

HPT&B



HUMAN PERFORMANCE, TRAINING, AND BIOSYSTEMS DIRECTORATE



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Background, Roles, and Responsibilities of the HPT&B Directorate

The HPT&B Directorate was established within the Office of the Assistant Secretary of Defense for Research and Engineering, ASD (R&E), and is charged with the responsibility to provide technical leadership, management oversight, and the development of policy guidance for science and technology. As with the other research directorates in ASD (R&E), these responsibilities are outlined in Department of Defense Directive 5134.3 (see the overview of DoDD 5134.3 in this newsletter) that provides the framework by which these efforts are achieved. The HPT&B portfolio encompasses more than \$3 billion/year of research and engineering significant to the Department of Defense (DoD). The HPT&B portfolio covers a diverse range of research and academic disciplines, including: biometrics, chemical and biological defense, civil engineering, combat feeding, directed energy biological effects, environmental sciences, human factors engineering, human performance optimization, human, social, culture and behavior modeling, human-system integration, irregular warfare, language and cultural training, medical and

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HPT&B TECHNOLOGY FOR HUMANS

In the Human Performance, Training, and BioSystems (HPT&B) Directorate, we believe that DoD technologies are developed to extend the capabilities of the human, enhance the capabilities of the human, sustain the human, or repair the human.

Visit www.dtic.mil/biosys for more information on the HPT&B Directorate.

WELCOME

From the Desk of Dr. Patrick Mason, Director HPT&B



Patrick A. Mason, Ph.D.

Director

Human Performance, Training,
and BioSystems Directorate

Welcome to the first issue of the Human Performance, Training, and BioSystems (HPT&B) Directorate Newsletter. Our goals in publishing the HPT&B Newsletters include providing current information on the priorities, objectives, and activities within the Office of the Assistant Secretary of Defense for Research and Engineering, the roles and responsibilities of the HPT&B team, and the HPT&B-related science and technology efforts being funded by the Department of Defense (DoD). The HPT&B Directorate has a critical role in promoting coordination, collaboration, and communication within the DoD and with other federal agencies, industry, and academia. In each of our newsletters, we will report on the visits we make to research facilities in order to meet the leadership and researchers and to obtain a better understanding of current DoD research capabilities and core competencies that support HPT&B research areas. Finally, the newsletter will report on emerging research, identify critical scientific breakthroughs, and recognize research successes within the HPT&B community.

In this inaugural issue, you will be introduced to the inner workings of

the HPT&B Directorate, provided with background information on core research areas, and become acquainted with Directorate goals for our high priority cross-cutting research activities. CAPT Dylan Schmorrow, Deputy Director of the HPT&B Directorate, and Dr. Jill McQuade, Assistant Director for Human Performance and Neurobiology Research, turn the spotlight on HPT&B activities in the area of Human Systems, paying particular attention to the activities of the Human Systems Community of Interest, as well as the Human Social Culture Behavior (HSCB) Modeling Program. COL Annette Hildabrand, Associate Director for Animal Research Protection Programs, describes the legislation, policy, and requirements that provide the framework for conducting research involving animal subjects in a safe, humane, and legal manner. Dr. Bindu Nair, Assistant Director for Exoskeletons and Prosthetics Research, describes an effort to develop a process to map transition paths for emerging technologies, such as Biomechanical Assist Technologies, that are not specifically identified within Programs of Record. We also recognize the effort by the US Air Force 711th Human Performance Wing and Naval Medical Research Unit-Dayton to foster increased inter-Service coordination, collaboration, and communication.

I encourage you to be innovative, design technologies to enhance human potential, and strengthen collaborations amongst researchers in government, industry, and academia. I invite you to send us your comments and success stories.

Exoskeletons: Envisioning and Expanding Capabilities

By Dr. Bindu Nair



*Concept of Defense Advanced
Research Agency (DARPA)
Defense Science Office's
Warrior Web*

One of the roles of the HPT&B Directorate is to understand and track emerging technologies within its domain. Many of these emerging areas of research are vital as they have the potential to lead to “leap ahead” capabilities for the department. However, not all of these emerging DoD research efforts have clearly defined transition paths into a Program of Record (POR). Despite the lack of formal Requirements, these projects are critical and need a clearly defined process by which they may be “pushed” into providing capabilities useful to DoD. The HPT&B Directorate is initiating a pilot study to guide the research community in these emerging areas into focusing their work into Department-relevant capabilities and then to assist the science and technology community

in formulating plans for evaluation and adoption into the Department’s acquisition cycles.

One area of emerging interest is in biomechanical-assist technologies. These technologies are designed to significantly modify the organic human capabilities of the Warfighter. The Department has research programs in prosthetics, exoskeletons, autonomous robots, and other off-loading technologies. The goal of most of these programs is to lighten the burden by human capability enhancement (such as in exoskeletons) or human capability substitution (such as in prosthetics and autonomous robots).

Robotics technology is developing rapidly and the DoD research community needs to figure out how these technologies might be used in future missions. To that end, our office will be

bringing the DoD scientists and engineers in these fields together with the Joint Staff to understand the concepts and scenarios that the Department is using to plan for the future. The purpose of these types of discussions is to provide the researchers the corporate DoD context of the future requirements of the Department. Based on this context, the science and technology (S&T) community can develop, along with the Joint Staff the most important attributes that these types of technologies could bring to bear on future missions.

Once we have the key attributes that these technologies should be aiming to produce, we can readily develop roadmaps that will inform us about the technology and funding gaps to achieve those goals. We can also figure out how to focus the programs

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that are currently funded. For example, should we be working on methods to reduce the power requirements of exoskeletons so that they can be used in combat operations? Or do we really think that the attributes that will most useful will be in logistics areas that will allow for tethered exoskeletons? Are the expected uses of autonomous humanoid robots in areas that humans cannot access or as an assistant to a squad? Should we emphasize powered or non-powered bio-assist technologies that can reduce the probability of injury when the Warfighter is fatigued? What real advantages can be gained if every member of a squad was able to run a four minute mile that could not be achieved through existing means?



2010/2011 Raytheon Sarcos XOS Exoskeleton

Furthermore, the research community can work with the Service Requirements writers and Program Managers to provide realistic expectations of the types of capabilities that can be expected. These planning tools should be a valuable asset as the Department develops its programs of the future.

Background, Roles, and Responsibilities of the HPT&B Directorate

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life sciences, neurosciences, non-lethal weapon biological effects, personnel selection, and threats posed by disease-carrying insects. The ASD(R&E) also assigned the HPT&B Directorate with the responsibility to provide guidance and oversight to meet the regulatory responsibilities associated with the protection and care of animals and humans in research. In fulfilling these objectives, the HPT&B office strives to ensure that the research in the HPT&B domain is well focused, relevant, and capable of meeting current and anticipated defense operational needs and objectives.

Overview of DoDD 5134.3

The Department of Defense Directive (DoDD) 5134.3 establishes the responsibilities of what was then the Director of Defense Research and Engineering (DDR&E) and is now the Assistant Secretary of Defense for Research and Engineering (ASD(R&E)). This DoDD states that the ASD(R&E) shall:

- Develop the strategies and supporting plans that exploit technology and prototypes to respond to the needs of the Department of Defense and ensure U.S. technological superiority (Section 4.2)
- Conduct analyses and studies; develop policies; and provide technical leadership, oversight and advice
- Make recommendations and issue guidance for the DoD R&E plans and programs (Section 4.3)
- Recommend approval, modification, or disapproval of programs and projects of the Military Departments and other DoD Components in assigned fields to eliminate unpromising or unnecessarily duplicative programs, and initiation or support of promising ones for R&E (Section 4.4)
- Oversee matters associated with R&E at DoD laboratories operated by the Military Departments or other DoD Components (Section 4.6)
- Promote coordination, cooperation, and mutual understanding of R&E within the Department of Defense and between the Department of Defense and other Federal Agencies and the civilian community (Section 4.7)

Animals in Research: Policy and Oversight

By COL Annette Hildabrand

In 1966, the precursor to the current Animal Welfare Act (AWA) Regulations (P.L. 89-544) was passed. This earliest version of the law was designed to prevent “backyard” experimentation of animals and required the licensing of accredited animal research facilities. It also provided authority to the US Department of Agriculture (USDA) to interpret and enforce all provisions under the Act.

At the core of the AWA is the expectation that animals used in research are cared for and used in a humane way. The success of this objective is keyed to active management oversight processes that assure follow through of institutional self-improvement and self-policing measures. The Act lays forth the minimum requirements for an organization to conduct animal research. These requirements include the formation of an advisory body, frequently called an, “Institutional Animal Care and Use Committee,” or IACUC. The IACUC is authorized by its institutional official to

inspect, review, and advise on animal research related activities.

Certain Federal Agencies, such as the Department of Commerce and the DoD, are not subject to inspection or reporting to other federal agencies, therefore a mechanism is needed to assure the public and Congress that the conduct of research in these agencies is performed in accordance with the AWA. To meet this objective, the DoD has developed and published its own [more restrictive] policy for animal research care and use through the Office of the Secretary of Defense. This policy takes form in DoD Instruction 3216.01, “The Use of Animals in DoD Programs.”

DoDI 3216.01 was recently revised in September of 2010 and set forward two significant changes to the prior Instruction. The first new provision requires each Service to submit its Component Animal Care and Use Management Plan to OASD(R&E) for approval. Each plan identifies the primary office responsible for

establishing the business processes designed to ensure compliance with the DoDI. Currently, there are seven Components with either a headquarters level oversight office or appropriate assignment to a responsible Component sister research office through the use of a Memorandum of Agreement. Offices or subordinate institutional research units reporting under this instruction include: The Army’s Animal Care and Use Review Office; United States Air Force’s Animal Use Program, Office of Research Oversight & Compliance, the Office of Veterinary Affairs; and the Navy Bureau of Medicine.

The second significant change in DoDI 3216.01 is a new requirement for Component headquarters to review animal use programs that utilize live animals for training in medical procedures. The policy requires all medical procedure training programs that use animals to adhere to the same requirements and protections afforded to animals used in research.

The Human Systems Community of Interest (HS CoI): Enhancing Coordination, Collaboration, and Communication

By Dr. Jill McQuade

The national security environment of today and of the forecasted future will place unprecedented physical, cognitive, and social demands on the warfighters and support personnel to safely and effectively prevail in their missions. Human Systems research is aimed at maximizing warfighter performance while minimizing harm and cost to the human by optimizing the integration of hardware, software, and human elements of warfighter systems. Given the multi-disciplinary nature of human systems research, establishing a venue for communication and collaboration for the research community is critical. The Human Systems Community of Interest (HS CoI), initiated by ASD(R&E), provides such a venue. The HS CoI serves, in part, to provide a framework for the DoD executives, scientists, engineers, and human systems integration practitioners to share information,

ideas, and best practices, as well as identify opportunities for cooperation and collaboration.

Dr. Mason is a member of the HS CoI Senior Leader Group which includes Senior Executive Service (SES)-level representatives who direct Service and Agency organizations involved in the areas of Human Systems, Human Performance, and Human Systems Integration. These leaders come together to develop a collective DoD vision of the Human Systems research area, promote strategic planning of the defense Human Systems S&T portfolio, foster coordination, identify emerging research challenges, and annually assess the state of health of the Human Systems technology area. Much of this work is accomplished through the establishment of Human Systems subareas, or key topic areas of emphasis. Currently,

the four subareas within the HS CoI are: Personnel, Training, and Leader Development; Protection, Sustainment, and Physical Performance; Systems Interfaces and Cognitive Processing; and Social and Cultural and Behavioral Understanding. CAPT Dylan Schmorrow and Dr. Jill McQuade are members of the HS CoI Working Group that guides subareas members in their work.

Promoting Coordination, Collaboration, and Communication

By CAPT Dylan Schmorrow and Dr. Jill McQuade

One of the top priorities of the HPT&B Directorate is to promote coordination, collaboration, and communication within the DoD, between the DoD and other Federal agencies, with the civilian community, and in the international arena. The following provides brief descriptions of several of these activities.

The Technical Cooperation Program (TTCP)

The Technical Cooperation Program (TTCP) is an international organization that provides its five participating nations (US, UK, Australia, New Zealand, and Canada) the opportunity to exchange defense science and technical information; achieve program harmonization and alignment; and share research activities. The structure and operating mode of the group have evolved significantly over the past twenty years, but the TTCP currently is divided into eleven S&T groups. The HPT&B Deputy Director, CAPT Dylan Schmorrow, is the National Representative for the Human Resources and Performance (HUM)

group. HUM Group concerns the application of human sciences to the development of military equipment and the enhancement of human performance in military activities. This includes the recruitment, selection, training and retention of the work force; the development of military systems and equipment that maximize the performance of the operator and his health and safety; and the development of techniques that enhance the performance of individuals and groups in military environments. HUM encompasses seven Technical Panels: TP2: Training; TP3: Military Human Resources; TP 12: Combat Casualty Care; TP 13: Psychological Health and Operational Effectiveness; TP 17: Human System Performance, Air; TP 18: Human System Performance, Maritime; and TP 19: Human System Performance, Land.

Human Factors Engineering Technical Advisory Group (HFE TAG)

The HFE TAG was established in 1976 as a forum for coordination and communication of HFE research and

development at the working level. The DoD HFE TAG is made up of SubTAGs, each of which represents an area of interest within HFE. The major goal of the HFE TAG is to provide a mechanism for the timely exchange of technical information in the development and application of HFE by enhancing the coordination among government agencies involved in HFE technology research, development, and application. Dr. Mason is the proponent of the HFE TAG and, as such, acts as an advocate for its efforts. In pursuit of the goal of uniting the research, acquisition, and policy aspects of Human Systems Integration (HSI), the HPT&B Directorate authored a Memorandum of Understanding between the HFE TAG and the Joint Human Systems Integration Steering Committee in 2012.

Joint Human Systems Integration Steering Committee (JHSISC)

The JHSISC was established in 2006 to address systemic HSI issues and

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Promoting Coordination, Collaboration, and Communication

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serve as a forum for discussions on R&D funding for HSI tools and methodologies. The JHSISC has HSI management responsibility and serves as the coordination and communication body between the Office of the Secretary of Defense and the Services. Dr. Mason co-chairs this committee with Mr. Nicholas Torelli, Director, Mission Assurance, OASD(R&E)/Systems Engineering. The committee is composed of Services HSI senior representatives, a representative from the Office of the Under Secretary of Defense (Personnel & Readiness), and the Chair of the Joint HSI Working Group. The JHSISC provides the platform to share knowledge and issues and assess the status of achieving joint and organization-specific goals.

Human Performance Optimization Advisory Committee (HPO AC)

The HPO AC is an advisory committee under the Force Health Protection Integrating Council. It was established in 2009 with the purposes of advocating for sound

HPO projects, initiatives and requirements to support the DoD warfighter and recommending HPO policy and non-materiel recommendations to the ASD (HA) and USD (AT&L). Dr. Craig Postlewaite, Director, Force Readiness & Health Assurance and Dr. Mason have driven the re-chartering of this committee to expand the scope and membership to encompass both medical and non-medical HPO researchers and users, as well as HSI practitioners. The purpose of this expanded scope and membership was to better integrate the research goals and priorities across the medical and non-medical communities.

National Science and Technology Council (NSTC)

The NSTC is the principal means within the executive branch to coordinate science and technology policy across the diverse entities that make up the Federal research and development enterprise. The work of the NSTC is organized under five primary committees, each of which oversees subcommittees and

working groups focused on different aspects of science and technology and working to coordinate across the federal government. Dr. Mason is the DoD representative on several Subcommittees, including the Subcommittee on Life Sciences within the Committee on Science; Subcommittee on Social, Behavioral and Economics Sciences within the Committee on Science; Subcommittee on Toxics and Risk Subcommittee (as Co-Chair) within the Committee on Environment, Natural Resources, and Sustainability; and the Subcommittee on Human Factors in Homeland and National Security (HFHNS) (as Co-Chair) within the Committee on Homeland and National Security.



“Open House”

Air Force 711th Human Performance Wing and Naval Medical Research Unit Dayton



Photo courtesy of NAMRU-D

Dr. Karen Mumy
explains her research to a tour during the Open House in the Environmental Health Effects Research Directorate



Photo courtesy of NAMRU-D

CDR Hardt
describes capabilities of the NAMRU-D inhalation lab



Photo courtesy of NAMRU-D

An Open House tour is introduced to the Disorientation Research Device Lab

On 7 November 2012, the US Air Force 711th Human Performance Wing (711th HPW) and Naval Medical Research Unit Dayton (NAMRU-D) held a research “Open House,” that gave scientists and engineers from both organizations an opportunity to tour over 25 laboratory facilities spread across the 711th HPW/NAMRU-D campus at Wright-Patterson Air Force Base (AFB), Ohio. The NAMRU-D tours highlighted the inhalation toxicology laboratories, neurobehavioral research laboratories, in vitro toxicology laboratory, hypoxia countermeasures laboratory, fatigue assessment and countermeasures laboratory, and ongoing research on motion sickness countermeasures and spatial awareness. The 711th HPW tour highlighted the Human Performance Integration Directorate, USAF School of Medicine (USAFSAM), and the Human Effectiveness Directorate (RH). Within the Human Performance Integration Directorate, the tour focused on the anthropometry laboratory, the Human Systems Division, and Human-Centered Unmanned Aerial Vehicle (UAV) ground control station design laboratory. The tours at USAFSAM included the Ophthalmology laboratory, the Aero-medical Evacuation training and Residency in Aerospace Medicine facilities, and the altitude chamber and centrifuge. The RH tour highlighted the Synthetic Teammate research, the Gaming Research Integration for Learning Laboratory, the Vigilant Spirit Control Station, and the toxicology laboratory. This type of event embodies the current goal of the HPT&B Directorate to foster increased inter-Service coordination, collaboration and communication.

EVENTS

Upcoming Activities, Conferences, and Workshops



International Conference on Social Computing, Behavioral-Cultural Modeling, & Prediction (SBP 2013)

When: April 2–5, 2013

Where: University of California DC
Center, Washington, DC

<http://sbp2013.org/>



Simulation Interoperability Standards Organization (SISO)

When: April 8–12, 2013

Where: Bahia Resort Hotel
(<http://www.bahiahotel.com/>),
San Diego, CA

<http://www.sisostds.org/>



GameTech

When: April 17–19, 2013

Where: Orlando, FL

www.gametechconference.com/



NDIA 14th Annual S&ET Conference/Defense Tech Expo

When: April 24–25

Where: National Harbor, MD

www.ndia.org/

International Symposium on Aviation Psychology

When: May 6–9

Where: Dayton, OH

[www.wright.edu/isap/resources/
docs/ISAP2013_
flyer.doc](http://www.wright.edu/isap/resources/docs/ISAP2013_flyer.doc)



Aerospace Medical Association (AsMA) Conference

When: May 13–16

Where: Chicago, IL

www.asma.org/annual-meetings



Human Computer Interaction (HCI) International 2013

When: July 21–26, 2013

Where: Mirage Hotel, Las Vegas, NV

<http://www.hcii2013.org/>

Cross Cultural Decision Making (CCDM) 2014

When: July 19–23, 2014

Where: Krakow, Poland

[http://www.ahfe2014.org/
conferenceCCDM.html](http://www.ahfe2014.org/conferenceCCDM.html)

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NEWSLETTER

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