The Boeing Company, Dallas TX ([stephen.c.merriman@boeing.com](mailto:stephen.c.merriman@boeing.com)) on “*Digital Human Modeling in System Design.*” Human models are useful tools in assessing anthropometric compatibility between users and their work spaces. In conjunction with design standards, human models can help the human engineer evaluate physical and visual access, posture/strength/fatigue, tool envelopes, and impacts of gloves, clothing and equipment. The presentation:

- Presented a brief history of human models, from the early 1970s through the present time.
- Described the various roles that digital human models can perform on acquisition programs.

- Reviewed high-end viewers for its capabilities to represent the wide variety of human sizes/shapes, analysis times, and ability to affix tools for maintainer manipulation.
- Contrasted low-end viewers that may be less capable but are well-suited to quick studies.
- Described a few current activities underway to optimize human model selection.



Catia-Delmia Human Model V5



VisJack Human Model

**System Safety/Health Hazards/Survivability SubTAG.** Mr. Ben Gibson (US Army Medical Dept, San Antonio, TX, [ben.gibson@us.army.mil](mailto:ben.gibson@us.army.mil)) chaired the SubTAG meeting. The first speaker was Major Dori Franco, MD, US Army; Medical Examiner (ME) for the Armed Forces Institute of Pathology (AFIP) (301-319-0000) spoke on *“Analyzing Human Factors Information from Soldier Autopsies to Improve Protective Equipment.”* Major Franco indicated that new facilities are being built at Dover AFB in 2011 to provide facilities for nine Medical examiners. The current Dover Port Mortuary opened in November 2003. It is a combination investigation/mortuary facility of approximately 70,000 square feet. Ten other regional medical examiners are located in places such as Kentucky, Germany and Japan. A medical examination team consists of:

- Medical Examiner
- Photographer
- Investigator
- Anthropologist

The ME leads all medico-legal investigations. Some of the major issues in these investigations are: jurisdiction (ME has jurisdiction of the remains, the coroner has jurisdiction of the scene), scene, autopsy examination, cause of death, manner of death, death certificate, final report. Title 10 USC 1471 grants Armed Forces Medical Examiners (AFME) the power to conduct medico-legal investigations. Identification is made via fingerprint, dental, DNA, radiographic and anthropologic techniques. An autopsy examination consists of:

- Photos, radiographs and EOD scans (to ensure no unexploded ordnance is embedded in the deceased)
- External examination (clothing, personal effects)
- Internal examination (injuries, natural diseases)
- Specimens for toxicological/histological/biological examination, recovery of foreign material, examination of disassociated portions

- Mechanism of death: for example, exsanguination, hypoxia, cardiac arrest, cardio-pulmonary failure
- Manner of Death: Natural, homicide, suicide, accident, undermined

MEs also provide information to the Joint Trauma and Analysis and Prevention of Injury in Combat (JTAPIC) organization with all injury data and information on any personal protective equipment (PPE) that may have been involved in the death. Injuries are graded on a 1 (highest) to 6 (lowest) injury levels; this is an international recognized injury code. Visual Anatomic Injury Descriptor (VAID) annotated pictures of people are provided highlighting injuries, amputations, etc. The information provided by the MEs help the personnel charged with development of PPE.

The second presenter was Ms. Dawn Woods (Human Factors Engineer, NSRDEC, Acting Lead, Soldier Domain Integrated Product Team (IPT) Occupant Centric Survivability), Natick, MA, who spoke on ***“Current Efforts using AFIP and Other Information to Design Future Combat Vehicles to Enhance Survivability.”*** The Occupant-centric Survivability program is managed by the US Army Tank and Automotive Research, Development and Engineering Center (TARDEC). Its scope includes protection from blast, roll-over, etc. Considerations include geometry, posture, protection, sharp corners inside vehicles, restraint systems, ingress-egress, catch-points, padding and airbags. The program is progressing in three segments: using Stryker and MRAP vehicles as demonstrators for protection technology, presentation of the “ideal hull,” and the insertion of improved requirements into design standards.

**Human Factors in Unmanned Systems Interest Group (Part II).** Mr. Ajoy Muralidhar, Naval Surface Weapons Center, Dahlgren, VA ([ajoy.muralidhar@navy.mil](mailto:ajoy.muralidhar@navy.mil)) chaired this session. The first presentation was by Dr. Jessie Chen (USARL-HRED, Orlando, FL, [Jessie.chen@us.army.mil](mailto:Jessie.chen@us.army.mil)) who spoke on ***“Supervisory Control of Robots Using Roboleader: Effects of Automation Reliability and Individual Differences.”*** When operators must exercise supervisory control over multiple robots, they experience high workload. Pre-planning of robot paths helps limit workload. Autonomous coordination between robots also helps. Roboleader is an intelligent agent that translates human operator comments (intent) into detail command signals to a team of robots. In 2010, Chen and Barnes found that an operator found fewer targets when controlling eight robots versus four robots. The next study, to be conducted in the summer of 2011, will determine if frequent gamers (virtual environment) do better in real world robot control experiments.

The second speaker was Ms. Kim Jackson (Massachusetts Institute of Technology), who reported on an investigation funded by Boeing at the MIT Humans and Automation Laboratory entitled ***“Demonstrating Human Supervisory Control of a Micro Aerial Vehicle in an Outdoor Environment.”*** The objective of the work was to increase operator situational awareness (SA) while flying a micro air vehicle. The Hummingbird Quadrotor helicopter was used; this is a battery-powered micro air vehicle with a small camera that can fly for approximately 10 minutes on a battery charge. Two modes of flight were studied, waypoint control (where the vehicle captures waypoints in order) and “nudge control.” Takeoff and landing was automated. End to end two-way time delays were in the neighborhood of 500 milliseconds. Good performance was achieved when operators were tasked with finding photos of people and eye charts, less good on recognizing the photographs after the flights. LIDAR was added to reduce collision with obstacles. A health indicator was provided for battery life remaining. MIT is working with JIEDO (Joint IED

Defeat Office at Aberdeen, MD. So far, no manufacturer has been found to mass produce such a system. Josh Downs was the point of contact at The Boeing Company.

The last presenter was Ms. Lauren Reinerman-Jones, University of Central Florida ([swoods@ist.ucf.edu](mailto:swoods@ist.ucf.edu)) who spoke on the “*Relevance of Task Switching, Incongruence, and Task Type to Adaptive Automation.*” The DOD wants 15,000 unmanned systems over the next few years. Goals of the UCF work are to reduce workload, increase SA. However, it is known that adaptive automation can actually degrade performance if implemented poorly. Adaptive automation is used to keep the operator more in the loop than total autonomy. The focus was on automation invocation; i.e., what is automated and how. Workload is considered to be a transactional process... the “cost” of engaging in task performance. Change detection tasks were used to discriminate performance. Manual, adaptive and autonomous control modes were investigated, under low and high complexity conditions. Physiological measures such as ECG, heart rate, heart rate variability and eye fixation duration were used. Operators were better on change detection tasks under low complexity conditions. Levels of automation had little impact on workload as assessed by NASA-TLX. Heart rate (inter-beat interval) was sensitive to workload.

**Human Factors Test and Evaluation SubTAG:** Not attended.

**Human Performance Measurement SubTAG (formerly Workload and Stress):**  
Not attended.

**Human Factors in Training SubTAG:** Not attended.

**Human Modeling and Simulation SubTAG:** Not attended.

**Human Factors in Extreme Environments SubTAG:** Not attended.

**User-Computer Interaction SubTAG:** Not attended.

**Cognitive Readiness Interest Group:** Not attended.

**Human Factors in Unmanned Systems Interest Group (Part I):** Not attended.

**Controls and Displays SubTAG:** Did not meet.

**Sustained/Continuous Operations (SUSOPS/CONOPS) SubTAG:** Did not meet.

**Personnel Selection and Classification SubTAG:** Did not meet.

**Thursday, 05 May 2011**

**DOD HFE TAG Operating Board Meeting:**

**Old Business:**

- TAG funding: A brief discussion was held with Service and other sponsoring agency representatives concerning timely funding of TAG activities.
- Katrina May mentioned that a new memorandum for the record is being drafted to reflect TAG pronency and connectivity to HSI and HSI organizations.

Service caucuses and SubTAGs briefed their attendance numbers, charter changes, leadership changes and significant issues.

**Caucus Reports:**

- **DHS:** Six attendees participated in the meeting. DHS funding to the TAG is late in work. DHS now has an HSI standard in development.

- **USAF:** USAF is exploring the use of Aristotle. The USAF believes that the joint upcoming TAG and HSIS meetings need to be advertized. TAG-68 will be held in Dayton. A new chair was nominated and elections will be held at the next meeting in November.
- **USN:** A lot of interest in Success Stories. Please send any success stories to LCDR Jeff Grubb at [jeff.grubb@navy.mil](mailto:jeff.grubb@navy.mil). The Navy will sponsor TAG-66 in Tyson's Corner, VA, joint with the HSIS conference. The theme will be "Protecting the Warfighter Before, During and After the Mission." In place of a tour, the TAG attendees will be invited to sit in on the HSIS Plenary Session (at no additional cost).
- **Army:** Severe R&D cuts are coming. Looking for success stories, especially those with positive operational impact. Some candidate success stories were suggested: MIL-STD-1472 updates, MRAP, TAG mentoring, HSI Data Item Descriptions.
- **FAA:** No report.
- **NASA:** Lots of interest in human error, integrated safety analysis and risk assessment. Expecting layoffs from Shuttle, Orion and Constellation programs.
- **TS/I:** Met with Dr. Mason to explore how DOD can continue increasing HSI guidance to industry. TS/I also explored how industry can best support development of a DOD Handbook for HSI practitioners.

#### SubTAG Reports:

- **Controls and Displays:** No meeting this time.
- **Design Tools and Techniques:** 20+ attendees, no changes in charter. Dr. Mike Feary spoke on System Safety tools and methods. Steve Merriman spoke on the history, status and future of digital human modeling as a human engineering tool.
- **HFE/HSI:** Two sessions were held with attendance above 20 at both. The three talks presented in session #1 focused on getting HSI into the acquisition cycle earlier. The two presentations in session #2 focused on attaining greater synergy between HFI/HSI and TS/I SubTAGs.
- **Extreme Environments:** One formal talk. One major discussion. Charter was updated.
- **Modeling and Simulation:** 19 attendees, 5 speakers. Emphasis was on synthetic environments.
- **HF Standardization:** A Data Deliverable evaluation tool was demonstrated. Two new DIDs were released on HSI. NASA 3001 was approved. HFE Data Digest will be printed and distributed after MIL-STD-1472G is out (if interested in helping with this, please contact Katrina May) Presentation made by President of HFES New England chapter.
- **T&E:** Five presenters and 35 participants. Darren Cole was elected as Co-chair.
- **Training:** 20+ participants. There were three presenters. Beth Atkinson was elected as new chair.
- **Modeling and Simulation:** 25 attendees participated. There were four presentations and one demonstration. Request a full day of meetings at the next TAG. New chair at next meeting.
- **Personnel Selection:** No meeting this time.
- **Sustained/Continuous Ops:** No meeting this time. The Operating Board voted to suspend this SubTAG.
- **Safety/Health Hazards/Survivability:** 25 participants. Interesting presentation by an Armed Forces Medical Examiner. Presentation on Occupant-centric Survivability John Plaga (711<sup>th</sup> HPW) will be co-chair.
- **UCI:** Sixteen attendees. Four presentations and one demonstration.

- **Human Performance Measurement** (formerly Workload and Stress): Four presentations. Finalized charter update.

Interest Group Reports:

- **Cognitive Readiness Interest Group:** This was a “by invitation” closed meeting. SBIRs were discussed. A total of 9 people participated in person and via telephone. Meeting will be open at the next TAG meeting.
- **Unmanned Systems Interest Group:** 23+ participants at each of two sessions.

Submitted by:

Stephen C. Merriman

DOD HFE TAG, TS/I Credentialed Representative of TechAmerica, SAFE Association and Aerospace Medical Association (AsMA)/ Human Factors Association (HFA)

Co-chair of the Design: Tools and Techniques SubTAG and Technical Society/Industry SubTAG

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## ATTACHMENT (1)

### **DOD HFE TAG Background**

The DoD HFE TAG was begun via memorandum of agreement signed by the Service Secretaries in November 1976. Goals of the TAG were established as follows:

- Provide a mechanism for exchange of technical information in the development and application of human factors engineering.
- Enhance working level coordination among Government agencies involved in HFE technology research, development and application.
- Identify human factors engineering technical issues and technology gaps.
- Encourage and sponsor in-depth technical interaction, including subgroups as required in selected topical areas.
- Assist as required in the preparation and coordination of Tri-Service documents such as Technology Coordinating Papers and Topical Reviews.

The TAG addresses research and technologies designed to impact man-machine system development and operation throughout the complete system life cycle. Topics include:

- Procedures for use by HFE specialists, system analysts and design engineers in providing HFE support during system development and modification
- Methodologies to identify and solve operator/maintainer problems related to equipment design, operation and cost/effectiveness
- Mechanisms for applying HFE technologies, including formal and informal approaches to validation and implementation, and the determination of time windows for application.

The TAG comprises technical representatives from Government agencies with research and development responsibilities in the topical areas mentioned above. Additional representatives from activities with allied interests affiliate with the TAG as appropriate. Technical experts in special topic areas may augment attendance at specific meetings. Also participating in the TAG are official representatives of technical societies (e.g., Human Factors and Ergonomics Society, SAFE Association) and industrial associations (e.g., Government Electronics and Information Technology Association) with a stated interest in HFE. These representatives may attend subgroup and general plenary sessions and they must be credentialed by the TAG prior to attending any meetings.

To facilitate detailed technical information exchange, the TAG is composed of committees and subgroups, or "SubTAGs." Committees are established to address specific issues or problems and are disestablished upon completion of their tasks. SubTAGs address problems of a general or continuing nature within a specific field of HFE technology. Membership in SubTAGs and committees may include non-government personnel involved in research, development and application. Attendance by non-government individuals is possible if the person is either sponsored by a government agency or if accepted by the TAG chair prior to the meeting. Chairing of the various subgroups and committees is rotated among the Services, NASA, FAA, DHS and TS/I members, as provided in individual charters.

The current sub-groups typically meeting at the HFE TAG meeting were as follows.

Sub-TAGs:

- **Controls and Displays/Voice Interactive Systems**
- **Design: Tools and Techniques**
- **HFE/Human Systems Integration: Management and Applications**
- **Human Factors in Extreme Environments**
- **Human Factors in Training**
- **Human Factors Standardization**
- **Human Factors Test and Evaluation**
- **Human Modeling and Simulation**
- **Personnel Selection and Classification**
- **Sustained/Continuous Operations (suspended)**
- **System Safety/Health Hazards/Survivability**
- **Technical Society/Industry**
- **User-Computer Interaction**
- **Human Performance (formerly Workload and Stress)**

Affiliated Interest Groups:

- ü [Unmanned Systems Interest Group](#)
- ü [Cognitive Readiness Interest Group](#)

## **Meeting Theme**

### **Human Dimension as a Starting Point**

During capability development, Human Dimension (cognitive, physical, and social components) considerations are often included after the fact or sometimes not at all. This can result in severe system compromises or perhaps even failures. In this meeting we will focus on how we can identify, investigate, and share current and emerging Human Dimension developments, with the goal of more clearly relating to our partners the importance of inserting Human Dimension considerations earlier in the capabilities development process.

#### **Background and Details:**

The Army's Research Development and Engineering Command has developed a framework to understand, communicate and task organize to solve problems to prioritize Science and Technology (S&T) capability needs to achieve a balanced Soldier S&T portfolio. While this framework may currently be specific to the Army, the principles and processes involved can be applied to all warfighters, homeland defenders, space explorers, air traffic personnel, or any other groups of *Humans* facing complex cognitive, physical and/or social challenges.

This framework crosses a series of Technology Focus Areas (such as Lethality, Sensors and Networks) across various Integration Domains (such as C4ISR, Air, and Ground). Of specific interest to us is the Technology Focus area known as Human Dimension and Training, which is now being regarded by the Army S&T leadership as a technology area as important as traditional areas such as Lethality, Sensors, and Networks.

In this framework the Human Dimension is defined as comprising the cognitive, physical and social components of soldier, leader, organizational development and performance essential to raise, prepare and employ the Army in full spectrum operations.

Using this framework many capability needs have been identified. Among those considered the most pressing are:

- Develop Cognitive, Physical, Social Assessments Capabilities;
- Improve the Acquisition/Selection of personnel;
- Enhance Soldier readiness;
- Rapid Adjustment/Delivery of Training;
- Develop Soldiers, Leaders and Organizations;
- Agile Management and Policy

The common theme across these capability needs is that inserting Human Dimension considerations at the beginning of the process maximizes system effectiveness. As a result, this meeting will focus on work being conducted in this domain with focus on work that falls under the capability areas listed above. In addition we will discuss: current and future system design; S&T research planning; development; test/evaluation; fielding; and other capability need areas as needed.

The end result of this meeting shall be a shared structure within which to influence capability needs developers to insert human dimension considerations as early as possible, leading to faster and more efficient development of highly effective systems. Attendees will come away with a deeper understanding of the human dimension framework, work currently being conducted and work awaiting attention within the human dimension domain.

## ATTACHMENT (3)

### Department of Defense Human Factors Engineering Technical Advisory Group Meeting 65, Natick, MA, 2-5 May 2011

#### **Monday, 2 May**

0830 - 1000 Executive Committee meeting  
1000 - 1100 New member orientation  
1130 - 1300 Luncheon break  
1300 - 1700 Plenary Session  
1800 - 2000 Mixer

#### **Tuesday, 3 May**

0730 - 0830 Technical Society/Industry  
0830 - 1100 Human Performance Measurement (formerly Workload and Stress)  
0830 - 1100 User-Computer Interaction  
0830 - 1100 Human Factors Standardization, Part I  
0930 - 1000 Networking, coffee  
1100 - 1230 Luncheon Break  
1230 - 1430 Human Modeling and Simulation  
1230 - 1430 Human Factors Standardization, Part II  
1230 - 1430 HFE/HSI: Management and Applications, Part I  
1430 - 1500 Networking, coffee  
1500 - 1700 Human Factors Test and Evaluation  
1500 - 1700 Human Factors in Training  
1500 - 1700 HFE/HSI: Management and Applications, Part II

#### **Wednesday, 4 May**

0815 - 1230 Tour of Natick Labs  
1230 - 1330 Lunch  
1330 - 1530 Design: Tools and Techniques  
1330 - 1530 Unmanned Systems Interest Group, Part I  
1530 - 1700 Service Caucuses  
1830 - 2200 Social

#### **Thursday, 5 May**

0730 - 0830 Cognitive Readiness Interest Group  
0830 - 1100 System Safety/Health Hazards/Survivability  
0930 - 1000 Networking, coffee  
1100 - 1230 Luncheon Break  
1230 - 1430 Human Factors in Extreme Environments  
1230 - 1430 Unmanned Systems Interest Group, Part II  
1430 - 1500 Networking, coffee  
1500 - 1700 Operating Board Meeting

*\* The Sustained/Continuous Operations, Controls and Displays, and Personnel Selection and Classification subTAGs did not meet at TAG-65.*

**ATTACHMENT (4) DOD HFE TAG Operating Board  
Executive Committee**

Proponent (Acting)	Dylan Schmorrow, CAPT, USN	(703) 588-7404 <a href="mailto:Dylan.schmorrow@osd.mil">Dylan.schmorrow@osd.mil</a>
Chair (Air Force)	Mr. Darren Cole	661) 275-3994 <a href="mailto:darren.cole@edwards.af.mil">darren.cole@edwards.af.mil</a>
Vice Chair (Army)	Dr. Pamela Savage- Knepshield	(732) 427-3854 DSN 987 <a href="mailto:pam.savageknepshield@us.army.mil">pam.savageknepshield@us.army.mil</a>
Immediate Past Chair (Navy)	Mr. Brad Collie	(850) 234-4744 <a href="mailto:bradley.collie@navy.mil">bradley.collie@navy.mil</a>
Army Representative	Dr. John Warner	(703) 695-5820 DSN 225 <a href="mailto:john.warner1@us.army.mil">john.warner1@us.army.mil</a>
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Air Force Representative	Mr. Adrian Salinas	(210) 536-4428 <a href="mailto:adrian.salinas@brooks.af.mil">adrian.salinas@brooks.af.mil</a>
NASA Representative	Ms. Faith Chandler	(202) 358-0411 <a href="mailto:faith.t.chandler@nasa.gov">faith.t.chandler@nasa.gov</a>
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TAG Coordinator	Ms. Sheryl Cosing Ms. Janet Malone	(703) 925-9791 <a href="mailto:cosing_sheryl@bah.com">cosing_sheryl@bah.com</a> (937)781-2826 <a href="mailto:malone_janet@bah.com">malone_janet@bah.com</a>



## Ex Officio Members - SubTAG Chairs

### Controls and Displays

Co-Chairs:

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### Design: Tools and Techniques

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

Co-Chairs:

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### Human Factors in Extreme Environments

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### Human Factors in Training

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### System Safety/Health Hazards/Survivability

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### User-Computer Interaction

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### Workload and Stress

Co-Chairs:

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## **Affiliated Groups**

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### **Cognitive Readiness Interest Group**

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**ATTACHMENT (5) DoD HFE TAG Attendees**

**< Will be provided when available >**

## ATTACHMENT (6)

### DoD HFE TAG Policies

1. Membership (General membership policies are outlined in the Operating Structure, under "Group Composition.")
  - 1.1 Individuals who are not affiliated with Government agencies (but who are associated with technical societies or industrial associations with a stated interest in human factors engineering) wishing to affiliate with the TAG may contact the current Technical Society/Industry SubTAG Chair to ascertain eligibility under the TAG Operating Structure. Once eligibility has been ascertained, the individual should submit a letter on the organization's letterhead, confirming his/her status as the organization's representative, to the current Chair of the Technical Society/Industry SubTAG.
  - 1.2 Emeritus Membership may be approved by the Executive Committee on a case-by-case basis for a former TAG member who is retired from government service or defense industry. Emeritus Membership is automatically deactivated during any period of re-employment with the government or defense industry.
2. Meeting Sites (Sites are recommended by the service caucus whose turn it is to host the TAG with a view toward a balance in geographic location and meeting facilities.)
  - 2.1 TAG members are encouraged to recommend potential meeting sites.
  - 2.2 Organizations who wish to host the TAG should contact their Service Representative or the current TAG Chair.
3. Agenda (The agenda is determined approximately three months before the scheduled meeting. The Chair Select selects the topics from those recommended by the Service Representatives, hosting agency and the TAG Coordinator.)
  - 3.1 TAG members are encouraged to suggest potential agenda topics or topics suitable for tutorial sessions to their Service Representative, the current TAG Chair, or the TAG Coordinator.
4. Registration (Registration fees and the date of the close of registration are announced in an information letter sent approximately two months before the scheduled meeting.)
  - 4.1 All attendees are expected to pre-register and prepay by the announced close of registration.
  - 4.2 Only individuals receiving late travel approvals may pre-register on-site. Payments made at the meeting site must be in cash.
5. Minutes (The Minutes of each meeting serve as the principal mechanism for the reporting of TAG activities. The Minutes will be published as a draft document on the website.)
  - 5.1 Individuals or agencies desiring to be included on the distribution list for a specific meeting should contact the TAG Coordinator.
6. SubTAGs and Committees (See the Operating Structure, section entitled "TAG SubTAGs," for specific information regarding the purposes and operating procedures of SubTAGs and committees.)

- 6.1 All SubTAGs and committees are encouraged to meet in conjunction with the TAG at least once each calendar year.
- 6.2 All SubTAGs and committees meeting in conjunction with the TAG are required to provide a chairperson for the specific meeting.
- 6.3 All SubTAG and committee chairpersons are to submit a brief report of each meeting to be included in the set of TAG Minutes covering the SubTAG/committee meeting time frame.
- 6.4 All SubTAGs and committees are required to provide the TAG Coordinator with an up-to-date list of their membership for use in the distribution of TAG announcements.
- 6.5 All SubTAGs are required to submit to the Executive Committee a Charter including, but not limited to, statements regarding:
  - objectives
  - membership policies
  - meeting schedule
  - scope
  - chair selection/tenure
- 6.6 Committees are required to submit to the Executive Committee a document including, but not limited to, brief statements regarding:
  - objectives
  - membership policies
  - chair selection/tenure
- 6.7 Rotation of the chair position is determined by SubTAG charter. If the position cannot be filled by the appropriate service at the election meeting, the SubTAG may progress to the next service willing to chair the SubTAG

## 7. SubTAG Establishment

- 7.1 Groups interested in addressing technical areas not covered by existing SubTAGs may request the TAG Chair to provide meeting time.
- 7.2 Formal SubTAGs and committees may be established by recommendation of the Executive Committee.

## 8. Chair/Representative Selection (General selection procedures are outlined in the Operating Structure under "Conduct of Business.")

- 8.1 A Service caucus may be called by the TAG Chair or the current Service Representative.
- 8.2 Methods of determining the Chair Select and Service Representatives are Service dependent.
- 8.3 Unexpired terms of office will be filled by appointment by the Executive Committee, until a caucus of the Service can be called at the next regularly scheduled TAG meeting.

9. Funding The funding required for the organization, conduct, franking, and documentation of all TAG meetings shall be done jointly by the three Services and other selected agencies. The specific mechanisms to obtain and allocate funding from the Services/agencies shall be arranged by the Current Chair, Chair Select, and Immediate Past Chair.

10. Policy Changes

10.1 Additions to or amendments of the above policies may be recommended by submitting the suggested change(s) in writing to the TAG Chair.

10.2 Policies may be amended by a majority vote of those Operating Board members in attendance at the Operating Board meeting at which amendments have been proposed.

Amended 14 November 1989 at TG-23, Killeen, Texas.

Amended 3 May 1994 at TAG-32, Oklahoma City, Oklahoma.

Amended 8 May 1996 at TAG-36, Houston, Texas.

Amended 7 November 2002 at TAG-48, Alexandria, Virginia.