MANPOWER, PERSONNEL, TRAINING, & EDUCATION – INFORMATION SCIENCES

ANNUAL RESEARCH COMPENDIUM

OFFICE OF NAVAL RESEARCH | CODE 34

FY24 ONR MPTE Portfoilo

From the Program Officer

It has been an incredible first year for me as the Manpower, Personnel, Training, & Education – Information Sciences (MPTE) Program Officer and I deeply appreciate the entire team's patience, enthusiasm, and hard work bringing me up to speed and advancing the science you are doing. Our leadership team of Mr. Adam Leibowitz, Mr. Austin Devitt, and myself are proud to carry the portfolio forward and work with each and every performer.

The MPTE portfolio works to optimize the Navy and Marine Corps most critical resource: the Warfighter. Taking on the strategic guidance from Navy requirements and CNO directives (Table 1), MPTE seeks to provide the innovative, foundational research to improve Sailor and Marine well-being, performance, and operational readiness. Through greater understanding of human behavior, we can leverage new and more complex data to predict critical outcomes and increase the probability of mission success.

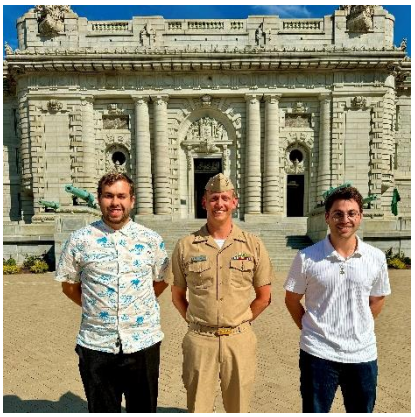
With 36 total project this year, MPTE wrapped up three efforts, started three new projects, and had thirty that continue across government labs, academia, and industry. These efforts spanned six primary focus areas:

- ***Data Science for Personnel Assessment***: expand personnel assessment and predictive capabilities to improve operational readiness via better Sailor assessment, selection, and assignment.
- ***Intellectual Readiness for Future Conflict***: develop Sailors into an innovative, cognitively ready force that develops novel tactics and solutions, quickly sifts and identifies relevant information in ambiguous situations, and readily adapts to new challenges in the high-end fight.
- ***Harmful Behavior Detection***: identify critical levers for intervention and policy change by establishing a common naval framework with new data collection methods to gain an increased ability to detect, predict, and prevent harmful and counterproductive workplace behaviors.
- ***Robotics Rating & Designator Development***: establishing the necessary knowledge, skills, abilities, and training necessary to operate and maintain autonomous and semi-autonomous systems for Navy enlisted and officer personnel.
- ***Talent Management***: develop and validate foundational framework of the observable behaviors and individual differences of effective leadership within the Navy.
- ***Manpower Planning***: develop a complex, multi-variable manpower modeling software tool to predict recruitment and retention across multiple "what if?" scenarios.

All efforts were presented during the annual MPTE Review held this year at the U.S. Naval Academy, July 9-11. Over 120 people from government, academia, and industry attended the three-day event in-person or virtually representing the research teams, stakeholders, and external reviewers. Feedback was extremely positive – both for the event and the exciting work the teams are conducting. Overall ratings across the portfolio show a high degree of confidence in the research problems MPTE is tackling, the methods explored to find answers, and the teams conducting the work (Table 2).

The MPTE portfolio had several other major accomplishments in FY24:

- 41 Peer-reviewed Publications
- 26 Conference Presentations
- 4 Doctoral & Masters Students Completed
- 6 awards to various performers



All this to say, it's been an exciting and incredible year for the portfolio and I am thrilled to continue and build upon our success in FY25! I will close with a personal motto – be EAGER: Excellent, Authentic, Grateful, Engaged, and Respectful.

LCDR Mike "Tinder" Natali, PhD, MSC, USN
Program Officer, Code 34 - MPTE
Office of Naval Research

From the Program Officer (Continued)

Capability	National Defense Strategy (2022)	SECNAV Priorities (2023)	CNO NAVPLAN (2022)	CNP Pillars (2024)	Operational Impact
Intellectual Readiness for Future Conflict	-Deterrence by Resilience -Force Planning Construct -Transform the Foundation of the Future Force -Adapt and Fortify Our Defense Ecosystem -Strengthen Resilience & Adaptability -Cultivate the Workforce We Need	-Strengthening Maritime Dominance -Building a Culture of Warfighting Excellence	-Readiness: Manpower, Critical Readiness Infrastructure -Capabilities: Contested Logistics, Artificial Intelligence -Capacity: Unmanned Systems -Sailors: Inclusive & Diverse Force, Ready Relevant Learning, Education, Total Sailor Fitness	-Deliver Ready Relevant Learning -Advance Navy Culture	Increase operational readiness at individual and organizational levels; Enhanced lethality in DIL environments; Larger ad hoc operational envelopes
Data Science for Personnel Assessment	-Deterrence by Resilience -Force Planning Construct -Make the Right Technology Investments -Cultivate the Workforce We Need	-Building a Culture of Warfighting Excellence	-Readiness: Manpower -Capabilities: Artificial Intelligence -Sailors: Inclusive & Diverse Workforce, Total Sailor Fitness	-Advance Navy Culture -Deliver Modern HR Services -Deliver Modern IT Solutions	Optimize Sailor performance; Retain naval personnel in operational forces; Reduced unplanned losses
Harmful Behavior Detection	-Deterrence by Resilience -Force Planning Construct -Adapt and Fortify Our Defense Ecosystem -Strengthen Resilience & Adaptability -Cultivate the Workforce We Need	-Building a Culture of Warfighting Excellence	-Capabilities: Artificial Intelligence, Naval Operational Architecture -Sailors: Inclusive & Diverse Workforce, Total Sailor Fitness	-Advance Navy Culture -Deliver Modern HR Services -Deliver Modern IT Solutions	Facilitate proper conditions for optimal unit performance
RxS Rating & Designator Development	-Force Planning Construct -Transform the Foundation of the Future Force -Adapt and Fortify Our Defense Ecosystem -Cultivate the Workforce We Need	-Strengthening Maritime Dominance -Building a Culture of Warfighting Excellence	-Readiness: Manpower, Critical Readiness Infrastructure -Capabilities: Contested Logistics, Artificial Intelligence -Capacity: Unmanned Systems -Sailors: Ready Relevant Learning, Education, Total Sailor Fitness	-Deliver Ready Relevant Learning -Advance Navy Culture	Establish future force career paths; Maximize Sailor talent; Retain naval personnel in operational forces
Targeted Talent Management Modernization	-Deterrence by Resilience -Force Planning Construct -Adapt and Fortify Our Defense Ecosystem -Strengthen Resilience & Adaptability -Cultivate the Workforce We Need	-Building a Culture of Warfighting Excellence	-Readiness: Manpower, Critical Readiness Infrastructure -Capabilities: Artificial Intelligence, Naval Operational Architecture -Sailors: Inclusive & Diverse Workforce, Total Sailor Fitness	-Advance Navy Culture -Deliver Modern HR Services -Deliver Modern IT Solutions	Provide talent management framework to foster and develop leadership; Retain naval personnel in operational forces; Reduced unplanned losses; Optimize Sailor performance
MyNavy Foresight	-Force Planning Construct -Adapt and Fortify Our Defense Ecosystem -Cultivate the Workforce We Need	-Building a Culture of Warfighting Excellence	-Readiness: Manpower, Critical Readiness Infrastructure -Capabilities: Artificial Intelligence, Naval Operational Architecture -Sailors: Inclusive & Diverse Workforce, Total Sailor Fitness	-Deliver Modern HR Services -Deliver Modern IT Solutions	Model manpower planning scenarios to optimize force structure; Retain naval personnel in operational forces; Reduce unplanned losses

Table 1

Right Problem	The team has a how the work will move from research to applied, operational work	5.12	1.46
	The team is able to frame results on how they relate to or impact the Navy/DoD	5.69	1.19
	The team is applying innovative science and/or technology to drive knowledge and research forward	5.60	1.04
	The team's efforts are at the forefront of research and scientific work in this field	5.32	1.06
	The team is making a significant contribution to the research topic area	5.48	1.05
	Results from this work have clear potential to make a significant contribution to the Navy	5.64	1.19
Right Approach	The team understands and is leveraging the topic area's empirical evidence and research literature	5.87	0.88
	The team's methodological approach is based on a strong theoretical foundation in the empirical evidence and research literature	5.79	0.98
	The team's research and efforts will add new empirical evidence to advance science in the topic area	5.53	1.11
	The team designed the research and analysis to reach actionable resultsplan for	5.62	1.12
	The statistical approach is justified and appropriate for the data collected and research being conducted	5.53	1.03
	The team's research design is scientifically sound for answering the research questions	5.60	1.12
Right Team	Team composition and experience are appropriate to conduct the work	5.81	0.95
	The team's educational background aligns well with the topic area and the Navy's need or capability gap	5.84	0.99
	The team has demonstrated levels of success and performance in the topic area	5.66	1.10
	The team understands and is committed to supporting the Navy and DoD mission	5.97	1.14

Table 2

Intellectual Readiness

The capability examines the individual, team, and organizational traits and training that will be necessary to effectively and efficiently conduct distributed maritime operations in contested and disrupted environments. Primary goal is to develop people into an innovative, cognitively ready force that develops novel tactics and solutions, quickly sifts and identifies relevant information in ambiguous situations, and readily adapts to new challenges in the high-end fight.

Guidance for this research stems from the USD R&E Technology Vision for Era of Competition (Feb 2022) and the Unmanned Campaign Plan Framework (Mar 2021).

Performers

LCDR Eric Vorm, PhD
Contract: N0001424WX02372

- Project: “Intellectual Readiness”
- Institution(s): Naval Air Warfare Center Aircraft Division (NAWCAD) & Johns Hopkins University Applied Physics Laboratory (JHU-APL)

Dr. Alex Kniffin
Contract: N0001424WX00487

- Project: “Assessing the Impact of Unguided, Unstructured Exploration on Intellectual Readiness for Military Tasks”
- Institution(s): Naval Surface Warfare Center - Dahlgren

Dr. C. Shawn Green
Contract: N000142212283

- Project: “Individual Differences in Learning a Complex Visuo-Motor Task”
- Institution(s): University of Wisconsin

Dr. Wayne Gray
Contract: N000142212109

- Project: “Expertise in Small Team Cooperative Activity”
- Institution(s): Rensselaer Polytechnic Institute

Dr. Jarrod Moss
Contract: N000142112617

- Project: “Strategy Development and Adaptation in Problem Solving”
- Institution(s): Mississippi State University

Dr. John Hollenbeck and Dr. Stephen Humphrey
Contract: N0001423MP00197

- Project: “Task Interdependence in Multi-team Systems”
- Institution(s): Michigan State University, Pennsylvania State University, Arizona State University, and University of South Florida

Intellectual Readiness for Emerging Technologies

AT A GLANCE

WHAT IS IT?

- Many ratings in the Navy require personnel who can adapt to rapid changes, especially in the face of uncertainty and the fog of war
- What are the skills and traits that personnel need to adapt in times of rapid technological and cultural changes?

HOW DOES IT WORK?

- We will develop a quantitative test of certain facets of intellectual readiness and design, develop, and validate the test
- We will experimentally test facets of intellectual readiness via cognitive tasks and a videogame that requires rapid adaptation and out-of-the-box thinking and adaptation to rapidly changing contexts (“Baba Is You”)

WHAT WILL IT ACCOMPLISH?

- A validated test could be used to identify or train personnel who are suitable for those ratings

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Emerging technologies such as AI, autonomous systems, biotechnology, and hypersonic weapons are changing the technological landscape in unpredictable ways. Current manpower, personnel, training and education (MPT&E) strategies emphasize a top-down approach to innovation, but many experts believe that US personnel are underprepared to respond effectively to unknown threats from emerging technologies

Current, legacy strategy prioritizes near-term readiness, but the uncertainty brought by emerging technologies necessitates a shift towards modernization and long-term preparedness. A fighting force comprising psychologically resilient, competently trained and educated minds who are empowered to think flexibly and creatively is the best antidote against this uncertainty.

The current research aims to help OPNAV N1 decide how best it can train or select the future force, across all designators and ranks, in light of constantly changing conditions. We have developed a study design using a computer-based battery of personality assessments, followed by a performance-based test that tests a participant’s ability to solve novel problems in unique, constantly changing environments.

Research Challenges and Opportunities:

- Collecting data from a wide swatch of Naval personnel presents logistical challenges
- Developing and validating a cognitive battery that elicits facets of intellectual readiness
- Determining how to measure facets that are critical for a future workforce
- Once we can measure these facets, we can test if they are trainable

Unguided Exploration (UE) for Intellectual Readiness

AT A GLANCE

WHAT IS IT?

- Definition of UE: *Free time to explore or "play" with a system in a way that is not linked to a specific task or goal.*
- The intent of this effort is to investigate the impact of UE in Navy relevant training/tasking and to provide data suggesting human performance improvements. As robotics are primed to become a larger role in the Navy's arsenal, this work is providing the research-based underpinning for a novel training methodology for the future fight.

HOW DOES IT WORK?

A between-subjects approach to evaluate differences in performance and measures of stress between groups participating in UE and those who receive follow-on adaptive training modules in a virtual environment.

WHAT WILL IT ACCOMPLISH?

This evidence will drive further change in training methodology to better train Navy operators for novel and unexpected situations. Advancing the military's knowledge of these training methodologies and concepts will create a more adaptive and intellectually ready warfighter.

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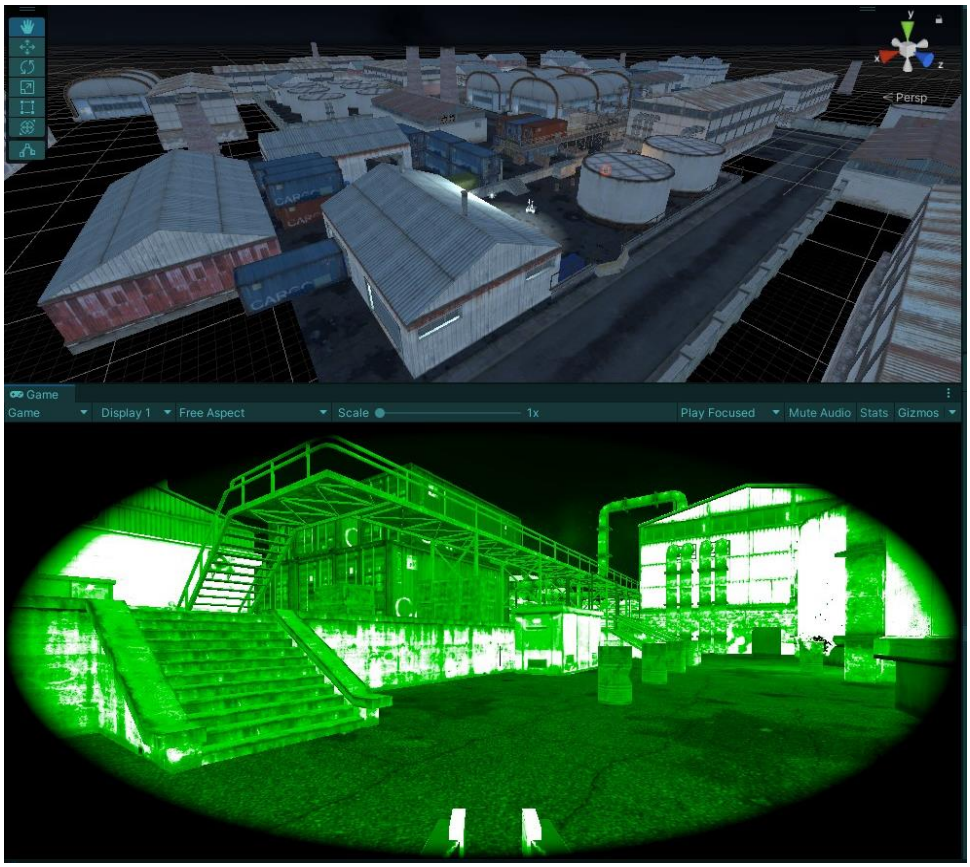

Unmanned systems are often large, expensive, and scarce resources, limiting user access outside of scheduled training, and prohibiting a more intimate knowledge of the system's capabilities. Because training may be limited to only the most likely scenarios, adapting to novel scenarios may be more challenging. We define Unguided, Unstructured Exploration (UE) as free time that is used to explore or "play" with a system in a way that is not linked to a specific task. While UE has likely been utilized with unmanned systems in an ad hoc manner, this study marks one of the first efforts to formally measure the impact of UE on performance, physiological measures of stress, cognitive load, behavior, and decision making in the area of unmanned systems. We use a between-subjects approach to evaluate differences in performance and measures of stress between groups participating in UE and those who receive follow-on adaptive training modules in a virtual environment. The results may be used to evaluate UE for application on a wider, more official scale, to address novel challenges and scenarios where there are several potential solutions.

Research Challenges and Opportunities:

- What is the best modality to train warfighters to adapt to novel or unexpected scenarios?
- What data is important to understand individual human performance?
- How can Intellectual Readiness be quantitatively measured?
- Where/How can wearable technology be leveraged in the Navy?

Individual Differences in Learning a Complex Visuo-Motor Task

AT A GLANCE

WHAT IS IT?

An examination of basic perceptual, cognitive, and motor capacities that underpin the ability to learn to fly a remote vehicle and to generalize that learning to new contexts.

HOW DOES IT WORK?

- This basic research project combines:
- 1) An individual differences approach where we measure basic perceptual, cognitive, and motor skills as well as personality traits and life-style experiences/habits (e.g., previous video game play)
- 2) A multi-session training approach where participants are trained to fly a mini-copter through a set course for multiple sessions
- 3) A generalization session where we ask whether participants, after training on one drone course, can fly on other courses/contexts.

WHAT WILL IT ACCOMPLISH?

- Our goal is to use the information gleaned above to design and deploy a video-game-based form of training that will accelerate the rate at which individuals acquire the ability to fly the unmanned systems and their capacity to generalize their training to new circumstances.
- The research can also be used for selection purposes – to best identify individuals who are likely to be capable of efficiently generalizing their learning to new contexts.

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This project is based on our emerging research findings showing (1) that there are significant differences in both the ability to learn and the ability to generalize learning; (2) that the basic perceptual, cognitive, and motor capacities that predict learning ability are not necessarily the same as those that predict generalization performance; and (3) that certain types of ”action” video game experience can accelerate learning and promote generalization.

In brief we are conducting an individual differences study mixed with a training/training generalization study to determine which basic perceptual, cognitive, and/or motor skills, which personality traits, and which types of previous experience (e.g., previous video game experience) are predictive of the ability to learn to fly a drone and then to generalize that learning to new circumstances.

Our goal then, in future work, is to add an initial training experience designed to enhance those basic perceptual, cognitive, and/or motor skills that underpin drone learning/generalization to determine whether it is possible to accelerate the rate at which drone skills are learned and/or generalized. The type of game we expect to utilize is similar to those we have utilized in previous work designed to enhance cognitive control – namely first-person shooter action video games.

RESEARCH CHALLENGES AND OPPORTUNITIES:

- Truly naïve participants frequently have extraordinarily poor initial performance. While this is a training challenge, it is also an opportunity in that in the real-world such individuals would typically quit rather than persist in training. Thus, our experiment can gather data about individual differences in learning that cannot be acquired via other means (e.g., examing people who are experts in flying drones).
- Which types of skills will be predictive of learning/generalization and can these be trained via some type of video game training?

Expertise in Small Team Cooperative Activity

AT A GLANCE

WHAT IS IT?

The study of action coordination in small human teams operating in a complex and dynamic task environment.

HOW DOES IT WORK?

Teams (of 4 people) work together in a complex and highly dynamic virtual task environment, in which they must coordinate their actions to achieve a shared goal. The virtual task is designed to simulate the experiences of a real-world complex cooperative task. Additionally, various environmental constrains are implemented in the system to test for their effect on team behavior and performance. Behavioral and task-state information is collected from each team (at 60Hz) across 8 one-hour sessions.

WHAT WILL IT ACCOMPLISH?

Longitudinal behavioral data collected from these experiments can provide valuable information about the development of efficient coordination strategies in action teams through effective communication and predictive behavior. Further, the implementation of environmental constraints in the task presents a unique opportunity to examine behavioral adaptation in teams in response to changes

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Navy teams are expected to operate efficiently under conditions of high cognitive load, which involve dynamic changes in task demands. It has been suggested that such teams can benefit from having members with broader and more flexible skill sets (Genevieve, Sebastien, Simon, et al., 2010), which present greater possibilities for the division of labor across multiple team members through fluid team roles, alleviating situations of high individual workload inherent to such complex environments (Urban, Bowers, Monday, & Morgan Jr., 1995). However, research on team behavior rarely accounts for the effect of role-fluidity on team coordination and performance. With this project, we perform an exploratory analysis of coordination behavior and their effect on team performance in role-fluid teams.

Our research suggests complex relationships between team coordination strategies and performance in such teams. Firstly, each team has a unique adaptation threshold for optimal performance, use of less of more adaptive strategies lead to worse performance for the team. Additionally, more effective teams present higher adaptation-thresholds. Teams also perform better initially with less adaptive strategies, while greater adaptation becomes beneficial at higher levels of skill. We also found that an over-abundance of highly interactive players can have detrimental effects for team performance, which is consistent with the “too-much-talent” effect.

Research Challenges and Opportunities:

As a consequence of the novelty and complexity of our research methodology, we had to overcome several challenges:

- Due to the complexity of our research paradigm (~25k lines of code), ensuring a bug-free implementation of the software was a major technical hurdle. However, the software can be an excellent open-source tool for the study of complex team behavior in highly dynamic tasks.
- The collection of longitudinal team data meant that it was necessary to form participant teams that were available at the same times during the week, and that those times coincided with experimenter availability. Because of these challenges, the data we collected is an extremely valuable and rare resource, which will be made public once we have conducted of planned analyses of the data.
- The software produces unstructured, high-resolution, and high-dimensional data, for which, both the extraction of relevant behavioral information and their analyses can be extremely challenging. With our research, we demonstrate novel and unconventional approaches that can be used for the analysis of such data.

Strategy Development and Adaptation

AT A GLANCE

WHAT IS IT?

Development of models and theory that can be used to augment training and develop computational aids that improve the effectiveness of strategies that people use to solve problems and adapt to changes in the task environment.

HOW DOES IT WORK?

- Utilizing computational cognitive models and machine learning techniques to identify the strategies that people develop as they work on a problem or task.
- Measuring individual differences in key cognitive capacities to understand their relationship to strategy development and effective strategy selection.
- Relating individual differences to task performance and strategy selection through a series of studies utilizing behavior, eye tracking, and strategy tracking algorithms.

WHAT WILL IT ACCOMPLISH?

The theory and models developed can be used as the conceptual foundation to develop tools to automatically track and augment strategy selection to improve performance in complex environments.

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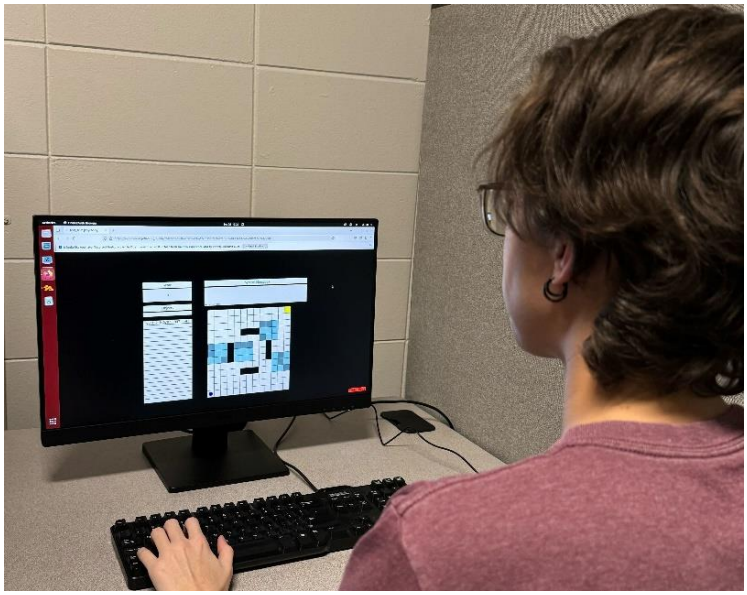

Example of person completing one of our tasks requiring efficient strategy selection in a multitasking problem-solving environment.

Naval operations require complex problem solving in dynamic environments. Problem solving is ubiquitous in these environments as warfighters attempt to adapt to new technologies, new tasks, and warfare-based degradation in command and control. The goal of this project is to develop a theory of the underlying mechanisms and sources of individual differences affecting how people develop effective problem-solving strategies. By understanding how strategies develop and how people adapt their strategies as tasks change, it will be possible to implement training interventions and computational aids to improve task strategies in a way that accounts for key individual differences in cognition. Even in simple tasks, there are significant differences in how individuals accomplish the task. Individuals who use strategies that take advantage of the structure of the task perform better than individuals using less effective task strategies. Our work shows that these differences are amplified as tasks become more complex.

In the past, research on this topic has been limited by the low reliability of self-reported strategy use. Our lab has developed reliable methods for identifying strategies using machine learning techniques and computational models of cognition. These tools enable us to begin addressing these research questions of both theoretical and applied value. The results of this project will enable approaches to augment problem-solving skills tailored to a sailor's individual capabilities by identifying the critical points in problem solving where computational aids may maximally impact problem-solving success.

Research Challenges and Opportunities:

- How do people represent a task and exploit the structure of the task to develop effective strategies?
- How do people adapt their strategies as the task environment changes?
- What individual differences are related to these strategy development and selection processes?
- How can task training be customized based on an individual's cognitive capabilities to promote effective strategy use?

Task Interdependence in Multiteam Systems

AT A GLANCE

WHAT IS IT?

We are studying how Multiteam Systems (MTSs) can be optimized.

- Creating a national infrastructure for studying MTSs
- Comparing face-to-face MTSs to partially distributed MTSs
- Comparing different interdependencies between component teams
- Examining member readiness
- Building computational models for examining how MTSs make decisions

HOW DOES IT WORK?

- Coordinating component teams at three universities (4 people per component team – 12 person MTSs) to form partially distributed MTSs
- Participants engage in a Remotely Piloted Aircraft Simulation, conducting a search and engage mission (i.e., a collective reasoning task)

WHAT WILL IT ACCOMPLISH?

- Provide guidance on how to design MTSs to optimize effectiveness
  - Address staffing, interdependence, & virtualization questions
- Build infrastructure for empirical MTS research
- Build computational model for effective modeling

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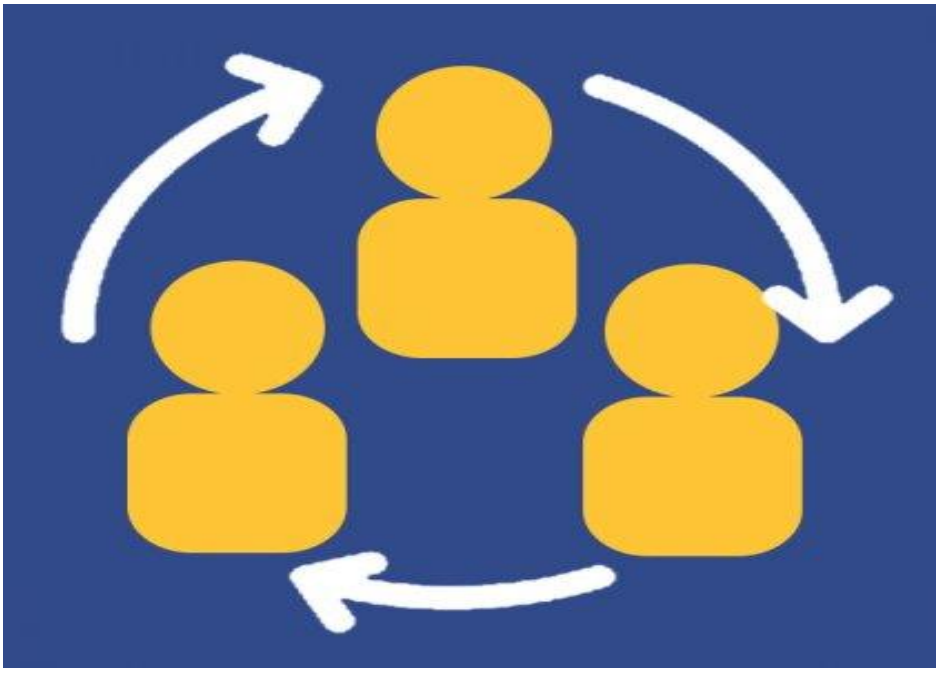

As the pace, scope, and complexity of work in organizations increases, traditional teams are too small and insufficiently specialized to meet the multifaceted demands of contemporary problems. This has resulted in an increased use of multiteam systems (MTSs) in business, government, medical, and military contexts. However, the growing research base on MTSs is imbalanced when it comes to theory building versus theory testing. Only a very small percentage of articles written on this topic describe empirical research that involves large MTSs (e.g., three or more teams and twelve or more members). This is problematic because the small amount of existing research conducted with MTSs makes it clear that size and specialization matter, and this precludes simple generalizations from teams to MTSs when it comes to theory and practice. The small amount of empirical work on this topic can be traced to the difficulties researchers working alone confront when it comes to recruiting a sufficient sample size of MTSs that are executing comparable tasks. Methodologically, we seek to create a multi-university virtual MTS infrastructure that would allow team researchers from across the country to conduct empirical research on MTSs. In this new paradigm, each research group provides one set of component teams that would work interdependently with other component teams provided by other research groups. Theoretically, we derive and test several propositions regarding the interaction of task interdependence, communication medium, team member diversity, and member readiness in the context of MTSs.

Research Challenges and Opportunities:

- We have tried expanding the national infrastructure (at no cost) to an additional University (to learn about on boarding processes).
- The depth and breadth of data collected has allowed for multiple projects (beyond the original research scope) to spin off.

Data Science for Personnel Assessment

The capability focuses research around reliable and valid performance predictors to maximize sailor-job fit and establishing predictive and criterion validity to military relevant outcomes. Primary goal is to ensure that there is a sufficient supply of qualified personnel to operational forces at any time. With a sufficiently supplied and qualified force, operational readiness increases and provides opportunity to optimize personnel assignment leading to improved job performance and higher retention.

The guidance for this area comes from CNO NAVPLAN for improved readiness via better manpower and CNO's First Day Letter to CNP.

Performers

Dr. Cyrus Foroughi
Contract: N0001424WX00298
- Project: "Advancing Navy Testing"
- Institution(s): Naval Research Laboratory

Dr. James Stone
Contract: N000142312317
- Project: "Interpretable, subject-specific mapping of neurological health"
- Institution(s): University of Virginia

Dr. Sophia Vinogradov
Contract: N000142112463
- Project: "Neuropsychometrics: Development of a Neurocognitive Computational Assessment Suite"
- Institution(s): University of Minnesota

Dr. David Martinez
Contract: N000142112220
- Project: "Examining the Cognitive Underpinnings of Creativity"
- Institution(s): University of Maryland

Dr. Dobromir Rahnev
Contract: N000142012622
- Project: "Assessing Metacognitive Ability"
- Institution(s): Georgia Institute of Technology

Dr. Darya Zabelina
Contract: N000142112213
- Project: "Creativity and Attention in Time-Bound Scenarios"
- Institution(s): University of Arkansas

Dr. Elena Grigorenko
Contract: N000142112207
- Project: "Individual Differences in Response to Stress: Behavioral and Neuropsychological Correlates"
- Institution(s): University of Houston

LT Alexandra Kaplan, PhD
Contract: N0001424WX00389
- Project: "Human Performance Assessment and Construct Validation in Virtual Reality"
- Institution(s): Naval Medical Research Unit - Dayton

Dr. Richard Landers
Contract: N000142412336
- Project: "CAPTAIN: AI Coaching Platform for Leader Development"
- Institution(s): University of Minnesota

Advancing Navy Testing

AT A GLANCE

WHAT IS IT?
The U.S. Navy uses selection testing (e.g., ASVAB, ASTB) to optimize how personnel are allocated with the end goals of maximizing training success and increasing long-term retention.

HOW DOES IT WORK?
- The Armed Services Vocational Aptitude Battery (ASVAB) is taken by 30,000-50,000 prospective Sailors per year who want to enlist.
- The Aviation Selection Test Battery (ASTB) is taken by nearly 10,000 individuals who want to become pilots or flight officers in the USN, USMC, or USCG.
- Small improvements in reliability or predictive validity of these tools result in reduced Navy attrition, reduced setbacks and failures during training, and millions in cost savings per year.

WHAT WILL IT ACCOMPLISH?
We are developing new tests for the ASVAB and ASTB that will increase retention, reduce setbacks and failures during training, thus saving the Navy millions in unwanted costs.

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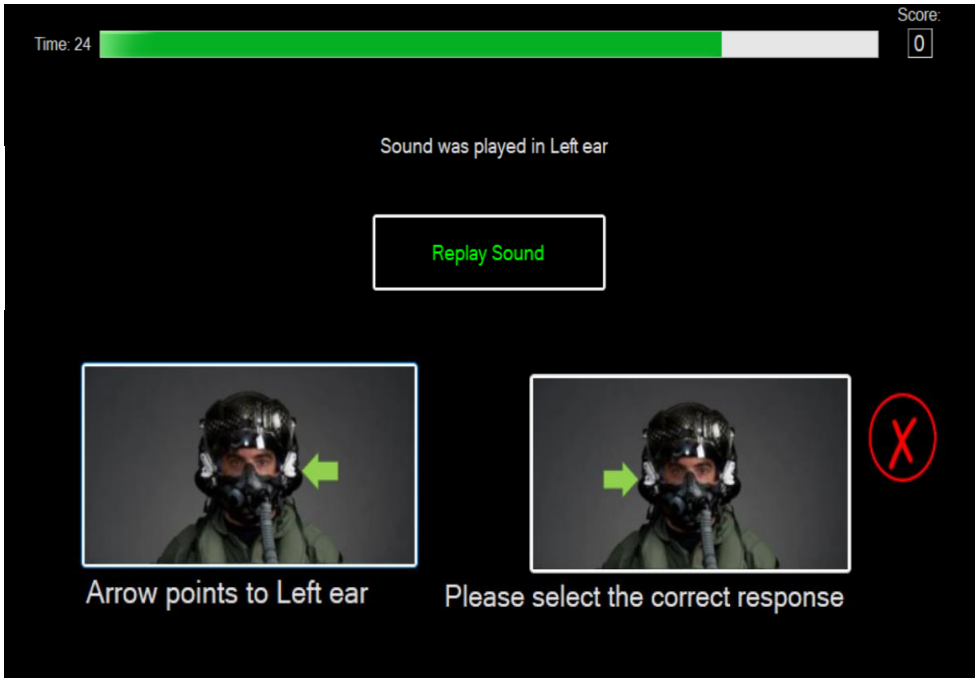
ABOUT
The U.S. Navy relies on selection testing to optimize manpower. The Armed Services Vocational Aptitude Battery (ASVAB) is taken by 30,000-50,000 prospective Sailors per year who want to enlist. The Aviation Selection Test Battery (ASTB) is taken by nearly 10,000 individuals who want to become pilots or flight officers in the USN, USMC, or USCG. Small improvements in reliability or predictive validity of these tools result in reduced Navy attrition, reduced setbacks and failures during training, and millions in cost savings per year.

Objective: To develop new tools (i.e., tests) and scoring methods that allow for the optimal selection and classification of Sailors.



The above is a picture of one of our newest prototypes that is measuring attention control. Once finalized, it is slated to be deployed in the ASTB.

RESEARCH CHALLENGES AND OPPORTUNITIES
- Challenge: The ASVAB and ASTB need to be continuously updated to optimize Sailor allocation
- Opportunity: By improving the ASVAB and ASTB, the U.S. Navy can reduce training setbacks and failures, increase retention, and save millions in wasted resources.

Interpretable, subject-specific mapping of neurological health in the performance setting

AT A GLANCE

WHAT IS IT?

A computational framework utilizing a battery of derived neuroimaging measures to objectively identify levels of resilience and sensitivity in Naval personnel cognitive performance and health.

HOW DOES IT WORK?

- Using Deep SiMLR, an advancement over previous work, meaningful embeddings of neuroimaging data will be learned and leveraged for assessment and intervention in the context of US Naval personnel performance.
- Longitudinal tracking of selected neurobiological variables will be critical to understanding individual health trajectories.
- Ultimately, the provided statistical framework will additionally further research insights into correlative relationships neuroimaging, socio-demographics, and health outcomes.

WHAT WILL IT ACCOMPLISH?

- This will create a framework for learning meaningful and objective neuroimaging measures that represent individual-level subtypes for a both research applications and potential metrics for health surveillance and monitoring of performance in Naval personnel.

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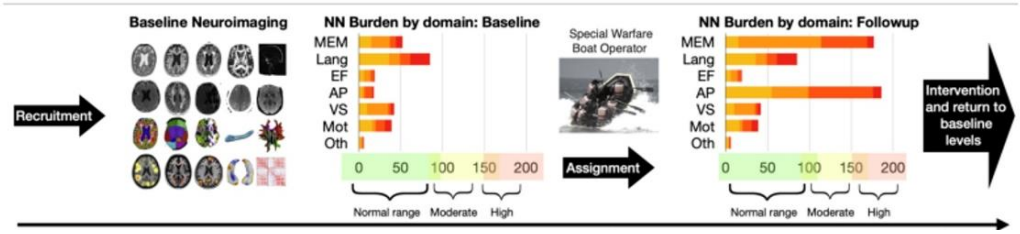

Naval personnel quantitative assessment and intervention

Currently, there is a paucity of established, multi-modal, non-invasive approaches for monitoring the neurological states that may contribute to improved normal or super-normal functioning, or to a spectrum of performance or resiliency within operational personnel. Longitudinal measurement of brain heath via psychometrics is especially challenging for healthy individuals due to the profound practice effects that occur with repeated administration of cognitive batteries. Based on the observation that quantitative signatures of intelligence, genotype and effects of stress and training are detectable in the brain, objective neuroimaging techniques such as “brain age” have been proposed and contribute significantly to a more objective understanding of brain health. Both structural and functional neuroimaging demonstrate reliable effects of the factors that contribute to neurological health. Although ample research confirms these relationships, the variability within normal brain health to performance and longer-term outcomes, in particular neurological resilience and vulnerability, is less well-studied. While academic studies provide some insight into such relationships, a clinical tool is needed that will allow ongoing tracking of a brain basis set that can be measured and referred to over time in relationship to field experience or training in monitoring and assessment of Naval personnel cognitive performance and health.

The proposed methodology will build upon the SiMLR algorithm---a groundbreaking tool for performing true multi-modal analyses of advanced imaging and non-imaging data within a joint analytical framework. While this tool is seeing rapid adoption for a variety of research applications, it also possesses the capability to identify powerful metrics that may be used for health surveillance and monitoring of performance. The next generation version of SiMLR, Deep SiMLR, will be implemented within a deep learning framework and thereby immediately gain representation power, improved computational efficiency, access to more flexible loss functions and adversarial optimization strategies. In order to train Deep SiMLR to learn meaningful embeddings that can be mapped to spaces that are relevant to sailor performance, we will also leverage large training data resources, including UK Biobank and the Human Connectome Project.

Deliverables will be primarily software-based with public availability open-source Advanced Normalization Tools ecosystem comprising several libraries and built upon the NIH-sponsored Insight Toolkit.

RESEARCH CHALLENGES AND OPPORTUNITIES:

- Which brain mapping metrics are most useful for health surveillance and monitoring of performance?
- What are the neurobiological contributions that explain changes in longitudinal performance?
- How does a model military population differ from the larger general population?

Neuropsychometrics: Development of a Neurocognitive Computational Assessment Suite

AT A GLANCE

WHAT IS IT?

Development of a brief cognitive assessment suite that is:

- Short, <30 min total
- Remotely administered
- Measures novel and informative cognitive abilities
- Demonstrates relevance to military performance and success

This cognitive suite was developed based on extensive knowledge in neurocognition and clinical neuropsychiatry to measure relevant aspects of cognitive function that vary widely across individuals and inform everyday functioning.

HOW DOES IT WORK?

This cognitive battery will measure multiple novel aspects of cognition not currently captured by other standardized tests consistently used across the military, including:

- Problem solving
- Social & emotional processing
- Cognitive control
- Sustained & divided attention
- Verbal learning
- Explore & exploit behaviors

WHAT WILL IT ACCOMPLISH?

This effort could provide a new, informative, and quick method of assessing military personnel to better inform their career paths or potential for success, potentially saving significant time and money in training processes across the DoD.

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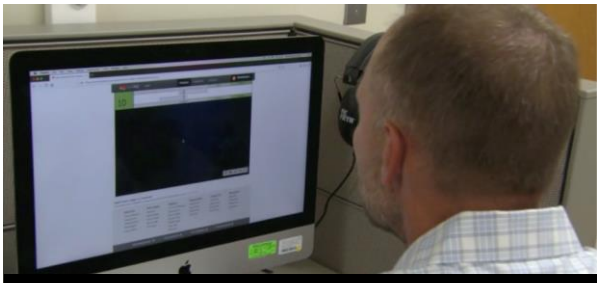
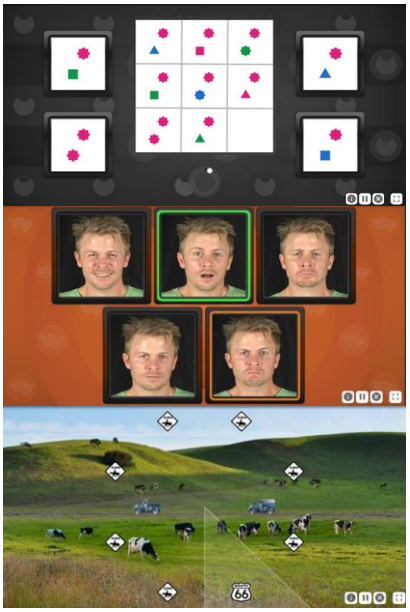


Veteran engaged in cognitive training at Walter Reed National Military Medical Center



Cognitive measures for problem solving (top), emotional processing (middle), and sustained attention (bottom)

There is no current existing reliable tool to assess key cognitive abilities in real-world settings in a manner that provides meaningful, easily interpretable, and actionable results. This effort aims to create such a capability, customized to be informative with respect to performance metrics relevant to military populations.

This project is based on our emerging research findings on cognitive assessments and training in populations with mental health conditions. We have developed a suite of brief cognitive assessments that can be self-administered and require less than 30 minutes to administer. This effort is in collaboration with researchers at the Minnesota Department of Veteran Affairs, who have established relationships and research efforts in conjunction with a representative military population, the Minnesota Army National Guard.

This effort has collected data on selected measures in various normative populations including participants recruited online, university students, and Minnesota State Fair attendees to create a robust baseline. We are currently collecting data from the Minnesota Army National Guard and are working to partner with other military entities to collect additional data in military populations in the next two years. Additionally, we aim to compare performance in our cognitive battery with military-relevant metrics of success such as MOS and vocational attainment.

We are working in partnership Posit Science, who are poised to offer this in an existing commercial platform as a future transition plan.

Research Challenges and Opportunities:

- How do these cognitive measures relate to other self-report measures and behaviors?
- How does a model military population (Minnesota Army National Guard) perform on these cognitive measures relative to the general population?
- How do other military populations perform on these measures?
- Do these cognitive measures relate to success/failure in their military careers?

Examining the Cognitive Underpinnings of Creativity

AT A GLANCE

WHAT IS IT?

Basic research to evaluate assessments of an ability that may be central to intellectual readiness for emerging technologies: creativity.

HOW DOES IT WORK?

- A large battery of established and novel creativity tasks along with other measures were administered to >500 individuals from the general population.
- Analyses were conducted to assess the reliability and validity of tests of creativity.

WHAT WILL IT ACCOMPLISH?

- Creativity may be a central component of intellectual readiness for emerging technologies and thus creativity tests could be useful in selecting individuals for their ability to leverage emerging technologies but assessments must be reliable and valid. The results of this project suggest that the reliability of creativity tests is generally fine but their validity can be improved. Further research focusing on improving the measurement of this important ability is warranted.

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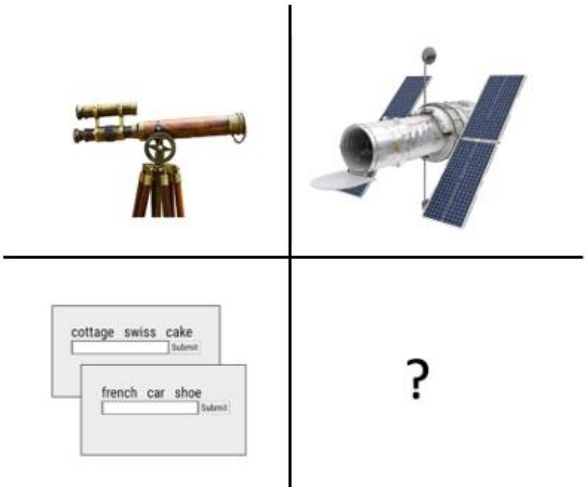

Caption: What will the improvement of creative thinking tests look like?

Creativity is an important factor, particularly in military leadership. The importance of creativity will only likely increase with the proliferation of sophisticated and relatively cheap technology and as our adversaries are able to invest more resources into their S&T R&D. In order to maintain dominance, it will be important to be able to accurate assess creativity so that we may understand, improve, and select for it.

This basic research project aimed to evaluate the measurement of creativity to aid in identifying measures that are valid and reliable and may be useful in a test battery, such as the ASVAB. Over 500 individuals between the ages of 18 and 35 participated in approximately 6 hours of research.

Results suggested that one class of creativity tests—divergent thinking tests—tend to be weakly related to other cognitive abilities, either because non-cognitive factors are significant enablers of performance on these tests or because these tests are unreliable. A second class of creative thinking tests—convergent thinking tests or creative problem-solving tasks—tend to be highly correlated with tests of intelligence.

Overall, this research suggests that creativity tests are not ready for use in high-stakes testing situations. Basic research to improve the assessment of creativity is needed.

RESEARCH CHALLENGES AND OPPORTUNITIES:

- Is creativity a unique ability or a conglomeration of other abilities and dispositions?
- Are there reliable neurological and/or physiological measures of creativity?
- Can large language models be used to improve the reliability of divergent thinking tests which tend to be subjectively scored?
- How can creative thinking be improved?

Assessing Metacognitive Ability

AT A GLANCE

WHAT IS IT?

- Navy personnel regularly make life-and-death decisions based on partial or uncertain information. In such situations, it is critical that one can appropriately communicate their confidence in a decision.
- The current project is developing the tools to allow the Navy to select personnel with high metacognitive ability, and improve the metacognitive ability of existing personnel

HOW DOES IT WORK?

- We have created and are actively maintaining the Confidence Database – a large collection of freely available confidence-related datasets
- We have developed new models, measures, and training programs for metacognition
- We have ensured that all new developments are compared to existing approaches and meet stringent psychometric criteria

WHAT WILL IT ACCOMPLISH?

- Better decisions made by individuals in the Navy
- Better group decisions in the Navy
- Better human-machine interaction in the Navy

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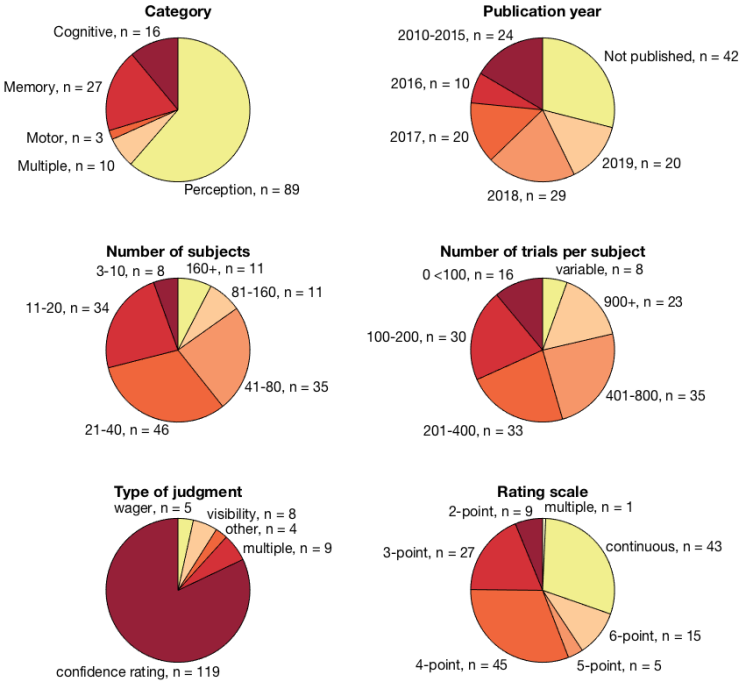


KEEP ALL TEXT IN THIS ONE TEXT BOX:

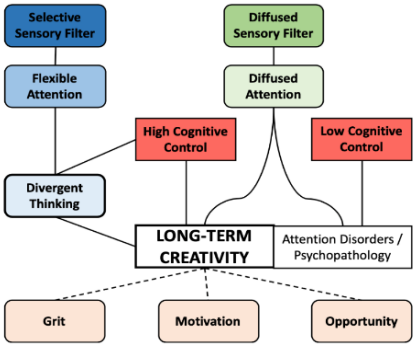
Life-and-death decisions are regularly made by Navy operatives up and down the command line. The majority of these decisions are based on partial or uncertain information and can rarely be guaranteed to be correct. Therefore, it is critical that one can estimate the relative likelihood that a decision is accurate. Such likelihood is communicated by reporting a sense of confidence. It is of utmost importance that Navy personnel can report an accurate and informative estimate of their confidence. People differ widely in their skill of using confidence ratings to communicate the certainty of their decisions. This skill is known as metacognitive ability. The confidence ratings of people with low metacognitive ability do not consistently predict the accuracy of their judgments, while the confidence ratings of people with high metacognitive ability do.

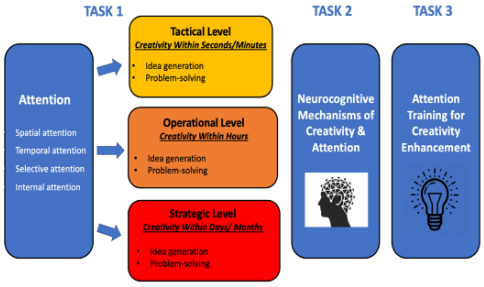
The current proposal is developing tools to both assess and improve people's metacognitive ability. Specifically, we have created a measure of metacognition based on an explicit computational model of how humans generate confidence judgments. We are working on validating both the underlying computational model and the new measures of metacognition. We are also developing training protocols that can specifically enhance the metacognitive ability of Navy personnel.

Research Challenges and Opportunities:

- Metacognition is challenging to isolate from confounding factors such as task performance and bias
- Our results show that computational modeling can be successfully be employed to meet this challenge
- We are exploring several methods for improving metacognition that can be applied to real-world decision-making

Creativity and Attention in Time-Bound Scenarios





AT A GLANCE

WHAT IS IT?

Cognitive neuroscience program of research examining the association between idea generation, problem solving, and attention in time-bound scenarios, namely minutes (tactics), hours (operations), and weeks/months (strategy).

HOW DOES IT WORK?

The research utilizes behavioral tasks and electroencephalography (EEG) to examine attention and creativity. It includes three studies: a Pilot Study and Study 1 (behavioral), both of which were a mixture of in-person and online tasks, and Study 2 (EEG), which was conducted entirely in-person. The studies assess different forms of attention—spatial, temporal, selective, internal, and sustained—while exploring creative thinking and problem-solving across various timeframes.

WHAT WILL IT ACCOMPLISH?

- Will characterize what forms of attention are associated with idea generation and problem solving in different time-bound scenarios.
- Will develop and test attention training techniques to enhance creative thinking.
- The project has the potential to dramatically improve the efficacy of the Navy training protocols.

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From tactical to strategic levels of warfare, vast array of Navy tasks require individuals to use creative thinking and problem solving to make decisions and act effectively. Creativity is the quality that the Navy can harness to increase its chances for success. Currently, creativity is developed only incidentally during training and on-the-job experience, costing time, money, and potentially lives. The primary objective of the proposed work is to leverage creative thinking and problem solving in a variety of time-bound scenarios, thus saving the Navy training costs and increasing its warfighting advantage.

To achieve this objective, a program of study is needed to establish a scientific understanding of what factors contribute to most effective creative thinking and problem solving when people only have a few minutes (tactics), hours (operations), or weeks/months (strategy) to generate creative solutions to given problems. Building on our research on the neurocognitive basis of attention in creative thinking, the proposed work with further characterize how attention contributes to creative thinking and problem-solving abilities at different time intervals. Our previous work demonstrated that people who have an exceptional ability to focus their attention are excellent at generating creative ideas within short time intervals (i.e., minutes). Thus, the ability to focus attention is likely the key characteristic for creative thinking at the tactical level. Our work also showed that people with more diffused attention generally have a high number of long-term creative achievements, suggesting that diffused attention may benefit creativity at the strategic level. It is not known, however, what forms of attention are most conducive for creative thinking and problem solving within shorter time intervals (i.e., seconds), or longer time intervals (i.e., hours, weeks). Once this characterization is complete, we will develop and test attention training techniques, which can consequently be used by the Navy personnel for enhancing their creative thinking and problem-solving abilities.

Task 1 will establish the core paradigm and test the link between attention and creativity in time-bound scenarios. Task 2 will examine neurocognitive mechanisms of attention in creative thinking. Task 3 will develop and test attention training techniques for creativity enhancement.

RESEARCH CHALLENGES AND OPPORTUNITIES:

- What is the link between attention (spatial, temporal, selective, internal) and creativity (idea generation, problem solving) in time-bound scenarios (tactical, operational, strategic)?
- What are the neurocognitive mechanisms of attention in creative thinking?
- Can attention training techniques be developed and tested to enhance idea generation and problem-solving abilities at different time scales?

Individual Differences in Response to Stress (IDRS): Behavioral and Neuropsychological Correlates

AT A GLANCE

WHAT IS IT?

The IDRS program aims to develop a novel, cost effective, and ecologically valid portable personnel selection (and training) evaluation platform, the Manpower and Personnel Assessment Battery (MPAB). The MPAB will result in an administrable performance battery that allows for easily repeatable testing scenarios to track progress and performance over time via key performance indicators.

HOW DOES IT WORK?

The IDRS platform integrates virtual reality technology with psychometric and biological markers to enhance personnel selection and training. These elements, combined with advanced data analytics, aims to mimic real-life military tasks, track performance across multiple levels, and predict performance under stress. The IDRS project seeks to show that this synthetic approach can produce meaningful, usable data.

WHAT WILL IT ACCOMPLISH?

The IDRS outcomes will serve to improve warfighter recruitment, occupational placement, and retention by identifying key biological, behavioral, and performance metrics that are most associated with cognitive performance under various forms of stress.

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The IDRS program is unique in its integration of virtual reality (VR) technology, psychometric assessments, and biological markers to create a comprehensive personnel selection and training platform. It helps warfighters by simulating tasks that
require working memory, inhibition, and motor skills, allowing for the assessment of both baseline and stress-induced performance. It also uses advanced data analytics to predict outcomes, which could have implications for job placement decisions in the
military.

Recent achievements include a peer-reviewed publication accepted into Military Medicine, where we found that longer color wavelengths in VR were associated with reduced behavioral accuracy in a Go/No-Go task. This result may have implications for future simulation and technology design. A team member, Ph.D. student Leandro Ledesma, also presented a poster at the 2024 MHSRS meeting in August 2024, where we found that response inhibition in VR was worse after sleep deprivation. Another student, undergraduate Tu Tran, received the Summer Undergraduate Research Fellowship from the University of Houston to study sex differences in effects of sleep deprivation.

As data collection nears completion, we are working on our data processing and analysis pipelines. We plan to finish data collection in 2025 and transition to analyzing and publishing final results.

Research Challenges and Opportunities:

- Hurricane Beryl hit Houston in July 2024, knocking out power to 2.6 million and delaying our data collection activities.
- After our MHSRS presentation in August 2024, we were invited to submit a publication to *Military Medicine* which we are working on now. This opportunity will provide scientific writing experience for a Ph.D. student and disseminate findings to the military research community.

Human Performance Assessment and Construct Validation in Virtual Reality

AT A GLANCE

WHAT IS IT?

Innovative examination of which constructs, necessary to success in aviation which can be better captured via virtual reality (VR) and emerging technology.

HOW DOES IT WORK?

By introducing more immersive experiences and measuring physiological as well as behavioral responses, emerging technologies can better capture constructs relevant to aviation without relying only on performance metrics or procedural knowledge.

WHAT WILL IT ACCOMPLISH?

VR scenarios designed to elicit constructs necessary to success in aviation, but not measurable by traditional methods, will put aviation candidates through situations that measure their resilience, grit, performance under stress, and more while using physiological, performance, and psychological measures to develop a better measurement of capabilities with fewer assumptions than traditional methods. This effort will expand and improve the selection process for the next generation of naval aviators.

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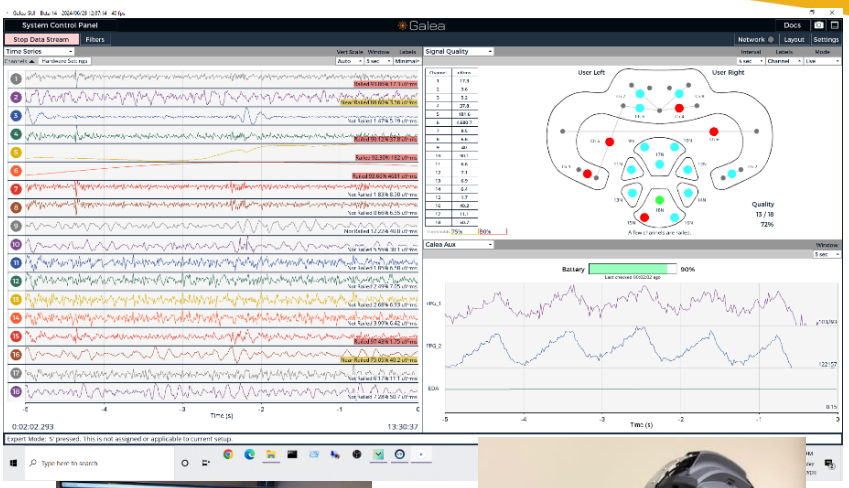

This project is an examination of the constructs that make for a successful aviator that are not fully assessed via current personnel selection methods. For example, the ability to perform well under stress is crucial, but cannot be tested in a traditional method. Performance can be tested, and it can be tested in an environment designed to be stressful, but without a psychoneurometric approach it cannot be guaranteed that the intended construct is being measured, and only proxy assessments can be assumed. The use of emerging technologies can help to directly assess the constructs of interest. VR in particular can be used as part of the next form of adaptive testing, by giving test administrators the ability to introduce and measure stress in real time. This effort will examine the feasibility of emerging technology as a theoretical method for directly measuring constructs necessary to success in aviation.

Research Challenges and Opportunities:

- What constructs, necessary to success in aviation, cannot be assessed via traditional testing methods?
- Can those constructs be better assessed in VR?
- Can VR-based assessment show convergent validity with established legacy assessment methods?
- Does VR-based assessment introduce any unintended consequence or adverse impact?

CAPTAIN: Generative AI for Leadership Development

AT A GLANCE

WHAT IS IT?

- Generative AI can be used to simulate high-quality interactions that traditionally require a 1-on-1 human interaction
- Leadership coaching is a beneficial but expensive 1-on-1 interaction that helps coaches achieve their goals faster and more directly
- By giving leadership coaching using generative AI, we can see these benefits for much lower personnel costs than ever before

HOW DOES IT WORK?

- In a pilot study, students at USNA will access the leadership coach through their phone or a laptop
- Sessions will be held once a week or biweekly, and the coach will check on each student's goal progress individually through conversation

WHAT WILL IT ACCOMPLISH?

- Leadership coaching is tied to many important outcomes, including improved retention, warfighter performance, and mental health

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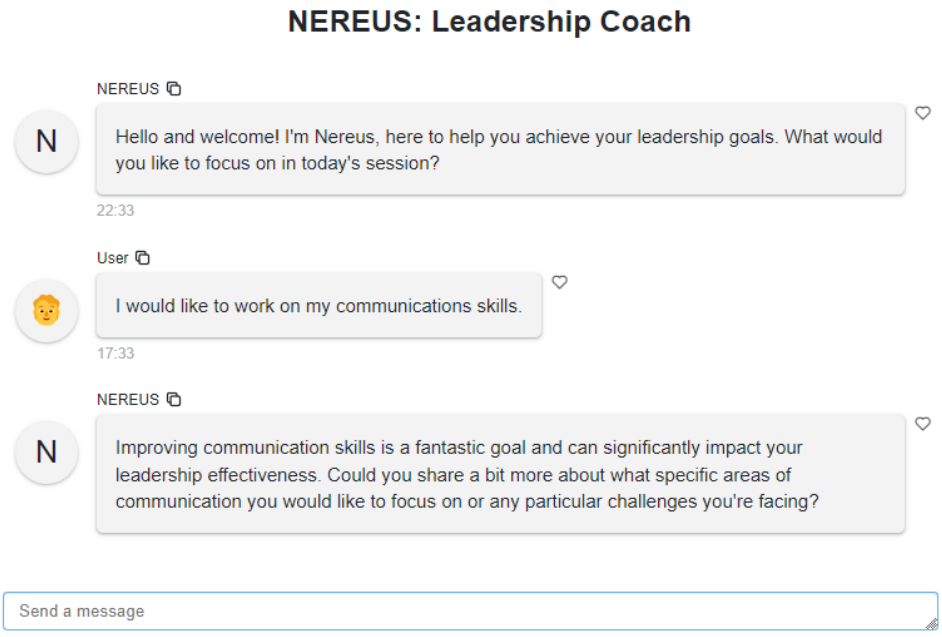

The CAPTAIN project aims to develop and empirically test the deployment of a generative AI based leadership coach at the US Naval Academy. The platform will help students accomplish their personal growth leadership goals in a way that is impossible with classroom or other broad instructions.

In our current prototype, coaches develop a personal relationship with Nereus, named after the Greek god of the sea, who will guide them on a personal development journey and help them better achieve their goals. Nereus follows standard practices of professional coaching established by worldwide organizations like the International Coaching Federation to help keep midshipmen on target. It is also already familiar with USNA practices and standards and is programmed to respect Navy values and traditions.

The promise of Nereus is to provide what traditional 1-on-1 coaching is intended to provide: improved performance, improved retention, and improved mental health. Many USNA students are stressed about the demands placed upon them, and Nereus is designed to help them navigate those demands to become the best they can be.

Research Challenges and Opportunities:

- A generative AI agent like Nereus is a cutting-edge technology, which means that designing it to be both effective and safe requires carefully balancing many different technical and social factors at the frontier of current understanding
- The success of developing Nereus will be driven by asking many people to try it out and provide feedback on its success in helping them to pursue their personal growth goals
- It is only through community feedback that Nereus will be able to become all it can be, to maximize its performance at supporting Navy personnel

Harmful Behaviors

The Harmful Behaviors capability aims to solve the problem of identifying the biggest levers for intervention and policy change by establishing a common naval framework to gain an increased ability to detect and predict harmful and counterproductive workplace behaviors.

The guidance that addresses this capability is part of the CNO's "Get Real, Get Better" Advancing Navy Behaviors and the SPRIRC – Suicide Prevention and Response Independent Review Committee.

Performers

Dr. Hans Breiter and Dr. Aggelos Katsaggelos
Contract: N000142312396

- Project: "Automated Mental Health (AMH) to Predict Inward and Outward Destructive Behaviors Along with Mental Health"
- Institution(s): University of Cincinnati & Northwestern University

Dr. Nathan Bowling
Contract: N000142312309

- Project: "Assessment, Prediction, and Prevention of Destructive Behaviors: Scale Validation and Extension to Narrow Behaviors"
- Institution(s): University of Central Florida

Dr. Cameron McCabe
Contract: N0001424WX00439

- Project: "Challenges of Operational Environments aboard Carriers"
- Institution(s): Naval Health Research Center

Dr. Nancy Leveson and Dr. Elizabeth Baker
Contract: N000142312551

- Project: "Systems Theoretic Approach to Destructive Behaviors"
- Institution(s): Massachusetts Institute of Technology & Virginia Commonwealth University

Dr. Doug Wiegmann and Dr. Scott Shappell
Contract: N000142312554

- Project: "A Human Factors Analysis of Destructive Behaviors"
- Institution(s): University of Wisconsin & Embry-Riddle Aeronautical University

Dr. Paul Salmon
Contract: N000142412458

- Project: "AcciMap - Understanding and Preventing Dysfunctional Behavior"
- Institution(s): University of the Sunshine Coast

Computational Behavior and Interpretable AI for Automated Mental Health (AMH)

AT A GLANCE

WHAT IS IT?

Empirically grounded and lawful function space for human reward and aversion judgments that enables prediction of mental health conditions (MH) and destructive behaviors (DB; suicide & violence).

HOW DOES IT WORK?

- Built a computational framework for relative preferent theory (RPT) modeling of reward and aversion judgments.
- Integrated variables from the RPT function space + contextual variables such as age & income into data-driven AI for predicting MH/DB for automated mental health (AMH) assessment.
- Quantified prediction accuracies for MH/DB conditions of depression, anxiety, and suicidality by AMH.
- Plan to extend MH/DB predictions to violence (multiple forms), addiction, & subjective cognitive decline.

WHAT WILL IT ACCOMPLISH?

- AMH predicts MH and DB to flag needs for early intervention and optimize critical readiness infrastructure.
- AMH does not need personally protected information and minimizes gaming of information.

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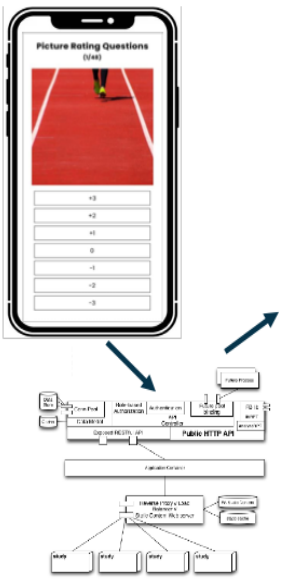
Computational Cognition Task



API for MH/DB Prediction

Goal: Automated Mental Health (AMH)

Impact/Transition: This AMH will provide the first automated assessment of suicide planning and multiple MH conditions. It can be easily deployed on simple digital devices. Nothing like this currently exists.

This project is engineering the components needed for automated mental health assessment (AMH), using advances in computational behavior and artificial intelligence (AI) that are based on validated neuroscience. This research has produced a novel form of interpretable AI (iAI) and will optimize how well variables that quantify reward/aversion judgments by individuals can be used to predict past and current mental health (MH) problems and destructive behaviors (DB).

AMH development has and will continue to focus on an engineering-based framework for reward/aversion judgments, referred to as relative preference theory (RPT) to predict MH/DB. DB and MH include a range of issues that can disrupt mission readiness, mission execution, and post-mission assessment, which are now recognized as significant challenges. DB include suicidality, homicidality, addiction, and antisocial/violent actions. MH includes all Axis I disorders in psychiatry and can be co-morbid with DB and exacerbate the risk of its incidence. Currently no system exists outside of our prototype that can rapidly and automatically assess the probability of DBs and separate them from the broad array of potentially co-morbid MH problems using a small set of variables as input for iAI. Tools that can assess DB and MH are needed for one-time assessments, for longitudinal assessment of the course of risk, and for assessing the rapidity with which intervention is needed.

The technical approach proposed for this problem follows a novel path that has not been implemented by existing frameworks using: (i) text mining, (ii) surveys at big data scale (including ecological momentary assessments), or (iii) smartphone and wearable sensors. This work will optimize how well RPT variables from a short cognitive task + contextual variables can predict the full set of MH and DB. It will further test the integration and scalability of this AMHA system, one that could run in real time without needing access to medically protected information in individuals.

Research Challenges and Opportunities:

- How broad an array of MH and DB do RPT + context variables predict?
- Can this AMH predict outward violence, across a range of contexts – e.g., from physical assault to toxic workplace environments?
- Can the current AMH be used for longitudinal assessment of MH/DB?

The Assessment, Prediction, and Prevention of Destructive Behaviors

AT A GLANCE

WHAT IS IT?

- Develop new, context-specific measures of destructive behavior (DB) that are specifically tailored to the unique needs of the U.S. Navy.
- Existing DB measures are appropriate and valid for use in civilian contexts.
- The development of context-specific DB measures would increase the U.S. Navy's capacity to detect and prevent DB.

HOW DOES IT WORK?

- Phase I: Focus groups to identify relevant DBs for four U.S. Navy communities (NCG, MESG, EOD, and NAVELSG).
- Phase II: Pilot testing of initial set of self-report DB items per U.S. Navy community.
- Phase III: Conduct construct validation studies for four DB scales.

WHAT WILL IT ACCOMPLISH?

- The current project will yield DB measures that are more content relevant to the U.S. Navy than are existing DB measures.

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What are destructive behaviors?

- DBs harm either (a) other people (e.g., other sailors, family members), (b) the Navy as a whole, or (c) the person performing the behavior.
- Example DBs include sexual assault, theft of Navy property, and binge drinking.
- The presence of DB undermines a Culture of Excellence, is incompatible with signature behaviors, harms the psychological and physical well-being of victims, and imposes financial costs. This research supports three FY2024 DoD research priorities related to harmful behaviors.
- Unfortunately, DBs are likely to be prevalent within a military setting because of the presence of stressful, high-tempo working environments.

Recent Achievements

- We recently completed a book chapter that draws from our ONR research to describe the development of context-specific DB measures.
- We presented a poster at the 2023 Military Health Systems Research Symposium examining the prevalence of DB within U.S. Navy communities.
- In June 2024, we presented about the importance of creating psychometrically sound measures at DON OFR's Lecture Series.
- We are preparing a symposium presentation for the 2025 Society for Industrial and Organizational Psychology conference that will examine the predictors of DB among U.S. Naval Academy Midshipmen.

Research Challenges and Opportunities:

- Phase II data collection has gone slowly, particularly for MESG and NAVELSG communities.
- Relaunching data collection within MESG and EOD. Leveraging additional data collection opportunities with the USNA and a pilot community.

Challenges of Operational Environments Study (COPE)

AT A GLANCE

WHAT IS IT?

The Challenges of Operational Environments Study (COPE) is a longitudinal mixed method study designed to examine the interplay of individual, unit, and organizational factors on command climate and risky and harmful behaviors, including suicide, across various phases of the aircraft carrier lifecycle.

HOW DOES IT WORK?

The COPE Study is currently following two US Navy aircraft carriers. At each collection, a team of 5-7 trained researchers conducts anonymous surveys (~1,000) and 60-90 minute focus groups (~10) over a 5-day period. Topics include stress at work and at home, mental and behavioral health, morale, cohesion, and perceptions of leadership. Following collection, data are analyzed and used to generate a comprehensive brief. Results are presented to command leaders 4-6 weeks post-data collection. Follow-ups are attempted every 6 months.

WHAT WILL IT ACCOMPLISH?

The COPE study aims to provide Navy leaders with realistic, specific, and actionable recommendations to prevent risky and harmful behaviors and improve command climate in near real-time. Long-term, data will aid in the development of a predictive model of risk and protective factors for risky and harmful behaviors at various stages of the carrier lifecycle.

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Study Progress and Objectives:

The COPE Study team is located at the Naval Health Research Center (NHRC) in San Diego, CA. The team has conducted several data collections in support of the Rapid Response Surveillance capability with two aircraft carriers undergoing prolonged maintenance phases. Its first collection occurred on a carrier in April 2022 and has since conducted 3 additional assessments, including during their first underway. COPE expanded in April 2023 and began supporting an additional carrier undergoing maintenance. To date, the team has conducted over 6,700 surveys and recruited more than 450 sailors to participate in focus groups.

By continuing to work with carrier crews and follow their progression over time, these efforts will provide insight into the unique challenges and stressors affecting Sailors in operational environments and at different phases of the carrier lifecycle (e.g., maintenance, deployment). Lessons learned from these collections are translated directly to Navy leadership, providing feedback on the status of their crew in near real-time. Further, by examining the impact of individual (e.g., mental/behavioral health screens, work-related stressors, etc.), unit (e.g., cohesion, trust), and organizational factors (e.g., leadership styles and behaviors, undermanning, work schedule) on crew health, evidence from the COPE study will contribute to the growing body of work aimed at early identification and prevention risky and harmful behaviors in the DON.

Research Challenges and Opportunities:

- Obtaining necessary regulatory approvals to conduct sensitive research can adversely impact timelines.
- Communication and scheduling delays with ships that are underway may extend follow-up timeframes, requiring flexibility.
- Ongoing consultation with carriers and parent commands may result in data collection opportunities aboard additional carriers.

Systems Theoretic Approach to Destructive Behaviors

AT A GLANCE

WHAT IS IT?

Applied research to model the design of destructive behavior (DB) intervention activities in the Navy using STAMP analysis techniques that will identify interventions to lower rates of destructive behaviors and improve total sailor fitness.

HOW DOES IT WORK?

Using the STAMP hazard analysis tool (STPA), we investigate the design of DB intervention activities in the Navy by modeling and analyzing the controls (policy and decision-making) over DB. We develop a high-level system model and drill down into more detailed views/models of the system by identifying different entities with responsibility, authority, and accountability over DB in the Navy surface forces ecosystem.

WHAT WILL IT ACCOMPLISH?

This work will introduce a model of causality based on a control structure around DB at supervisory and organizational levels in the surface forces. Modeling these actions and decisions as part of an entity's responsibilities shows where the opportunity for DB arises and how responsibilities could be prioritized to implement successful interventions to lower the DB rate.

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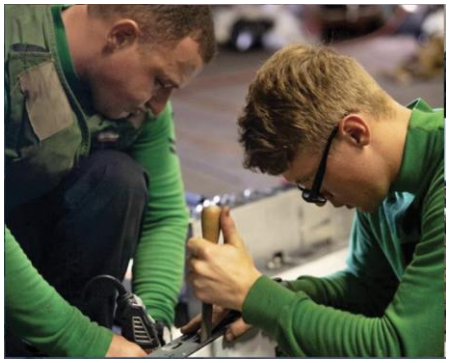

Photo by Petty Officer 2nd Class Ace Foster, DVIDs

AID TO WARFIGHTER READINESS

This approach using STAMP tools provides the value-added of targeted intervention identification, which will lead to successful system constraints being put into place rapidly and thus at a lower cost. This will aid in retaining sailors in the force and conserve resources while providing more effective support to sailors engaging in destructive behavior.

Novelty of Approach:

- It provides causality for decisions made (or not made) and the impact of those decisions throughout the system [cause-and-effect]. It is not simply a taxonomy.
- Traceability is provided for unmet leadership decisions (called unsafe control actions), which can be traced back to the hazard realized that leads to a loss.
- A comprehensive view of the community—The model can be abstracted for a higher-level view of the entire community or drilled down into for analysis of a smaller subset in the organization.
- A formal description of the relationship between individuals in the community

Upcoming Milestones: Sponsor SURFPAC

- **CY24:** Completed STAMP-based hazard analysis on suicide-SRB; Completed model control structure for SA, SH, D, H, DV/IP (substantiated)
- **CY25:** Continued investigation into how to remediate control structure gaps, such as gathering data from idle, ready & reacting stages of mental health interventions for suicide-SRBs (Chaplains, military, and family life counseling, FFSC, One Source); Completed STAMP-based hazard analysis on SA, SH, D, H, DV/IP (substantiated); Completed model control structure for drug positives, alcohol incidents, DUIs

Research Challenges and Opportunities:

- **Opportunity:** Identification of the lack of data on idle, ready, and reacting stages of mental health interventions for sailors leaves a significant research gap in how the Navy can prevent mental health incidents from escalating to full-blown medical scenarios requiring already scarce medical personnel.
- **Challenge:** The continuous, rapid rollout of initiatives to stem destructive behaviors involves changing leadership responsibilities, accountability, and control over specific pieces of responses to destructive behavior. It makes it challenging to model the relationships among entities and the cause-and-effect of interventions.
- **Challenge:** Implementing IPP policies in real time introduces additional organizational factors that dynamically alter models as the analysis progresses, making it difficult to pinpoint specific effective actions.

A Human Factors Approach to the Analysis and Prevention of Destructive Behaviors in the Workplace

AT A GLANCE

WHAT IS IT?

The Human Factors Analysis and Classification System (HFACS) is an evidenced-based framework for investigating, coding, and analyzing organizational and work system factors that impact human performance.

HOW DOES IT WORK?

- We utilized an iterative design and validation process to adapt the HFACS tool for use in the investigation, evaluation, and mitigation of DBs.
- This recently redesigned tool, called HFACS-Workplace Behaviors or “HFACS-WB,” will be used to analyze both unstructured and structured data to test the model.
- Results will provide deeper insights into why DBs happened.

WHAT WILL IT ACCOMPLISH?

- This project seeks to provide “actionable” findings that will ultimately enable senior leaders to develop data-driven policies, programs, practices, and processes (P^4s) that target and eliminate the underlying root causes of DBs across the Fleet.

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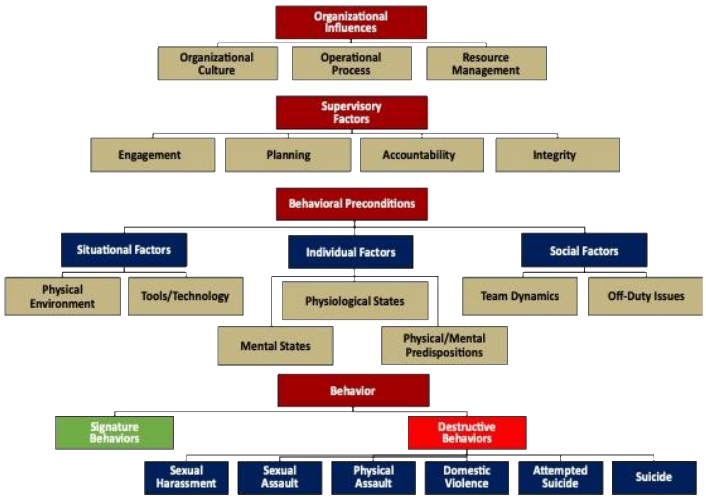
The Human Factors Analysis and Classification System – Workplace Behavior (HFACS-WB)



Destructive behaviors (DBs) in the workplace, such as incivility, racism, bullying, hazing, sexual harassment, and physical assault can degrade morale and combat readiness. They also do significant harm to our sailors and their families, as do other tragic forms of destructive behaviors (DBs), such as attempted and completed suicides. Unfortunately, DBs have risen, seemingly unabated, over the past several years in the Fleet. This is largely due to the difficulty that psychological and scientific communities have had with identifying and mitigating human factors that foster DBs. Traditional tools and procedures in place for investigating the genesis of these behaviors have often proven ill-suited for the task. Moreover, investigations of DBs tend to lack the standards and quality control measures necessary to go beyond merely describing "what” happened, to include an understanding of "why" they occurred.

To help remedy this problem, members of our research team have been working with ONR to test the value that novel human factors tools, proven effective in supporting operational readiness in other domains (e.g., aviation), might have in analyzing and mitigating DBs. These evidenced-based tools include the Human Factors Analysis and Classification System (HFACS), the Human Factors Intervention Matrix (HFIX), and FACES (a multiple-criterion decision method for evaluating/selecting interventions).

Preliminary efforts indicate that each of these tools add unique value to the process of mitigating DBs. The purpose of this project, therefore, is to advance these efforts by further testing the validity of the HFACS model in analyzing the organizational and work system factors that impact behavior and well-being of sailors in the Fleet.

RESEARCH CHALLENGES AND OPPORTUNITIES:

- Does HFACS-WB framework contain a complement of human factors categories that substantively reflect the underlying human factors “root causes” of DBs in the fleet?
- Does HFACS-WB contain a breadth of human factors categories capable of encompassing a large range of human factors issues associated with diverse types of DB’s in the fleet?

Understanding and preventing dysfunctional behavior-related incidents

AT A GLANCE

WHAT IS IT?

- There are key gaps in the knowledge base regarding the systemic causes of dysfunctional behavior in defence personnel
- Current methods for reporting, analysing, and learning from dysfunctional behaviour-related incidents involving defence personnel are limited, which in turn is impacting the effective management of dysfunctional behaviour
- Project aim is to create and validate a novel dysfunctional behavior-related incident contributory factor classification scheme to support future reporting, investigation, analysis, and learning

HOW DOES IT WORK?

- The new dysfunctional behaviour-related incident contributory factor classification scheme will be used to investigate and analyze dysfunctional behavior incidents and support the development of more effective prevention strategies

WHAT WILL IT ACCOMPLISH?

- This work will address key knowledge gaps around the causes of dysfunctional behavior incidents and how such incidents can be prevented.

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Dysfunctional behaviors (e.g., sexual assault, suicide, drug and alcohol misuse) are an area of increasing concern for defence forces worldwide. Over the past decade, systems thinking methods such as the Accident Mapping technique (AcciMap) have become popular when attempting to understand and prevent adverse events. Such methods are now dominant in safety science and are used across the safety critical domains to develop a comprehensive understanding of the systemic factors that contribute to adverse events. To date, however, methods such as AcciMap have not been applied to the analysis of dysfunctional behaviour-related incidents involving defence personnel. This project involves the development and validation of a dysfunctional behaviour-related incident contributory factor classification scheme. The outcomes will include new knowledge on the systemic causes of dysfunctional behaviour-related incidents and a novel classification scheme that will support the use of AcciMap in future incident analysis and learning efforts. This will support the development of more effective interventions and a reduction in dysfunctional behavior-related incidents.

Research Challenges and Opportunities:

- Accessing existing data on dysfunctional behavior-related incidents
- Identifying the systemic conditions that interact to create dysfunctional behavior-related incidents involving defence personnel
- Using data from other domains to support the classification scheme development
- Developing a contributory factor classification scheme that is valid, reliable, and usable in practice

Robotics Rating & Designator Development

The Robotics Rating TECAN provides the foundational science supporting the establishment of the Robotics Warfare Specialist enlisted rating, tests and evaluates novel training methodologies to support the rating, and investigates the relevance of an officer rating and/or qualification.

This TECAN aligns with guidance from the 2022 CNO NAVPLAN.

Performers

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- Project: “Robotics Warfare Specialist Rating Support”
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Robotics Training and Competition Validation

AT A GLANCE

WHAT IS IT?

A design-based research program co-evolving theory and effective training for Robotics Warfare Specialists (RW), who will be expected to thrive as optainers of critical Naval robotics platforms amidst rapid technological change.

HOW DOES IT WORK?

Existing robotics technician training materials are adapted and used as a vehicle to test design principles for RW training. Data collected in each iteration drives revision of instructional theory and domain-specific curriculum design principles; as well as produce repurposable experimental curricula embodying the design hypotheses of the latest cycle.

WHAT WILL IT ACCOMPLISH?

The project seeks to address:

- Whether and how hands-on training on many different small robots promotes *rapid practical comprehension across platforms*
- Whether and how programming and AI instruction improve RW performance, even though RW neither writes code nor trains AI
- Novel emergent phenomena discovered through testing

Experimental materials may also:

- Accelerate the stand-up of RW "A" School (from OCT 2026)
- Shorten RW training time (experimental length: 6 weeks)

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In February 2024, the Navy announced the establishment of its first new rating in years: RW, the Robotics Warfare Specialist, to maintain and operate the wide array of robotic systems in the Navy today, and the even larger number is expects in the near future. In September, NAVPLAN 2024 and Project 33 re-emphasized the urgent need to simultaneously operationalize robotic and autonomous systems and invest in warfighter competency – training and training methods.

This project uses a design-based research methodology to embrace the dual nature of research and development through iterative co-evolution of theory and curriculum. We jump-started the cycle with an existing robotics technician training curriculum, adapted it for RW in Winter 2023, and piloted it in Summer of 2024. First cohort participants reported value from hands-on engagement with multiple robots, and in understanding all components of the system rather than siloed subsystems. Inclusion of Programming and AI topics had been hotly debated– RW does not write code, nor does it train AI models -- but participants found both valuable.

These findings have been synthesized into second iteration design hypotheses:

- That the use of multiple, increasingly advanced robot platforms will produce a productive spiral of motivation, knowledge, and reasoning about novel platforms
- That "adjacent" domain training will improve performance on core RW tasks by enabling *technical situational awareness* that facilitates troubleshooting decisions

Research Challenges and Opportunities:

- Measures of empirical performance on RW tasks do not exist yet; we are simultaneously developing a Robotics Competition to serve this function
- Design requirements evolve at the speed of robotics technology and Naval needs, testing the limits of our rapid iteration-based methodology
- Research findings can inform the development of RW and other "A" Schools
- Curricular products could establish the basis for very short but effective training

ROKI Robotic Combat Systems Operator Knowledge Skills & Abilities Investigation

AT A GLANCE

WHAT IS IT?

ROKI is focused on identifying the knowledge, skills, and abilities (KSAs) required to operate and maintain novel robotic and autonomous systems (RxS) to support defining a future 'Robotics Rating' for the United States Navy.

HOW DOES IT WORK?

We employ early-development technology in unscripted free-play force-on-force experiments, providing insight into the KSAs and training that future warfighters will need to operate and maintain ('optain') robotic and autonomous systems.

WHAT WILL IT ACCOMPLISH?

In-development technology is a moving target – identifying KSAs needed by the personnel in the future based on early-development technology is our primary objective in order to inform USN Manpower planning, talent management, and recruitment.

Capturing future RxS KSAs is critical to meet FD2030 recruitment and training objectives.

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During field experimentation, developers work alongside warfighters to adapt technology rapidly to support relevant use cases. We have partnered with several organizations that have provided us with regularly occurring opportunities for new training with uninitiated users. This provides feedback on training requirements on the most up-to-date systems.

We leverage regular unscripted free-play force-on-force experiments to observe operations and maintenance of in-development RxS. Unscripted force-on-force enables warfighters to employ these novel RxS within the most realistic available training/experimentation environment. Friction, human factors and environment effects all come into play.

Observations from these experiments allow us to decompose tasks for configuration, employment and maintenance of low-TRL technologies. Then compare and translate the KSAs into occupational standard language. We are able to consolidate observations into 'roles' associated with future RxS employment concepts.

Research Challenges and Opportunities:

- We are targeting pre 'Milestone A' technology to gain insight into KSAs and training that future warfighters will need to operate and maintain robotic systems.
- We leverage Kobol Force-on-Force experiments as data-collection opportunities
- We work with our ONR development and USMC partners to capture data regarding robotics system technology and processes associated with their employment and maintenance.

Understanding and Optimizing Unmanned Maritime Systems (UMS) Operator Training

AT A GLANCE

WHAT IS IT?

- UMS operators provide mine counter-measures mission planning/operations, deployment of UUVs, and conducting PMA of vehicle data to identify mine-like objects.
- There is little knowledge of the human factors and reliable predictive variables underlying successful performance, selection of future talent recruitment and personnel.

HOW DOES IT WORK?

- Mixed methods research including observations of platoon training and active fatigue monitoring through the off-the-shelf wearables.
- Pre-existing training data (e.g., test scores, instructor ratings) will be incorporated into predictive models.

WHAT WILL IT ACCOMPLISH?

- Findings from this effort will provide information on the cognitive, motivational, academic, and physiological predictors of successful mission performance needed to address current and future Naval UxS needs related to optimizing performance/training and manpower requirements.

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The Department of the Navy has recently put the importance of unmanned systems (UxS) at the forefront of the campaign towards increased lethality and survivability. UxS goals are not merely focused on the engineering of technologies. Given much of current platforms are still human dependent, the selection of future personnel, talent recruitment, and training optimization are also critical aims. One group, Navy Unmanned Maritime Systems (UMS) platoons, are a current example of a dissociation between Navy's ambitions for UxS, and the actual state of operations. Successful UMS Operations are essential to the safe passage of the fleet given missing mines could cause catastrophic damage including Warfighter casualties. Critically, however, UMS platoons are currently pieced together with a variety of Navy rates, with training occurring at disjointed time points relative to command operations, and little knowledge of the human factors and reliable predictive variables underlying successful performance. This study leverages relationships with operational partners focused on UMS training and performance, including leadership at EOD Training and Evaluation Unit One (TEU1), to identify the cognitive, motivational, academic, and physiological variables associated with successful mission performance. Participants will complete attention testing, motivational questionnaires, and undergo active fatigue monitoring during their Final Evaluation Exercise (FEE). Instructors at TEU have provided performance metrics associated with the FEE. Modeling efforts will attempt to identify factors that are uniquely predictive of mission performance, as well as fatigue resilience during operations.

Research Challenges and Opportunities:

- How to optimally down-select predictor variables to bring the most utility to the community
- Recruitment is dependent on the availability of platoons that cycle through the training pipeline; platoon do not always overlap (e.g., 2-4 week gap before next platoon on boards)

Human Performance for Current and Future Robotics Systems: Officer Considerations

AT A GLANCE

WHAT IS IT?

Provide insights: *What KSAs are criteria for recruitment/selection of strong candidates to serve as RAS experts and leaders? How are officers' contributions differentiated from enlisted crewmates' in a robotically-enabled operational unit?*

- Baseline of human performance parameters
- Qualitative investigation of role of an officer in RAS operations

HOW DOES IT WORK?

Grouded Theory approach

- Task Analysis through widely accepted methods
- Questionnaires, structured interviews, hierarchical task analysis, operational sequence diagrams, observation

Hypothesis-driven approach

- "Officers in RAS operations will require specialized training and/or must exhibit certain criteria to be effective in their roles."
- Emphasis on "future" systems and capabilities
- Consider different officer roles/models across the Navy

WHAT WILL IT ACCOMPLISH?

Working toward overall goal of improved selection of and training for future robotics leaders and experts.

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Human-machine teaming (HMT) with robotic and autonomous systems (RAS) is a crucial part of Navy's future. Majority of Knowledge, Skills, and Abilities (KSAs) for operation and maintenance of RAS are acquired outside of standard training leading to difficulty identifying candidates for HMT tours and constant (re)training of incoming sailors.

Development of an RxS rating for enlisted sailors is well underway; Navy Enlisted Occupational Classification System (NEOCS) package has been approved and is undergoing rollout. This effort shifts the focus to providing foundational understanding toward a potential Navy Officer Occupational Classification System (NOOCS) product. Official guidance for officers who work with RAS will be vital given their expected role as experts and/or leaders in the Navy

This work features a bi-direction approach to research enabling data collected to both inform formation of theory but also refute or support hypotheses on the role of officers involved with RAS. Prior work on job task analysis for RAS is leveraged to expedite progress toward research goals, with an ultimate aim to provide recommendations for future official guidance with respect to officers in RAS.

The officer community in the Navy faces a unique challenge with providing attractive career pathways and opportunities to potential recruits. This work aims to support fleet readiness by guiding effective allocation of manpower, personnel, training, and education (MPT&E) resources.

Research Challenges and Opportunities:

- Officer role(s) with respect to RAS is not well-defined / has multiple concepts of operations (CONOPS) from an officer perspective
- NOOCS has multiple sub-systems to consider for transition of this work

Robotics Warfare Specialist (RW) Rating Support

AT A GLANCE

WHAT IS IT?

- This effort supports an **Office of the Chief of Naval Operations (OPNAV)** N13-directed, multi-year, cross-organization endeavor to develop a new Navy rating for enlisted personnel in robotics-focused jobs.
- **Naval Air Warfare Center Training Systems Division (NAWCTSD)** Research Psychologists provide technical support for analyses of **Robotic and Autonomous Systems (RAS)**-focused tasks at enlisted and, subsequently, Officer levels.

HOW DOES IT WORK?

- **Industrial and Organizational (I/O)** Research Psychologists and Job Analysts performed extensive, domain- and platform-spanning job analyses to identify, validate, classify, and disseminate the occupational tasks required to train and staff robotics personnel.

WHAT WILL IT ACCOMPLISH?

- This effort served as the foundation for the **Navy Enlisted Occupational Classification Standards (NEOCS)** package to establish the **Robotics Warfare Specialist (RW)** rating.
- Creating RW enlisted and Officer communities will posture the Navy to leverage RAS more effectively.

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RW Rating Symbol/Badge
"The rating symbol…comprises an airplane propeller and lightning bolt crossed over a treaded wheel, all layered over a single wave. Each element represents a warfare domain that RWs are expected to operate in to support the DOD's mission." (Navy.mil, July 2024)

There are specific foundational data required by higher authority to justify the establishment of a Navy rating. For the RW rating, NAWCTSD I/O Psychologists assisted the **Navy Manpower Analysis Center (NAVMAC)** Workforce Classification Team (Code 10) in obtaining the required information via virtual and in-person Knowledge Elicitation Workshops, as detailed below.

- Workshop Preparation: Obtained and reviewed documentation relevant to RAS tasks; prepared data collection materials (e.g., schedules, job aids, checklists, **Task Inventory List [TIL]**)
- Workshop Facilitation: Populated data collection instruments (checklists & the TIL spreadsheet) with **Subject Matter Expert (SME)** feedback during panel interviews/discussions
- Post-Workshop Analysis: Refined and organized data (e.g., defined requisite tasks, skills, abilities, & corresponding notes in the TIL)
- Results Presentation: Created or updated written materials to report on data collected during workshops or on the overall RW effort

Throughout the effort, NAWCTSD I/O Psychologists also assisted with follow-up discussions with SMEs, which facilitated capturing more nuanced task-relevant information. The workshops were comprised of ~60 SMEs from ~24 ratings across all domains, and they resulted in 150 Occupational Tasks across 6 Functional Areas. The SMEs also clarified the scope and descriptions for the two RW job titles—Robotic Systems Specialist and Robotic Systems Manager—each corresponding to its respective **Navy Enlisted Billet Classification (NEBC)**.

Challenges and Opportunities

- NAWCTSD participation began mid-FY22, requiring quick ramp-up of staff to gain situational awareness of project goals and approaches.
- The **Occupational Standard (OCCSTD)** developed through this effort is published in Volume I of the NEOCS, NAVPERS 18068F.
- The newly-established Navy RW rating was announced in NAVADMIN 036/24.
- The new rating offers research opportunities to guide future training/staffing of RWs.

Targeted Talent Management Modernization

The Targeted Talent Management Modernization (T2M2) Technology Candidate (TECAN) focuses on the development, assessment, screening, and slating of sailors for leadership roles. A major objective is to establish a foundational model of effective leadership across communities in the Navy, vice different models for different groups, to provide the Navy a standardized and comparable set of critical leadership behaviors and traits.

Guidance for this effort comes from National Defense Strategy and the CNO's "Get Real Get Better" initiative. This work is transitioning to a Future Naval Capability (FNC) in FY25: "TM Nexus".

Performers

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- Project: "Targeted Talent Management Modernization (T2M2)"
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- Project: "Navy Leadership Behavioral Model"
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Dr. Dominica Hernandez
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- Project: "Building a Competency Model for SUBFOR Leadership"
- Institution(s): Naval Submarine Medical Research Laboratory

Dr. Cyrus Foroughi and Dr. Catina Smith
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- Project: "Leadership Development for AIRFOR & EOD"
- Institution(s): Naval Research Laboratory & Peraton

Dr. Kevin Mullaney and CAPT Andrew Ledford
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- Project: "USNA Leader Development Assessment Project"
- Institution(s): United States Naval Academy

Dr. Benjamin Bell
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- Project: "Talent Management Analytics Ashore and Afloat (TMA3)"
- Institution(s): Eduworks

Targeted Talent Management Modernization (T2M2)

AT A GLANCE

WHAT IS IT?

A robust, data-driven application to support Navy Leadership Assessment Program (NLAP). NLAP focuses on assessing sailors and identifying leadership attributes for mission success and warfighter wellbeing.

HOW DOES IT WORK?

The NLAP supported tool is called TM Nexus. TM Nexus will have a Navy Leadership Behavioral Model (NLBM) digital framework linked to Sailor information used to access and evaluate sailors via the following capabilities.

- Smart Baseball Card
- Development Smart Map
- Decision Support Tool
- Analytical Capability Tool

WHAT WILL IT ACCOMPLISH?

- (NLBM) Develop and validate an evidence-based and data-driven framework for the determinants of effective leadership
- (TM Nexus) Central data-driven system to support NLAP

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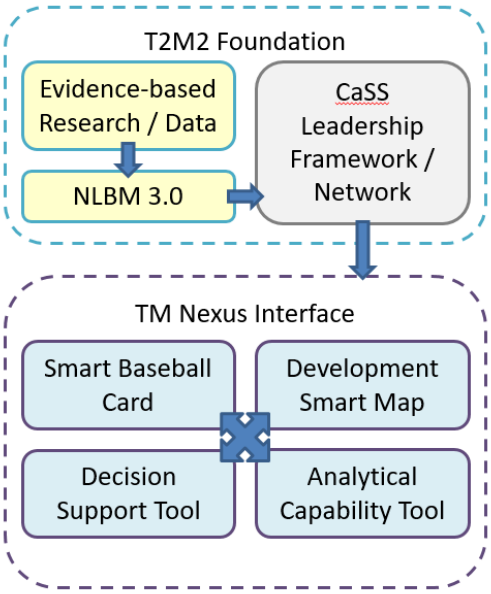

OPNAV N1, Navy Personal Command (NPC) and MyNavy Human Resources Information Technology Solutions are coordinating the development of the Talent Management Nexus tool that will support the Navy Leadership Assessment Program (NLAP) in the slating, selection and development of Navy Leaders. This capability will be developed in the MyNavy HR enclave with Application Programming Interface (API) connections to the Authoritative Data Environment (ADE).

TM Nexus involves 3 phases:

- The first phase, performed during the ONR Technology Candidate period, developed the Navy Leadership Behavioral Model (NLBM). Over the past three years, research and evidence data has been collected and compiled to assist in the building of the NLBM. The new model will support software extendibility to allow for TYCOMs/Communities unique leadership behaviors/competencies.

- The second phase of system development will be the connection to different data sources such as OAIS, FLTMPS, NSIPS, EMPRS. These interfaces will provide data about a sailor's profile, recruiting, retention, training, and behavior to determine the sailor's leadership competency and/or lack of competency leading to command slating and selection recommendations and/or for leadership development recommended /training.

- The third phase will include the direct/indirect connection to internal/external assessments that will provide a sailor's leadership data profile. The sailor's leadership profile will map to the NLBM, and the system will provide helpful information to the sailor's leadership. This information will assist leadership with leader selection and slating as well as provide recommendations for custom leadership training for the sailor.

The application will be built within a DevSecOps environment, managed and built using an agile, user-centered approach, leveraging the ADE for prototyping, development, testing, production, and operation.

Research Challenges and Opportunities:

- The ADE's development environment is constantly maturing, requiring all parties to be adaptive

Navy Leadership Behavioral Model (NLBM)

AT A GLANCE

WHAT IS IT?
A systematic and technology-driven approach to support career-long leadership assessment and development, better retain and manage talent, and inform professional development.

HOW DOES IT WORK?
- The Navy Leadership Behavioral Model and community-specific leadership models identify exemplary leader behaviors and link them to behavioral assessments and training.
- The models will be housed in an existing competency management system connected to each other and other Navy databases.
- Each sailor will have a profile of their leadership development over the course of their career.
- Key Navy stakeholders and systems can populate and examine the profiles for leadership assessment, development, talent management, retention, and selection

WHAT WILL IT ACCOMPLISH?
This project will develop scientifically validated models of Navy leadership behaviors to assist stakeholders' coordination efforts in identifying, developing, retaining, and selecting future leaders.

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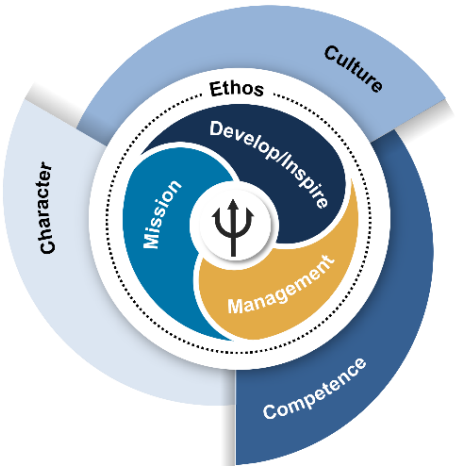
ABOUT
The U.S. Navy is making efforts to better understand and support the development of its current and future leaders. Individual commands are already responding with the development of leadership models, but no scientifically driven Navy-wide model exists that reflects common leadership behaviors. These models would serve as the foundation for a comprehensive system that tracks individual sailors' leadership development and would help stakeholders coordinate their efforts to accurately assess, personalize training for, and guide the retention and selection of leaders.



Objective: To develop Navy-wide and community-specific behavioral leadership models that are housed in a management system that allows stakeholders to coordinate their efforts to better identify, develop, retain, and select leaders.

Leadership Behaviors
This behavioral leadership model describes the critical knowledge, skills, abilities, and other attributes (KSAOs) that exemplary leaders demonstrate across all Navy communities. The project starts with two crucial assumptions about what it takes to be an effective Navy leader. First, effective leadership depends on the context. For example, the best Seabee captain would likely not make the best Riverine captain or submarine captain. Second, all effective Navy leaders share certain KSAOs. All three captains should be able to demonstrate behaviors that support mission accomplishment, enhance sailor development, provide inspiration, and demonstrate management capabilities. Our goal is to develop a Navy-wide model that works in concert with behavioral models that have been developed within and for Navy communities. The NLBM has been and will continue to be developed and validated with Navy subject matter experts. This approach will ensure that these models accurately reflect exemplary leadership behaviors at the major command and department levels (i.e., E-7 and up, O-5 and up).

Competency Management System
The Navy has developed CaSS as an open-source, profile-based competency management system to track sailors' career-wide leadership development. A prototype has been developed for the model. Next, a user interface will be developed and tested as part of the transition plan to help Navy stakeholders easily add other behavioral leadership models to the system. The system's interoperability with existing Navy databases, such as training, will be tested to ensure they can push and pull data to and from it.

Applications
The NLBM has been mapped to existing assessments and training programs both from within and outside of the Navy and new 360 assessment items will be developed where current content doesn't not exist. This will help create a path for sailors to make more objective decisions about the professional development needed to improve their leadership skills. As a result of these models, stakeholder coordination efforts to communicate, predict, train, retain, assess, and manage leadership talent are anticipated to improve.

RESEARCH CHALLENGES AND OPPORTUNITIES
- **Challenge:** Ensuring CaSS's interoperability with Navy training and other databases.
- **Opportunity:** Clarifying common Navy leadership behaviors might help other commands more quickly develop and refine their own behavioral leadership models.
- **Opportunity:** Development of interconnected technology solution to better track, assess, and train leadership behaviors Navy-wide.

Validation Effort for SUBFOR Leadership Competency Model

AT A GLANCE

WHAT IS IT?

- The primary objective is to gather empirical criterion related validity evidence that supports the Submarine Force's Leadership Competency Model's utility in predicting leader effectiveness among Commanding and Executive Officers within the Submarine Force.

HOW DOES IT WORK?

- Development of an instrument with a pool of 30 items per competency.
- Seven participants will rate the items on relevance and clarity. The instrument will be revised based on this feedback.
- The refined instrument will be administered to two separate samples to first conduct a EFA and subsequently a CFA.
- The final step involves recruiting Navy leaders and their respective supervisors and subordinates that will utilize the instrument to evaluate the leader's effectiveness on the leadership competencies.

WHAT WILL IT ACCOMPLISH?

- Development of an instrument capable of measuring the SUBFOR's leadership competencies.
- Robust assessment of the criterion-related validity of the SUBFOR leadership competency model.

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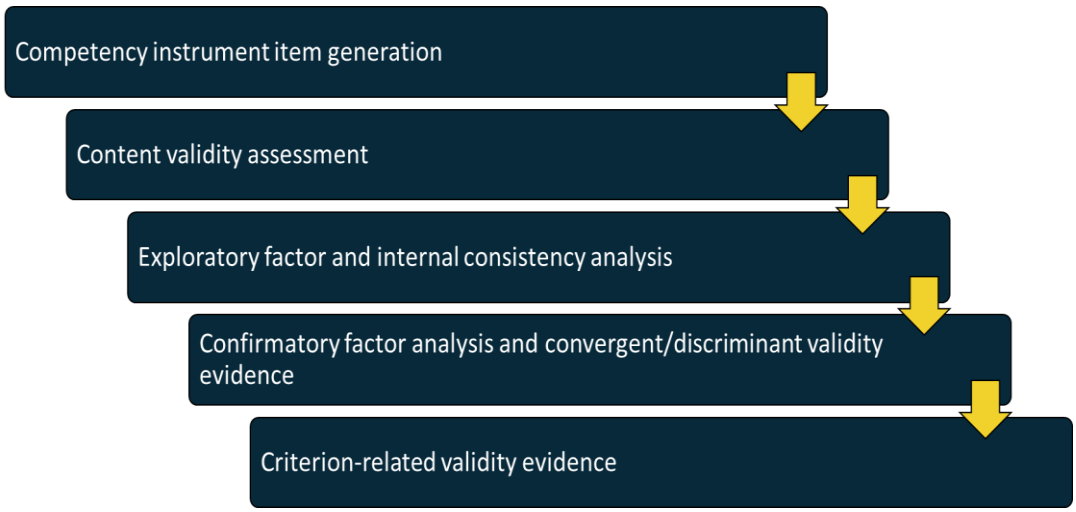

Figure: Validation steps for SUBFOR leadership competency model

MILESTONES OF THE PROGRAM:

Develop and refine an instrument capable of measuring the SUBFOR leadership competencies.

- Recruit a sample of participants to evaluate the factor structure of the instrument and evaluate how well it correlates with psychological constructs with which it should theoretically correlate.
- The seven raters will evaluate the relevance and clarity of the generated items, comprising three content experts, two psychometric experts, and two laypersons. Iterative revisions will be made based on the raters' feedback.

This refined instrument will be administered to two separate samples.

- One sample will be utilized to conduct an exploratory factor analysis (EFA) to explore the factor structure of the leadership competency model instrument.
- A separate sample will be used to conduct a confirmatory factor analysis (CFA) to corroborate the factor structure obtained from the EFA.

Gather concurrent criterion-related validity evidence that leadership competencies predict leader effectiveness.

- Submarine leaders will be recruited, along with their supervisors and direct reports. The supervisors will complete a measure of the leaders' effectiveness, whereas the direct reports will complete the newly developed measure of the leaders' leadership competencies.
- Associations between the leadership competencies and leader effectiveness will be calculated and tested to determine the validity coefficients for the leadership competencies.

Research Challenges and Opportunities:

- Recruiting multiple sets of participants for each phase of the study
- Balancing stakeholders' expectations of delivery with timelines
- Assessing what operational outcomes constitute leadership effectiveness and the respective competency

AIRFOR Leadership Development

AT A GLANCE

WHAT IS IT?
A systematic and technology-driven approach to support career-long leadership assessment and development, better retain and manage talent, and inform professional development.

HOW DOES IT WORK?
- The Navy Leadership Competency Model and command-specific leadership competency models identify key competencies and link them to behavioral assessments, training, and experiences.
- The models will be housed in an existing competency management system connected to each other and other Navy databases.
- Each sailor will have a profile of their leadership competencies over the course of their career.
- Key Navy stakeholders and systems can populate and examine the profiles for leadership assessment, development, talent management, retention, and selection

WHAT WILL IT ACCOMPLISH?
This project will develop a scientifically validated model of Navy leadership for the Naval Air Forces that will be used as part of the Command Qualification Board (CQB).

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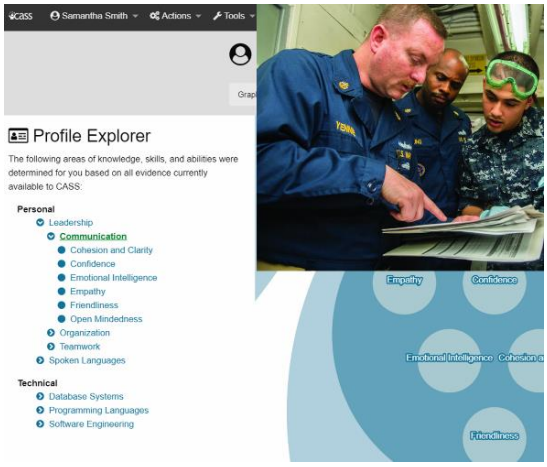
ABOUT
The U.S. Navy is making efforts to better understand and support the development of its current and future leaders. Individual commands are already developing leadership competency models in response, but no scientifically driven Navy-wide model exists that reflects common leadership competencies. These models would serve as the foundation for a comprehensive system that tracks individual sailors' leadership development and would help stakeholders coordinate their efforts to accurately assess, personalize training for, and guide the retention and selection of leaders.



Objective: To develop a command-specific Navy Leadership Competency Model for the Naval Air Forces that will be used as part of the Command Qualification Board (CQB)

Leadership Competency
A competency model describes the critical knowledge, skills, abilities, and other attributes (KSAOs) required for effective job performance. The project starts with two crucial assumptions about what it takes to be an effective Navy leader. First, effective leadership depends on the context. For example, the best Seabee captain would likely not make the best Riverine captain or submarine captain. Second, all effective Navy leaders share certain KSAOs. All three captains should be able to organize, inspire, and develop their sailors to be effective. Our goal is to develop a command-specific leadership competency model for the Naval Air Forces. This model will be developed and validated with subject matter experts from the Naval Air Forces. This approach will ensure that these models accurately reflect command-specific and common Navy leader competencies of major command officers (O-6 and above). Furthermore, Behaviorally Anchored Rating Scales (BARS) will ensure objective leadership assessment in the classroom and during operations.

Competency Management System
The Navy has developed, and is beginning to implement, an open-source competency management system, CaSS, to create individual sailor leadership competency profiles tracking their development across their career. We will incorporate the initial leadership competency models into that system with the help of its designers. A user interface will be developed and tested as part of the transition plan to help Navy stakeholders easily add other leadership competency models to the system. The system's interoperability with existing Navy databases, such as training, will be tested to ensure they can push and pull data to and from it.

Applications
This project will assess whether the models help sailors make more objective decisions about the professional development needed to improve their leadership skills. As a result of these models, stakeholder coordination efforts to communicate, predict, train, retain, and manage leadership talent are anticipated to improve.

RESEARCH CHALLENGES AND OPPORTUNITIES
- Challenge: Gaining consensus on command-specific and common leadership KSAOs
- Challenge: Addressing attributes (e.g., attitudes) that are difficult to measure behaviorally
- Challenge: Ensuring CaSS's interoperability with Navy training and other databases
- Opportunity: Clarifying common Navy leadership KSAOs might help other commands more quickly develop and refine their competency model

NECC/EOD Leadership Assessment

AT A GLANCE

WHAT IS IT?
A systematic and technology-driven approach to support career-long leadership assessment and development, better retain and manage talent, and inform professional development.

HOW DOES IT WORK?
- The Navy Leadership Competency Model and command-specific leadership competency models identify key competencies and link them to behavioral assessments, training, and experiences.
- The models will be housed in an existing competency management system connected to each other and other Navy databases.
- Each sailor will have a profile of their leadership competencies over the course of their career.
- Key Navy stakeholders and systems can populate and examine the profiles for leadership assessment, development, talent management, retention, and selection

WHAT WILL IT ACCOMPLISH?
This project will develop a scientifically validated approach for assessing Naval leaders for the Navy Expeditionary Combat Command (NECC).

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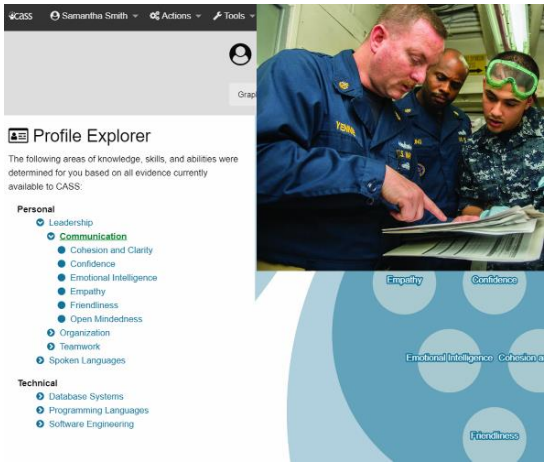
ABOUT
The U.S. Navy is making efforts to better understand and support the development of its current and future leaders. Individual commands are already developing leadership competency models in response, but no scientifically driven Navy-wide model exists that reflects common leadership competencies. These models would serve as the foundation for a comprehensive system that tracks individual sailors' leadership development and would help stakeholders coordinate their efforts to accurately assess, personalize training for, and guide the retention and selection of leaders.



Objective: To develop a scientifically validated approach for assessing leadership for the Navy Expeditionary Combat Command (NECC).

Leadership Competency
A competency model describes the critical knowledge, skills, abilities, and other attributes (KSAOs) required for effective job performance. The project starts with two crucial assumptions about what it takes to be an effective Navy leader. First, effective leadership depends on the context. For example, the best Seabee captain would likely not make the best Riverine captain or submarine captain. Second, all effective Navy leaders share certain KSAOs. All three captains should be able to organize, inspire, and develop their sailors to be effective.

Our goal is to develop a scientifically-validated approach for assessing leadership for the Navy Expeditionary Combat Command (NECC). To do this, we will assess Sailors using a variety of validated leadership assessments. This information will be packaged together with traditional metrics resulting in a "whole-person" assessment of the Sailor.

Competency Management System
The Navy has developed, and is beginning to implement, an open-source competency management system, CaSS, to create individual sailor leadership competency profiles tracking their development across their career. We will incorporate the initial leadership competency models into that system with the help of its designers. A user interface will be developed and tested as part of the transition plan to help Navy stakeholders easily add other leadership competency models to the system. The system's interoperability with existing Navy databases, such as training, will be tested to ensure they can push and pull data to and from it.

Applications
This project will assess whether the models help sailors make more objective decisions about the professional development needed to improve their leadership skills. As a result of these models, stakeholder coordination efforts to communicate, predict, train, retain, and manage leadership talent are anticipated to improve.

RESEARCH CHALLENGES AND OPPORTUNITIES
- Challenge: Gaining support for this work from NECC leadership
- Challenge: Addressing attributes (e.g., attitudes) that are difficult to measure behaviorally
- Challenge: Ensuring CaSS's interoperability with Navy training and other databases
- Opportunity: Clarifying common Navy leadership KSAOs might help other commands more quickly develop and refine their competency model

The Leader's Compass

AT A GLANCE

WHAT IS IT?

The Leader's Compass provides an institution wide leadership competency development tool that provides consistency and integration of a Midshipmen's leadership development across their 47 month Naval Academy Journey

HOW DOES IT WORK?

- **Profile Based** for faculty, staff, and students
- **Event Based:** enables hands on leader development in situ to leverage to the rich array of leadership experiences available at USNA
- **Competency Based** to focus developmental efforts and align curricular, extracurricular, and brigade developmental experiences

WHAT WILL IT ACCOMPLISH?

- Retains feedback and performance data in Midshipmen profiles and curates feedback by either event or competency
- Provides rich data to enhance the precision of performance management, to target developmental efforts, and to inform service selection

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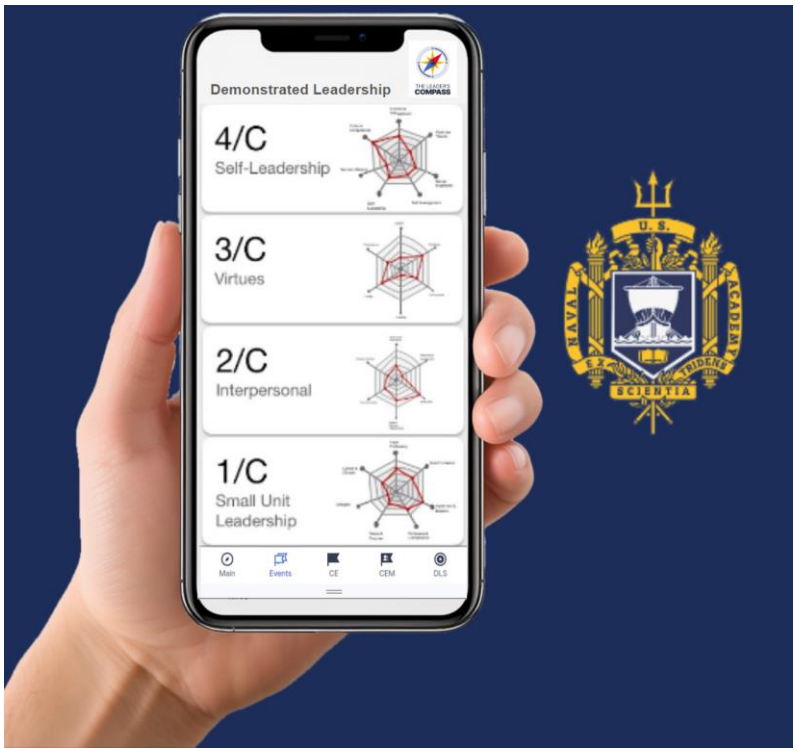

The Leader's Compass seeks to optimize the use of data for leadership and character development and assessment.

The Naval Academy has long referred to itself as a leadership laboratory and indeed utilizes a wealth of data in the process of executing curricular, extra-curricular, and brigade leadership and character development. This data has not, however, been systematically aggregated in an effort to optimize development and assessment. The Leader's Compass provides the right tool, a chromeless browser extension to the CORAS Federal platform that functions like a phone-based app, to facilitate the collection of leadership competency and performance assessments in the midst of the myriad of leadership development experiences at the Naval Academy.

The Leader's Compass provides Midshipmen with a profile to aggregate all relevant developmental feedback based on the Naval Academy's leadership competency framework. The Leader's Compass contains a full suite of developmental content for each competency, to include incremental development goals, developmental exercises, reflection prompts, 360 feedback tools and references, to enable Midshipmen and faculty to actively engage in competency development in the classroom, in athletics, in extracurriculars, in summer training, and in the Brigade of Midshipmen.

The beta version of the Leader's Compass was launched in the summer of 2023 and piloted for the last year by more than 1500 Midshipmen in plebe leadership classes, summer training, and in two of thirty-six companies in the Brigade.

Research Challenges and Opportunities:

- Implement system redesign based on pilot feedback to optimize the curation of developmental resources
- Continue to develop data visualizations to support all stakeholders
- Validate competency framework using USNA and fleet performance data

Talent Management Analytics Afloat and Ashore (TMA3)

AT A GLANCE

WHAT IS IT?

- Enhances Navy MPT&E practices with data-driven tools and interoperable, scalable platform
- Integrated infrastructure to collect, manage, and analyze Sailor competency data
- Initial configuration provides evidence-based insights to Selection Boards, psychologists, and candidates.

HOW DOES IT WORK?

- Tracks Sailor performance data using Competency and Skills System (CaSS), Navy-accredited
- Digitizes Navy Leadership Behavioral Model, maps to metrics
- Sailor data ship-to-shore transfer
- Leverages Eduworks' technologies used in related Navy efforts

WHAT WILL IT ACCOMPLISH?

- Decision-making support across Fleet with dashboards, insights, AI/ML-derived readiness metrics
- Improved personnel management both ashore and afloat.
- Initial configuration: Enhanced analytics and visualizations for promotion candidates, Selection Boards, and psychologists.
- Fleet-wide, future-proof capability for collecting, managing, maintaining, leveraging Sailor performance and competency data

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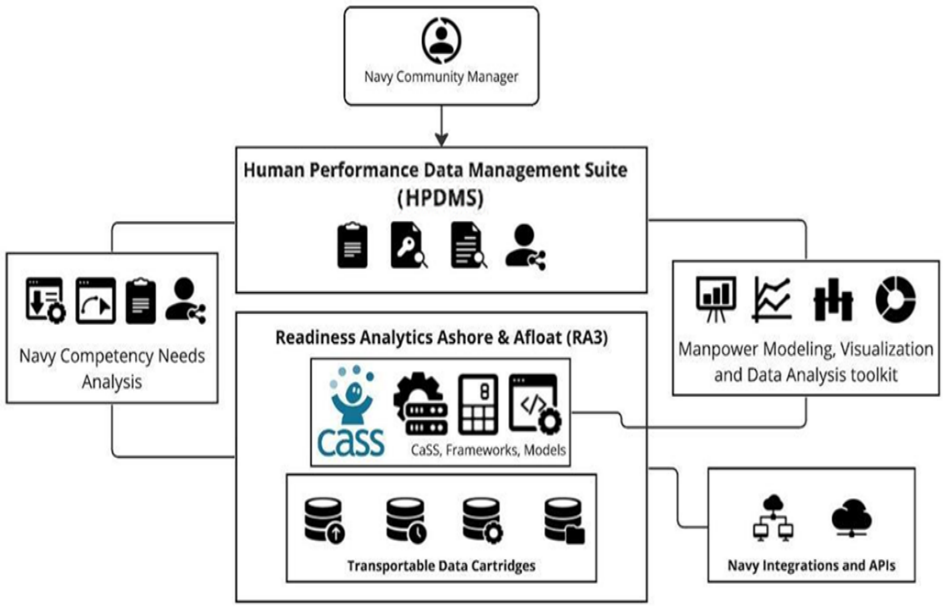

Four capabilities for digital chain of evidence providing actionable MPT&E insights

Digitization - Representation of Navy frameworks (competencies, doctrine, requirements) with a digitization workflow to collect, analyze, and integrate human performance and capabilities data from disparate sources

Human Performance and MPT&E Data Management - Tools for managing, describing, and understanding human performance data supported by machine actionable definitions for data streams, objects, and frameworks for current/future MPT&E efforts

Visualization and Modeling Tools - End-user tools that allow Sailors and leaders to analyze and assess competency-based mission and Fleet readiness

Training Needs Analysis - Platform for task and competency-based needs analysis, including traceability of Fleet requirements, signoff, and lifecycle management as ratings, doctrine, and goals emerge and evolve

Research Challenges and Opportunities:

- New integrated deployment environment (ADE)
- Identifying use cases that demonstrate value to the Sailor

Near-Term Impact

- Evidence-based objective data for Selection Board process
- Role-based dashboards for Board members, psychologists, candidates
- Improved leader preparation and outcomes

Long-Term Impact:

- Address current siloed data issues in the Navy
- Improve data transfer between ship and shore
- Future-proof, scalable tools for readiness and performance optimization

MyNavy Foresight

MyNavy Foresight works to develop a novel manpower modeling application. Using agile engineering processes, the multi-team collaboration leverages existing technology while providing its own innovations exploring, evaluating, and modeling Navy personnel data.

The effort aligns with guidance from the 2022 CNO NAVPLAN and National Defense Strategy

Performers

Dr. Kondo Litchmore

Contract: N0001424WX00495

- Project: “MyNavy Foresight”
- Institution(s): Naval Surface Warfare Center – Dahlgren, Dam Neck Annex

Ms. Natalie Keeney

Contract: N0001423C2023

- Project: “MyNavy Foresight”
- Institution(s): Applied Research Associates

MyNavy Foresight (MNF)

AT A GLANCE

WHAT IS IT?

A web-based, decision-assistance tool that maps Manpower, Personnel, Training, and Education (MPT&E) dynamics to potential outcomes in near real-time.

HOW DOES IT WORK?

MNF consists of three major parts:

1. Data sources
2. Model
3. Web interface

MNF is being developed within the Authoritative Data Environment (ADE) and leverages its **abundant, centralized** data sources.

ADE data is fed into MNF's model, which creates scenario-based simulations.

Several variables can be configured in the web interface that influence scenario outcomes (e.g., 3% vs. 7% unemployment rate). Scenario results are presented to users in various mediums.

WHAT WILL IT ACCOMPLISH?

- Eliminate the need to aggregate data from multiple external sources
- Enable rapid evaluation of potential scenario outcomes
- Establish standard data references and forecasted values

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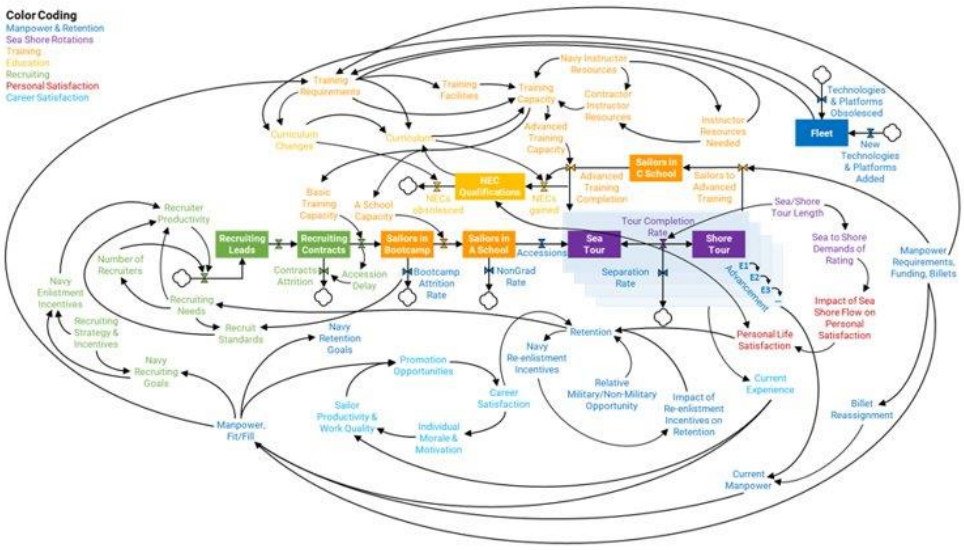

MNF has two on-going efforts: development of an in-house prototype and evaluation of a mature, Australia-developed solution.

The in-house (ONR & OPNAV N1 sponsored) prototype is one of the first applications being integrated in the ADE. This is significant because the ADE provides a centralized, authoritative source for MyNavy HR data, eliminating the bottleneck of aggregating data from multiple external sources with differing data standards. The time required to assess possible outcomes is potentially reduced from several months to several minutes.

MNF prototype development is guided by pre-defined MyNavy HR use-cases, such as Competitive Economy and Training Backlog and Surge, and demonstrated to stakeholders to receive feedback at the end of each agile sprint.

ONR has also been evaluating the Athena software suite that has been developed by Defense Science and Technology Group Australia (DSTG Australia), an organization under the Australian Department of Defense. It is a mature solution that offers similar capabilities to what is desired from MNF. If found to be able to fulfill the Navy's needs, adopting the Athena software suite would eliminate the time required to build a similar, full-fledged application.

ONR has been proactive in assessing the Athena software suite. Activities include visiting DSTG Australia and speaking directly to their users, performing usability and vulnerability assessments on the software, and collaborating with other services on potential adoption such as the U.S. Coast Guard, U.S. Air Force, and the U.S. Army.

Research Challenges and Opportunities:

- The ADE's development environment is constantly maturing, requiring all parties to be adaptive
- Future collaboration opportunities with DSTG Australia (e.g., lessons learned)
- Future collaboration with other U.S. services in adopting a standardized tool

MyNavy Foresight

AT A GLANCE

WHAT IS IT?

Sailor-centric, HR-driven, course of action analysis decision-support tool to enable force management, development, and enterprise support ensuring operational readiness, proper alignment of tasks and personnel, continued professionalism, and technical proficiency with minimum loss of time to meet supply chain demands.

HOW DOES IT WORK?

The MyNavy Foresight interface uses discrete event simulation driven by existing personnel data, supplemented by models incorporating other factors affecting behavior within the MyNavy HR domain. This allows users to perform "what-if" analyses, understand which inputs the targeted outputs are most sensitive to, and provides a common operating picture-like view of the MyNavy HR domain.

WHAT WILL IT ACCOMPLISH?

Improve decision-making in the MyNavy HR domain and reduce friction losses by creating a decision support interface that will accurately, rapidly, and holistically generate, evaluate, and monitor alternative COAs, including 2nd-, 3rd-, and Nth-order effects. The decision support interface facilitates improved decision-making within time and resource constraints over time with robust traceability and explain ability of model predictions.

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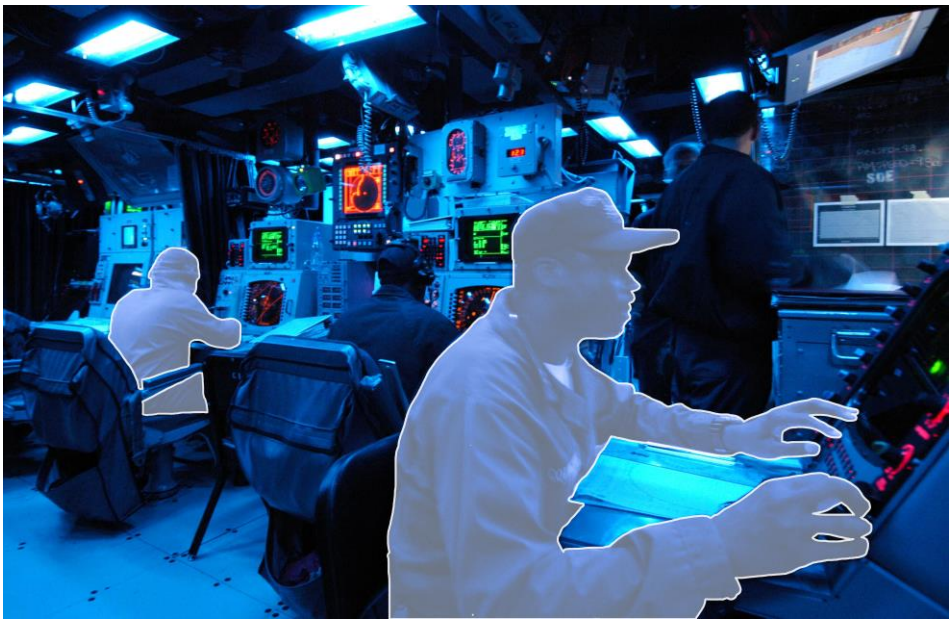

Critical fit/fill gaps persist across ranks and ratings. Current tools and processes take six months or more to assess only two to three outcomes and are unable to meet CNO NAVPLAN "SAILORS" and "READINESS" pillar requirements.

The Navy lacks the capability to rapidly and holistically evaluate alternative courses of action (COA) across the MyNavy HR Enterprise and larger Navy. The current process is fragmented, sequential, and uses dissimilar models. Extensive staff effort and time is required even to develop a small set of COAs, which—due to the magnitude of the problem space—is not guaranteed to include optimal solutions. Scenario generation capability is manual and yields only a small number of scenarios (and variables/objective constraints).

Functionality

A web-based decision support interface for a general audience with an ability to:

- Coordinate course of action analyses while controlling input data, assumptions, constraints, and objectives that drive/explain behavior
- Quickly generate COAs (manual and automated) that meet specified objectives
- Align COAs with human-led decision making and intent
- Track implemented COAs and identify performance gaps

Supporting deliverable is a common data model that provides all users with initialization variables, including forecasted values, for each scenario and/or issue being studied.

Research Challenges and Opportunities

- Improve decision-making through quantitative comparison of alternative courses of action (COAs) without suggesting value proposition
- Develop an Enterprise strategic planning decision support capability validated and accepted by MyNavy HR stakeholders as a common operational picture
- Capture interconnections and time delays and enable rapid 'what-if' analysis on readiness outcomes with full traceability and explain ability
- Integrate with analytic capability in the Navy's Authoritative Data Environment (ADE)

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