Statement of
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Mr. Chairman and Members of the Committee:

I speak to you today in my role both as a veteran with a spinal cord injury who has benefited from research and as a VA research scientist. For 24 years I have been a user of multiple assistive devices, and have used a wheelchair as my primary means of mobility. I have been a VA-funded research scientist for nearly fifteen years, and the Director of the Human Engineering Research Laboratories since 1994, which is one of the VA's designated Centers of Excellence in Rehabilitation Research and Development. I am going to confine my remarks to how ongoing research and development intersects with the promotion of full participation in society of veterans with severe mobility impairments, which is our main concern.

The increase in military deployments overseas has provided a steady stream of young veterans with disabilities. It is important to note that a large percentage of veteran wheelchair users are from special disability populations (SDP) such as spinal cord injury and dysfunction (SCI/D), traumatic brain injury, and amputation. There are a number of other veterans who are using or will likely use wheelchairs in the future. The chances of acquiring a disability increase with age, and people over 65 represent about 43 percent of individuals with severe disabilities. Over 35 percent of VA users are 65 or older compared to 17 percent in the general population. While VA predicts that the total number of veterans is likely to decline by 19 percent between 1990 and 2020 (without accounting for the War on Terrorism or other hostilities), the number of older veterans from the Vietnam and Korean conflicts is expected to climb sharply. VA has shifted focus from hospitalization to community integration. For veterans with disabilities, assistive technology is critical to this effort.

While our Center is focused on veterans, we would be remiss not to address the broader needs for wheelchairs. In the U.S. an estimated 2.2 million people currently use wheelchairs for their daily mobility. World wide, an estimated 100-130 million people with disabilities need wheelchairs, though less than 10 percent own or have access to one. While these numbers are staggering, experts predict that the number of people who need wheelchairs will increase by 22 percent over the next ten years. The leading cause of disabilities in the world can be attributed to landmines, particularly in developing nations, leading to 26,000 people injured or killed by landmines worldwide each year.

Given that major limb loss, spinal cord injury and traumatic brain injury affect a growing number of military personnel serving in Operation Enduring Freedom, Operation Iraqi Freedom, and other foreign deployments, further research is particularly important. There is an overwhelming need for wheelchairs and prosthetic limbs and the research and development required to make them safer, more effective, and widely available. This was pointed out by the VHA Rehabilitation Strategic Healthcare Group who identified the following areas as being of particular importance: practitioner credentials, accreditation, device evaluation, device user training, patient education, clinical prescribing criteria, national contracts, and access to new technology.

Wheelchair-related research is a broad topic with many focused areas of investigation. The studies proposed in the following section represent this diversity, covering topics ranging from remote monitoring, to vibration exposure, to clinical education related to assistive technology. Recent deployments have resulted in the largest number of young, military-aged American veterans with amputations since Vietnam. Veterans of the Vietnam War were the last major influx of individuals acquiring traumatic or surgical amputations from injuries sustained during conflict deployment. Since that time, the focus of prosthesis design has shifted away from deployment-related, traumatic amputations, and moved towards older individuals who have required amputations due to peripheral vascular disease. Clearly, there is a need for deployment-related research and development, especially for veterans with traumatic limb loss.

The main reason I have been involved with research and development in VA for the past 15 years is that I feel that VA is a particularly favorable place for providing excellent prosthetics and assistive technology services. Among VA's advantages are the computerized patient record, including the national prosthetics patient database, and the veterans themselves who are a particularly rewarding group to work with, and who participate in research more actively and with greater enthusiasm than the average person in the private sector. In addition, VA has a long history of notable accomplishment in rehabilitation research and clinical service delivery often setting a standard for this field.

I would like to address how our research benefits veterans within a VA healthcare environment. I will limit my remarks to our research program in Pittsburgh; however, other VA medical centers have analogous stories. Our VA research program covers a wide spectrum of studies and development projects, from basic biomechanics through development of new devices to clinical studies and new structures of service delivery. All of our studies are veteran-focused, and many of our research and development concepts are directly inspired by veterans' needs. For example, a fundamental driver for the high prevalence of upper extremity pain and joint degeneration is the improper selecting and fitting of manual wheelchairs. My colleagues, Drs. Michael Boninger and Alicia Koontz, were intimately involved in developing clinical practice guidelines with a consortium of organizations, including the Paralyzed Veterans of America, to reduce the incidence of, if not to prevent, repetitive strain injuries to the upper extremities. Many of the recommendations were based upon their work on the biomechanics of manual wheelchair propulsion and modeling of the upper extremities. These studies were able to show that the use of ultra-light weight wheelchairs fitted for the user placed less stress on the upper extremities during propulsion and reduced the incidence of arm pain and injury. In addition, they prompted the design of more ergonomically designed manual wheelchairs and components. Through the application of advanced engineering materials, design processes and manufacturing techniques, manual wheelchairs today are nothing like the first wheelchair I received 24 years ago. This is an example of how a problem faced by

many veterans who use wheelchairs was investigated and led to new products and changes in clinical practice.

Surveys of therapists working in seating and mobility clinics have reported that about 50 percent of individuals who are assessed are unable to independently operate a wheelchair due to physical, mental or technological limitations. This has prompted my colleagues and me to develop and investigate the clinical application of new control algorithms, sensors, and human interface technologies to allow people with severe traumatic brain injury, multiple sclerosis, or amyotrophic lateral sclerosis the ability to independently operate an electrically powered wheelchair and more fully participate in life's activities. Our approach has been to work with veterans in identifying the design issues and to team with clinicians to meet the veteran's goals. Through the integration of sensors to detect obstacles in the environment, algorithms to compensate for irregular movements and unexpected events, coupled with natural interfaces, we expect to increase the number of veterans and others who will be able to move independently. This combination of advanced electronics and software would also have spin-off benefits for individuals who use prosthetic limbs in the development of more advanced limbs to promote greater community participation.

I mentioned the development of clinical practice guidelines earlier, but VA has also been a leader in the development and application of technical standards, especially for wheelchairs. Technical standards help to ensure minimum quality and allow the objective comparison of products or devices. There is currently a suite of technical standards adopted by the Rehabilitation Engineering and Assistive Technology Society of North America and the American National Standards Institute that VA uses in its purchasing decisions. VA research and development has been, and continues to be, a cornerstone for clinical and technical standards development. These standards affect thousands of veterans who use wheelchairs, and millions of non-veterans with disabilities.

Mr. Chairman, I have tried to give a few examples of the spectrum of wheelchair and rehabilitation engineering research in Pittsburgh and to show you how it is integrated into VA medical care, which is our primary focus. I will be happy to answer any of your questions. Thank you.