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**STATEMENT TESTIMONY OF**

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**BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES  
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SUBCOMMITTEE ON TERRORISM, UNCONVENTIONAL THREATS  
AND CAPABILITIES**

**AND**

**COMMITTEE ON SCIENCE AND TECHNOLOGY  
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION**

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Mr. Chairmen, distinguished members of the Subcommittees, thank you for this opportunity to appear before you to discuss the Department's science and technology (S&T) challenges and investments in the social sciences. I will use this opportunity to describe the Department's past investments and their impact on our forces, as well as the current operational challenges and the underlying science base and technological advances that can help the Department to meet these challenges. I am also pleased to have the chance to highlight one of the new initiatives the Department is undertaking in the area of socio-cultural understanding and modeling. These efforts specifically address work in areas related to Irregular Warfare and the Global War on Terror (GWOT).

I have organized this testimony into three sections, the first section deals with the historical role of the social sciences in the Department, the second section will focus on how the social sciences can support the Department with the unique challenges that arise in non-traditional or irregular warfare, and the last section will highlight the coordination and collaboration within the social sciences across the Department of Defense (DoD) and government agencies.

### **Historical Contribution of Social Sciences to the Department of Defense and National Security**

The social and behavioral sciences encompass several disciplines most people are familiar with, including psychology, sociology, anthropology, economics, history, and political science. They also encompass some disciplines that are not as familiar, such as human factors, computational social science, and linguistics. The common goal of these

disciplines is to develop a better understanding of human beings at every level, and to understand the behavior of an individual as well as the forces that shift the beliefs of an entire society. They seek to understand the functioning of individual minds as well as the dynamics of a society's recovery from a horrendous natural disaster. The social sciences are often called 'soft' sciences, which is meant to somehow differentiate them from the 'hard' sciences such as physics and chemistry. Designating a scientific field as being soft gives the listener a not so subtle hint that there is an absence of scientific or empirical rigor in the field, or that the science is not mature enough to have any practical value. However, this is far from the case with the social sciences. The social sciences are based in theories that are empirically tested, and the questions that the social and behavioral sciences try to answer are in some ways harder and more difficult than the physical sciences. It is arguably easier to predict the motion of a single neutrino or muon than to predict how a video posted on YouTube can propagate through a social network and the on-line media to reshape a national debate and change policy. It is easier to identify the existence of a new planet by studying wavelength shifts of distant stars than it is to predict which individual in a society will turn from a political activist to a violent extremist. The social sciences try to understand behavior, what factors influence current and future human behavior, and how the human-to-human and human-to-environment interactions can change outcomes.

The core of the Department and its ability to perform its role in National Security is its people, i.e., the military, civilian and contractor workforce. Warfighting platforms are tools that require a skilled and well trained workforce to operate. In the past the

Department's military and civilian personnel's readiness has always been the difference between victory and defeat, and there is no reason to believe the future will be any different.

### **Social Science Research in Defense: World War I**

The social sciences have had a long history in the formation and shaping of the force structure of the Department of Defense. Prior to World War I, there was no formalized relationship between the social science research community and the Department. During World War I, many psychological science pioneers such as Robert Yerkes worked for the government to develop personnel selection tests and classification systems to meet the surge in demand for forces and to screen the over 1 million recruits that came through the front door. They developed the U.S. Army selection tests to screen all applicants, and there was preliminary work done to screen applicants from more technically challenging fields such as aviation. Their work, in what today would be called the field of psychometrics, saved substantial amounts in training costs, and likely many lives through better matching of recruit skills to job requirements. At the end of the war, the social scientists went home, but their personnel selection tools continued to provide value to the manpower, personnel and training processes in the Department. This research area continues to be explored today by the U.S. Army Research Institute (ARI) and the U.S. Navy Personnel Research, Studies and Technology (NPRST) Laboratory.

## **Social Science Research in Defense: World War II to Present**

During World War II, the contributions of the social sciences were expanded beyond their prior applications in personnel selection. There was a rapid increase in the need for large numbers of forces in specific fields (e.g., pilots, sonar operators, and engineers) and a surge in the rate at which technologies were developed and integrated into warfighting platforms. For comparison, in 1939, within the United States only 6,000 aircraft were built per year. However, by 1944 over 9,000 aircraft were being delivered to our forces every month. It was not uncommon for the cockpit systems and design of an aircraft coming off the same assembly line to change on a monthly basis. The surge in the need for an educated and more technically skilled workforce led to advances to the development of performance based selection tools for fields such as aviation. It also led to more advanced training systems that were the precursors to today's advanced training simulators, and the development of systems to familiarize aviators on the ground with spatial disorientation and climatic conditions that can prove fatal in flight. With these advancements, the attrition rate of aviation cadets, which ran as high as 70% at the beginning of the war, was cut in half.

The technological advances during WWII were also most evident in the field of aviation. The changes in cockpit design and the increased capabilities of the new aircraft highlighted the need for consistency in design, or at the very least designs that were congruent with human proclivities and expectations. This led to the birth, within the Department, of the field of Human Factors. Human Factors is focused on optimizing the

human-machine interface and interaction. Early on this meant using known human perceptual and cognitive abilities to make the cockpit easier and safer for the aircrew through the use of color, lighting, and control and display designs and location. Today the field of Human Factors employs over 12,000 practitioners nationally who are responsible for designing a wide variety of commercial and government products for improved usability and safety.

Following World War II, the Army, Navy and Air Force created research laboratories that were specifically devoted to social science research and human factors. The work done at these laboratories was still focused on the manpower and personnel area, the field of Human Factors, and on finding ways to reduce the increasing costs of training our combat forces. Advances in our understanding of human cognition and learning have had a tremendous impact on how the Department trains its force, and how it plans and executes its missions. The social sciences contributed heavily to the application of simulation technologies to prepare and train our forces for potential scenarios and missions. Today, thanks to pioneering work done by the Air Force Research Laboratory, the Naval Air Warfare Center – Training Systems Division, the Army Research Institute for the Behavioral and Social Sciences, and others, aircraft simulators in Florida can link with ships in port in Norfolk and train for a joint mission with actual aircraft flying over Nellis Air Force Base in Nevada. Other applications of social science research have been in the development of decision support tools and decision aids that support operational planning, and command and control.

Currently, the various activities within the Department employ social scientists, both uniformed and civilian, as well as funding contract social scientists who support the Department in the areas of individual and team training, leadership development, organizational research, cognitive systems and interface design, personnel protection, and technologies to support training simulation (performance measurement, after-action review, human behavior representation). Most of this work is executed at the Service level and is overseen at the Office of the Secretary of Defense level by the Director, Defense Research and Engineering (DDR&E), and is coordinated through the Department's Reliance 21 process. The S&T challenges in this field are in the areas of unmanned vehicle control, performance in network-enabled environments, whole-person (cognitive, mental, emotional) assessment for recruitment, improving decision making under stress and in complex environments, human-robot interactions, adaptive automation, team performance, cultural awareness training, embedded training, the use of gaming technology for training and mission rehearsal.

### **Current Efforts and the Global War on Terror**

Social science continues to contribute to DoD capabilities in the manpower and personnel and human factors arenas. Independent of the threat to our national security, there is still the need to bring in the best quality recruits and to match their skills to the right job, and there is still the need to design systems that optimize the ability of our forces to use those systems in wartime. However, the GWOT, and, more generically,

Irregular Warfare (IW) have added additional roles for our Soldiers, Sailors, Airmen, and Marines. They now must be able to plan and operate effectively in settings where they must have the skills to work in novel, culturally complex situations while supporting non-combat, non-kinetic operations. They find themselves in a more dynamic human-centered environment in which they must adapt to changing conditions and more fully understand human nature, and foreign cultures and societies. The social sciences can, at the very least, inform, if not prepare, our forces for these kinds of environments.

The need for improved cultural awareness training was identified in the early phases of Operation Iraqi Freedom. It was realized that the general purpose forces needed some of the same cultural awareness competency that our Special Operations Forces have traditionally maintained. Military operations in complex, multicultural environments require more than just being culturally sensitive to the dos and don'ts of a society. They require an awareness and knowledge that can be applied to improve interactions and shape the outcome of the interactions. Each of the Services have established cultural awareness training centers that are developing content, sharing this content, and have begun training their personnel on the specific knowledge necessary to support their military missions. In addition, cultural training is ongoing at the Service Academies, and is provided to forces prior to deployment. The cultural awareness training centers have been developing their content from the extensive on-the-ground experiences of the Soldiers and Marines returning from Iraq, combined with the relatively well known academic knowledge of Iraq's religious and sectarian history. Providing the same level of 'understanding' and training for data-poor, less studied socio-cultural



environments, such as the mountainous tribal regions of Afghanistan or the multicultural regions of Indonesia, for example, is much more difficult. The Army Research Institute is funding research into understanding the foundations of culture skills and competencies that can be used across deployments and geographic assignments. Also, the Department has begun to develop methods and processes to collect and examine what data are relevant and sufficient to understand a culture, relative to our military missions. The Department is also developing systems that can handle this type of data/models to help plan for non-kinetic operations and to measure the intended and unintended outcomes of these operations. The ultimate goal is to achieve an acceptable baseline for cultural competency across our forces. The first generation capabilities in this area are being derived from the best academic and professional subject matter experts providing schoolhouse content. An example of this type of work is the Combating Terrorism Technology Support Office work to develop training support packages that focus on the operational and tactical applications of cultural awareness, with a specific focus on Indonesia. The next generation capability will likely be computer-mediated training and mission rehearsal in relevant venues. One example of this work is ongoing efforts as part of the Small Business Innovation Research (SBIR) Program that is developing a system that will train how to read Middle Eastern non-verbal cues and develop an understanding of what those cues say about a person's intentions. Another example is the Defense Advanced Research Projects Agency's Tactical Iraqi Language and Culture Training System which uses interactive computer 'avatars' to teach soldiers basic language and cultural understanding. The third generation capability will be embedded within more

immersive, dynamic environments. Work in the area of human behavior representation and agent-based modeling would support this type of capability.

Last year, the DDR&E initiated a program to support Human Social, Culture and Behavior (HSCB) Modeling that can help the Department to understand social and cultural “terrains” as well as the complicated dimensions of human behavior that can lead to peaceful and/or violent intent. The HSCB is focused on developing the required scientific base and will field mature technologies that support human terrain understanding and forecasting across a range of mission areas and geographic regions. It will focus on identified technical gaps in our ability to plan and execute military operations in which socio-cultural issues are a dominant factor. The HSCB effort will work on filling in the gaps in data collection/infrastructure and knowledge management, and then developing the models to forecast societal and cultural behaviors. In addition to delivering software modules that are fully integrated into DoD command and control systems, the HSCB effort will help to create the infrastructure (simulations and content, which includes data, models, and theories) to support tactical through strategic training, mission rehearsal and experimentation using valid cultural entities and models. The output from the HSCB program will improve the Department’s ability to plan for stability, security, transition, and reconstruction operations in complex environments. These improvements will occur at the tactical, operational and strategic level, and will enhance the Department’s coordination with other agencies (e.g., Department of State) in their efforts to stabilize ‘hot spots’ around the world. The program has just completed its

initial review of proposals from its first Broad Agency Announcement, and contract awards will be pending.

### **Interagency Coordination and Collaboration**

Even prior to the release of the National Security Presidential Directive (NSPD) – 44, Management of Interagency Efforts Concerning Reconstruction and Stabilization, there were a number of professional and governmental venues through which social science research and policy were shared. A number of professional societies, such as the Human Factors and Ergonomics Society and the American Psychological Association have specific military focused sessions and groups that are heavily attended by government, industry and academic representatives. Internal to the U.S. Government, the National Science and Technology Council (NSTC) established a Subcommittee on the Social, Behavioral and Economic Sciences. This active subcommittee includes representatives from all of the executive branch agencies who represent the social science research and policy portfolios of their respective agencies. Some of the efforts of the subcommittee have focused on identifying common themes and complementary research programs, and on identifying future research needs that span across the agencies. Currently, the NSTC’s Committee on National and Homeland Security is in the process of establishing a subcommittee on Human Factors for Homeland and National Security (HFHNS) for interagency cooperation. There are, additionally, project level collaborations between agencies (Department of State and Department of Defense) that

focus on regional stability. Finally, cooperation is even extending to the North Atlantic Treaty Organization Alliance where research groups have been established to share knowledge and expertise on such topics as social science modeling, and terrorism.

### **Conclusion**

In conclusion, social sciences have been a consistent contributor to the Department's mission to support National Security, and the DoD S&T program has provided both core and supporting capabilities that have had an impact on military readiness. The Defense S&T social science investments have adapted to the realities and challenges of the GWOT. The new investments being made today by the Department of Defense will meet these challenges and directly support the training and equipping of tomorrow's force. Thank you for this opportunity to address both subcommittees. The Department truly appreciates the continued support of Congress in providing us the tools and resources to carry out our vital mission.