

Command Profile Booklet



Research Facilities & Investigators

Version 2

Naval Medical Research Unit Dayton

Distribution A. Approved for public release, distribution unlimited (NAMRU-D-20-013)



Naval Medical Research Unit Dayton

Naval Medical Research Unit Dayton (NAMRU-Dayton) is a major Department of Defense (DoD) medical research command and home of the **Naval Aerospace Medical Research Laboratory (NAMRL)** and the **Environmental Health Effects Laboratory (EHEL)**.

As a subordinate command to Naval Medical Research Center and one of eight Navy Medicine Research & Development laboratories, NAMRU-Dayton conducts aerospace medical and environmental health effects research to enhance warfighter health, safety, performance and readiness.

With two unique science labs, our research addresses identified fleet needs, and results in products and solutions ranging from basic knowledge, to fielded technologies.

MISSION

To maximize warfighter performance and survivability through premier aerospace medical and environmental health effects research.

VISION

Working with military, government, academic and industry partners, we will develop innovative solutions for the aeromedical and environmental health threats faced by our Navy and Marine Corps.





Co-location with the Air Force Research Laboratory at Wright-Patterson Air Force Base, Ohio facilitates direct collaboration and leverages unique research capabilities.

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CONNECT WITH US

 @NavalMedicalResearchUnitDayton

 @NAMRUDayton

 Naval Medical Research Unit Dayton

 www.med.navy.mil/sites/nmrc/Dayton



Naval Aerospace Medical Research Laboratory Director

Dr. Richard Arnold, Ph.D.

(937) 938-3877

richard.arnold.10@us.af.mil

Environmental Health Effects Laboratory Director

Dr. Karen Mummy, Ph.D., DABT

(937) 904-9474

karen.mummy@us.af.mil

WORKING WITH US



Cooperative
Research &
Development
Agreements



Educational
Partnership
Agreements



Support
Agreements



International
Agreements

NAMRU-Dayton participates in a wide variety of collaborative efforts with military, government, academic and civilian research organizations. Our goal is to achieve the customer's research objectives in a cost-effective, expeditious and professional manner. We have the capability of conducting benchtop, animal and human research as well as our own Institutional Review Board (IRB) to monitor our human research protocols.

COMMAND LEADERSHIP

Captain Nimfa Teneza-Mora
Commanding Officer



Captain Dennis Faix
Executive Officer



Dr. Richard Arnold
Director, NAMRL



Dr. Karen Mumy
Director, EHCL



**Lieutenant Commander
Julia Hardy-Carr**
Director, Administration



NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY

FACILITIES

Naval Aerospace Medical Research Laboratory

**NAMRL
FACILITIES**

The Naval Aerospace Medical Research Laboratory (NAMRL) is equipped with research capabilities in acceleration and sensory science, environmental physiology, biomedical sciences, and engineering and technical services, all of which are supported by a unique collection of state-of-the-science research devices. Our unique research portfolio enables NAMRU-Dayton to transition validated knowledge and effective technologies to the fleet to sustain and enhance performance and mitigate and prevent leading factors associated with flight mishaps, aerospace health threats, and aircrew performance.

Departments

Acceleration & Sensory Sciences Dept.

Biomedical Sciences Dept.

Engineering & Technical Support Services Dept.

Environmental Physiology Dept.

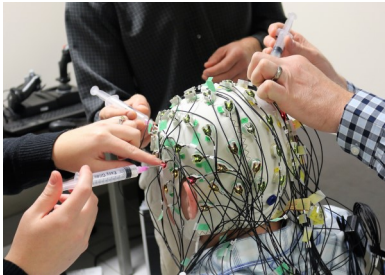
Core Science Facilities

- Altitude Labs
- Applied Physiology Labs
- Electroencephalography Lab
- Fatigue Assessment & Countermeasures Lab
- Fabrication Shop
- Acceleration and Motion Effects
 - Disorientation Research Device – the Kraken™
 - Motion Base System (MOOG)
 - Neuro-Otologic test Center (NOTC)
 - Visual Vestibular Sphere Device (VVSD)
- Laser Lab
- Mixed Reality Simulation Lab
- MV-22 Osprey Static Display Lab
- Respiratory Physiology Labs
- Sensors Lab
- Spine Biodynamics Lab
- Spatial Disorientation Simulator Labs
- Vision Lab & Eye Lane
- Night Vision Goggle Lab
- Wet Lab

In addition, NAMRU-Dayton has access to the DoD's only human centrifuge via the Air Force Research Laboratory (AFRL).

Altitude Effects

ELECTROENCEPHALOGRAPHY LAB



- **64 channel Brain vision ActiCHamp EEG system**

Active electrode system used to record electrophysiological brain data

REDUCED OXYGEN BREATHING ENVIRONMENT

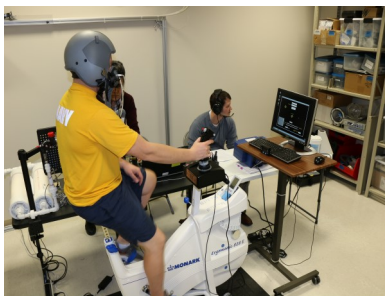


- **1 Reduced Oxygen Breathing Environment (ROBE)**

Designed for multiple subject exposure.

- 35,000 ft. in altitude replication

RESPIRATORY PHYSIOLOGY LAB



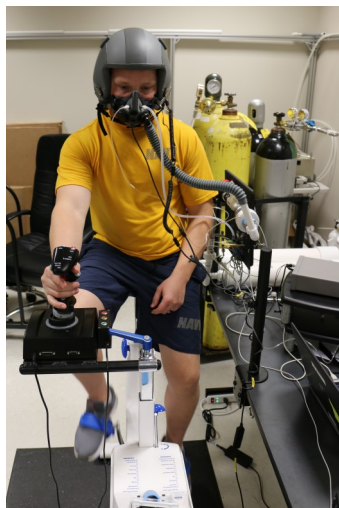
- **1 Hans-Rudolph breathing simulator**

Piston-driven, programmable device to simulate human respiration to test regulators, masks, or other breathing systems at various levels of breathing demand. Can be combined with Sensors Lab chamber to simulate heated and humidified breathing in hypobaric environments.

- Various sized head forms for unmanned test and evaluation of dynamic breathing and equipment function of gas delivery systems, regulators, etc.
- 3 gas drop stations plumbed from the neighboring gas supply room with piping to deliver mixtures of breathing air, O₂, CO₂ and N₂.

Altitude Effects

RESPIRATORY PHYSIOLOGY LAB



- **4 Reduced Oxygen Breathing Devices (ROBD)**

Portable, computerized, gas-blending device that delivers normoxic (21% O₂), and hypoxic (<21% O₂) air mixtures through a mask without exposing subjects to environmental pressure changes. Capable of exposures up to 34,000 ft.

- **1 gas switching apparatus**

Able to change gas sources automatically and remotely. This apparatus will be used to explore a wide range of impacts and insults from fluctuating O₂.

- **1 F-35 mock cockpit* equipped with F-35 ejection seat, harness, seat portion assembly; throttle and joystick, and physiologic monitoring equipment. Currently used to test the pulmonary, cognitive, and postural impacts of F-35 pilot flight equipment and ejection seat harnessing.**

*Skeleton on loan from 711 HPW/RHA

- **1 Easy One Pro device with one impulse oscillometry device***

Measures various pulmonary function metrics, capacities, volumes, gas dilution, inspiratory and expiratory pressures and airway resistance.

*On loan from 711HPW/USAFSAM/FECI



- **2 Monark cycle ergometers**

Used to introduce various levels of physical demand and breathing dynamics in participants.

- **2 MinXRay devices**

Portable X-ray devices used for lab and field assessments of chest imaging to detect aero-atelectasis amongst the high performance aviation community.

Altitude Effects

RESPIRATORY PHYSIOLOGY LABORATORY



- **1 Hypoxia-Ventilation Research Device (HVRD)**

Computerized, gas blending instrument designed to replicate the life support system of tactical aircraft under a variety of conditions. The HVRD will allow operators to dynamically manipulate gas pressure and flow, as well as deliver a broad range of gas mixtures and concentrations through a standard aviation mask without exposing subjects to the environmental pressure changes.

- **Cardio-respiratory accessories**

Various masks, valves, sampling lines, tubing and hoses, pneumotachometers to measure instantaneous flows during breathing, pressure transducers to measure pressures, head harnesses and oxygen and capnography monitors for measuring O₂ and CO₂ concentrations.

- **Physiologic monitoring devices and software**

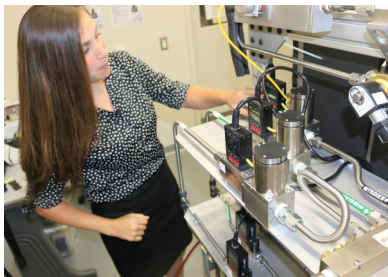
Heart rate; respiration rate; pulse oximeters; beat by beat blood pressure; transcutaneous CO₂; urine specific gravity; in-house software for calculation of respiratory parameters, i.e., minute ventilation, tidal volume, breathing frequency, peak flows, end tidal CO₂, external work of breathing, and calculation of virtual shunt.



- **Aircrew Flight Equipment (AFE) Scale** with stadiometer for measuring height and weight and calculated body mass index; high precision anthropometer set with adjustable branches; two Lange skinfold calipers.

Altitude Effects

SENSORS LABORATORY



- **Small hypobaric environmental chamber**

Designed to replicate the dynamic tactical aviation environment. The chamber allows to independently, or simultaneously, control five distinct parameters of the simulated tactical aviation environment: gas concentration, flow, temperature, humidity, and pressure/altitude. The chamber can be used for verification and validation of developing sensor suites and commercial -off-the-shelf (COTS) devices, and for safe-to-fly rapid decompression testing of aeromedical devices (MIL-STD-810G).

- 20.5" x 20.5" x 20.5" internal dimensions
- Concentration: 1-100% concentrations of O₂ and CO₂ delivered via mass flow controllers and gas mixing system, verified by gas sensors in line and mass spectrometer
- Pressure/Altitude: 0-60K ft. verified by multiple pressure sensors located in line and in the chamber; capacity for rapid decompression
- Flow: 0-500LPM delivered by mass flow controllers and verified by mass flow meter; capacity for 1000LPM of single gas
- Temperature: 45°-140°F delivered through heating elements and verified by thermometer in line and in the chamber
- Humidity: 0-100% controlled and verified through thermistor and humidity sensor in line and in the chamber

- **Perkin-Elmer MGA 1100 Mass Spectrometer**

Provides precise measurements for verification of delivered gas concentrations

- **SOGEVAC SV 200 Vacuum Pump**

3600+LPM flow capacity; 3x the previously used pump.

- **ISO 16900-5 Head Forms**

Each has a standardized trachea to ensure proper simulated breathing measurements and includes pickups for measuring mouth pressure, gas sampling and temperature.

Applied Physiology

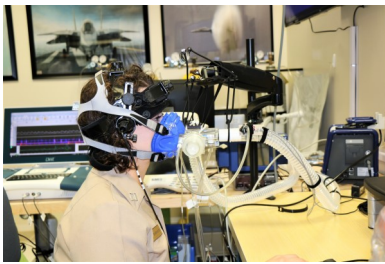
AEROSPACE OPERATIONAL PHYSIOLOGY LABORATORY



- **Metabolic Measurement Systems:**
measure breath-by-breath expired gases to assess metabolism, respiration and ventilation. Can be used in hypoxia.
 - Vmax Encore Metabolic Cart
 - MetaMax Portable Metabolic System: can be used in field as it is wireless
- **Cardiovascular/Respiratory Assessment**
 - Polar heart rate monitors
 - Equivitals: monitor heart rate, breathing rate, accelerometry
 - Zephyr Biomodules: provide physiological status across more than 20 variables
 - Finapres NOVA fingertip plethysmography, noninvasive continuous blood pressure with ECG
 - CNAP continuous blood pressure monitor
 - Wired and wireless Nonin reflectance and transmittance pulse oximeters
 - Transcutaneous oxygen and carbon dioxide monitors
 - Custom multi-source breathing gas delivery system
 - Gas switching apparatus: able to change gas sources automatically and remotely
 - Various oronasal respiratory equipment to measure instantaneous flows during breathing, pressure transducers to measure mask pressures

Applied Physiology

AEROSPACE OPERATIONAL PHYSIOLOGY LABORATORY



- Gas analyzers (O₂, CO₂)
- Custom software for calculation of respiratory parameters, i.e., minute ventilation, tidal volume, breathing frequency, peak flows, end tidal CO₂, external work of breathing

• Cerebral Hemodynamics and Oxygenation

- Continuous-wave near infrared spectroscopy (NIRS) systems with 2-3 penetration depths
- Transcranial Doppler Ultrasound: to assess cerebral, ocular and carotid blood flow velocity
- Custom 2-channel frequency domain NIRS with diffusive correlation spectroscopy to assess cerebral hemodynamics, cerebral oxygenation, cerebral blood flow and cerebral edema



• Skeletal Muscle Hemodynamics

- Artinis PortaMon systems: near infrared spectroscopy with 3 penetration depths

• Blood Analysis: various

Applied Physiology

AEROSPACE OPERATIONAL PHYSIOLOGY LABORATORY



• Thermoregulation

- Equivital skin and core temperature monitoring system
- HQ Inc core temperature monitoring system
- Laser Doppler skin blood flow, heat flux and skin temperature
- Wireless skin temperature monitors
- Macroduct sweat collection system
- Absorbent patches for sweat collection and rate measurements
- Custom skin and oral temperature monitoring system
- Temperature probe calibration system: automated, triple point of water reference, water baths
- Weather Station with wet bulb globe temperature
- Refractometer for urine specific gravity
- Sweat gland density measurements
- Precision balances to 1 mg



• Ergometers

- Woodway Curve Treadmill: non-motorized, at will, instantaneous speed increase/decrease, with resistance
- Woodway 4Front Treadmill
- Custom Woodway 4Front Treadmill: up to 16.5mph, up to 25% grade, incline or decline
- Lode Corival Cycle: electromagnetically braked
- Lode Excalibur Sport Cycle Ergometer: electromagnetically braked

Applied Physiology

AEROSPACE OPERATIONAL PHYSIOLOGY LABORATORY

- Lode Excalibur Sport Cycle Ergometer with Pedal Force Measurements and Wingate: electromagnetically braked
- Stepmill

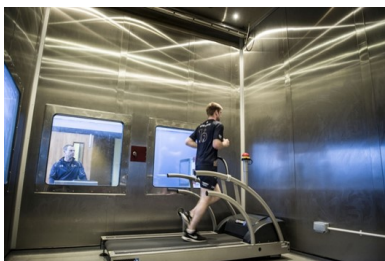
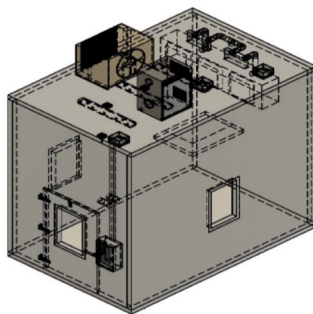
- **Multi-Environmental Chamber (MECha)**

1800 ft³ combined environments chamber for human performance testing.

- Can control temperature, humidity, oxygen concentration
- Combined exposures can be created simultaneously to better reflect the aerospace or other operational environments
- Can be used for short and long duration exposures
- Can be used for physical performance tests using treadmills, step mills and bikes as well as cognitive tests, flight simulation, and shipboard operations (e.g., bridge, Combat Information Center, damage control)

Specifications

- Temperature: -20°C to 50°C; ability to produce radiant infrared heat to simulate the direct rays of the sun if desired
- Relative humidity: 5%-95%.
- High dynamic capability (can quickly change temperature and humidity to accommodate the most grueling ramp protocol)
- Normobaric hypoxia: up to 22,000 ft-equivalent to simulate high altitude or low quality breathing air
- Hypercapnia: up to 5% carbon dioxide to simulate conditions such as resistive breathing from a pilot's faulty mask valve, disabled submarines, or confined conditions on the International Space Station



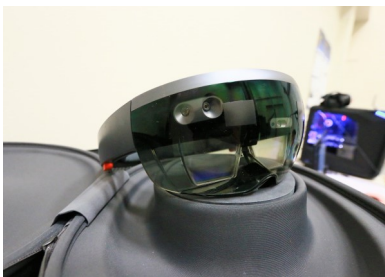
Acceleration & Motion Effects

DISORIENTATION RESEARCH DEVICE – THE KRAKEN™



- One-of-a-kind research platform capable of multi-axis motion as experienced by up to two subjects in yaw, pitch, roll, heave while undergoing planetary and linear accelerations, up to 3Gz sustained.
- Device provides an unmatched authenticity in vehicular motion.
- All can be controlled by the subject as a man in the loop research system.
- As an RDT&E platform, supports several key Human Systems Integration domains.

MIXED REALITY SIMULATION LABORATORY



- **2 Visual reality headsets**
Headsets that can display a variety of self-contained virtual environments for testing or training purposes.
- **2 Augmented reality headsets**
Headsets that can display information overlaid on the actual environment.
- **1 Multi Axis Balance Perturbation Platform**
Six degree-of-freedom platform that can replicated motion profiles of various modes of transport and can be synchronized to a virtual environment display.

Acceleration & Motion Effects

NEURO-OTOLOGIC TEST CENTER (NOTC)



- Three axis rotary chair with full field optokinetic stimulus and a digital eye tracking system with a vast range of vestibular, optokinetic and oculomotor testing abilities.
 - 50 RPM maximum
 - 0-30 degrees off-vertical tilt range
 - 400 degrees per second maximum chair velocity

MOOG DEVICE



- A 6 degree of freedom motion platform.
- Seat with 5-point harness and helmet to control head motions.
- Features yaw, pitch, roll, vertical, x, and y axes of motion.

VISUAL VESTIBULAR SPHERE DEVICE (VVSD)



- Offers visual and vestibular stimuli isolation through the independent control of subject and visual field rotation.
- Allows for the evaluation of spatial reflexes as they relate to the stabilization of retinal images.
- 30 RPM rotations in the same or opposite directions.

Acceleration & Motion Effects

SPATIAL DISORIENTATION SIMULATOR LABORATORIES



- 5 flight simulation stations with a wide range of fields-of-view
- Day and night flight simulation capability with full flight parameter and pilot performance data recording modules
- In-flight helmet mounted display research capability in collaboration with USAF and the University of Iowa

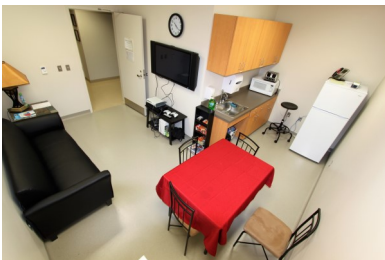


Fatigue

FATIGUE ASSESSMENT & COUNTERMEASURES LABORATORY



- Test and house research participants 24 hours/day over several days
- 2 sound-attenuated, shielded test rooms with separate observation room for researchers
- 2 fully-outfitted bedrooms for polysomnography (PSG) recordings
- 1 participant lounge with refrigerator, microwave, sofa and entertainment devices



Aircrew Neck/Back Pain & Injury

OPERATIONAL BIOMECHANICS & ERGONOMICS (OBiE) LABORATORY



- **24 Camera Prime 13/13W/x22/Color Optitrack system & 8 Camera Flex 3 Optitrack System**

Passive infrared full-body motion tracking system with sub-millimeter accuracy*

- 17 Sensor Xsens MVN Analyze Full Body Inertial Measurement Unit (IMU) motion tracking system

- 15 Sensor Xsens MTw Awinda IMU motion tracking system, portable kinematic measurements

- GazePoint GP3 HD Eye Tracker

- **TEMA 6D** - Software to analyze 3D motion from video camera data (5x GoPro HERO8 cameras)

- **Bertec Corporation FP6090-15 Force Plate**

Measures three-dimensional forces and moments for biomechanical modeling*

- **AMTI AccuSway Force Plate and Biodex BioSway**

Measures three-dimensional balance and sway

- **Clinical Lumbar Motion Monitor**

Clinical measurement system to dynamically assess low back function, structural/muscular pathology, test reliability, and ability to return-to-work*

- **Shimpo Digital Force Gauge**

Ergonomics force measurement

- **Hand and pinch dynamometer kits**

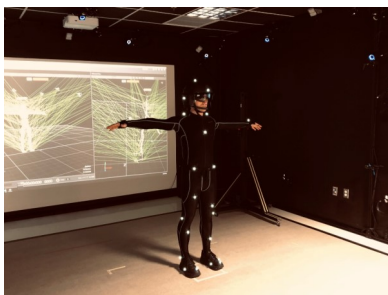
Strength measurements

- **Artinis PortaLite Near-Infrared Spectroscopy (NIRS) system**

Measurement of localized muscle oxygenation

Aircrew Neck/Back Pain & Injury

OPERATIONAL BIOMECHANICS & ERGONOMICS (OBiE) LABORATORY



- **32 Channel Delsys Trigno Wireless Electromyography System**
Continuous measurement of multiple muscle systems. Trigno Snap-Leads, Trigno Quattro, Trigno Duo Sensors
- **MotionMonitor System**
Multiple biomechanical systems and biofeedback integration for turn-key data collection. Synchronizes motion capture, physiological sensors, virtual reality, EEG, eye tracking, and biofeedback systems, also provides biomechanical analysis
- **Motive (Optitrack) and STT Insight Rehab**
Motion capture systems integration with EMG and force plates
- **Visual3D**
Biomechanics modeling and analysis
- **Oculus Rift Virtual Reality System**
- EksoVest, SuitX, and Levitate exoskeletons
- HGU-56P Rotary Wing Helmets (XS-XL)
- **dorsiVi Movement Suite**
Clinical analysis of movement and muscle activity, rehab gamification

MV-22 OSPREY STATIONARY DISPLAY LABORATORY



- Will be used to conduct static aerospace medical research to provide solutions toward preventing musculoskeletal injury to tilt-rotor aircraft crew
- Will be used to study en route care to determine the most useful way to load and employ aircraft in that role.

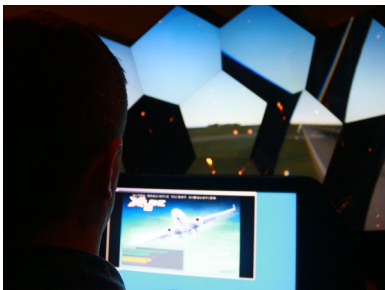
Vision Standards & Performance

VISION LABORATORY & EYE LANE



- **Ocular Coherence Tomography and Retinal Photography**
Imaging technologies
- Multiple computerized color vision testing and color discrimination tasks
- Video mosaic collimated light flight simulator
- Canopy laser veiling glare simulator
- Indoor simulated marksmanship training with visual search capabilities; M9 and M4 compatible
- **Level 4 Mission Oriented Protective Posture (MOPP) gear** for simulated human performance in chemical, biological, radiological, or nuclear (CBRN) threat environments
- 4 Camera Smart Eye flight simulator cockpit eye tracking system

NIGHT VISION GOGGLE LAB



- **Night Vision Compatible Non-Motion Simulator**
Stand-alone, non-motion flight simulator capable of generating simulated free flight and pre-programmed flights in night environments for night vision device (NVD)-related spatial disorientation (SD) research, low light level unaided SD research, and test and evaluation of improved NVDs. The simulator is also capable of generating NVD compatible SD training scenarios and nighttime mishap re-creations.

Additional Facilities

FABRICATION SHOP



- 10,000 sq. ft. facility on-site containing \$300k worth of industrial machinery.
- Equipped to construct in-house research devices, reconfigure existing devices, and perform a wide range of fabrication supporting research requirements.



WET LABORATORY



- Vitals monitoring equipment
- Portable blood chemistry analyzer
- Tabletop centrifuge for specimen processing
- Lab refrigerator for blood storage
- -80 degree freezer for long-term plasma storage
- Tabletop blood chemistry analyzer
- Research staff credentialed in phlebotomy and/or blood chemistry analysis

ENVIRONMENTAL HEALTH EFFECTS LABORATORY

FACILITIES



Environmental Health Effects Laboratory

The Environmental Health Effects Laboratory (EHEL) assesses potential health effects associated with exposure to various environmental stressors our military encounters, such as physical stressors and chemical and material hazards. EHEL evaluates the effects of exposure from multiple standpoints. The ultimate objective is to generate appropriate data used in the development of health protective exposure standards for our military and civilian populations.

Departments

Behavioral, Cognitive & Neurophysiology Dept.

Occupational & Environmental Health Dept. (Environmental Toxicology)

Inhalation Toxicology Dept.

Technical Research Support Dept.

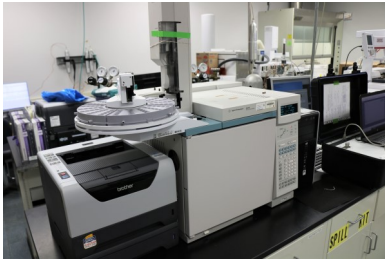
Core Science Facilities

- Analytical/Chemistry Lab
- Animal Exposure Facility
- Animal Hearing Assessment Lab
- Animal Imaging Lab
- Animal Pulmonary Assessment Facility
- Cell/Tissue Culture (In vitro)
- Pre-clinical Assessment Lab
- Animal Behavioral/Cognition
- Neuroelectrophysiology
- Physical Performance
- Molecular Biology
- Rodent Centrifuge

In addition, NAMRU-Dayton has a Veterinary Pathologist and access to an AAALAC accredited animal facility operated by the Air Force Research Laboratory, which has necropsy, surgical and histology capabilities.

Health Effects

ANALYTICAL LABORATORY



- **Agilent 7890/5975 GC/MS with Markes Thermal Desorption Unit**

Identifies and measures volatile and semi-volatile organic compounds

- **Agilent 7890 GC with a 5975 MS**

Capable of direct injection and headspace injection and solid phase micro-extraction

- **Agilent 6890 GC with dual micro electron capture detectors**

Analysis of pesticides/herbicides and halogenated hydrocarbon compounds



- **Waters e2695 XE HPLC with an Aquity QDa mass spectrometer**

Allows for sensitive, targeted analyses on specific compounds

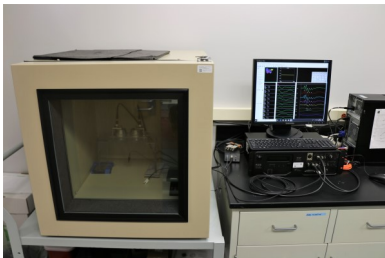
- **Agilent 7900 ICP-MS**

Enables characterization of metals in environmental and biological samples

- **Agilent 6545 QTOF with Infinity 1200 UHPLC**

Determination of metabolite and lipid profiles in biological samples

ANIMAL HEARING ASSESSMENT LABORATORY



- **Electrically shielded sound attenuating booth**

- **Distortion Product Otoacoustic Emissions (DPOAE) testing**

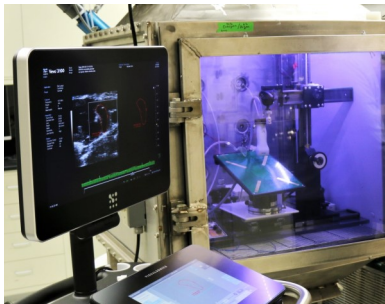
Measures the level of cochlea response

- **Broadband and narrow frequency Auditory Brainstem Response (ABR)**

Measures amplitude and latency of evoked responses at ABR waves I-V

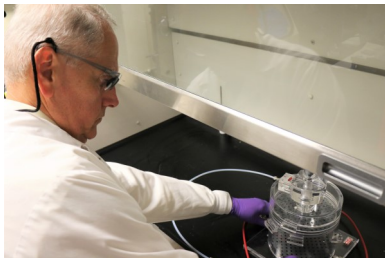
Health Effects

ANIMAL IMAGING



- **Visualsonics Vevo 3100 ultra-high frequency ultrasound system**
Allows *in vivo* non-invasive visualization of anatomical and physiological changes in vascularized structures, including real-time responses during acute exposures

ANIMAL PULMONARY ASSESSMENT FACILITY



- **DSI Buxco plethysmography system**
Measures respiratory physiology in rodents with either using a whole body plethysmograph system or dual chamber plethysmograph systems
- **SCIREQ Flexivent system**
Measures pulmonary parameters such as lung resistance and compliance in rodents
- **MouseOx Plus system**
Uses pulse oximetry to non-invasively measure blood oxygenation and can measure heartrate and breathing rate in rodents

MICROSCOPY FACILITIES



- **Two fully equipped epi- fluorescence microscopes, Olympus BX51 upright and Leica DMI6000 B Inverted**
- **Leica DNi8 confocal microscope**
Features both the high sensitivity and speed required for both fixed and live cell and tissue fluorescent imaging
- **Horiba LabRAM HR Evolution NIR Confocal**
Raman spectroscopy macro and micro measurements in 2D and 3D space

Health Effects

MOLECULAR BIOLOGY FACILITIES



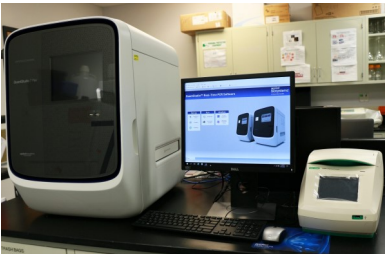
- **Agilent SureScan Microarray Reader**

Allows for investigations of gene copy number alterations, single nucleotide polymorphisms, differential transcriptomics and gene expression, and comparative genomics



- **Illumina MiSeqDx next generation DNA sequencer**

Sequencing of DNA samples; Aids in the profiling of complex microbial communities to ascertain microbiome responses to environmental exposures



- **Beckman Coulter MoFlo AstriosEQ flow cytometer with cell sorter**

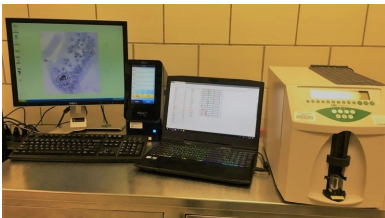
- **Meso Scale Discovery multiplex microplate system**

Provides high sensitivity and multiplex measurement of molecules in biological samples

- **QuantStudio 6 qPCR**

Allows for real-time PCR analyses

PRE-CLINICAL LABORATORY



- **Abaxis Vs2**

State-of-the-art chemistry, electrolyte, immunoassay and blood gas analyzer for use with whole blood, serum or plasma

- **Hemavet 400**

Hematology analyzer

- **Gem 400**

Blood gas analyzer

- **GEM PCL+**

Measures blood clotting time

- **Hamilton Thorne IVOS Sperm analyzer**

Allows for evaluation of sperm count, morphology and motility

Health Effects

NEUROBEHAVIORAL LABORATORIES



- **Dynamic Weight Bearing**
Designed to measure paw placement and muscular and joint pain

- **Cincinnati Water Maze**
Assess learning and memory using egocentric navigation

- **Elevated Plus Maze**
Assess anxiety

- **Functional Observational Battery (FOB)**
Measures changes in animal appearance and behavior

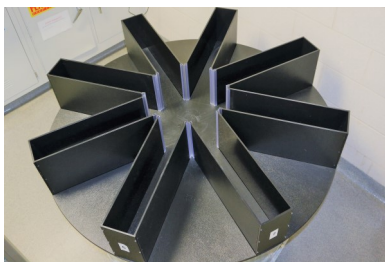


- **Kinetic Weight Bearing**
Designed to measure gait and movement

- **Morris Water Maze**
Spatial learning and memory

- **Zero Maze**
Assess anxiety

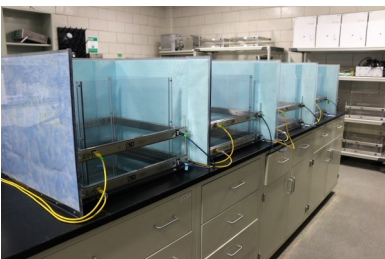
- **4 Novel Object Recognition (NOR)**
Assess learning and memory and decision making



- **Passive/Active Avoidance (shuttle box)**
Assess conditioned learning and memory

- **Radial Arm Maze**
Assess spatial learning and memory

- **8 Open field activity chambers**
Measures general activity levels, exploratory behaviors and stress



- **4 Acoustic startle chambers**
Measures brain stem reflexive response and sensory motor gating

- **8 Active/Passive avoidance chambers**

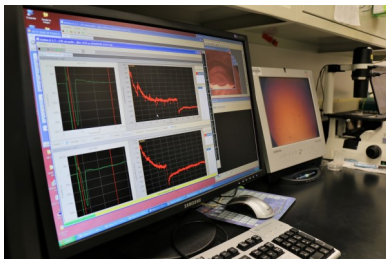
Health Effects

NEUROBEHAVIORAL LABORATORIES

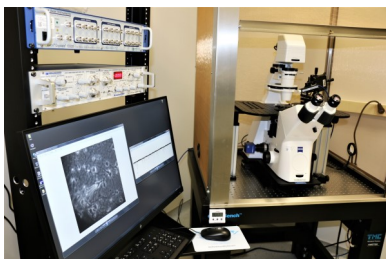


- **12 Rotarod systems** (12 tall drop height)
Measures animal coordination and endurance in real- time (in chamber) and post exposure settings
- **8 Real-time (in chamber) open field activity systems**
- **Porsolt Forced Swim apparatus**
Measures learned helplessness as an animal model of depression
- **Tail flick pain threshold meter**
Measures animal pain sensitivity
- **Ultrasonic vocalization detection system**
Measures a variety of animal vocalizations

NEUROPHYSIOLOGY LABORATORY

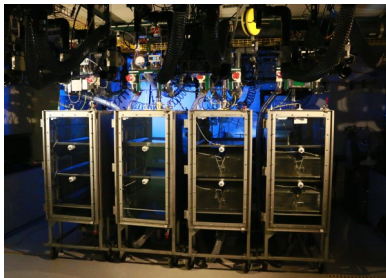


- **Microelectrode dish system (MED64)**
Assess electrophysiological activity in live brain tissue slices. Quantitates the effects of exposures to a chemical or stressor on the nervous system and can provide preliminary information regarding the mechanism of effect
- **Wireless *in vivo* electrophysiology system**
Assess neuronal activity in freely moving animals. Ideal for real time detection of central nervous system effects resulting from exposures to a chemical or stressor. Designed to determine if effects are acute, transient, persistent, progressive, and or delayed.
- **Patch clamp electrophysiology system**
Assess electrical activity in individual neurons. Designed to investigate the precise mechanism of effect, pinpointing specific ion channel, receptor or other synaptic protein that is the ultimate target of effects.



Operational Exposures

ANIMAL ENVIRONMENTAL EXPOSURE LABORATORY



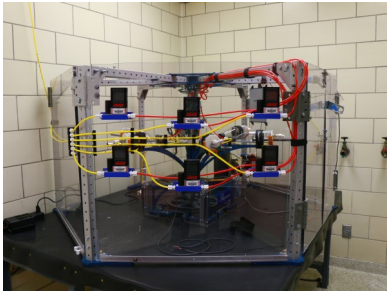
- Capable of simultaneously testing chemical exposures with environmental stressors
- **18 Whole-body animal inhalation systems.**
Total exposure capacity: 2,304 rodents
 - 4 2000 L H2000 whole-body inhalation chambers
 - 16 1000 L H1000 whole-body inhalation chambers
 - 4 690 L Toxic Hazard Research Unit (THRU) Chambers



- **22 Nose-only inhalation systems.**
Total exposure capacity: 760 rodents
 - 13 52-port units
 - 7 12-port units
 - 2 mobile units
- **3 Continuous Noise Generation Units for H1000 Whole-Body Inhalation Chambers**
- **3 Impulse Noise Generation Units for H1000 Whole-Body Inhalation**
- **2 690 L Modified THRU Altitude Simulation Chambers (<20,000 MSL)**
- **2 750 L Abbess Altitude Simulation Chambers (<50,000 MSL)**
- **2 Mini Hyperbaric Chambers**

Operational Exposures

ANIMAL ENVIRONMENTAL EXPOSURE LABORATORY



- **Rodent centrifuge**

Custom built centrifuge designed for rodents

- Capable of reaching 1-9 g-s in a rat model of exposure.
- Capable of simultaneously exposing a rodent model to a chemical (via inhalation) at the same time as g-force.

CELL CULTURE FACILITIES



- **Standard tissue culture facilities and supporting equipment**

For designing and building cellular models for exposure

- Sterile hoods
- 4 CO₂ incubators
- Centrifuges

- **Unique exposure capabilities**

Ability to leverage our environmental exposure facilities to also expose cells and tissue models

NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY



INVESTIGATORS



NAMRL INVESTIGATORS

Richard Arnold, Ph.D.

Director, Naval Aerospace Medical Research Laboratory



- Aviation Psychology
- Test & Scale Construction
- Personnel Selection Testing
- Differential Psychology

Dr. Arnold serves as the Director, Naval Aerospace Medical Research Laboratory (NAMRL) at Naval Medical Research Unit Dayton (NAMRU-Dayton). His Navy research career began in 1999 when he was commissioned as a US Naval Aerospace Experimental Psychologist. After completing Officer Indoctrination School at Newport, RI and the aeromedical officer course and flight training at Naval Air Station (NAS) Pensacola, FL and NAS Whiting Field, FL he was assigned to Naval Aerospace Medical Institute (NAMI), Pensacola, FL, where among other duties he administered the Navy's aviation personnel selection testing program. He was subsequently assigned to Naval Air Warfare Center, Training Systems Division (NAWC TSD), Orlando, FL, where he conducted research on simulation technologies and training effectiveness. From 2006 to 2008 Dr. Arnold ran a small consulting firm specializing in aeromedical and human factors research.

In 2008 he returned to the Navy as a civilian staff scientist at NAMRL, NAS Pensacola. He was promoted to Acting Scientific Director in 2009 and Scientific Director in 2010. His research at NAMRL included work in aviation personnel selection and fatigue countermeasures. As Scientific Director he was responsible for execution of NAMRL's research mission, spanning a range of aeromedical and aviation human factors topics such as motion sickness countermeasures, spatial orientation, fatigue effects and countermeasures, altitude effects, vision sciences, personnel selection and aeromedical standards.

In 2011 he relocated with the laboratory, as directed by the Base Realignment and Closure Act of 2005, to Wright-Patterson AFB, OH, since which time he has continued to direct the activities of the aeromedical lab at NAMRU-Dayton.

Dr. Arnold is an active member of the Aerospace Medical Association and the Department of Defense (DoD) Human Factors Engineering Technical Advisory Group. He serves on numerous DoD and non-DoD boards and panels, including chair of the JPC-5 Aviation Mishap Prevention Working Group, NAMRU-Dayton representative to the Ohio Federal Research Network, and NAMRU-Dayton representative on the DoD/FAA Aeromedical Research, Alignment and Coordination (AMRAC) Working Group. He served as 2018 Chair of the DoD Human Factors Engineering Technical Advisory Group.

Kara Blacker, Ph.D.
Research Psychologist

- Cognitive Neuroscience
- Cognitive Training
- Neuroimaging
- Electroencephalography

Dr. Blacker is a research psychologist with NAMRL at NAMRU-Dayton. Dr. Blacker's area of expertise is in cognitive neuroscience. Dr. Blacker studies the cognitive and neural effects of hypoxia using methods like electroencephalography (EEG) and functional brain imaging. Dr. Blacker received her Ph.D. from Temple University, specializing in the study of cognitive training and perceptual expertise. Prior to joining the team at NAMRU-Dayton, Dr. Blacker completed a postdoctoral fellowship at Johns Hopkins University studying the neural basis of working memory and the neural underpinnings of effective cognitive training.

J. Lynn Caldwell, Ph.D.
Senior Research Psychologist



- Fatigue Assessment
- Fatigue Countermeasures
- Circadian Disruption

Dr. Caldwell is a senior psychologist at NAMRU-Dayton. Her research interests include assessment of the impact of long periods of wakefulness and/or circadian desynchronization on performance. In addition to research, she frequently provides fatigue-management workshops, safety briefings, and training courses to aviation personnel, flight surgeons, commanders, and safety officers. She serves as a fatigue consultant for a variety of military and civilian groups. Past roles include working at the U.S. Army's Aeromedical Research Laboratory performing human-factors research, conducting numerous simulator and in-flight investigations on fatigue countermeasures and circadian rhythms in rated military pilots. She is certified by the American Academy of Sleep Medicine as a Board-Certified Sleep Specialist and is a Fellow of the American Academy of Sleep Medicine, the Aerospace Medical Association, and the Aerospace Human Factors Association.

Matthew Funke, Ph.D.
Research Psychologist



- Cognitive Psychology
- Non-Invasive Cerebral Monitoring
- Workload & Stress Assessment

Dr. Funke is a research psychologist at the NAMRU-Dayton. Dr. Funke received his doctorate in human factors psychology from the University of Cincinnati, concentrating in sustained attention, workload, and stress measurement. Following a post-doctoral appointment with the Air Force Research Laboratory, Dr. Funke joined NAMRU-Dayton where he is currently investigating the effects of hypoxia, altitude, and other elements of the flight environment on human performance.

NAMRL INVESTIGATORS

Megan Gallo, MS *Research Physiologist*



- High-G Acceleration
- Anti-G Straining Maneuver
- Hypobarica
- Hypoxia
- Thermal Stress
- Aircrew/Pilot Flight Equipment
- Aerospace Physiology
- Exercise Physiology

Megan Gallo is a Research Physiologist at NAMRU-Dayton. She joined NAMRL in 2016 and serves as Principal Investigator, Co-Investigator, or Test Lead for a variety of human performance and aerospace physiology related research. In her current position, Gallo provides research direction and support by designing, conducting, and overseeing various research efforts and collaborations. Her research experiences include: designing applied, operationally relevant investigations; correlating lab and field based assessments of physical performance; and, studying physiologic responses to abnormal stressors of the aerospace environment, such as, hypoxia, hypobarica, Gz acceleration, thermal burden, and the protections and implications of aircrew worn flight equipment. In addition to research, Gallo teaches the USAF Aerospace and Operational Physiology Officer (AOPO) Acceleration 101 course annually, was previously an instructor for the US Navy and US Marine Corps Centrifuge-based Flight Environment Training (CFET) program (Wyle, 2013-2014), and taught exercise physiology labs at the University of Dayton for many semesters. Gallo earned a Bachelor of Science (2009) and a Master of Science (2011) in Exercise Science from the University of Dayton.

Peter Le, Ph.D. *Biomedical Engineer*



- Biomechanics
- Low Back & Neck Pain
- Human Factors & Ergonomics

Dr. Le is a research biomedical engineer for NAMRL at NAMRU-Dayton. He serves as the PI of the Operational Biomechanics & Ergonomics (OBiE) Lab to address musculoskeletal disorders, neck pain, and low back pain in aviators and aircrew. Dr. Le holds a Ph.D. in Industrial and Systems Engineering (Biomechanics and Ergonomics) from The Ohio State University with minors in Applied Mechanics and Rehabilitation Science and has extensive research training from the Spine Research Institute. He also holds an M.S. in Engineering Systems (Mechanical Specialty, Bioengineering Subspecialty) from the Colorado School of Mines and a B.S. in Mechanical Engineering from the University of Colorado Denver. Dr. Le's research portfolio is funded by various sources including the Joint Program Committee-5 (JPC-5), Defense Health Program 6.7 (DHP 6.7), and the Office of Naval Research (ONR). His current research focuses on the biomechanical and physiological effects of low-level physical loading for long durations (i.e., aircrew/aviator seating), mind-body (biomechanical-cognitive) interactions, occupational loading within the aviation environment (i.e., aircrew and maintainers), and technologies for the quantitative assessment of spine function and rehabilitation.



Daniel McHail, Ph.D.
Research Psychologist



- Neuroscience
- Electrophysiology
- Learning & Memory

Dr. McHail is a research psychologist at NAMRU-Dayton, where he investigates maximizing warfighter cognitive performance. Dr. McHail received his doctorate in neuroscience from George Mason University, specializing in molecular, physiological, and behavioral neuroscience. He was awarded a DoD Science, Mathematics, and Research for Transformation (SMART) scholarship in 2017. His research focuses on impacts of fatigue, spatial disorientation, motion sickness, and hypoxia on aviators and aircrew, and on the underlying neural mechanisms and countermeasures for these threats.

Michael Reddix, Ph.D.
Senior Research Psychologist
Technical Advisor



- Cognitive Psychophysiology
- Visual Psychophysics
- Directed Energy Bioeffects

Dr. Reddix holds a Ph.D. in Educational Psychology, with an emphasis in cognitive psychophysiology, from the University of Illinois at Urbana-Champaign, an M.A. in General Experimental Psychology and a B.A. in Psychology from the University of West Florida. Dr. Reddix is a former Office of Naval Technology Postdoctoral Fellow (Non-ionizing Radiation Bioeffects). He accepted a commission as a Medical Service Corps Officer, USN, in June 1992 and completed flight training as an Aerospace Experimental Psychologist in April 1993 and completed over 1100 hours of flight time in a variety of military rotary- and fixed-wing aircraft. He retired from active-duty service in 2014. Dr. Reddix upholds the academic rank of Associate Professor, USN and currently serves as the Technical Director for NAMRL, NAMRU-Dayton. He has an extensive research portfolio that includes vision science, aviation human factors, neurocognitive (EEG/ERP) and eye movement correlates of information processing, and directed energy bioeffects. Dr. Reddix's current research interests include color vision assessment for special-duty occupations, the impact of laser veiling glare on aviator human performance, weapon-platform specific laser eye protection test and evaluation, adaptive display technology for aviation MFD & HMD applications, and human performance in chem-bio operating environments.

NAMRL INVESTIGATORS

F. Eric Robinson, Ph.D. *Research Psychologist*



- Human Factors Psychology
- Team Performance
- Human Performance

Dr. Robinson has been a research psychologist at NAMRU-Dayton since 2016. He serves as a principal investigator examining the cognitive aspects of spatial disorientation and the performance implications of physiological episodes during flight. In addition to these main focus areas, he has been involved with research on fatigue, medical device usability, en route care, and the human performance effects of chemical protective equipment. He started working at the lab in 2011 as a research assistant during graduate school, earning his PhD in Human Factors Psychology from Wright State University in 2017. His graduate work investigated contextual effects on physician behavior in emergency departments and the utility of procedure-independent constructs for assessing surgical performance.

Stephanie Warner, MS *Biomedical Engineer*



- Hypoxia Mitigation
- Biomedical Equipment Design/Validation
- Imaging & Sensing Technologies

Warner is a biomedical engineer at NAMRU-Dayton and serves as the technical lead for NAMRL's Sensors Laboratory. Her research program focuses on manned and unmanned evaluations of the efficacy of physiologic and environmental sensors developed for high performance, tactical aviation. Ms. Warner also serves as a technical lead for the design and development of the Hypoxia Ventilation Research Device (HVRD), which can dynamically control the breathing resistance, flow, and concentration of gases to better represent proper and improper functioning of the breathing environment that can be experienced in flight. Additionally, she is a principal investigator for multiple imaging studies associated with identifying the cerebral hemodynamic response to hypoxia and/or fatigue. Ms. Warner received her Bachelor of Science and Master of Science in biomedical engineering from Wright State University.



Henry Williams, Ph.D.
Senior Research Psychologist



- Cognitive-Experimental psychology
- Aviation human factors
- Aviation spatial disorientation

Dr. Williams has 30 years of experience in aviation human factors and flight simulation, and he is an active private pilot. He received his Ph.D. in Cognitive-Experimental Psychology from the University of Illinois Aviation Research Lab in 1993, and was then employed by General Motors and Delco Electronics working on driver perception and performance issues, including the human factors of enhanced vision systems and head up displays. In 1995 Dr. Williams was commissioned as a Naval Aerospace Experimental Psychologist (AEP). He worked on aircraft cockpit design, manned and unmanned aircraft pilot selection, and the role of flight simulation in aviation training. He has logged over 250 hours as Special Aircrew in 10 different types of Naval aircraft. One of his tours as an AEP included duties as the head of the Aviation Selection Division at NAMRL in Pensacola, the predecessor of the current NAMRL at NAMRU-Dayton. In 2002 Dr. Williams transitioned back to civilian life as a Senior Engineering Psychologist in the Naval Air Systems Command's Human Systems Department, working on advanced pilot-vehicle interfaces, including helmet mounted displays. In September 2011, he accepted a position as a Senior Research Psychologist at NAMRU-Dayton, where he plans and conducts human factors research regarding manned and unmanned aircraft.

NAMRL INVESTIGATORS

Commander Matthew Doubrava, MD, MPH

Senior Medical Officer (Flight Surgeon)
Department Head, Biomedical Sciences



- Occupational/ Environmental Medicine
- Aerospace Medicine
- Public Health

Cmdr. Doubrava holds an MD from the Jacobs School of Medicine and Biomedical Sciences from the State University of New York at Buffalo and an MPH from the University of West Florida. He was residency trained in Aerospace and Occupational Medicine at the Naval Aerospace Medical Institute and the US Army School of Aviation Medicine. He also has an MA in physical anthropology from the University of Nevada, Las Vegas and a BS in Geology from the University of New Mexico. His operational assignments include being the flight surgeon for Marine Helicopter Light Attack Squadron 369 with two deployments in support of Operation Iraqi Freedom and being the Senior Medical Officer of Marine Aircraft Group 12 in Iwakuni, Japan. Doubrava also served as a commissioned line officer in the US Marine Corps before transferring to the Navy to serve in the Medical Corps. Currently Doubrava is the Senior Medical Officer and Department Head of Biomedical Science, NAMRL at NAMRU-Dayton since joining the command in 2016. His research areas include motion sickness countermeasures, en route care and aviation epidemiology. Dr. Doubrava is board certified in Aerospace Medicine and Occupational Medicine through the American Board of Preventive Medicine. He is a member of the Aerospace Medicine Association, American Society of Aerospace Medicine Specialists and the American College of Occupational and Environmental Medicine.

Captain Richard Folga, CASP, FAsMA, FAsHFA

Aerospace Physiologist
Department Head, Engineering and Technical Support Services



- Aerospace Physiology
- Test and Evaluation
- Motion Research Devices; Disorientation Research Device: Kraken™
- Spatial Disorientation

Capt. Folga is a Naval Aerospace and Operational Physiologist serving as the head of NAMRU-Dayton's NAMRL Engineering and Technical Support Services department and Program Manager for the Disorientation Research Device (the Kraken™). He is the BUMED appointed USN Air and Space Interoperability Council Spatial Disorientation Subject Matter Expert, is board certified in aerospace physiology (2006), Fellow of the Aerospace Medical Association (2009) and the Aerospace Human Factors Association (2019). Captain Folga has 22 years and 1200 hours of military flight experience in 24 airframes, including over 200 hours of Night Vision Goggle flight time in 10 different platforms.

Commander Cheryl Griswold, MS, M.E.S.S.

*Aerospace Physiologist
Department Head, Environmental Physiology*



- Dehydration
- Physiological Episodes Response
- Bladder Relief

Cmdr. Cheryl Griswold is a U.S. Navy Aerospace & Operational Physiologist. She holds a Master's Degree in Exercise and Sports Sciences with an emphasis in Clinical Exercise Physiology from the University of Florida in Gainesville, FL. Griswold accepted a commission as a Medical Service Corps (MSC) Officer, United States Navy, in June 2006. She completed aeromedical officer and associated flight training as the 291st U.S. Navy Aerospace and Operational Physiologist in June 2007. Griswold has completed over 600 hours of flight time in a variety of military fixed wing ejection, fixed wing non-ejection and rotary wing aircraft. Currently, Griswold serves as the Department Head for NAMRL's Environmental Physiology Department, NAMRU-Dayton. She supervises eighteen researchers with a main effort of investigating causes and mitigations related to combating Physiological Episodes for tactical jet aircrew. Griswold's current research interests include de/hydration status of aircrew, in-flight bladder relief, thermal burden and vocal waveform prediction of hypoxia.

Commander Tatana Olson, Ph.D.

*Aerospace Experimental Psychologist
Deputy Director, Naval Aerospace Medical Research Laboratory*



- Industrial & Organizational Psychology
- Personnel Assessment & Selection
- Aviation Psychology

Cmdr. Olson is a Naval Aerospace Experimental Psychologist serving as the deputy director of the NAMRL at NAMRU-Dayton. Olson manages the daily administrative and research activities of a staff of 75 scientists and research support personnel across a broad research portfolio addressing challenges the aerospace operational environment presents to human health, safety, readiness, and performance. Olson received her doctorate in industrial and organizational psychology from Purdue University and was then commissioned as naval aerospace experimental psychologist. Prior to her arrival at NAMRL, July 2017, Olson served as the Operational Psychology Department head at the Naval Aerospace Medical Institute in Pensacola overseeing the Navy's Aviation Selection Test Battery (ASTB), the primary tool used to select aviation candidates for the Navy, Marine Corps, and Coast Guard. Her research primarily focuses on personnel assessment and selection and individual differences and their impact on human performance, especially with regard to personality, motivation, and cognitive ability. Olson is a member of numerous professional scientific organizations, including the American Psychological Association, the Society for Industrial and Organizational Psychology, and the Society for Military Psychology.

NAMRL INVESTIGATORS

Lieutenant Sarah Sherwood, MS *Aerospace Experimental Psychologist*



- Human Factors
- Aviation Psychology
- Human Systems Integration

Lt. Sherwood is a U.S. Navy Aerospace Experimental Psychologist. She holds a Masters of Science in Human Factors & Systems and a Doctor of Philosophy in Human Factors from Embry-Riddle Aeronautical University in Daytona Beach, FL. At Embry-Riddle, Sherwood studied cognitive performance, decision-making, and the acquisition of cognitive elements of expertise in ambiguous, complex, and information-rich environments. Her research focused on the identification and mitigation of training efficacy and safety concerns associated with the injection of synthetic tracks into live F/A-18 air combat training exercises and unmanned aerial systems operator supervisory control performance. Sherwood accepted a commission as a Medical Service Corps (MSC) Officer, United States Navy, in 2018 and completed flight training as the 160th U.S. Navy Aerospace Experimental Psychologist in February 2019. Sherwood currently serves as a researcher in the Acceleration and Sensory Sciences Department at NAMRL. Her current research interests center on aviation human factors and physiology, with emphasis on spatial disorientation and visual illusions and their effect on aircrew performance and safety of flight.



Vincent Billock, Ph.D.
Senior Research Scientist

- Color & Spatial vision
- Sensory Integration
- Nonlinear Dynamics & Complexity Theory
- Theoretical/Computational Neuroscience & Visual Psychophysics

Dr. Billock is an ORISE contract sensory biophysicist at NAMRU-Dayton whose expertise is in connecting psychophysics and neuroscience. He does research in color vision, spatial vision, sensory integration and nonlinear dynamic neural modeling. His early work focused on inducing catastrophic sensory failures like image melting, forbidden hues, induced hallucinations and causality violations, and was intended to push the edge of the perceptual envelope. His recent work focuses on neural modeling of color vision and sensory integration. He has a current side interest on manipulating time perception in virtual reality. Dr. Billock did his doctorate in sensory biophysics at The Ohio State University and completed postdoctoral training in clinical color vision and spatial vision. He later used a two year National Research Service Award to study the application of complexity (chaos) theory to neuroscience and much of his research is informed by this powerful mathematical approach. Prior to arriving at NAMRU-D, he was an Associate Professor at the Ohio State University. He has been elected a Fellow of the American Academy of Optometry and the Ohio Academy of Science. He is a Diplomate of the American Academy of Optometry. He is currently writing a book on vision for Springer-Verlag.

Elizabeth Damato, Ph.D., IPA, CWRU
Senior Research Physiologist

- Neuroscience
- Electroencephalography

Dr. Damato received her undergraduate degree at Vanderbilt University and holds graduate degrees from University of Pennsylvania and Boston College. She is a clinical scientist with recent funding by the National Institute of Biomedical Imaging and Bioengineering, where she developed expertise and knowledge in interventional neurostimulation in preclinical models. Her training in bench research and neuroscience included a focus on neuroimaging and electroencephalography. Her research interests include the effects of sleep loss, hypoxia, and hyperoxia on executive functioning. Her current research efforts involve the integration of high-density electroencephalography with magnetic resonance imaging. She is licensed as a nurse practitioner in the state of Ohio and is faculty at Case Western Reserve University in the School of Nursing, the Case Center for Imaging Research, and the Department of Neurosciences, Case School of Medicine.

Michael Decker, Ph.D., IPA, CWRU
Neuroscientist

- Respiratory Physiology
- Neuroimaging
- Neuroscience

Dr. Decker received his Ph.D. from the School of Medicine at Case Western Reserve University, Cleveland, OH, where he trained in both respiratory physiology and neuroscience. Subsequent appointments included Emory University, Department of Neurology and the Centers for Disease Control and Prevention, Chronic Viral Diseases branch. His ongoing research has revealed that brief,

NAMRL INVESTIGATORS

Continued from previous page

Michael Decker, Ph.D., IPA, CWRU

repetitive exposures to hypoxia evoke permanent remodeling within neural regions mediating executive function. Concurrent studies characterize the extent that neurovascular responses to hyperoxia influence patterns of cortical network activity. Those findings also inform our understanding of potential mechanisms contributing to acute, but temporary cognitive dysfunction and fatigue. To identify traits conferring resiliency to extreme environments, he has participated in field studies within the high altitude, low oxygen regions of the Andean, Himalayan and Simien mountains. His laboratory employs in-vand in-vitro techniques ranging from simultaneous high-density electroencephalography with magnetic resonance imaging, immunohistochemistry and microdialysis to hypoxic ventilatory response testing. His research has been supported by the National Institutes of Health, Centers for Disease Control and Prevention and the Department of Defense. He is a Diplomat of the American Board of Sleep Medicine and maintains licensure as a Respiratory Therapist and Registered Nurse.

DeAnn French, Ph.D.

Research Psychologist

- Experimental design
- Statistical analysis of data
- Communication of scientific results
- Neuroimaging
- Electroencephalography

Dr. French is a ICON contract research psychologist at NAMRU-Dayton. She assists with research, including the writing of protocols, grants, data collection manuals, experimental set-ups, and data analysis. She earned her Ph.D. in Educational Psychology/Quantitative Methods from The University of Texas at Austin. Since then, she has worked at program design and evaluation at the Texas Department of Human Services and the Austin Independent School District. She worked at Wright State University as a statistical consultant for 16 years, helping faculty, staff, and students with research. She also served on the Institutional Animal Use and Care Committee for several years. Most recently, she worked as a Human Factors Engineer for a company contracting with the U.S. Air Force. As a research psychologist, she is returning to her love of research and data analysis.

Dan Merfeld, Ph.D., IPA, OSU

Senior Vestibular Scientist

- Vestibular Physiology
- Spatial Disorientation
- Balance

Dr. Merfeld is the senior vestibular scientist at NAMRU-Dayton. He is also the professor and Vice-Chair of Research in the Department of Otolaryngology at The Ohio State University. Prior to that, he had been a professor at the Harvard Medical School. Dr. Merfeld earned a doctorate in biomedical engineering and has developed from that into a neuroengineering and neuroscience career. As a neuroscientist, his basic research focuses on understanding how the brain combines sensory information with a primary interest in how the brain processes information from the vestibular system, which is the part of our inner ear that provides our sense of spatial orientation and that contributes to balance. As a neuroengineer, he is attracted to translational projects like efforts to: (A) develop an inexpensive, simple, and portable vestibular screening test, (B) reduce aircraft mishaps caused by spatial disorientation, and (C) improve the diagnosis of vestibular patients.

Emily Mills, Ph.D.
Biomedical Engineer

- Biomechanics
- Gait Analysis
- Orthopaedic Preclinical Models
- Viscoelastic Tissue Mechanics

Dr. Mills is a post-doctoral research biomedical engineer at NAMRU-Dayton working with the Spine Health Improvement Program (SHIP) to investigate causal mechanisms of neck and back pain in military aviators and aircrew. Dr. Mills received her doctorate in biomedical engineering from the University of Florida, specializing in biomechanics and preclinical orthopaedic models. Her current research focuses on quantitative measures to better understand the complex interactions between biology, mechanical loading, cognitive workload, psychosocial effects, and environmental exposures which contribute to neck and back pain in military aviators and aircrew. Her research also includes evaluating new technologies for quantifying neck and back pain risks to ensure accurate and reliable data for military research and field assessments.

Jeffrey Phillips, Ph.D., IPA, IHMC
Research Psychologist

- Aviation Psychology
- Hypoxia Mitigation
- Physiology
- Human Performance

Dr. Phillips works half-time for NAMRU-Dayton through a contract with the Institute for Human and Machine Cognition in Pensacola, FL. Dr. Phillips has worked in the area of human performance in extreme military environments for over twelve years. Dr. Phillips' work focuses on the effects of environmental stressors such as hypoxia, breathing resistance, fatigue, motion sickness, and cognitive workload on operator cognitive and perceptual performance as well as mitigation strategies to optimize performance in all settings. Dr. Phillips leads efforts to test the validity of operator physiological status monitors in tactical aviation environments. Dr. Phillips was also a part of the F-22 Raptor Physiological Analysis Team and was instrumental in restoring the F-22 to flight status following a class-A mishap and an outbreak of physiological episodes. These contributions were recognized through the receipt of the Delores M. Etter Top Scientists and Engineers in the Navy in 2012 and the Department of the Navy Superior Civilian Service Award in 2017.

Kyle Pettijohn, Ph.D.
Research Psychologist

- Cognitive Psychology
- Learning & memory
- Event cognition

Dr. Pettijohn is a ICON contract research psychologist with NAMRL at NAMRU-Dayton. He studies the effects of hypoxia on spatial disorientation in aviators and the impact of hypoxia on neurological function. Dr. Pettijohn also studies the relationship between vestibular function and battlefield performance. Dr. Pettijohn received his doctorate from the University of Notre Dame where he studied how people segment experience into discrete events and how those events influence memory and forgetting.

NAMRL INVESTIGATORS

Valarie Schroeder, Ph.D., IPA, HJF

Cognitive Psychologist

- Cognitive Psychology

Dr. Schroeder is a Research Scientist with HJF, currently on assignment to NAMRU-Dayton in an Intergovernmental Personnel Act (IPA) position. Prior to working with HJF, Dr. Schroeder served as a Research Psychologist with NAMRU-Dayton with a focus on understanding fatigue of the warfighter, and served as a statistician as a contractor for the U.S. Air Force School of Aerospace Medicine (USAFSAM). Dr. Schroeder received her Ph.D. from Miami University in Brain and Cognitive Sciences, with a concentration in Developmental Psychology. Her research background involves investigating various environmental factors and their impact on human performance and cognition.

Mariateresa Sestito, Ph.D.

Research Psychologist

- Neuroscience
- Psychophysiology
- Clinical Neuropsychology & Rehabilitation
- Lifespan Neuropsychiatric Diseases
- Clinical Neuropsychology & Rehabilitation

Dr. Sestito is an ORISE contract research psychologist at NAMRU-Dayton. Dr. Sestito's area of expertise encompasses neurophysiology and clinical neuropsychology. Such expertise is complemented by flight experience in single engine aircraft. Dr. Sestito current research activity is focused on the study of the psychophysiological facets of operational challenges in aviators. The goal is to implement evidence-based solutions to prevent and mitigate physiological degradation to aircrew that impacts their performance, safety and survivability. Dr. Sestito received her doctorate in Neuroscience from Parma University, specializing in the study of the psychophysiological aspects of emotion in participants affected by schizophrenia. Prior to joining the team Dr. Sestito completed a postdoctoral period at Wright State University investigating the neurophysiological correlates of flight expertise in pilots using electroencephalography. During a prior postdoctoral period at French National Center for Scientific Research Dr. Sestito studied the neural basis of decision making and reward processing in patients with acquired brain injuries and neurodegenerative diseases.

Barbara Shykoff, Ph.D.
Senior Research Engineer

- Applied Respiratory Physiology
- Cardiovascular & Exercise Effects

Dr. Shykoff is a senior research engineer at NAMRU-Dayton through the ORISE Senior Scientist program. Her specialty is applied respiratory physiology with interest in the interaction of the human and equipment, currently as applied to tactical aircraft. Before joining the team at NAMRL, Dr. Shykoff was a research scientist at the Navy Experimental Diving Unit. There, she extensively studied pulmonary oxygen toxicity and effects of breathing resistance and carbon dioxide retention. Earlier in her career Dr. Shykoff investigated blood pressure control and cardiac output measurements from expired carbon dioxide at the University at Buffalo, and respiratory modulation of heart rate at the University of Toronto. Dr. Shykoff received her doctorate in chemical engineering through the Biomedical Engineering Unit at McGill University with research on the distribution of ventilation in the lungs. She belongs to a number of professional scientific organizations, is a guest reviewer for several journals, and is a member of the Aerospace Physiology Committee for the Navy Aviation Environment Scientific Advisory Board (AESAB) Respiratory Subcommittee.

Dan Warkander, Ph.D.
Senior Research Engineer

- Respiratory Equipment
- Respiratory Physiology
- Work of Breathing
- Respiratory Protection Performance Standards

Dr. Warkander is an ORISE contract senior research engineer at NAMRU-Dayton and has over 35 years of experience of testing respiratory devices in standardized ways. His human subject research relates to the effects of - and tolerance to - breathing resistance, work of breathing and inspired carbon dioxide in aviation and diving as well as during occupational use. Previously he was a research scientist at the Navy Experimental Diving Unit and before that he was a research assistant professor in physiology at the University at Buffalo. Dr. Warkander has been appointed to the Navy Aviation Environment Scientific Advisory Board (AESAB). He is a member of the U.S. Technical Advisory Group to the International Standards Organization's Respiratory Protection Standards (ISO/TC94/SC15) and is the Convener of SC15's Human Factors Group. He has authored several of the published Standards. Professional memberships include American Physiological Society, IEEE, International Society for Respiratory Protection, Aerospace Medical Association and ASTM International. Dr. Warkander holds over a dozen patents related to respiratory protective devices.

ENVIRONMENTAL HEALTH EFFECTS LABORATORY



INVESTIGATORS



EHEL **INVESTIGATORS**

Karen Mummy, Ph.D.

Director, Environmental Health Effects Laboratory



- Toxicology
- Chemical Exposure
- Health Effects of Exposure
- Environmental Exposures
- Microbiology
- Cellular Biology
- Inflammation
- Microbiome

Dr. Mummy is the director of EHEL at NAMRU-Dayton. Dr. Mummy leads the Navy's largest basic science research lab consisting of nearly 50 active duty, civilian and contractor scientists who focus on deciphering and addressing the health concerns of service members exposed to environmental stressors and toxicants. She received a Bachelor of Science in Biological Sciences from Michigan Technological University and a Doctorate in Microbiology from Miami University. She was then selected for a joint post-doctoral fellowship in the Department of Pediatrics at Massachusetts General Hospital and the Department of Microbiology and Molecular Genetics at Harvard Medical School. Her post-doctoral research focused on infectious diseases, mucosal immunology, and the underlying mechanisms of inflammation. Previously she was an assistant microbiologist at Massachusetts General Hospital and research instructor at Harvard Medical School and performed infectious disease research at the University of Massachusetts Medical School. She then joined EHEL in 2009 as a research microbiologist and was appointed deputy director in 2012 prior to becoming director in 2017.

Dr. Mummy is a board-certified toxicologist with the American Board of Toxicology and is a member of numerous working groups and panels within the DoD, as well as many scientific societies, including the Society of Toxicology, and the American Society for Microbiology. She is an adjunct faculty member at Sinclair Community College and an adjunct assistant professor at Wright State University, teaching graduate courses on good laboratory practices as well as biokinetics and biodynamics. She also guest lectures at the Air Force Institute of Technology. Dr. Mummy contributed to the most recent editions of the Encyclopedia of Toxicology and Chemical Warfare Agents, and her publications have appeared in well-respected journals, including the *Journal of Immunology* and *Science*. In 2017, she was one of three across the entire US Navy to be featured by the Office of the Secretary of Defense Office of Diversity Management and Equal Opportunity for Women's History Month with the theme "Honoring Trailblazing Women in Labor and Business". In 2018, Dr. Mummy was honored with the Meritorious Civilian Service Award.

Joyce Rohan, Ph.D.
Research Physiologist



- Neuroscience
- Electrophysiology
- Ion Channel Physiology
- Neurotransmitter Release Mechanisms
- Synapse Physiology

Dr. Rohan is a research physiologist at NAMRU-Dayton. She is skilled in neuro-electrophysiology and has been performing patch clamp, two electrode voltage clamp and extracellular recording for over 20 years. Her expertise also includes standard molecular biology and biochemistry techniques. Dr. Rohan conducts neuroscience and neuro-toxicology research, using in vitro, ex vivo and in vivo electrophysiology as well as biochemistry techniques to assess central nervous system effects of various chemicals and environmental stressors. Many of her projects are collaborative, involving joint efforts with the US Air Force and/or the US Army. Her projects are funded by various sources including Air Force Office of Scientific Research (AFOSR), Office of Naval Research (ONR), Army's Congressionally Directed Medical Research Program (CDMRP), Defense Health Agency (DHA), as well as Joint Medical Committee 5 (JPC-5). Dr. Rohan holds a doctorate in neuroscience from University of Colorado School of Medicine, a master's in aerospace engineering sciences from University of Colorado at Boulder, and a Bachelor of Arts in biomedical and electrical engineering from University of Southern California. Dr. Rohan joined the team in 2012.

Lieutenant Maria Greenwood, Ph.D.
Research Psychologist



- Neuroscience
- Pharmacology
- Toxicology

Lt. Greenwood is a U.S. Navy Research Psychologist. She holds a Doctor of Philosophy in Neuroscience from Florida State University, with emphases on behavioral neuroscience and neuroendocrinology. She previously completed her Masters of Science in Biopsychology with a focus on Behavioral Pharmacology from Virginia Commonwealth University in Richmond, Virginia. Greenwood was commissioned in 2019. Her previous research experience focused on neurotoxicology, substance abuse, traumatic brain injury, PTSD, stress and pain. Currently Greenwood is serving as a researcher in the Occupational and Environmental Health department at NAMRU-Dayton. Her current research interests include assessing neurological, behavioral, and physiological effects of chemical exposures in operational environments and developing novel translational approaches to investigating occupational health hazards.

EHEL **INVESTIGATORS**

Colonel Cary Honnold, DVM, Diplomate ACVP, ACVPM

Veterinary Pathologist



- Comparative Pathology & Consultation
- Veterinary Preventive Medicine
- Veterinary Anatomic Pathology

Col. Honnold is an Army veterinary pathologist assigned to NAMRU-Dayton. He collaborates with various research groups in the NAMRU-Dayton enterprise and allied partners providing comparative pathology support and consultation. Prior to arriving at NAMRU-Dayton, Honnold served as the Director/Head of Comparative Pathology at the U.S. Army's Walter Reed Institute of Research (WRAIR), the Navy Medical Research Center, and Medical Research Institute of Chemical Defense (MRICD). He obtained his undergraduate degree in biological sciences from the University of Vermont and his doctorate in veterinary medicine from Purdue University. Honnold practiced veterinary medicine for six years prior to commissioning as a veterinary corps officer in the U.S. Army in 2004. He completed his residency training in anatomic pathology at the Armed Forces Institute of Pathology (AFIP) and is board certified in Veterinary Anatomic Pathology and Veterinary Preventive Medicine.

Lieutenant Commander Taj King, Ph.D.

Biochemist

Department Head, Inhalation Toxicology



- Toxicology
- Biochemistry
- Molecular & Cellular Biology

Lt. Cmdr. Taj King is the Department Head of Inhalation Toxicology, EHEL, NAMRU-Dayton. He oversees research for 13 staff members, including three principal investigators, conducting research related to inhalation of environmental toxins and their toxic effects to address questions related to the health and safety of military personnel. Prior to joining the staff at EHEL, LCDR King served as chief of two departments including Quality Assurance and the Department of Defense Drug Detection Quality Assurance Laboratory, Division of Forensic Toxicology, Armed Forces Medical Examiner System (AFMES DFT), Dover AFB, Delaware. He also served as a laboratory certifying scientist and subject matter expert witness for drug-facilitated sexual assault cases and drug positive cases. In July, 2015 LCDR King began his second tour in the U.S. Navy at the Navy Drug Screening Laboratory, Naval Air Station Jacksonville, Florida (NDSL JAX), serving as Deputy of Operations for Initial Testing and Support Services until May 2016 when he became Deputy Director of Operations for all testing departments including Quality Control and Confirmation. LCDR King also served as a subject matter expert for drug positive cases by supporting administrative separation boards and military courts-martial. LCDR King was a recipient of the Joint Service Commendation Medal for his tireless service at AFMES DFT from 2012-2015 and the Navy and Marine Corp Achievement (2017) and Commendation (2018) Medals for implementing various automated drug-testing processes at NDSL JAX.



Lieutenant Commander N. Cody Schaal, Ph.D., CIH, CSP

Industrial Hygiene Officer

Department Head, Occupational and Environmental Health



- Chemical Induced Hearing Loss
- Hearing Conservation
- Hazardous Noise Exposure Characterization
- Occupational Exposure Assessment
- Industrial Hygiene

Lt. Cmdr. Schaal is a U.S. Navy Industrial Hygiene Officer. In 2016 he earned a Doctor of Philosophy in Safety Sciences from Indiana University of Pennsylvania. From 1996-2005 he worked in the U.S. Air Force Bioenvironmental Engineering career field in several industrial hygiene and environmental protection program roles ensuring force health protection for over 24,000 service members. After joining the U.S. Navy, Schaal served in a variety of assignments from 2005 to 2016 at Environmental and Preventive Medicine Unit 2, USS ENTERPRISE, and several naval hospitals providing safety, environmental, radiation, and occupational health support for over 70,000 service members. From 2016-2019 Schaal was an assistant professor and the Master of Science in Public Health program director at Uniformed Services University where he was responsible for instruction and advising. He is currently the Occupational and Environmental Health department head at NAMRU-Dayton where his research interests include addressing public health challenges such as chemical induced hearing loss, noise, and exposure assessment techniques. He is a Certified Industrial Hygienist and Certified Safety Professional. He was selected in 2018 and 2011 as Industrial Hygiene Officer of the Year and 2010 CAPT ERNEST W. BROWN award for Navy Occupational Health excellence.

Commander Jason Schmittschmitt, Ph.D.

Biochemist

Deputy Director, Environmental Health Effects Laboratory



- Biochemistry

Cmdr. Schmittschmitt serves as the deputy director of EHEL, NAMRU-Dayton. He holds a Bachelor of Science in biology from the University of Kentucky where he focused on toxicology and a doctorate of biochemistry biophysics from Texas A&M where he worked on thermodynamics of protein folding. Following a postdoc at the University of Virginia studying protein membrane interaction he joined the United States Navy. Previous roles include technical director of the Navy Drug Screening Laboratory, logistics officer, training officer and assistant department head at Navy Environmental Preventive Medicine Unit 5. Additionally, he was the naval liaison officer to the U.S. Army Research Development and Engineering Command working to increase collaborative efforts among services. He led the efforts of the Technology Solutions Team in direct support of the Deployed Science and Technology Teams, providing timely science and

EHEL INVESTIGATORS

Continued from previous page

Commander Jason Schmittschmitt, Ph.D.

technology solutions to problems faced by the Warfighter. Then he served as the Navy Bureau of Medicine and Surgery liaison to Joint Program Executive Officer for Chemical and Biological Defense and was the deputy of Medical Acquisitions where he led the effort to develop and acquire safe, effective and innovative medical solutions and systems to combat chemical, biological, radiological, and nuclear threats and emerging infectious diseases. Schmittschmitt was the executive officer for the Navy Drug Screening Laboratory, Great Lakes where he supported the DoD zero tolerance drug deterrence program. Schmittschmitt's awards include Meritorious Service Medal (Jan 2012-Aug 2014), Joint Service Commendation Medal (Sep 2013-Mar 2014), Meritorious Service Medal (Mar 2010-Dec 2012), Army Commendation Medal (Oct 2010-Sep 2011), Navy Marine Corp Commendation Medal (Jun 2008-Aug 2010), and Navy Marine Corp Commendation Medal (Aug 2004-Jul 2007).

Lieutenant Commander Matt Shipman Ph.D.

Aerospace Physiologist

Department Head, Technical Research Support



- Microbiome
- Systems Biology
- Hypoxia/Decompression Illness
- Physiological Response to Operational & Environmental Exposures
- Microbiology

Lt. Cmdr. Shipman is the department head for the Technical Research Support Department, EHEL, NAMRU-Dayton. He oversees all aspects of research support for EHEL staff members conducting research and development related to inhalation and environmental toxicology to address questions related to operator health, performance and safety. Prior to arriving at EHEL, Shipman served as the aeromedical safety officer/director of safety and standardization for Marine Aircraft Group 31, and as director for Aviation Survival Training Center Jacksonville. He was commissioned into the Navy in 2011 and earned his wings as an aerospace and operational physiologist in 2012. Shipman earned his doctorate in biochemistry from Montana State University in 2010. His research has focused primarily on -omics and in silico investigations of small molecule physiology and systems biology related to questions of biodefense, metabolic engineering, and environmental chemical exposures.

Lieutenant Dan Xu, Ph.D.

Biochemist

Department Head, Behavioral, Cognitive and Neurophysiology



- Stem Cell Biology
- Toxicology

Lt. Dan Xu is a biochemist with the Environmental Health Effects Laboratory (EHEL) at NAMRU-Dayton. As the Department Head of Behavioral, Cognitive and Neurophysiology (BCN) Department, she oversees research programs that aim to minimize operational performance degradation and reduce health risks posed by hazardous materials. As a stem cell biologist, Lt. Xu is committed to promote stem cell technology to toxicology research and to develop new in vitro testing models for decreasing test model development cost and for increasing the rate of identifying toxicants. The models she is developing are cheap and rapid test means for advancing significantly the understanding of pressing human performance challenges to the fleet. She also leads efforts promoting Navy toxicology research in tri-service toxicology research cooperation by leading the development of a milSuite-based, information-sharing platform named TRAIN (Toxicology and health Risk Assessment Information Network). TRAIN will facilitate coordination and collaboration within DoD stakeholders about the activities of the community of interest and about the work units involved within the enterprise.

Prior to her commission (June 2017) Lt. Xu completed postdoctoral training at Nevada Cancer Institute and Stanford University where she led research teams in developing innovative and creative proof-of-concept cell therapies for hemophilia, hemangioma, acute liver damage and chronic drug-induced liver damage. She developed an adipose stem cell based cell therapy invention that will be translated to clinical testing and applications, which will be beneficial for patients with liver diseases.

EHEL INVESTIGATORS

Richard Agans, Ph.D.

Research Molecular Biologist

- Molecular & Cellular Biology
- Microbiology
- Microbiome
- Nanotoxicology
- *In vitro* Model Design

Dr. Agans is a Parsons contract molecular biologist and microbiologist supporting EHEL at NAMRU-Dayton. Dr. Agans studies how inhalation and whole-body exposures to various environmental contaminants and operational environments impact human associated microbiota, human health, and performance. Dr. Agans' interests involve understanding how host-microbe relationships influence performance and health. Dr. Agans holds a Bachelor of Science in Biology from Ohio Dominican University; he also earned his Master of Science in Microbiology and Immunology, and Doctorate in Biomedical Sciences from Wright State University. Previously Dr. Agans has studied the role of diet and nutrition on the gut microbiota and development of *in vitro* models to study microbial and cell populations. Prior to joining NAMRU-Dayton, Dr. Agans supported the efforts of the Air Force Research Labs Human Performance Wing in developing *in vitro* models, and determining the toxicity of engineered nanomaterials on human tissues.

Michael Crenshaw, Ph.D.

Research Chemist

- Analytical Chemistry
- Organic Chemistry
- Physical & Chemical Properties
- Toxic Substances

Dr. Crenshaw is a ICON contract chemist supporting EHEL at NAMRU-Dayton. His research has focused on assessing threats posed by Weapons of Mass Destruction (WMD) to military and civilian personnel. To accomplish this, he has developed analytical methods for identification of highly toxic materials, industrial chemicals, and explosives and fertilizers. When no chemical standard was available, Dr. Crenshaw has performed the laboratory synthesis of these and related materials. He also has measured physical properties and performed stability/decontamination studies to support risk assessments. Dr. Crenshaw's prior work experience includes research at Battelle Memorial Institute, MIT-Lincoln Laboratory, and Boeing. At Boeing, he performed chemical analyses to support the development of the Environmental Control Life Support System for the international space station. He earned his doctorate in organic chemistry from the University of Cincinnati.

David Ellis, Ph.D.*Research Toxicologist*

- Toxicology
- Pharmacology
- Cellular Biology
- Neurobehavior
- Cognitive Neuroscience

Dr. Ellis is a ICON contract research toxicologist with NAMRU-Dayton. He studies the effects of chemical, physical, and environmental stressors on the physical and cognitive performance of men and women and explores methods for detecting, preventing, and mitigating those effects. He has 30 years of combined experience in cellular and animal models of toxicology and pharmacology. His previous research includes cognitive performance studies and nanotoxicology with AFRL, drug discovery at Procter & Gamble and HMR Pharmaceuticals, occupational health toxicology with AMRL, perinatal toxicology with the US EPA, risk assessment for Kao USA, and immunotoxicology at Wright State University. Dr. Ellis has studied the mitigation of cognitive deficits caused by sleep deprivation, hypoxia, or oscillating hypoxia-hyperoxia and changes in the gut microbiome induced by sleep deprivation or hypoxia. He has studied neurobehavior using a host of tests including open field, grip strength, passive avoidance, Rotarod, novel object recognition, elevated circular maze, and Morris water maze. He has developed models to explore the release of silver ions from nano-activated dressings and the bacterial development of silver resistance, a method employing cellular senescence as an endpoint for nanotoxicology, and microdialysis and bioassay methods for determining drug concentrations in blood, bile, lymph, muscle, and brain regions.

Frank Golich, Ph.D.*Chemist*

- Aerospace Physiology
- Biochemistry
- Physiological Responses to Operational Environmental Exposures

Dr. Frank Golich is an ORISE contract research scientist at NAMRU-Dayton. As a chemist and retired Air Force aerospace physiologist he works on a variety of projects related to factors that may influence aircrew susceptibility to physiologic episodes (PEs). Dr. Golich studies the effects of inhalation and whole-body exposures to various chemical contaminants in the environment on human health and operational performance. He holds a Bachelor of Science degree in chemistry from Illinois Institute of Technology in Chicago and a doctorate in bioinorganic chemistry from Miami University of Ohio. His military and professional experience includes military assignments as an aircrew life support specialist, a medical technician and aeromedical evacuation technician, and as an aerospace physiologist working in research and clinical hyperbaric medicine. He was employed as a research chemist in environmental, pharmaceutical development and clinical laboratories. He previously taught chemistry, biochemistry, and physiology at Kettering College in Kettering, Ohio where he earned the rank of associate professor. Dr. Golich supports EHEL and NAMRL.

EHEL INVESTIGATORS

Rachel Howes, Au.D., CNIM

Audiologist

- Neurophysiologic Intraoperative Monitoring
- Electroneurodiagnostic Technology
- Hearing Thresholds
- Hearing Loss

Dr. Howes is a contract audiologist at NAMRU-Dayton supporting EHEL. She received a doctorate of audiology from Ball State University and holds a certificate of neurophysiologic intraoperative monitoring awarded by the American Board of Registration of Electroencephalographic and Evoked Potential Technologists (ABRET). Following completion of graduate study, Dr. Howes took a position as a clinical neurophysiologist. She is currently an instructor of Electroneurodiagnostic Technology at Sinclair Community College in Dayton, Ohio. Her previous research experience has focused on distortion product otoacoustic emissions (DPOAEs) as well as the effects of vibration and noise on the auditory system. Dr. Howes is a member of The Neurodiagnostic Society (ASET) and Ohio Neurodiagnostic Society

R. Arden James

Equipment Engineer

- Inhalation Systems Design
- Construction & Automation

R. Arden James, B.A., is an equipment engineer contractor for Parsons and manages the environmental exposure facility for EHEL at NAMRU-Dayton. He has spent more than 30 years in various research roles managing inhalation exposure facilities and providing technical expertise designing, constructing and developing unique inhalation exposure systems including automated methodologies to deliver gases, vapors, liquids, solids, aerosols and nanoparticle test atmospheres to a variety of animal models. Mr. James is a member of the Society of Toxicology.

Andrew Keebaugh, Ph.D.

Environmental Toxicologist

- Environmental Toxicology
- Inhalation Toxicology

Dr. Keebaugh is an ORISE contract toxicologist working with EHEL at the NAMRU-Dayton. Dr. Keebaugh is working to understand the physiological effects of inhaled chemicals and stressors such as noise, hypobarica, and hypoxia in rodent models to determine the impact these exposures will have on human health, readiness, and performance in operational environments. Dr. Keebaugh received a doctorate in Environmental Toxicology from the University of California, Irvine. His doctoral research was focused on the health effects of inhaled ambient air pollution, primarily the impact of inhaled particles on the progression of chronic cardiovascular disease.

Andrew Koesters, Ph.D.*Neuroscientist*

- Electrophysiology
- Cell & Tissue Culture
- Molecular & Cellular biology
- Synaptic Physiology

Dr. Koesters is an ORISE contract neuroscientist with EHEL at NAMRU-Dayton. Dr. Koesters' expertise is in electrophysiology using rodents as model organisms to identify and mitigate toxic environmental exposures to our servicemen and women. Prior to joining NAMRU-Dayton, Dr. Koesters was a postdoctoral fellow at Wright State University where he studied the electrophysiological changes in cardiomyocytes following sepsis-induced cardiomyopathy. His research has also focused on using molecular genetics to investigate mutant SOD1 effects on cytotoxicity in ALS, and patch-clamp electrophysiology to elucidate synaptic plasticity mechanisms. Dr. Koesters received his doctorate from Wright State University in biomedical sciences with a concentration on neuroscience and physiology.

Sanjeev Mathur, MBBS MS RDMS*Imaging Scientist*

- Ultrasound Imaging
- Surgeries

Dr. Mathur is a Parsons contract research scientist at NAMRU-Dayton. Dr. Mathur specializes in ultrasound imaging (point of care ultrasound) with a focus in translational imaging projects. He is interested in exploring limits of high resolution portable ultrasound application (Cardiac and Lungs). He holds a Radiological Diagnostic Medical Sonography (RDMS) certification from Alliance for physician certification and advancement (APCA). Dr. Mathur welcomes consults for any imaging projects.

Shannon Romer, Ph.D.*Neuroscientist*

- Neuroscience
- Neurobiology & Neurophysiology
- Immunohistochemistry
- Respiratory Plasticity
- Neuronal Motor Circuits
- Motoneurons

Dr. Romer is an ORISE contract research scientist supporting EHEL at NAMRU-Dayton. As a neuroscientist, her expertise is in motor circuits, from brain to muscle, specializing in motoneuron anatomy and physiology. Dr. Romer studies the effects of various chemical contaminants in the environment on human health and operational motor performance. Dr. Romer holds a Bachelor of Science degree in biology, a Master of Science in biology specializing in genetics and a doctorate in biomedical sciences, specializing in neuroscience, from Wright State University. Additionally, Dr. Romer is also a certified neurophysiologic intraoperative monitor (CNIM), requiring knowledge and proficiency in several neurodiagnostic tests including EEG, EMG, transcranial motor evoked potentials, brain mapping and cranial nerve recording including auditory brainstem monitoring.

EHEL **INVESTIGATORS**

Satheesh Sivasubramani, Ph.D.

Inhalation Toxicologist

- Inhalation Toxicology & Technology
- Aerobiology & Cellular Biology
- Aerosol Science

Dr. Satheesh K. Sivasubramani is a Parsons contract inhalation toxicologist working at NAMRU-Dayton. He is a trained aerosol scientist and has over 20 years of work experience in his research field. Dr. Sivasubramani's career focused on respiratory health and the contaminants of air environment, especially, on obtaining a better understanding of inhalational exposure in the context of the development and application of disease models. His expertise includes animal model development specifically, non-human primate model for toxicological and infectious disease studies. At NAMRU-Dayton, his major goal is to provide a laboratory investigation using animal models for inhalational exposure of chemicals as well as airborne particulate contaminants. With his unique training in aerosol science, combined with his strong background in biology, he is extremely competent in various research areas such as inhalational toxicology, aerobiology, aerosol science and pulmonary drug delivery research.

Brian Wong, Ph.D.

Senior Inhalation Toxicologist

- Inhalation Toxicology & Technology
- Aerosol Technology
- Atmospheric Chemistry

Dr. Wong is a ORISE contract senior inhalation toxicologist with NAMRU-Dayton. He has conducted inhalation studies in areas of interest to the Navy and DoD, such as alternative jet fuels, fire extinguishing powders, and southwest Asian dusts and solid waste burn pit emissions, and provided guidance in the design and conduct of other studies conducted at NAMRU-Dayton. Dr. Wong has more than 30 years of research experience and peer-reviewed publications in the field of toxicology evaluating the toxicity of gases, vapors, aerosols and nano materials.

David Xiao Yang Wu, Ph.D.

Cell Physiologist

- Pulmonary Morphometry
- Cellular Biology
- Physiology
- Ion Channel Physiology
- Inflammation
- Immunology
- Inhalation Toxicology
- *In vitro* Skin Toxicology

Dr. Wu is a ICON contract cell physiologist with EHEL, NAMRU-Dayton. Dr. Wu works in the Occupational & Environmental Health Department conducting research to address the challenges the operational environment present to service member health, safety and performance. Prior to arriving at NAMRU-Dayton, Dr. Wu was the research scientist at Cincinnati Children's Hospital. Dr. Wu received his doctorate from the University of Bern, Switzerland, specializing in lung morphometry and cell physiology. His research has focused principally on pulmonary morphometry, physiology, and immunology.

Jason (Zhong Xin) Wu, Ph.D.

Physiologist

- Molecular Biology
- Physiology & Pharmacology
- Inhalation of Irritants
- Toxicology in Respiratory & Cardiovascular Systems

Dr. Wu is a ICON contract scientist III at NAMRU-Dayton. Dr. Wu previously worked as an assistant professor in West Virginia University. His research focused on the health effects of acute and chronic irritants exposure, and physiological and pharmacological properties in regulating cardiopulmonary functions under normal and various pathophysiological conditions. He is a member of American Thoracic Society and American Physiological Society.

ACRONYM LIST

711th HPW	711th Human Performance Wing
ABR	Auditory Brainstem Response
AEP	Aerospace Experimental Psychologist
AESAB	Aviation Environment Scientific Advisory Board
AFE	Aircrew Flight Equipment
AFOSR	Air Force Office of Scientific Research
AFRL	Air Force Research Laboratory
ASET	American Society of Electroencephalographic Technicians
AsMA	Aerospace Medical Association
AsPS	Aerospace Physiology Society
ASTB	Aviation Selection Test Battery
ASTC	Aviation Survival Training Center
BUMED	Bureau of Medicine and Surgery
COTS	Commercial-off-the-shelf
CWRU	Case Western Reserve University
DHA	Defense Health Agency
DoD	Department of Defense
DPOAEs	distortion product otoacoustic emissions
DRD	Disorientation Research Device
EEG	electroencephalography
EHEL	Environmental Health Effects Laboratory
EPA	Educational Partnership Agreement
HVRD	Hypoxia-Ventilation Research Device
IHMC	Institute for Human and Machine Cognition
IPA	Intergovernmental Personnel Act
ISMT	Indoor Simulated Marksmanship Trainer System
JPC-5	Joint Medical Committee 5
MECha	Multi-Environmental Chamber

ACRONYM LIST

MED64	Microelectrode dish system
MOPP	Mission Oriented Protective Posture
MSC	Medical Service Corps
NAMRL	Naval Aerospace Medical Research Laboratory
NAMRU-Dayton	Naval Medical Research Unit Dayton
NIRS	near-infrared spectroscopy
NMRC	Naval Medical Research Center
NMFP	Navy Medicine Forces Pacific
NOR	Novel Object Recognition
NOTC	Neuro-Otologic test Center
NVD	Night Vision Device
ONR	Office of Naval Research
ORISE	Oak Ridge Institute for Science and Education
OSU	The Ohio State University
PE	Physiological Episodes
PSG	polysomnography
ROBD	Reduced Oxygen Breathing Device
ROBE	Reduced Oxygen Breathing Environment
SAFE	Space and Flight Equipment Association
SD	spatial disorientation
SHIP	Spine Health Improvement Program
THRU Chambers	Toxic Hazard Research Unit Chambers
TRAIN	Toxicology and health Risk Assessment Information Network
USAFSAM	U.S. Air Force School of Aerospace Medicine
USARIEM	U.S. Army Research Institute of Environmental Medicine
VVSD	Visual Vestibular Sphere Device
WPAFB	Wright-Patterson Air Force Base
WRAIR	U.S. Army's Walter Reed Institute of Research

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Version 2

Naval Medical Research Unit Dayton
2624 Q St., Bldg. 851, Area B
Wright-Patterson AFB, OH 45433

This document was published in June 2020