Seventy Years of Naval Aeromedical Research
Excellence Moves to Dayton, OH

By Dr. Richard D. Arnold

Naval Air Station Pensacola has been home to aeromedical research in the naval services since 1939. While the aeromedical research laboratory stood under several names in its history, Naval Aerospace Medical Research Laboratory (NAMRL) is the name most widely recognized. NAMRL was at the forefront of many of Naval Aviation’s formative scientific endeavors, from setting the standards for naval aviator selection, to playing an integral part in the space race alongside NASA. Early contributions to the space program under the guidance of long-time research director Dr. Ashton Graybiel included roles in the development of the first space suit and the transdermal scopolamine patch. In addition, NAMRL investigators conducted critical investigations into space survivability and radiation exposure. The first primate to survive space flight, Miss Baker, was a NAMRL squirrel monkey. However, NAMRL’s primary focus has always been on Fleet aeromedical issues. For example, to facilitate safe, portable, and effective hypoxia familiarization for pilots and aircrew, NAMRL scientists designed the Reduced Oxygen Breathing Device (ROBD). The ROBD has not only significantly changed the way Naval aircrew train, but other U.S. and international services and civilian aviation agencies have adopted its use. Another milestone invention was a novel acoustic dampening material designed to address the ever-present problem of intense noise in the aviation environment. Both of these inventions garnered the prestigious Federal Laboratory Consortium Award for Technology Transfer. More recent highlights include two award-winning projects, one involving an intranasally-administered countermeasure for motion sickness, and the other, an oral countermeasure for fatigue, both of which received the Surgeon General’s Research and Development Procedural Advancement Award.

(Continued on page 2)
By LT Pedro A. Ortiz

Hearing loss is one of the most prevalent service-connected disabilities for veterans of the armed forces, with noise-induced hearing loss being a major military operational health hazard. Although widespread hearing conservation measures have been adopted, noise-induced hearing loss is as high as 20-30% in the military. Noise exposure standards have historically been based on the range of human auditory sensitivity and exposure duration; however, recent research has established that simultaneous and even successive exposure to noise and specific chemical agents, including those found in jet fuel, can potentiate noise-induced hearing loss or produce additive effects. In a project funded by the Air Force Surgeon General, researchers from NAMRU-Dayton, the Air Force 711 Human Performance Wing/RHPBA and Jerry Pettis Mem-
NAMRU-D Investigates Health Risks to Troops from Burn Pit Emissions

By CDR Daniel Hardt

Open 'burn pits' have been used extensively in the Middle East by our Armed Forces to dispose of large quantities of solid waste [generated at a rate of 10 lbs per person per day]. This method of disposal has drawn considerable criticism recently on concerns that personnel are exposed to smoke containing potentially toxic chemical compounds. Several hundred (former and active) military members claim to have been sickened by smoke emitted from “burn pits”, both from occupational and incidental exposures; yet evidence remains anecdotal and requires further scientific evaluation.

In February 2011 NAMRU-D conducted a series of three test burns within a pilot-scale surrogate ‘burn pit’ facility, using a historically representative mixed solid waste stream to simulate the waste consumed in ‘burn pits’ in Iraq and Afghanistan between 2006 and 2009. The Battelle Memorial Institute’s Ambient Breeze Tunnel was used to maintain open burn environmental conditions, while directing the plume of smoke into analytical instruments, collection devices, and exposure chambers containing human airway and lung cell cultures. Combustion emissions were measured both inside the tunnel and from the manifolds inside the mobile laboratory to ensure representative exposure. A comprehensive gas and particle characterization of emissions was generated, which included: sulfur dioxide; carbon monoxide; carbon dioxide; volatile organic compounds; total hydrocarbons; poly-aromatic hydrocarbons; dioxins; furans; carbonyl compounds; total particle mass; particle composition and particle size distribution.

NAMRU-D intends to conduct a comprehensive toxicological study of the health effects of inhalation exposures to open combustion emissions. These preliminary data are an essential first step towards effectively designing future animal studies, and are currently being used by NAMRU-D’s Tri-Service Partners to develop more effective industrial hygiene programs and engineering controls in-theater.

The DRD is scheduled to be complete by Spring of 2012.
NAMRU-D and AF Scientists Submit Collaborative Research Proposals

By Dr. Jeffrey Phillips and Dr. Lynn Caldwell

Scientists from NAMRU-D, the Air Force 711th Human Performance Wing (711 HPW), and the Air Force Institute of Technology (AFIT) recently submitted several joint research proposals for funding from the Air Force Surgeon General's office (AFSG), which leverage resources and scientific expertise to address military operational problems. The proposal topics include spatial disorientation, fatigue countermeasures, and hypoxia. Each proposal addresses a specific issue by capitalizing on the unique resources of the BRAC-created Joint Center of Excellence for Aeromedical Research, Education, and Training housed at the new MGen Harry G. Armstrong complex on Wright-Patterson Air Force Base. Unique capabilities include: state-of-the-art fatigue and hypoxia laboratories, high-altitude chambers, and several one-of-a-kind devices designed to investigate specific spatial disorientation phenomena. Three of the proposals submitted to the 711 HPW for review were accepted and sent forward for final review by AFSG. The fourth proposal was accepted for funding without further review.

The first proposal submitted by NAMRU-D, 711 HPW, and AFIT, will be a collaborative approach with a main objective of determining the effects of inadequate sleep on spatial disorientation (SD) incidence and simulated flight performance. The overall goal of the study is to reduce aviation mishaps through heightened awareness of specific SD risks during night operations. In the second proposal, NAMRU-D and the Air Force Human Performance Directorate will join efforts to assess the combined effects of modafinil and an over-the-counter (OTC) alertness aid on cognitive and physical performance of airmen over the course of several days with restricted sleep. The results of this study will allow more flexible and effective use of prescription and OTC alertness-enhancing substances during military operations. The third proposal submitted, a collaboration between NAMRU-D and the U.S. Air Force School of Aviation Medicine (USAFSAM), will focus on developing a system to detect low O₂ concentrations and the presence of volatile organic compounds in air mixtures delivered by On Board O₂ Generating Systems (OBOGS). This effort aims to eliminate pilot in-cockpit loss of consciousness associated with malfunctioning OBOGS units. Lastly, the funded proposal submitted by NAMRU-D and USAFSAM will investigate the suitability of using the Reduced O₂ Breathing Environment (ROBE), a normobaric hypoxia training environment, as a proxy to high altitude chambers for flight crew hypoxia training. If successful, the ROBE will provide a significant improvement to safety and cost effectiveness over current methods.

Proposals are currently being reviewed by the AFSG Office and decisions are expected as early as October. Scientists from NAMRU-D are energized by the collaborative environment surrounding the Joint Center. This new campus allows Navy and Air Force scientists to leverage respective expertise, experience, and capabilities to solve common aeromedical issues that span across the military services.

NAMRU-D Participates at the 2011 Advanced Technology Applications for Combat Casualty Care (ATACCC) Conference

By Dr. Lynn Caldwell

The 2011 Advanced Technology Applications for Combat Casualty Care (ATACCC) Conference was held 15-18 August in Fort Lauderdale, FL. This annual meeting, sponsored by the Combat Casualty Care Research Program, is the military’s premier scientific conference and a major venue for scientists involved in both clinical and scientific activity related to military medical interests. Past conferences have focused on Army medicine; however, this year’s meeting was intended to join the efforts of Army, Navy, and Air Force members and to share their medical expertise. More than 1300 people from both military and civilian institutions across the United States attended the meeting. COL Hack, Director of the U.S. Army Combat Casualty Care Research Program, opened the conference Monday morning. Presentations throughout the week focused on human performance, dietary supplements, combat-related Posttraumatic Stress Disorder (PTSD), Traumatic Brain Injury (TBI), and wound-related issues such as infection and shock.

Dr. Richard Arnold, NAMRU-D Aeromedical Research Director, presented results from research completed over the past year on individual differences in fatigue resistance during chronic and acute sleep restriction. The presentation was well received and elicited numerous questions from the audience. CDR Simmons, NAMRU-D Executive Officer, attended the meeting as well. She had many occasions to discuss NAMRU-D’s new laboratory facility with various attendees, opening opportunities for future collaborations with Army, Air Force, and Navy scientists. Overall, the meeting served as an excellent venue for sharing NAMRU-D current and future research, meeting other scientists, and discussing future research needs in human performance.
As researchers at the Naval Medical Research Unit-Dayton (NAMRU-D) transitioned existing in-house research to Wright-Patterson Air Force Base (WPAFB) this spring, NAMRU-D leadership also sought to establish new connections with scientific institutions in the Dayton region. These connections were seen as vital in realizing BRAC’s aim of synergistically operating within the new Center of Excellence and Dayton region and achieving the goal of enhanced mission accomplishment through partner-associated growth.

In an effort to cultivate Air Force partnerships, NAMRU-D staff met with leadership from the U.S. Air Force School of Aerospace Medicine (USAFSAM) and the Air Force Institute of Technology (AFIT) to discuss emerging topics of research interest. Discussions with USAFSAM’s research leaders included topics of how NAMRU-D might aid USAFSAM in providing current and innovative technologies for their students, several potential research collaborations, and possible future aeromedical research partnerships. These discussions led to the submission of four joint research proposals to an Air Force Surgeon General sponsored Broad Agency Announcement (BAA).

Another series of meetings was conducted with representatives from the Air Force Institute of Technology (AFIT). AFIT recently created Human Systems/Factors specialty tracts within the Systems Engineering graduate programs, an area of expertise for several NAMRU-D researchers. Conversations with the AFIT Human Systems Integration Program Chair and Lead Professor explored the possibility of joint research efforts that may provide benefit to the AFIT student population and the potential for NAMRU-D staff to participate as guest lecturers for their newly developed program. NAMRU-D also reached out to several Dayton area university research institutes including the University of Dayton Research Institute (UDRI) and Wright State Research Institute (WSRI). NAMRU-D and UDRI currently have two collaborative research studies on-going and recently submitted two joint project proposals for funding. NAMRU-D hopes to form similar connections with WSRI, which develops innovative technologies to be employed by government and commercial agencies.

As NAMRU-D continues to grow and becomes an increasingly active contributor within the Dayton scientific community, it expects the number of collaborations with other scientific institutions within the region to increase significantly. These collaborations will strengthen NAMRU-D’s capability and capacity to innovate and create better solutions for the issues that face our men and women of the armed forces.

**NAMRU-D Presentations & Products**


Commanding Officer’s Corner

By CAPT Keith Syring

On September 2nd NAMRL closed its doors for the last time, concluding a year-long transition of Naval aeromedical research from NAS Pensacola to Wright-Patterson AFB. In the face of much speculation and concern about the BRAC realignment, and the daunting task of relocation, the NAMRL and NAMRU-D staffs have worked tirelessly to sustain our aeromedical research mission throughout the transition, and firmly root it in our new home in Ohio. The transition has presented many challenges to our staff members – moving their jobs and families, reestablishing laboratories, and integrating into the local research community, all while maintaining an active research portfolio focused on addressing crucial fleet needs. Now their dedication and hard work are paying off.

Several local partnerships have already been established, and we continue to pursue others. Recent exchanges with USAF 711th Human Performance Wing, Air Force Institute of Technology, Wright State Research Institute, and University of Dayton Research Institute highlight the key liaisons we are establishing in the local research community. Our outstanding aeromedical researchers and unique laboratory facilities offer an attractive partnership to local Air Force, academic, and industry partners. And, in partnering with such outstanding collaborators, NAMRU-D will ensure we provide our fleet customers the most effective research products and solutions possible.

I am thankful for the NAMRU-D staff’s enthusiasm and diligence in the establishment of our new command. With the NAMRL disestablishment this month, I’ve focused on our aeromedical mission; however, our toxicology staff, though already a resident of Wright-Patterson, has also experienced a significant transition, reorganizing into NAMRU-D. Their dedication and professionalism have been equally important in the successful establishment of this new command. As we continue forward, I encourage all the active duty, civilian, and contract personnel working together for NAMRU-D to remain motivated and focused on establishing an active role within the local research community. Your commitment to the growth and development of the command has encouraged me, and as your Commanding Officer, I look forward to our bright future.

Captain Keith Syring, USN
Commanding Officer

NAMRU-D

Commanding Officer
CAPT Keith Syring, MSC, USN

Executive Officer
CDR Rita Simmons, MSC, USN

Naval Medical Research Unit-Dayton
Wright-Patterson Air Force Base
2624 Q Street, Building 851, Area B
WPAFB, OH 45433-7955

Phone: 937-938-3914
Fax: 937-904-8813
www.med.navy.mil/sites/nmrc/Pages/namrud