

# Army HSI Newsletter

Human Systems Integration



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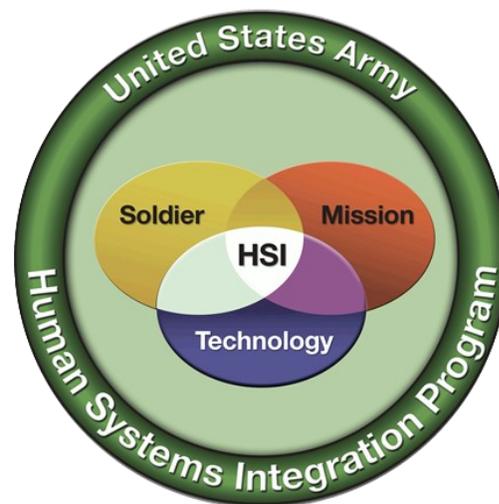
Winter 2015-2016 Edition

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### OUR MISSION:

The mission of Army Human Systems Integration (Army HSI), formerly known as Manpower and Personnel Integration (MANPRINT), is to optimize total system performance, reduce life cycle costs, and minimize risk of Soldier loss or injury by ensuring a systematic consideration of the impact of materiel design on Soldiers throughout the system development process.



# WELCOME



## Dr. Michael Drillings

Director

Army HSI

One of the great pleasures of being the Director has been hosting and attending the HSI Practitioner's Workshop. The most recent Workshop was held in early December at Aberdeen Proving Ground. It was the first time that the event was held outside the D.C. area and it looks like doing so was a good idea. One objective was to increase attendance and that was successful. Another objective was to increase attendance from the acquisition community and that was also partially successful. Unfortunately, all of the PEOs and many of the PMs were called to a meeting held by HON Shyu that was scheduled after our Workshop. Still, the deputy PEO, IEWS, MG Vollmecke, attended and gave a terrific keynote address. We also had several people, below the senior ranks, attend from the local acquisition offices.

## The Director's Corner

I enjoyed the technical presentations, where I often learn about how our practitioners and researchers continue to develop new methodologies and instruments to improve HSI practice. I also look forward to the award session where so many deserving people are recognized for their contributions.

Whether you were able to attend or not, you can see the presentations by going to the following link through a government computer:

<https://www.us.army.mil/suite/files/19191326>

At this time we have not been able to arrange access for non-government people, but if you wish to see a presentation, please contact Erin Nielsen at [enielsen@contractingrg.com](mailto:enielsen@contractingrg.com)



As many of you know, I am retiring very soon and I wanted say that it has been a great honor to be the HSI Director. Thank you all for the tremendous support you have provided for the HSI mission. It has been a great joy to have served.

When people have asked me what has been the most challenging part of the job, I answer that it is to be ethical. Our mission is to identify problems and bring them to the attention of others. This is not a job that typically makes you well-liked with those who have to respond to your analysis. Yet, for the good of the Army, its Soldiers, and to maintain the ethics of our profession, this is what we must do. If we are to be relevant, we must continue to do that even if the price is temporary unpopularity.

A recent event really brought out the importance of what we do for the Army and our Soldiers. I had the privilege of attending a Medal of Honor ceremony at the White House in honor of Captain Florent Groberg. Through the President's gracious remarks, we learned about the significant events that merited that award. More so, we could see CPT Groberg's modesty and disappointment that he was not able to do even more. CPT Groberg, through both his modesty and accomplishment, illustrated for me the value of what we do — improving the Army and helping to protect our Soldiers. I know that every one of you is motivated to do a great job, because this mission is so important.

# INFORMATION

**WE WELCOME YOUR ARTICLES, COMMENTS, AND SUGGESTIONS.  
PLEASE SUBMIT FEEDBACK TO:**

## Army HSI NEWSLETTER

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## POLICY

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## DIRECTORY OF DESIGN SUPPORT METHODS

Defense Technical Information Center, DTIC-A San Diego, NAS  
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## Army HSI DOMAIN POCs:

### SYSTEM SAFETY

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### HEALTH HAZARDS

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## SOLDIER SURVIVABILITY

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**Ms. Lisa Peters** 225-5848 703-695-5848  
Executive Assistant  
Email TBD - will be provided in an update



## Reflections and Resolutions

**Jeffrey Thomas**

ARL-HRED

Happy New Year! Reflections and resolutions are commonplace at New Year's. It is the time when organizations and people look backwards evaluating their performance against prior goals and objectives and forwards to formulate new ones. The same is true for the Army's Human Systems Integration (HSI) practitioners at Aberdeen Proving Ground (APG) working Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) and Enterprise Information Systems (EIS) programs. In this article we look back and briefly reflect on a few programmatic successes from 2015; ones that we resolve to continue in 2016.

In 2015, the APG C4ISR Field Element made many significant inroads in promoting, conducting, and integrating HSI in Army acquisition. Among the most notable were commissioning an early human factors and engineering (HFE) study for the Advanced Field Artillery Tactical Data System (AFATDS), leading an evaluation of usability of proposed Commercial Off-The-Shelf (COTS) and Government Off-The-Shelf (GOTS) solutions for the Distributed Common Ground System-Army (DCGS-A) - the Army's major intelligence program for a Trade Study directed by the Department

# HSI for a New Year: Reflections and Resolutions

of Army Headquarters G-3/5/7, and educating the Army's independent test and evaluation community and its stakeholders on HSI tools and methods for evaluating operational suitability during testing. In January 2015, the APG C4ISR Field Element of the Army Research Laboratory Human Research and Engineering Directorate (ARL HRED) briefed HSI capabilities to senior leaders in Fires Support Command and Control (FSC2). The briefing highlighted ARL's capabilities and tools to lead a user-centered design (UCD) process and our ability to conduct UCD activities and translate data from activities such as usability studies, heuristic evaluations, and other user research to inform product design and development. We provided a roadmap and examples of how results from user research are used to reduce HSI and usability risks that impact operational effectiveness and suitability. Historical HSI data demonstrates that if HSI and usability risks are unidentified and unmitigated early, they create unintentional consequences that negatively impact operational testing.

The latter is important as failures during testing increases costs, delays schedule, and are indicative of poor performance. At the conclusion of several briefings and discussions that followed, ARL HRED is now fully integrated with the Program Manager (PM) Mission Command (MC), FSC2 tasked to lead the redesign of AFATDS and other small hand-held fires capabilities.

Continued on next page . . .

The logo for the Army Research Laboratory (ARL) features the letters 'ARL' in a large, bold, black sans-serif font. Each letter has a yellow triangular shape above it, pointing downwards towards the top of the letter. The background of the page is a light gray grid pattern.

# Reflections and Resolutions

**Jeffrey Thomas**

ARL-HRED

Lastly in 2015, the APG C4ISR Field Element began educating the Army's independent test and evaluation (T&E) community about HSI and survey design to ensure operational test and evaluation designs and reports include important data from Soldiers during testing. This followed as defense acquisition officials within the Office of Secretary of Defense (OSD) Director, Operational Test and Evaluation (DOT&E) and others became increasingly concerned about usability and over burdening users with increasingly complex systems. To date, the feedback has been positive from the over 300 acquisition professionals who participated in 1 of 10 2-hour seminars or a 2-day class developed for the Operational Test Command (OTC). The classes have provided another opportunity to communicate the value of Army HSI in test and evaluation and ensure that as a team operational testing meets requirements to systematically include critical Soldier feedback about military utility, operational suitability, and usability.

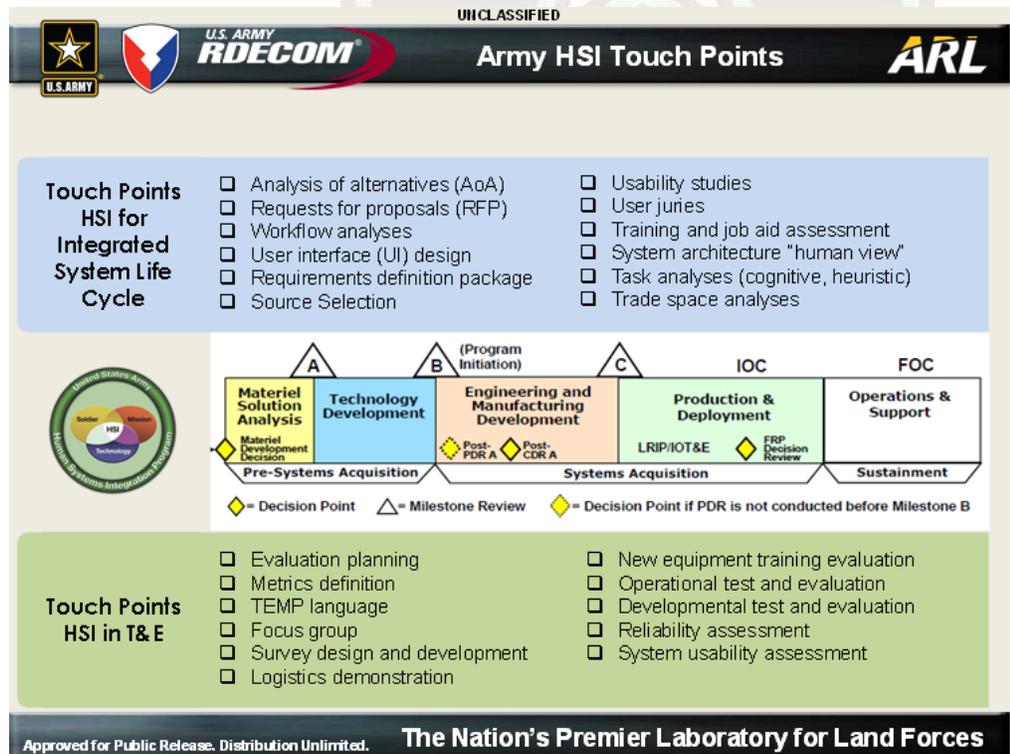
These efforts and many more alike are indicative of what Army HSI is and has demonstrated the value it brings to the acquisition community – ensuring

# HSI for a New Year: Reflections and Resolutions

that system end-users and their needs are considered early and often throughout the procurement process to improve human system performance during mission execution. For the APG C4ISR Field Element it means leading early user research, conducting user needs and requirements analysis, and participating in testing.

In 2016 we look forward to capitalizing on Army HSI touch points in research, development, and acquisition (see below) by continuing our partnerships with, for example, the Communications-Electronics Research, Development and Engineering Center (CERDEC), Cyber

Center of Excellence (COE), the Army Test and Evaluation Command (ATEC), and program managers for Mission Command (MC), Warfighter Information Tactical (WIN-T), Tactical Radios (TR), Position Navigation and Timing (PNT), Sensors Aerial Information (SAI), Distributed Common Ground Systems-Army (DCGS-A), and Integrated Personnel and Pay System – Army (IPPS-A). We resolve to ensure the voice of the Soldier is systematically and scientifically included in research, development, design, and testing of Soldier capabilities.



# Timelines, Designs, HSI

**Rich Zigler**

## HSI Soldier Survivability (SSv)

### Point of Contact

“Timeliness” and “value-added” are what the HSI Evaluators should always focus on, addressed by early generation of issues of a program’s design(s), and resolution of issues that, if addressed at a later time, could negatively impact the program’s schedule or cost.

### **MAJOR COST DECISIONS ARE MADE AT THE BEGINNING**

A majority of design decisions will be influenced by the capabilities stated in TRADOC’s Initial Capabilities Document (ICD). By the time a program is in its Materiel Solution Analysis phase, 70-75% of the cost-related decisions have already been made. For example, for an armored vehicle, once the decision is made between wheels and tracks for its mobility, a large part of the vehicle design is already influenced. Similarly, once the decision is made between a fixed-wing versus a rotary-wing for an aircraft, many decisions are already made for the resulting design. In Technology Development phase, 85% of the cost-related decisions have been made, and when in the Engineering and Manufacturing Development and Demonstration phase 90-95% of those decisions have been made. The ICD, acquisition specifications, Contract Data Requirements Lists, Sections L & M of the contract, assessing the design iterations, and the generation and resolution of issues are the fertile grounds for Army HSI Practitioners. HSI Coordinators can include their Health Hazard Assessment and SSv POC’s early here for best results.

# TIMELINES, DESIGNS, & HUMAN SYSTEMS INTEGRATION (HSI)

## **ASSESSMENT NOW**

HSI affords the evaluator an opportunity to provide real-time vulnerability and/or problem recognition at the same time that the contractor’s designs and decisions are being made. The customer, Program Manager, contractor team, Training & Doctrine Command (TRADOC) capabilities developers, or others, require REAL-TIME design assessments to help them maintain costs and schedules, as delays cause difficulties. If the design must undergo change of direction, the new issues must be developed and resolved shortly. For a design engineer and the design team, it is best to review the design(s) with government personnel as it occurs to see if anything has not been taken into account. It is always better for an issue to be raised immediately so the design team can go back to the design and make any changes to address the issue, as it is fresh in their minds. If time is allowed to fly by before an issue is raised about a design in the past, the contractor team will have made many additional design decisions based upon the original design component(s) (now requiring a necessary change).

## **LOST TIME CANNOT BE MADE UP LATER**

The driving force for the Army HSI Evaluator must be to evaluate new designs as quickly as possible to minimize the number of design decisions that must be un-done, and then re-decided with resultant schedule delays and cost increases that impact both the PM and the contractor team.

Design decisions may consist of a given capability, a part concept, a material, a dimension, a tolerance, or placement of components.

## **CONTRACTOR & ARMY HSI MUST BE MUTUALLY SUPPORTIVE**

Contractor generation of a design proposal is when their HSI personnel emplace the different HSI features and lessons-learned into their company’s designs. They will anticipate the Army’s issues by arguing for sound HSI principles. When a major program goes through the full acquisition process, the Technology Development phase leading to Milestone B (plus the Preliminary and Critical Design Reviews (PDR; CDR) portrays where Army and contractor HSI should plan to expend the most effort for greatest impact. HSI Practitioner(s) must be proactive during this time period, poring over new designs as they are generated, while participating in many teams and groups. After the PDR-CDR design reviews, the design will become fairly firm, before much of the modeling and testing starts.



# Human-Systems Integration (HSI) and the Network Integration Evaluations (NIEs): Observations on HSI at the System-of-Systems Level

## HSI and NIEs

### John K. Hawley

US Army Research Laboratory  
Human Research and  
Engineering Directorate  
Ft. Bliss Field Element

For the past three years, the Army Research Laboratory's (ARL) Human Research and Engineering Directorate (HRED) has provided Human-Systems Integration (HSI) support to TRADOC's Brigade Modernization Command (BMC) for the Network Integration Evaluations (NIEs). HRED has participated in the NIEs in three capacities. First, HRED personnel have provided HSI support to the Army Test and Evaluation Command (ATEC) during formal operational tests of individual equipment items. These operational tests are embedded within an NIE. Second, HRED personnel have provided limited HSI support for the evaluation of systems of systems used within the exercise. A system of systems is collection of task-oriented systems that are integrated to create a new, more complex system which offers more functionality and performance than the simple sum of the component systems. And third, HRED personnel from the Ft. Bliss Field Element have provided direct support to the BMC for the evaluation of systems of systems used within an integrated operational environment.

Historically, Army HSI has been applied at the individual system level for programs of record. HSI applied at the system of systems and organizational levels is a relatively new undertaking.



A large-scale exercise like the NIEs permits such macro-level HSI analyses to be performed. The emphasis of much of the discussion to follow is the increasing need for this third level of HSI support—systems of systems used within an organizational context.

The HRED team's first look at the third level of HSI support referenced above was during NIE 13.1. After observing field operations and reviewing database entries during that exercise, HRED staff members concluded that the cognitive load associated with network-enabled mission command was emerging as a major HSI concern.

The cognitive load associated with mission command performed using modernizing NIE Tactical Operations Centers (TOCs—also referred to as Command Posts) also was an expressed concern of the then Chief of Staff of the Army and other elements of the DA staff. Consequently, the primary focus of HRED's direct HSI support to the BMC during subsequent NIEs was cognitive load issues associated with mission command as conducted in modernizing TOCs. The term "modernizing" means that NIE TOCs are an experimental work in progress using updated systems and technologies not generally available to other Army units. In present usage, cognitive load is defined as the aggregate mental load placed on commanders, battle staff members, or other personnel by an increasingly complex mission command work setting.

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# Human-Systems Integration (HSI) and the Network Integration Evaluations (NIEs):

## Observations on HSI at the System-of-Systems Level

### HSI and NIEs

#### SUMMARY OF NIE FINDINGS

HRED analysts identified three primary contributors to extraneous cognitive load in TOCs as observed across NIEs:

**1. Component design.** Many of the individual systems used to support mission command are neither user friendly nor sufficiently reliable.

**2. Mission Command Systems Integration.** Many of the individual systems within TOCs are not well integrated to support mission command as cognitive work. Moreover, new technology such as that on display during the NIEs often changes the nature of the work that technology is intended to support. TOC and mission command processes and procedures must be adapted to reflect these changes.

**3. Training and Battle Staff Expertise.** Many of the personnel using mission command systems have not been adequately trained on them individually or as an integrated equipment suite supporting mission command as an integrated warfighting function.

The factors listed above combine and act to increase the aggregate level of perceived complexity and cognitive load for commanders and their battle staffs. While some of the cognitive load associated with mission command in NIE TOCs is intrinsic to participant roles, high levels of extraneous cognitive load are needless consequences of insufficient attention to HSI in mission command component design and integration coupled with inadequate training for both individual system users and for battle staffs operating as a team.

Across NIEs, commanders and their staffs tended to view modernizing TOCs as “complicated and fragile.” Battle staff personnel constantly have to “work the workarounds” to meet mission objectives. During interviews and focus group sessions, unit commanders and their staffs routinely commented on the distracting and frustrating impact of having to manage their mission command equipment suites on their more important role of “managing the fight.” This diversion of cognitive resources to managing mission command equipment suites is a nuisance task that has significant implications for perceived cognitive load and overall mission command performance.

None of these observations should come as a surprise to an experienced HSI practitioner. TOC component design and integration generally is not approached from an overarching system-of-systems perspective. It is arguable that the TOCs observed during the NIEs are not explicitly or purposively “designed” in the standard use of that term. Rather, they consist of a collection of individual systems cobbled together to form the TOC and support the mission command warfighting function.

#### IMPLICATIONS FOR HSI PRACTICE GOING FORWARD

As noted, Army HSI efforts have traditionally been applied at the individual system level. And that has been the case with most of the individual equipment items comprising NIE TOCs. What has not been adequately addressed is the evaluation of HSI issues arising out of the relationships between Soldiers and technology, not just at the individual system level, but also at the system of systems and organizational levels.

Some of the most demanding and problematic aspects of TOC operations as observed across NIEs are emergent properties that only show up when the individual systems comprising the TOC are brought together and configured in a particular way. These emergent properties might not show up in an isolated assessment of individual mission command component systems. HSI for the TOC considered as a system in and of itself involves more than simply rolling up the assessments for the individual components. The whole is more than the sum of its parts. A primary lesson to be taken from HRED’s BMC support work is that HSI analyses for a system of systems such as a TOC must reflect the integrated, team-based nature of that performance setting.

Beyond system of systems concerns, additional HSI issues are encountered when equipment suites are placed in an operational environment. Functional systems such as a TOC composed of teams in interaction with a tool suite display cognitive properties that are radically different from the properties of those individuals acting alone. What is necessary in these cases is an assessment of naturally situated cognition in which the unit of cognitive analysis is work as it is performed by a functional team operating in its natural organizational setting. Some might argue that operational testing provides a suitable setting for the study of naturally situated cognition. However, the limitations associated with formal operational testing often act to constrain Soldier and team performance in ways that make that setting somewhat unrepresentative of the natural environment. Taken together, system of systems-level analysis and a consideration of what might be termed cognition in the wild as enabled in an exercise such as the NIEs represent a new and important frontier for HSI practice.

# PRACTITIONER'S WORKSHOP

On behalf of the Army HSI Directorate, we would like to thank all who attended and participated in the HSI Practitioner's Workshop that was held on 1-2 December, 2015 at Aberdeen Proving Ground. In addition to large participation within the Army Community, specifically Army Research Laboratory (ARL), Human Research and Engineering Directorate (HRED), all branches of the services were represented including OSD, along with select educational Institutions. The workshop consisted of two days dedicated to presentations that were comprehensive on a variety of topics of interest, current events, and HSI advances designed to exchange information within the HSI community.



(Pictured Left): The 2015 Practitioner's Workshop award winners with Dr. Drillings.



(Pictured Left): A view of the 2015 Practitioner's Workshop in action.



# PRACTITIONER'S WORKSHOP

The following Practitioners received awards for their outstanding achievement and dedication to the Army and the HSI Mission:

Name	Organization	Award
Robert Booze	Health Hazard Assessment	Special Achievement
Charles Augustus Jeffrey Everette Lamar Garrett Charles Hernandez Kenneth Light Frank Morelli Samson Ortega Pamela Savage-Knepshield Ronald Spencer	ARL-HRED FAST Team	Special Achievement
Henry L. Phillips IV Owen D. Seely James A. Pharmer Eric Stohr	US Navy	Technology Research & Development or Studies
Jeffrey Thomas	ARL-HRED	Technology Research & Development or Studies
Andrew Bodenhamer	ARL-HRED	Army Materiel Systems
John K. Hawley	ARL-HRED	Practitioner of the Year

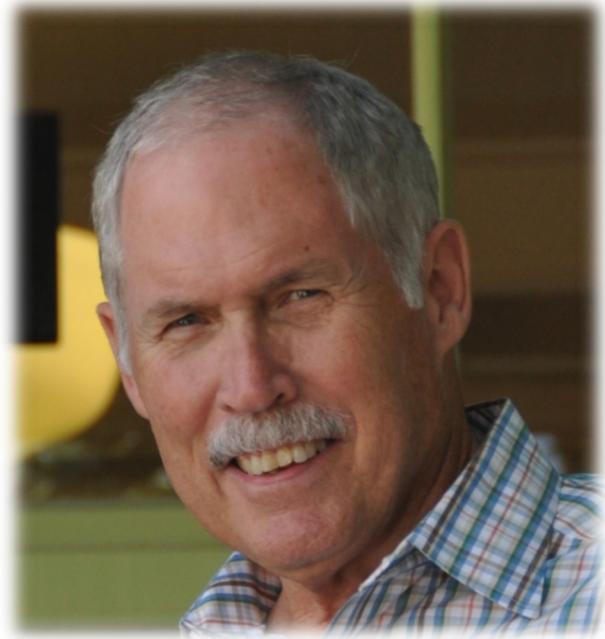
All presentations available for public release can be obtained by contacting:  
Erin Nielsen — erin.n.nielsen.ctr@mail.mil



# PRACTITIONER'S WORKSHOP

## 2015 Practitioner of the Year: John K. Hawley

Dr. John K. Hawley is a senior technical staff member at the US Army Research Laboratory's Human Research and Engineering (ARL-HRED) Field Element at Ft. Bliss, Texas. He received his PhD in psychology from the University of North Carolina at Chapel Hill in 1977. Since receiving his doctorate, Dr. Hawley has worked as an applied psychologist for more than 35 years in a variety of government and private-sector organizations. These include the US Army Research Institute for the Behavioral and Social Sciences and the US Army Research Laboratory. Dr. Hawley began working with Patriot and other automated air and missile defense systems in the late 1970s, and has extensive technical and operational experience with them. He has written more than 100 professional journal articles, technical reports, trade journal articles, and book chapters on the subjects of human systems integration (HSI), human-automation integration, and human performance in complex military systems. Dr. Hawley returned to Ft. Bliss as project leader for an Army effort to examine human performance contributors to fratricides involving the Patriot air and missile defense system during the Second Gulf War (Operational Iraqi Freedom) and recommended potential solutions. He has continued working with the air defense community to implement and evaluate selected recommendations involving system design practices, HSI practices, test and evaluation methods, personnel assignment practices, and operator and crew training.



*Dr. Hawley is recognized as Practitioner of the Year for his early contributions in instituting the MANPRINT program, his applied work in analyzing the Patriot errors in Operation Iraqi Freedom and for contributions in understanding many of the current challenges to effective Soldier Performance.*

Dr. Hawley is a member of The Honorable Order of Saint Barbara and is an honorary Patriot "Top Gun." At present, he is ARL-HRED's task leader for HSI support to the Brigade Modernization Command (BMC) during the Network Integration Evaluation (NIEs). Dr. Hawley also served as co-leader of the HSI support effort for the Army's Future Combat Systems (FCS) program. The primary thread running through Dr. Hawley's professional experience is helping people and organizations manage the human side of transitions to new systems, processes, and technologies.



## Education and Events

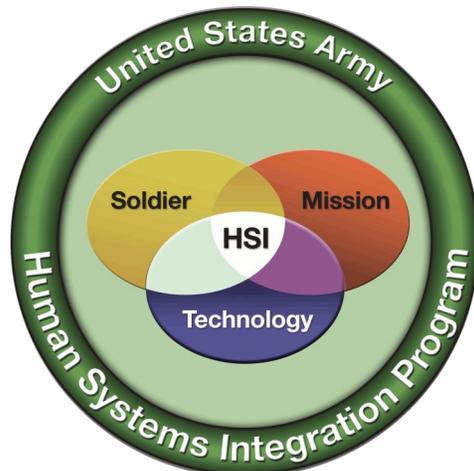
Army HSI Practitioner's Course		
Registration Information	Location	Time
POC: Ms. Kelly Hopkins Army HSI Education Administrator <a href="mailto:khopkins@alionscience.com">khopkins@alionscience.com</a>	Huntsville, AL	9:30-12:00 *Classes will be held on select Tuesdays throughout each month in 2016
<b>DAU Course CLE 062, Human Systems Integration</b>		
*Now listed as a 'Core Plus' certification course for: SPRDE-SE Level II: <a href="https://dap.dau.mil/career/sys/Pages/Certification2.aspx">https://dap.dau.mil/career/sys/Pages/Certification2.aspx</a> SPRDE-PSE Level I: <a href="https://dap.dau.mil/career/pgm/Pages/Certification.aspx">https://dap.dau.mil/career/pgm/Pages/Certification.aspx</a>		
Registration Information	Location	
<a href="http://www.dau.mil/default.aspx">http://www.dau.mil/default.aspx</a>	Online	

### Joint HSI Pentagon Exhibit

May 3-4, 2016  
Washington, DC

### NDIA Human Systems Conference

February 9-10, 2016  
Waterford at Springfield



The Army HSI Newsletter is an official bulletin of the Deputy Chief of Staff, G-1, Department of the Army. The Army Human Systems Integration (HSI) Program (AR 602-2) is a comprehensive management and technical initiative to enhance human performance and reliability during weapons system and equipment design, development, and production. Army HSI encompasses seven key domains: manpower, personnel, training, human factors engineering, system safety, health hazards, and soldier survivability. The focus of Army HSI is to integrate technology, people, and force structure to meet mission objectives under all environmental conditions at the lowest possible life-cycle cost. Information contained in this bulletin covers policies, procedures, and other items of interest concerning the HSI Program. Statements and opinions expressed are not necessarily those of the Department of the Army. This bulletin is prepared twice yearly under contract for the HSI Directorate, G-1, under the provisions of AR 25-30 as a functional bulletin.