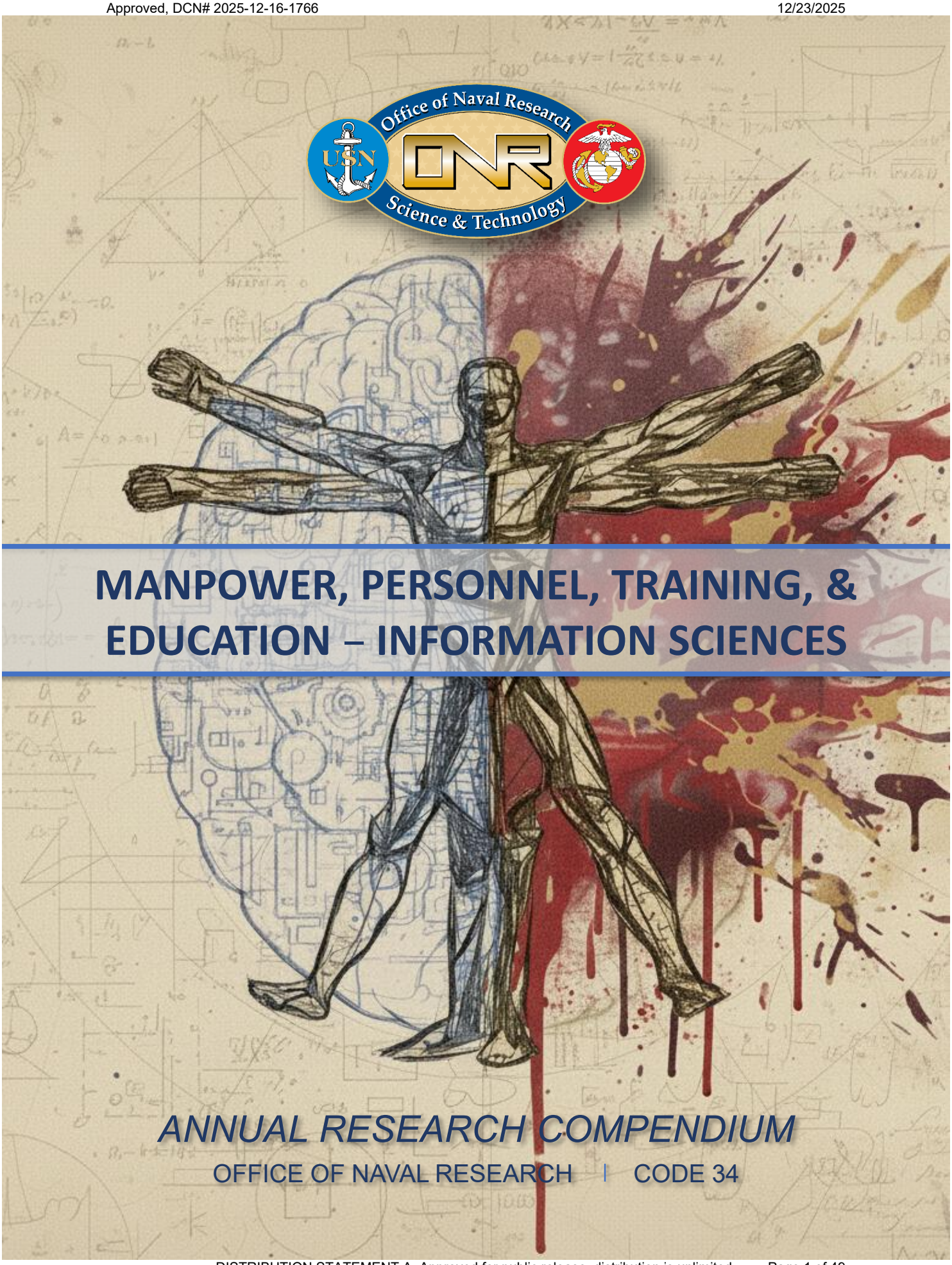
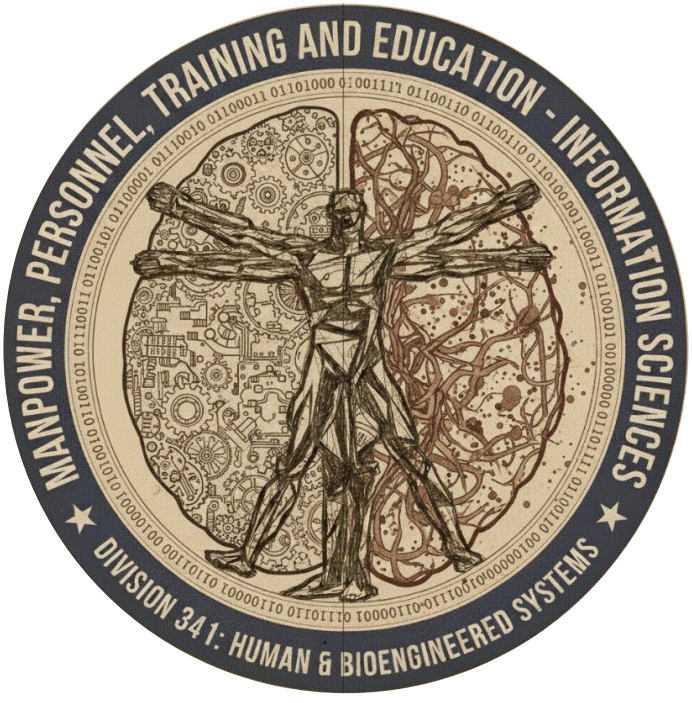


MANPOWER, PERSONNEL, TRAINING, & EDUCATION – INFORMATION SCIENCES

ANNUAL RESEARCH COMPENDIUM

OFFICE OF NAVAL RESEARCH | CODE 34

FY25 ONR MPTE Portfolio



From the Program Officer

Fiscal year 2025 (FY25) is in the books! And the Manpower, Personnel, Training, & Education – Information Sciences (MPTE) portfolio has continued to grow and deliver high-quality research. The incredible group of scientists working with us continue to amaze, enlighten, and inspire the MPTE team to provide the best possible support as we collaboratively work towards improving the Navy. Mr. Leibowitz, Mr. Danner, and myself are proud to lead the portfolio.

The MPTE portfolio continues to focus on optimizing Warfighter performance. Sailors and Marines are our most critical resource and selecting the best candidates, training them to their fullest potential, and sustaining them through the rigor and stress of a military career are at the forefront of CNO's Campaign Plan through "*Battle-Ready Sailors*" (Table 1). The research across MPTE seeks to provide innovative, foundational research to improve resiliency, world-class learning, and health to ensure combat-ready Sailors and Marines. Through greater understanding of psychological traits, human behavior, team/social dynamics, neuro and physiological signals, and emerging technology capabilities, we can leverage more complex data, networks, and interactions to predict critical outcomes and increase the probability of mission success.

MPTE managed 38 projects in FY25 across government labs, academia, and industry; by the end of the FY, six efforts were completed and there were three new starts. These efforts spanned seven primary focus areas:

- ***Data Science for Personnel Assessment***: expand individual differences measurement and testing predictive capabilities to improve operational readiness via better Sailor assessment, selection, and assignment.
- ***Leadership Assessment & Development***: develop and evaluate innovative assessments of the determinants of leadership, examine longitudinal processes facilitating leadership development, and design training methods and interventions to improve Navy talent management.
- ***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; engineer innovative software applications to compile, analyze, visualize, and summarize leadership information.
- ***Manpower Planning***: develop a complex, multi-variable manpower modeling software tool to predict recruitment and retention across multiple "what if?" scenarios.

Efforts were presented at the annual MPTE Showcase at the U.S. Naval Academy, July 14-17. Over 160 people from government, academia, and industry attended the four-day event in-person or virtually, a 30% increase from FY24! Attendees represented 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 were equal to or better than FY24, highlighting the 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 FY25:

- 37 Peer-reviewed Publications
- 30 Conference Presentations
- 3 Doctoral & Masters Students Completed
- 2 Individual/Team Awards

FY25 was exciting and incredibly successful! The scientific advancements across MPTE's diverse portfolio are something all performers should be proud of and we are honored and humbled to lead the work. MPTE definitely personifies my motto of being *EAGER*: Excellent, Authentic, Grateful, Engaged, and Respectful. Here's to building on our success in FY26!

LCDR Natali, PhD, MSC, USN
Program Officer, Code 34 – MPTE
Office of Naval Research

Figure 1. MPTE Portfolio Overview

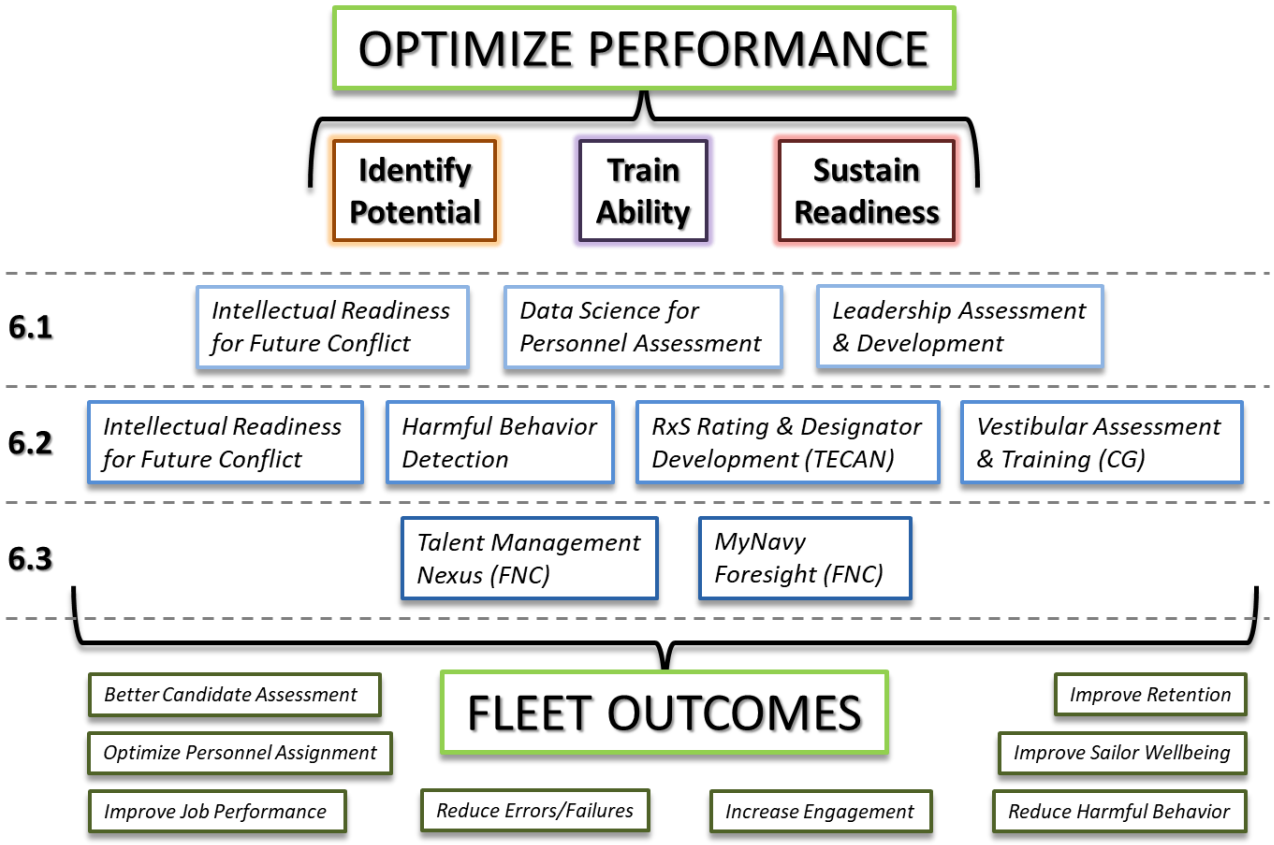
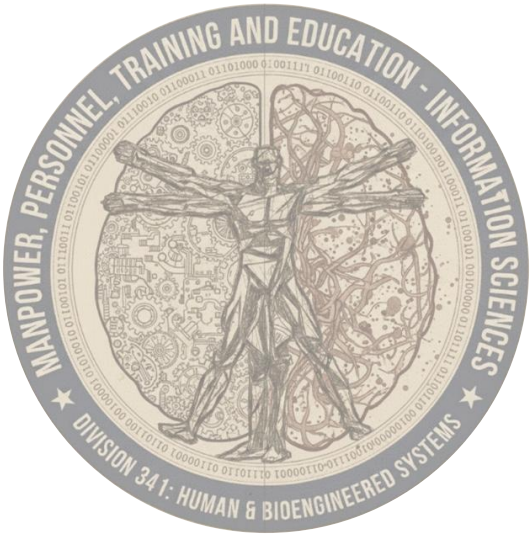


Table 1

Capability	National Defense Strategy (2022)	SECWAR Priorities (2025)	SECNAV Priorities (2025)	CNO 34 Campaign Plan (2025)	CNP Strategic Guidance (2025)	Operational Impact
Data Science for Personnel Assessment	-Deterrence by Resilience -Force Planning Construct -Make the Right Technology Investments -Cultivate the Workforce We Need	-Restore Warrior Ethos & Accountability	-Warfighter Culture & Recruiting	-Battle-Ready Sailors	-Ensure a Fleet-Aligned Talent Strategy -Build a Culture of Continuous Improvement -Drive Data-Informed Decision Superiority -Modernize the Sailor Experience	Optimize Sailor performance; Retain naval personnel in operational forces; Reduced unplanned losses
Leadership Assessment & Development	-Deterrence by Resilience -Force Planning Construct -Strengthen Resilience & Adaptability -Cultivate the Workforce We Need	-Restore Warrior Ethos & Accountability	-Warfighter Culture & Recruiting	-Battle-Ready Sailors -Battle-Ready Force	-Ensure a Fleet-Aligned Talent Strategy -Build a Culture of Continuous Improvement -Drive Data-Informed Decision Superiority -Modernize the Sailor Experience -Empower People through Leadership Development	Provide talent management framework to foster and develop effective leadership; Retain naval personnel in operational forces; Reduced unplanned losses; Optimize Sailor performance
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	-Restore Warrior Ethos & Accountability	-Warfighter Culture & Recruiting -Fleet Readiness	-Battle-Ready Sailors -Battle-Ready Force -Battle Force Today and Tomorrow	-Build a Culture of Continuous Improvement -Modernize the Sailor Experience	Increase operational readiness at individual and organizational levels; Enhanced lethality in DIL environments; Larger ad hoc operational envelopes
Harmful Behavior Detection	-Deterrence by Resilience -Force Planning Construct -Adapt and Fortify Our Defense Ecosystem -Strengthen Resilience & Adaptability -Cultivate the Workforce We Need	-Restore Warrior Ethos & Accountability	-Warfighter Culture & Recruiting	-Battle-Ready Sailors	-Build a Culture of Continuous Improvement -Drive Data-Informed Decision Superiority	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	-Restore Warrior Ethos & Accountability	-Warfighter Culture & Recruiting -Shipbuilding & Industrial Base	-Battle-Ready Sailors -Battle Force Today and Tomorrow	-Ensure a Fleet-Aligned Talent Strategy -Build a Culture of Continuous Improvement -Drive Data-Informed Decision Superiority -Modernize the Sailor Experience	Establish future force career paths; Maximize Sailor talent; Retain naval personnel in operational forces
Talent Management Nexus	-Deterrence by Resilience -Force Planning Construct -Adapt and Fortify Our Defense Ecosystem -Strengthen Resilience & Adaptability -Cultivate the Workforce We Need	-Restore Warrior Ethos & Accountability	-Warfighter Culture & Recruiting -Fleet Readiness	-Battle-Ready Sailors -Battle-Ready Force -Battle Force Today and Tomorrow	-Ensure a Fleet-Aligned Talent Strategy -Build a Culture of Continuous Improvement -Drive Data-Informed Decision Superiority -Modernize the Sailor Experience -Empower People through Leadership Development	Provide talent management framework to foster and develop effective 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	-Restore Warrior Ethos & Accountability	-Fleet Readiness -Warfighter Culture & Recruiting	-Battle-Ready Sailors -Battle-Ready Force -Battle Force Today and Tomorrow -Global Battle Integration	-Ensure a Fleet-Aligned Talent Strategy -Drive Data-Informed Decision Superiority -Modernize the Sailor Experience	Model manpower planning scenarios to optimize force structure; Retain naval personnel in operational forces; Reduce unplanned losses

Table 2

	Review Rating Questions: 1 – Strongly Disagree; 7 – Strongly Agree	**FY25** Mean (SD) n = 42	**FY24** Mean (SD) n = 125
Right Problem	The team developed/investigated interesting research question(s) while applying innovative science and technology at the forefront of knowledge and research in the field	**5.88 (0.86)**	5.77 (0.90)
	The team's research clearly aligns with Navy/DoW capability gaps and/or needs and the team frames results on how they relate to or impact the Navy/DoW	5.88 (1.07)	5.86 (1.08)
	The team has a plan for how the work will move from research to applied, operational work and outlines the work's potential to make a significant contribution to the Navy	**5.71 (1.28)**	5.38 (1.33)
Right Approach	The team's methodological approach is based on a strong scientific understanding and theoretical foundation in the empirical evidence and research literature	**6.07 (0.68)**	5.83 (0.93)
	The team applied innovative and/or robust methodologies that support advancing science in the topic area and providing empirical evidence	**5.88 (0.63)**	5.57 (1.11)
	The team's research methodology, analysis, and reporting ensures the results are understandable and actionable (i.e., the Navy can leverage results to improve)	**5.95 (0.58)**	5.58 (1.07)
Right Team	Team composition, experience, and scientific performance in research are appropriate to conduct the work on their topic	**6.02 (0.68)**	5.83 (0.97)
	The team collaborates with or is composed of personnel from academia, industry, and DoW/Navy to support and advance the effort, to include undergrad/grad students, interns, professors, and professionals	**5.83 (0.75)**	-
	The team demonstrates an understanding and commitment to align their research in support of the Navy and DoW mission	**6.36 (0.95)**	5.82 (1.12)
Impact	Rate the potential impact for the Navy from the results of this work	**7.62 (1.25)**	-



Data Science for Personnel Assessment

Performers

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

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

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

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

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

Dr. Brian Loyd
Contract: N000142512015
Project: "Advancing Remote Vestibular Technology to Improve Health of Service Members"
Institution(s): University of Montana

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

Dr. Kevin Novak
Contract: N0001424WX02475
Project: "Advancing Remote Vestibular Assessment Technology as a Strategy for Motion Sickness Mitigation"
Institution(s): Naval Medical Research Unit - Dayton

Capability

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.

Guidance

- National Defense Strategy (2022)
  - Deterrence by Resilience; Force Planning Construct; Make the Right Technology Investments; Cultivate the Workforce We Need
- SECWAR Priorities (2025)
  - Restore Warrior Ethos & Accountability
- SECNAV Priorities (2025)
  - Warfighter Culture & Recruiting
- CNO 34 Campaign Plan (2025)
  - Battle-Ready Sailors
- CNP Strategic Guidance (2025)
  - Ensure a Fleet-Aligned Talent Strategy; Build a Culture of Continuous Improvement; Drive Data-Informed Decision Superiority; Modernize the Sailor Experience

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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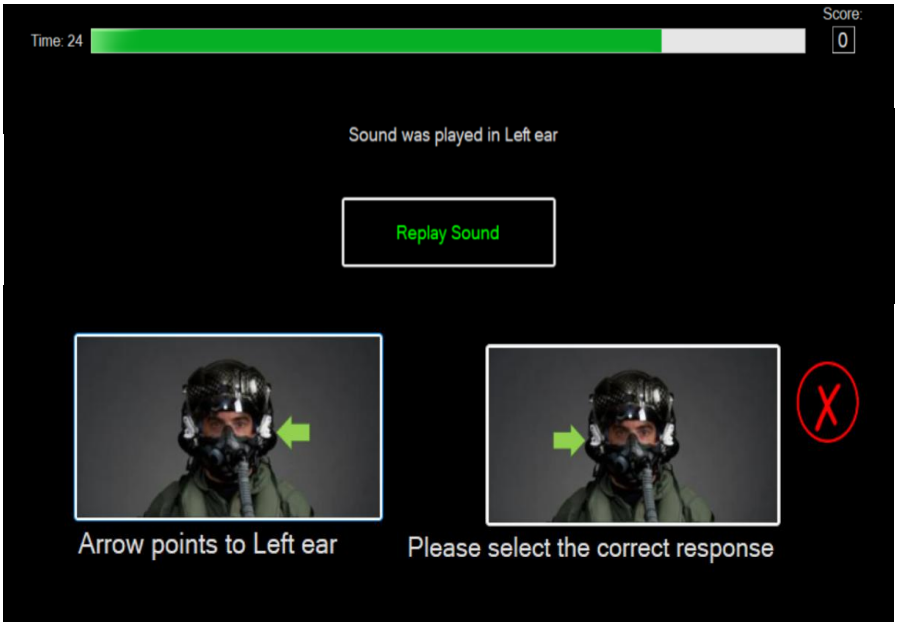
ABOUT
The U.S. Navy relies on selection testing to optimize manpower. The Armed Services Vocational Aptitude Battery (ASVAB) is taken by 30,000-50,000 prospective Sailors per year who want to enlist. The Aviation Selection Test Battery (ASTB) is taken by nearly 10,000 individuals who want to become pilots 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.

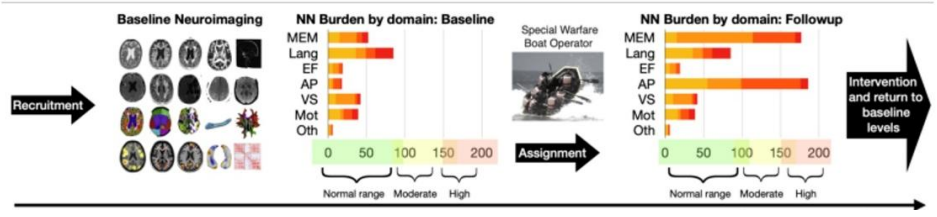
Objective: To develop new tools (i.e., tests) and scoring methods that allow for the optimal selection and classification of Sailors.



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 and deep learning normalizing flows to identify levels of resilience and sensitivity in cognitively normal individuals.

HOW DOES IT WORK?

- Deep SiMR, an advancement over previous work, extracts meaningful embeddings of neuroimaging data 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.

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Naval personnel quantitative assessment and intervention

Currently, there is a paucity of established, multi-modal, non-invasive approaches for monitoring neurological states that may contribute to improved or super-normal functioning, or to a spectrum of performance and resiliency within operational personnel. Longitudinal measurement of brain health 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 the 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 related to performance and longer-term outcomes, particularly neurological resilience and vulnerability, is less well studied. While academic studies provide some insight into such relationships, a clinical tool is needed that allows ongoing tracking of a brain basis set that can be measured and referred to over time in relationship to field experience or training.

The proposed methodology builds upon the SiMR algorithm, a groundbreaking tool for performing multi-modal, multi-view 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 for health surveillance and monitoring of performance. The next-generation version of SiMR, **DeepSiMR**, has been implemented within a deep learning framework, immediately gaining representation power, improved computational efficiency, and access to more flexible loss functions and adversarial optimization strategies. To train DeepSiMR to learn meaningful embeddings that can be mapped to spaces relevant to sailor performance, we leverage large training data resources, including UK Biobank, the Human Connectome Project, NHANES, and PPMI.

Deliverables are currently available as open-source software within the Advanced Normalization Tools (ANTsX) ecosystem, built on the NIH-sponsored Insight Toolkit. Key repositories include **ANTsTorch** (deep learning and normalizing flow implementations for DeepSiMR), **ANTsPyMM** (large-scale image-derived phenotyping), and **ANTsXNet** (neural network architectures for neuroimaging). These publicly released tools ensure reproducibility, transparency, and accessibility for both research and clinical translation.

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?

Testing a brief cognitive assessment suite that is:

- Short, <30 min total
- Remotely administered
- Measures novel and informative cognitive abilities
- Relevant 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 measures 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 is poised to provide a new, informative, and quick method of assessing cognitive function in military personnel to better inform their career paths and/or potential for success. This could potentially save significant time and money in training processes across the DoW.

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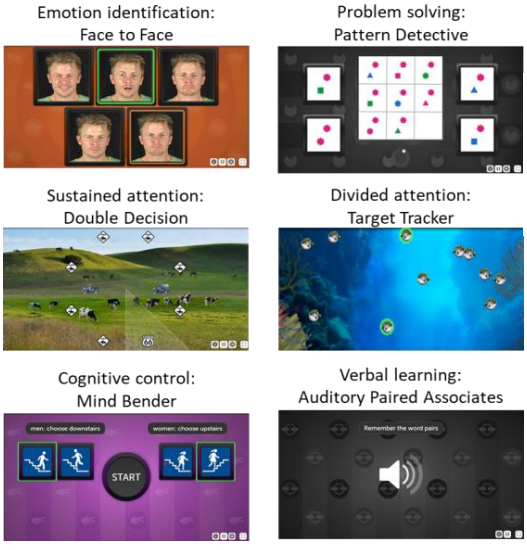
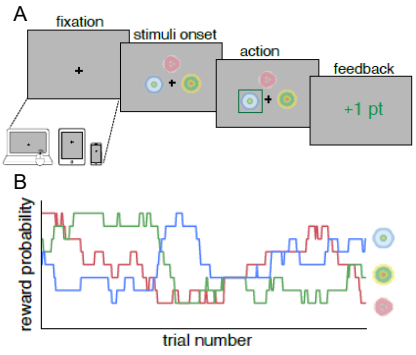


Examples of BrainHQ Measures by Posit Science



Translational Bandit Task (TBT) overview: A) Task presentation; B) Sample of dynamic reward probability

There is no currently 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 develop and test 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 complete. This effort is in collaboration with researchers at Posit Science for the BrainHQ platform that has a robust, scientifically-backed catalog of measures relevant to various cognitive functions. Our team also has an established relationship and has run previous research efforts in 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 testing out variations in the battery to find the most robust and informative versions of the measures. We have run the battery in members of the Minnesota Army National Guard, and are working to partner with other military entities to collect additional data in military populations. 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 metrics in military careers?

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?

- Provides a validated framework for studying divergent thinking in realistic, time-bound scenarios.
- Equips the Navy with evidence-based strategies to enhance mission-critical decision-making.
- Supports development of targeted training to build cognitive flexibility and problem-solving under pressure.
- Offers tools to reduce learning curves, increase readiness, and improve performance across operational timelines.

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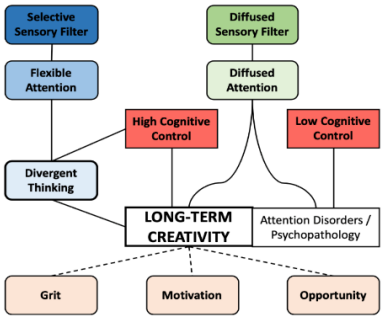

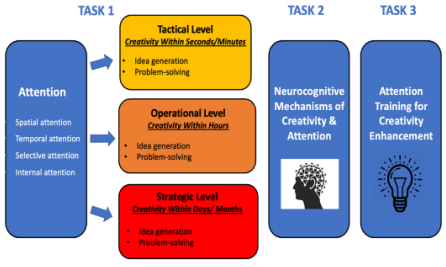

From tactical to strategic levels of warfare, vast array of Navy tasks require individuals to use creative thinking and problem solving to make decisions and act effectively. Creativity is the quality that the Navy can harness to increase its chances for success. Currently, creativity is developed only 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.

Data collection finished in 2025 followed by a shift in focus towards the transition to analyzing and publishing results.

Research Challenges and Opportunities:

- Participants move more in virtual reality compared to traditional computer-based tasks, causing more motion artifacts in EEG data. Participants also engage in fidgeting during lengthy tasks.
- Determining optimal ways to update personnel assessment instrumentation by incorporating 21st-century technologies that rely on high-density real-time data collected in ecologically valid situations

Human Performance Assessment and Construct Validation in Virtual Reality

AT A GLANCE

WHAT IS IT?
Innovative examination of personality constructs that are necessary for success in aviation, which can be better captured in simulations that use 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 examines the constructs that contribute to aviator success but are not fully assessed by current selection methods. The ability to maintain performance under stress, for example, is essential yet cannot be captured through questionnaires alone. A psychoneurometric approach, which integrates psychological, physiological, and behavioral measures, improves the validity of construct assessment and yields more accurate candidate evaluations. Virtual reality offers adaptive environments where stress and other critical constructs can be evoked and measured in real time, making it a key tool for advancing selection methods.

Recent achievements include the completion of Study 1, which employed two VR-based scenarios designed to assess Stress Resilience (SR) and Vigilance/Self-Regulation (V/SR). Pilot findings confirmed that the scenarios elicited the intended psychophysiological effects, establishing a foundation for future validation. Next steps will focus on in-depth analysis and the design of Study 2, which will include an updated iteration of the V/SR scenario and a second Self-Regulation scenario implementing a 3-dimensional Flanker object task.

This approach ultimately relies on multiple VR-based assessments to capture a broad range of candidate attributes. Planned studies will target individual constructs across distinct scenarios, advancing a multidimensional framework for personnel selection that more fully reflects the demands of aviation performance.

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?

Remote Vestibular Assessment Technology

AT A GLANCE

WHAT IS IT?

Field-based assessment of vestibular performance is currently limited by lack of valid/reliable applied assessment technology. This project is exploring various aspects of remote vestibular assessment and treatment aimed at improving training and performance for Naval aviators.

HOW DOES IT WORK?

The ability to assess vestibular function and head-eye coordination in military populations is limited by current technologies, which are non-portable, research- or clinic-grade laboratory based technologies. This study is designed to develop technologies that can be routinely performed by Navy service members in real-world, field-based environments.

WHAT WILL IT ACCOMPLISH?

This work is advancing the state of the art by focusing on bringing high fidelity and reliable measures from the research laboratory to the field. It is also aimed at making tools that are useable in training environments for Naval aviators.

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Navy service members experience a range of atypical exposures to the vestibular system (e.g., high G-force in aviation, long duration sea travel, pressure events in diving or blast exposures). Of particular relevance to the Naval aviator and flight crew, vestibular performance influences head-eye coordination, spatial orientation, and resistance to motion sickness, among other key functions. Currently, there is an inability to readily assess vestibular function in the field, potentially limiting training decisions and leading to suboptimal readiness or warfighter lethality. This project aims to enhance the Navy's vestibular training capabilities, by 1) advancing technology for precise field-based assessments of vestibular exposures, as well as warfighter/aviator vestibular performance, 2) better understanding vestibular exposures incurred during routine or simulated training environments and the impact on performance, and 3) developing vestibular training programs aimed at mitigating motion sickness, with an eye towards future training programs to optimize performance of elite Naval aviators.
The overall objective of this work is to advance vestibular performance assessment capabilities, to optimize training and readiness of Navy aviators, air crew, and other service members.

Research Challenges and Opportunities:

- Develop assessments of head-eye coordination that are precise, reliable and responsive.
- Demonstrate that assessments can be routinely performed in real-world training environments.
- Demonstrate that results of assessments can be used by Navy service members to inform decisions regarding training, exercise prescription, or readiness.

Advancing Remote Vestibular Assessment Technology as a Strategy for Motion Sickness Mitigation

AT A GLANCE

WHAT IS IT?

This study will be a novel investigation into the effects of visual vestibular (V-V) exercise on motion sickness and vestibular function in individuals without vestibular deficits. Given practical limitations for evaluating airsickness in Naval aircraft, this study design utilizes a rotating chair and controlled head movements to induce motion sickness in the laboratory environment.

HOW DOES IT WORK?

The intervention is a take-home device that subjects will use to exercise (daily) their visual-vestibular systems. To ensure the exercises remain challenging weekly assessments using the same device will direct changes in V-V exercises. Visual-Vestibular functional components and motion sickness susceptibility will be tested both before and after the 4-week exercise intervention to objectively and subjectively quantify improvements.

WHAT WILL IT ACCOMPLISH?

This study will identify an intervention that may mitigate motion sickness symptoms and enhance performance without the anxiety and stress of existing Barany chair strategies. This may facilitate the efficient habituation of Naval air crews to the dynamic environments, and, in turn, impart budgetary savings by decreasing attrition due to air sickness, increase effective training and work hours, decreasing medication utilization, and improving overall readiness.

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This study seeks to address multiple objectives, including feasibility, implementation, cost-effectiveness, and efficiency, with the potential to advance the field of sensory system performance and motion sickness mitigation. The introduction of a remote, at-home training tool reduces the need for clinic or office visits, allowing for more efficient use of time and minimizing disruption to pilots' training schedules when addressing motion sickness.

Currently, AMSO must be present when Student Naval Aviators (SNAs) undergo traditional motion sickness habituation through rotating chair exercises. This method is not only unpleasant and labor-intensive, but can also provoke fear, anxiety, and, in some cases, exacerbate symptoms, making it an antiquated and counterproductive approach. By contrast, an updated, remote training strategy may decrease SNA attrition rates, thus reducing overall training costs.

We propose that this novel training strategy, which focuses on enhancing visual-vestibular system function, could provide modern methods exercising sensory systems, as no such intervention currently exists for healthy military personnel to our knowledge. Additionally, the device used to administer this training is significantly more affordable than traditional clinic-based tools, aligning with the cost reduction objective.

In summary, this technology has the potential to provide cost-effective, flexible, and efficient training that can be conducted at the user's convenience, wherever they are. If shown to be effective, it hold promise for significantly reducing motion sickness and improving overall performance, thereby advancing the capabilities of both the individual warfighters and the Department of War as a whole

Research Challenges and Opportunities:

- Can sensory system neuroplasticity be directed with specific exercises to overcome motion sickness and accelerate environmental tolerance
- Continue to provide CNATRA and Naval Air Training Wings with information and opportunities to modernize air sickness mitigation strategies.

Leadership Assessment & Development

Performers

Dr. Richard Landers

Contract: NOD0142412336

Project: "CAPTAIN: AI Coaching Platform for Leader Development"

Institution(s): University of Minnesota

Dr. Hernandez

Contract: NOD01424WX00797

Project: "Building a Competency Model for SUBFOR Leadership"

Institution(s): Naval Submarine Medical Research Laboratory

CAPT(R) Mullaney, PhD

Contract: NOD01424WX01318

Project: "USNA Leader Development Assessment Project"

Institution(s): United States Naval Academy

Capability

The capability aims to improve and guide Navy talent management focusing on validated approaches to develop highly effective leaders and retain personnel. Furthermore, the capability aims to evaluate novel and innovative metrics, methods, and processes to assess the determinants of leadership, the longitudinal processes facilitating leader development, and identify new constructs to more holistically evaluate leadership effectiveness.

Guidance

- National Defense Strategy (2022)
  - Deterrence by Resilience; Force Planning Construct; Strengthen Resilience & Adaptability; Cultivate the Workforce We Need
- SECWAR Priorities (2025)
  - Restore Warrior Ethos & Accountability
- SECNAV Priorities (2025)
  - Warfighter Culture & Recruiting
- CNO 34 Campaign Plan (2025)
  - Battle-Ready Sailors; Battle-Ready Force
- CNP Strategic Guidance (2025)
  - Ensure a Fleet-Aligned Talent Strategy; Build a Culture of Continuous Improvement; Drive Data-Informed Decision Superiority; Modernize the Sailor Experience; Empower People through Leadership Development

CAPTAIN: Generative AI for Leadership Development

AT A GLANCE

WHAT IS IT?

- Leadership coaching is a beneficial but expensive leadership development
- A year of biweekly traditional leadership coaching for 4000 USNA students for one year could cost $30M; an AI version could mostly replace this

HOW DOES IT WORK?

- Students at USNA can access the leadership coach through their phone
- Sessions are held biweekly, and the coach checks 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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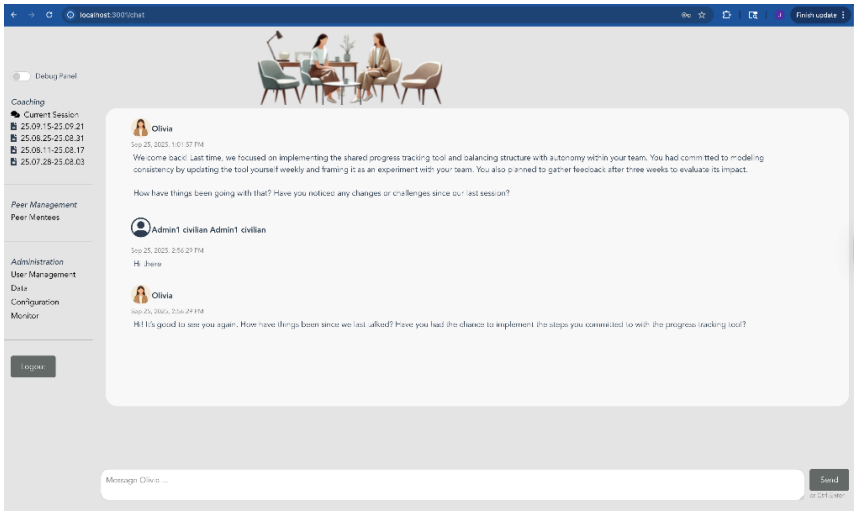

The CAPTAIN project aims to develop and empirically test the deployment of a generative AI based conversational leadership coach at the US Naval Academy. The AI coach, named Olivia, helps students accomplish their personal growth leadership goals in a way that is impossible with classroom instruction alone.

Development and oversight of the platform is guided by the International Coaching Federation's AI Coaching Framework and Standards to ensure alignment with high-quality and ethical coaching. Many USNA students are stressed about the demands placed upon them, and Olivia is designed to help them navigate those demands to become the best they can be.

Research Challenges and Opportunities:

- A generative AI agent like Olivia is a cutting-edge technology, which means that designing it to be both effective and safe requires carefully balancing many different sociotechnical factors at the frontier of our current understanding of AI.
- The success of Olivia has been 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 Olivia will continue to grow, to maximize its performance at supporting Navy personnel.

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 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 during 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

Building a Competency Model for SUBFOR Leadership

AT A GLANCE

WHAT IS IT?

NSMRL is collaborating with SUBFOR to develop an **evidence-based leadership behavioral model** and **instrument** that can be leveraged to support standardized leadership selection and development programs in the Submarine Force.

Results will inform talent management (TM) processes, including *ongoing executive coaching efforts, leadership development,* and *command qualification boards*. Results will also support broader Navy talent management modernization efforts by providing a validated model of effective leadership.

HOW DOES IT WORK?

Participants: 700 active-duty Navy officers and enlisted members.

Materials: A 220-item survey, including 178 new items and 42 from established scales (MLQ, ILS).

Procedure: Participants will be asked to base their survey responses on one leader they interact with often. Survey will take approx. 60 min. to complete.

Analysis: Psychometric properties will be assessed to confirm framework and instrument functionality.

WHAT WILL IT ACCOMPLISH?

- Provide a validated Leadership Model for SUBFOR

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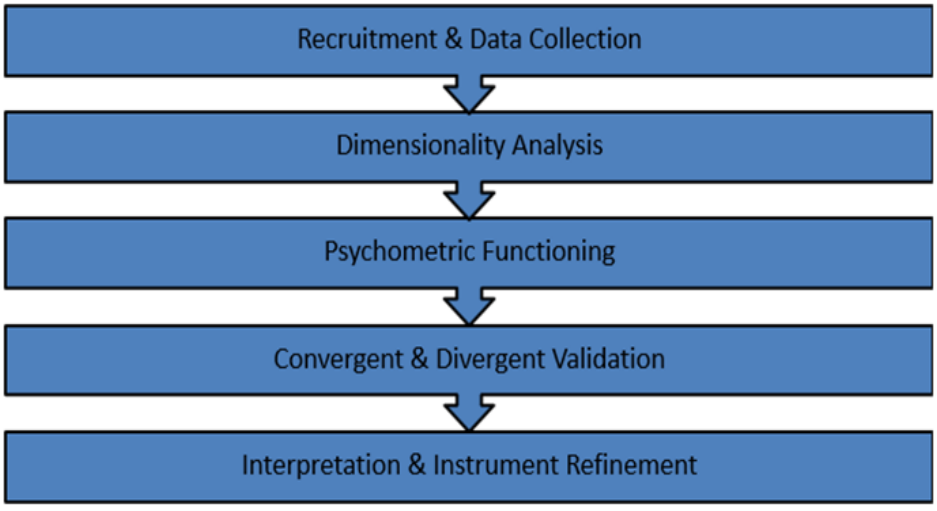
Validation Procedure



MILESTONES OF THE PROGRAM:

Content Validation Phase Complete

This Phase led to a critical restructuring of the SUBFOR leadership model. Originally organized into four broad categories: *Drive the Mission*, *Builds the Team*, *Takes Charge*, and *Displays Character*, the model was revised to three core categories (removing *Takes Charge*) based on rater feedback and empirical data.

Instrument items went through a refinement process to ensure they followed best practices in survey methodology.

NSMRL SRB and IRB Approval

The protocol for this next phase was recently reviewed and approved by NSMRL's Internal Scientific Review Board (SRB) and Internal Review Board (IRB).

Research Challenges and Opportunities:

- Balancing stakeholders' expectations of delivery with timelines
- Leveraging findings in applied settings (e.g., executive coaching, leader development initiatives)

Intellectual Readiness

Performers

LCDR Vorm, PhD & LT Albizu, PhD
Contract: N0001424WX02372
Project: "Intellectual Readiness"
Institution(s): Naval Air Warfare Center Aircraft Division (NAWCAD) & Johns Hopkins University Applied Physics Laboratory (JHU-APL)

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. Jarrod Moss
Contract: N000142112617
Project: "Strategy Development and Adaptation in Problem Solving"
Institution(s): Mississippi State University

Dr. John Hollenbeck & Dr. Stephen Humphrey
Contract: N0001423MP00197
Project: "Task Interdependencein Multi-team Systems"
Institution(s): Michigan State University, Pennsylvania State University, Arizona State University, and University of South Florida

Capability

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

- National Defense Strategy (2022)
  - 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
- SECWAR Priorities (2025)
  - Restore Warrior Ethos & Accountability
- SECNAV Priorities (2025)
  - Warfighter Culture & Recruiting
- CNO 34 Campaign Plan (2025)
  - Battle-Ready Sailors; Battle-Ready Force; Battle Force Readiness Today and Tomorrow
- CNP Strategic Guidance (2025)
  - Build a Culture of Continuous Improvement; Modernize the Sailor Experience

Intellectual Readiness for Emerging Technologies

Readiness is the highest priority of the US Navy. Ships must achieve conditions of material readiness before going to sea, indicating the ship is the most prepared and in the best condition to do battle should the need arise. Sailors achieve physical readiness by getting immunizations and health screenings, indicating they are physically ready to respond to any threat. Speculative future warfare scenarios increasingly feature a battlespace that is technologically complex, morally complicated, and increasingly uncertain. To meet the demands of these potential futures, US Naval personnel must be intellectually ready– but what exactly does it mean to be intellectually ready? Defining intellectual readiness is a first step towards developing robust investment strategies and policies to support the future fighting force.

Objective: Identify the cognitive and personality factors that forecast performance in dynamic and uncertain environments relevant for future Naval operations

The conceptual origins of Intellectual Readiness (IR) were grounded in qualitative analyses of expert interviews with historians, technologists, senior officers, and defense strategists, which identified twelve cognitive and affective facets thought to underpin adaptive expertise in future warfighting domains. These include anticipatory thinking, pattern recognition, metacognition, intellectual curiosity, far transfer, computational fluency, mechanical comprehension, situation awareness, resilience, teamwork, emotion regulation, and neurodiversity. While some of these dimensions (*e.g.*, mechanical comprehension, teamwork, *etc.*) are indirectly captured in existing training or selection instruments. Anticipatory thinking, far transfer, curiosity, metacognition, neurodiversity, and pattern recognition remain largely unmeasured within current readiness paradigms. This lack of quantifiable assessment limits the Navy's ability to identify, recruit, and train personnel capable of excelling in technological and rapidly changing environments.

To empirically test and quantify IR, the current study proposes an experimental design integrating psychometric assessment with applied problem-solving performance. Participants complete a cognitive battery composed of established, literature-validated measures to assess each factor of IR. Following the battery, participants engage with Baba Is You—a deceptively simple yet cognitively demanding rule adaptation game that requires players to continuously adjust their problem-solving strategies as the governing logic of the game changes. The task operationalizes the dynamic adaptability and cognitive flexibility central to IR.

AT A GLANCE

WHAT IS IT?

Applied research to assess and develop the future MPT&E requirements necessary to achieve an intellectually ready Naval force.

HOW DOES IT WORK?

We propose a comprehensive framework for assessing Intellectual Readiness (IR) through an empirically validated battery of cognitive tasks designed to capture key facets of adaptability, reasoning, and metacognition. This cognitive battery includes measures chosen to represent distinct dimensions of intellectual flexibility and analytical depth. Once baseline cognitive data are collected, participants engage in a complex rule-adaptation game, Baba Is You, which serves as an operational testbed for real-time problem solving under dynamic and unpredictable conditions. The game's shifting rules and logic structures simulate the cognitive demands of novel and uncertain environments.

WHAT WILL IT ACCOMPLISH?

By correlating cognitive battery scores with in-game performance metrics, we aim to identify which specific IR factors most strongly predict adaptive success. This approach establishes a method for quantifying IR in a controlled, replicable environment.

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RESEARCH CHALLENGES AND OPPORTUNITIES:

This research represents the Navy's first effort to develop a quantitative, evidence-based framework for measuring IR. Beyond its immediate application to training and selection, the approach offers a scalable model for understanding how IR can contribute to human performance in complex operational domains. Establishing reliable metrics for IR may thus enable targeted interventions that enhance adaptability, decision-making, and learning agility across the Fleet for the future fight.

Unguided Exploration (UE) for Intellectual Readiness

AT A GLANCE

WHAT IS IT?

- UE Definition: *Free time to explore or "play" with a system in a way that is not linked to a specific task or goal.*
- The intent is to investigate the impact of UE in Navy relevant training/tasking and to provide data suggesting a method to improve human performance and Intellectual Readiness. As technology, such as AI, becomes more prevalent in warfare, military personnel must be able to adapt to events in which they may not have been specifically trained. This work provides the research-based underpinning for an updated and adapted training methodology for the future fight.

HOW DOES IT WORK?

Our team is pursuing a between-subjects approach to evaluate performance differences between the group receiving UE training and the control group receiving instruction-based training. The experimental use case is a naval navigation task in a virtual environment. Training benefits will be determined through task performance, physiological data from wearable devices, and subjective questionnaires.

WHAT WILL IT ACCOMPLISH?

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

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Technological advancements offer our military services opportunities to train personnel using cutting-edge tools and programs designed to maximize warfighter performance. However, our adversaries can also leverage these advancements, creating unforeseen challenges that may outpace current training paradigms. While rigorous training programs prepare warfighters for a wide range of mission scenarios, certain events remain difficult to anticipate or replicate fully. Unexpected events can trigger detrimental surprise and startle responses that impact cognitive and physiological states that can lead to a performance decrease in theater. We hypothesize that UE will close that potential training gap and better prepare operators to respond to adversarial technological advancements. UE gives the operator free time to explore the system and its capabilities which opens the door for creative solutions and an extended understanding of the system capabilities. These solutions and critical thinking are exactly what the operator needs to respond to an unexpected event.

As such, this study investigates the potential of Unguided Exploration (UE) to enhance readiness and performance during unexpected events. Leveraging a government owned ship based wargaming modeling and simulation tool, Joint Cognitive Operational Research Environment (JCORE), a between-subjects experiment was designed where the participants are trained (UE vs Instructional Training) on a naval navigation task and exposed to unexpected events. Task performance, physiological response, and a series of questionnaires were used to quantify human performance and ultimately determine training efficacy. Additionally, challenges of future threat and advanced technologies highlight a growing need to better evaluate and predict training effectiveness in real time. This challenge can be addressed with wearable technology and advanced data analysis. The study is still ongoing, but results will be delivered via DTIC report in December 2025.

Research Challenges and Opportunities:

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

Individual Differences in Learning a Complex Visuo-Motor Task

WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

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.

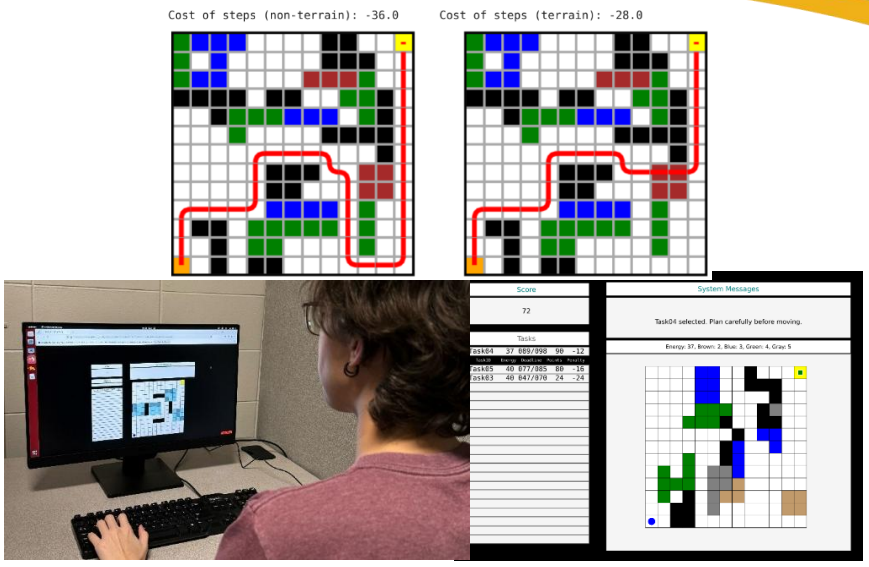
In brief we are conducting an individual differences study mixed with a training/training generalization study to determine which basic perceptual, cognitive, and/or motor skills, which personality traits, and which types of previous experience (e.g., previous video game experience) are predictive of 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., examine 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?

Strategy Development and Adaptation



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

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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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 and future research along these lines 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:

- Volume of recorded voice communications, coupled with advances in AI, have allowed us to capture, process, and utilize in depth interactions amongst team members. We are looking to also process video recordings to see if we can capture emotions and/or non-verbal behaviors.

Harmful Behavior Detection

Performers

Dr. Hans Breiter & Dr. Aggelos Katsaggelos

Contract: N000142312396

Project: "Automated Mental Health (AMH) to Predict Inward and Outward Destructive Behaviors Alongwith 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. McCabe

Contract: N0001424WX00439

Project: "Challenges of Operational Environments

Institution: Naval Health Research Center

Dr. Nancy Leveson & Dr. Elizabeth Baker

Contract: N000142312551

Project: "Systems Theoretic Approach to Destructive Behaviors"

Institution(s): Massachusetts Institute of Technology & Virginia Commonwealth University

Dr. Doug Wiegmann & 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

LCDR Carnes, PhD

Contract: NMR1135529

Project: "CHAMPS Counterproductive Workplace Behaviors"

Institution(s): Naval Health Research Center

Dr. Benjamin Nye & Dr. Bill Swartout

Contract: W912CG24D0001

Project: “Generative AI for Micro-Tailored Adaptation (GAIMA) to Train Suicide Prevention and Resilience

Institution(s): University of Southern California Institute for Creative Technologies

Capability

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.

Guidance

- National Defense Strategy (2022)
  - Deterrence by Resilience; Force Planning Construct; Adapt and Fortify Our Defense Ecosystem; Strengthen Resilience & Adaptability; Cultivate the Workforce We Need
- SECWAR Priorities (2025)
  - Restore Warrior Ethos & Accountability
- SECNAV Priorities (2025)
  - Warfighter Culture & Recruiting
- CNO 34 Campaign Plan (2025)
  - Battle-Ready Sailors
- CNP Strategic Guidance (2025)
  - Build a Culture of Continuous Improvement; Drive Data-Informed Decision Superiority

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 Computational Cognitive AI for predicting MH/DB for automated mental health (AMH).
- 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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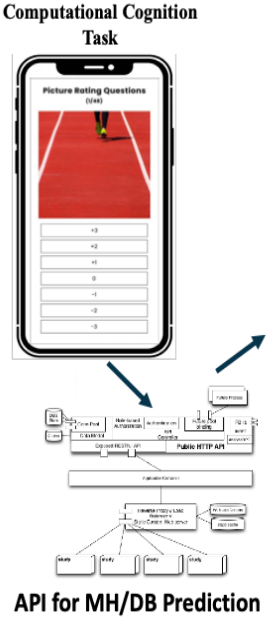

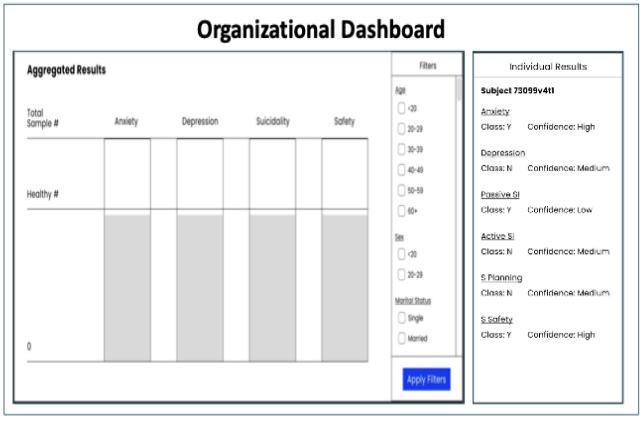

Impact/Transition: This AMH will provide the first automated assessment of suicide planning and multiple MH conditions. It can be easily deployed on simple digital devices. Nothing like this currently exists.

This project is engineering the components needed for automated mental health assessment (AMH), using advances in computational cognition and artificial intelligence (AI) that are based on validated neuroscience. This research has produced a novel form of AI called computational cognitive AI (CCAI) and will optimize how well reward/aversion judgment variables can be used to predict current and future 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, counter-productive work behaviors, 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 CCAI. 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 AMH 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?

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 DoW 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

- Recent completion of a book chapter that draws from this ONR research to describe the development of context-specific DB measures.
- Poster presentation at the 2025 Military Health Systems Research Symposium examining the prevalence of DB within U.S. Navy communities.
- Presentation at the 2025 Society for Industrial and Organizational Psychology conference that examined the predictors of DB among U.S. Naval Academy Midshipmen.

Research Challenges and Opportunities:

- Inherent social sensitivity of DBs present challenges for recruiting participants.
- Communities at different phases than others.

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 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 voluntary and 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 that is presented to command leaders within 4-6 weeks post-data collection. Follow-ups are attempted every 9-12 months.

WHAT WILL IT ACCOMPLISH?

The COPE study aims to provide Navy leaders with realistic, specific, and actionable recommendations to prevent 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 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, and one carrier returning from a combat deployment. Since April 2022, the COPE team has conducted eight (8) assessments across the three carriers at different operational phases. In total, the team has conducted over 7,750 surveys and recruited more than 500 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, pre-deployment work-ups, deployment, reintegration). 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 harmful behaviors in the DON.

Research Challenges and Opportunities:

- Obtaining necessary regulatory approvals to conduct sensitive research can adversely impact timelines.
- Shifts in command priorities, turnover in leadership, and communication gaps contribute to scheduling delays and 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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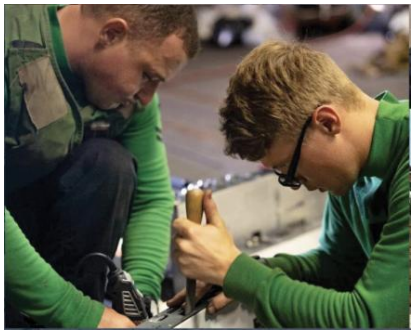

Photo by Petty Officer 2nd Class Ace Foster, DVIDs

AID TO WARFIGHTER READINESS

This approach, using STAMP tools, provides the value-added benefit of targeted intervention identification, which will lead to the rapid implementation of successful system constraints at a lower cost. This will help retain sailors in the force and conserve resources while providing more effective support to sailors who engage 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 model 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 and can be viewed through a socio-ecological lens.
- A formal description of the relationship between individuals in the community

Upcoming Milestones: Sponsor SURFPAC

- **CY24:** Completed STAMP-based hazard analysis on suicide-SRB; 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); Began model control structure for SA, SH, D, H, DV/IP (substantiated)
- **CY25:** Completed initial control structure on SA, SH, D, H, DV/IP (substantiated); Completed STAMP-based hazard analysis on 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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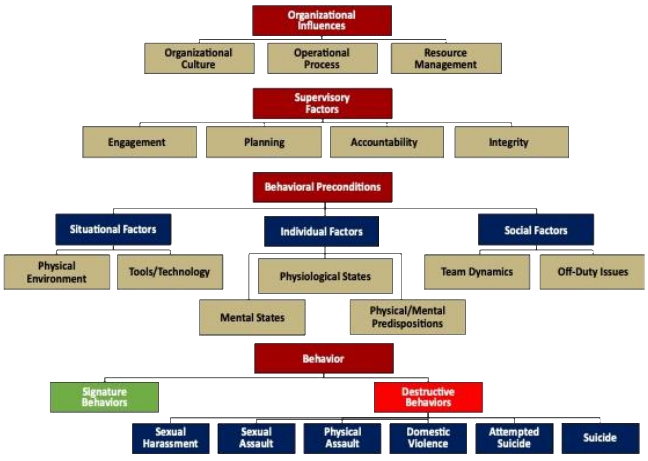
The Human Factors Analysis and Classification System – Workplace Behavior (HFACS-WB)



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 defense personnel
- Current methods for reporting, analyzing, and learning from dysfunctional behavior-related incidents involving dysfunctional personnel are limited, impacting the effective management of dysfunctional behavior
- Project aim is to develop and validate a dysfunctional behavior-related incident contributory factor classification scheme

HOW DOES IT WORK?

- The new dysfunctional behavior-related incident contributory factor classification scheme will support the reporting and analysis of dysfunctional behavior-related incidents and support the development of effective prevention strategies

WHAT WILL IT ACCOMPLISH?

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

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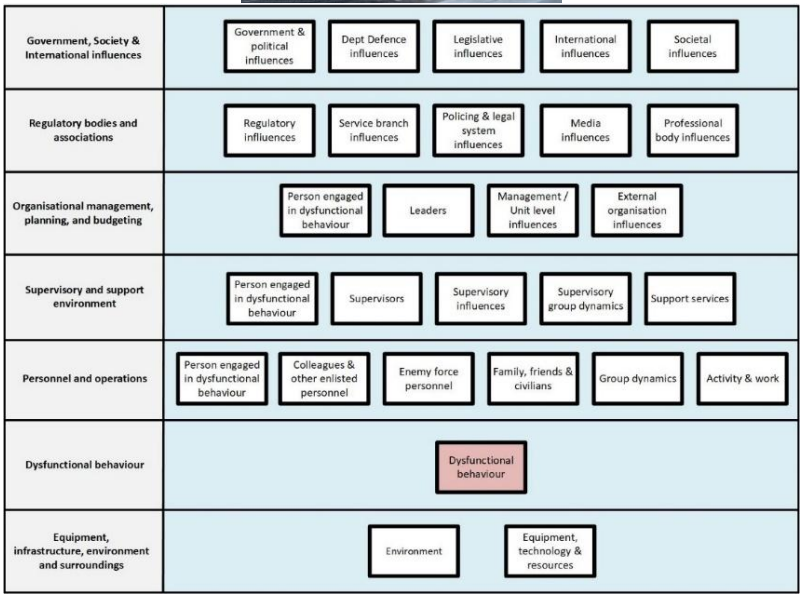


Dysfunctional behavior (e.g., sexual assault, suicide, substance abuse) is an area of increasing concern for military forces worldwide. Systems thinking methods such as the Accident Mapping (AcciMap) technique are dominant in safety science and are used across safety-critical domains to develop a comprehensive understanding of the systemic factors that contribute to adverse events. To date, the AcciMap have not been applied to the analysis of dysfunctional behavior-related incidents involving defense personnel.

This research project involves the development and validation of a dysfunctional behavior-related incident contributory factor classification scheme. Project outcomes include new knowledge on the systemic causes of dysfunctional behavior-related incidents and a novel classification scheme that will support the use of AcciMap in future incident analysis and learning efforts. This will ultimately support the development of more effective prevention and intervention strategies to reduce dysfunctional behavior-related incidents involving defense personnel.

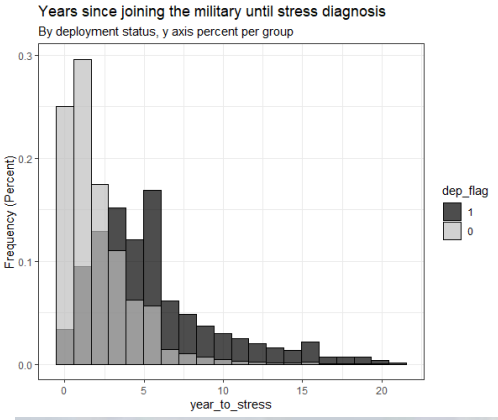
A prototype dysfunctional behavior-related incident contributory factor classification scheme has been developed, based on an umbrella review conducted by the research team and a review of existing systems thinking-based incident analyses. The prototype classification scheme has been refined based on subject matter expert feedback and tested with real-world and AI-generated scenarios of dysfunctional behavior-related incidents. A Delphi consensus study is currently in preparation, to validate the prototype classification scheme. This study will engage international experts in dysfunctional behavior research.

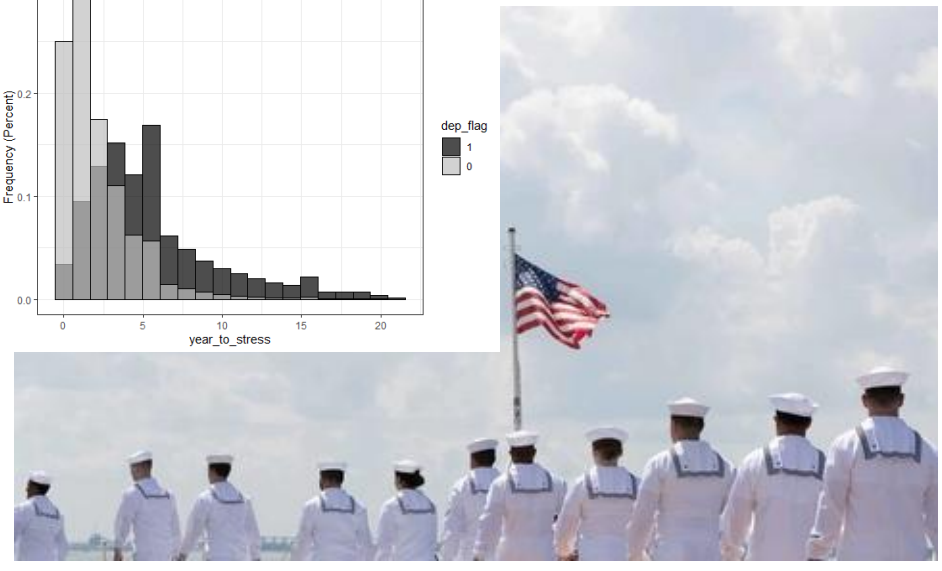
Research Challenges and Opportunities:

Challenge: Recruiting experts in dysfunctional behavior research to participate in the Delphi consensus study

Opportunities: Identifying the systemic conditions that interact to create dysfunctional-behavior-related incidents involving defense personnel; developing a contributory factor classification scheme that is valid, reliable, and usable in practice

CHAMPS Counterproductive Workplace Behaviors





AT A GLANCE

WHAT IS IT?

Counterproductive workplace behaviors (CWB) significantly impact readiness and Sailor well-being and can serve as a precursor to more extreme harmful behaviors.

CWB can be obscured within the day-to-day operations of an organization, so better assessment and mitigation of these behaviors is an important focus of OPNAV N17.

The Career History Archival Medical and Personnel System (CHAMPS) has more than 1.2 billion records describing the career milestones and medical history of U.S. service members, which can serve as a rich resource to investigate precursors and contributing factors to CWB.

HOW DOES IT WORK?

CHAMPS will be prepared for advanced statistical analysis to support investigation into the longitudinal and contextual factors that impact CWB prevalence, leading to the identification of accurate risk indices of CWB.

WHAT WILL IT ACCOMPLISH?

CHAMPS will identify key metrics and performance drivers for human behavior that will positively impact force development, management, and enterprise-wide function areas.

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CHAMPS Counterproductive Workplace Behaviors

The Navy's Culture and Force Resilience Office (OPNAV N17) is leading the Culture of Excellence (COE) 2.0 that empowers the Navy to achieve a warfighting mindset by fostering Sailors' mind, body, and spiritual toughness. Unfortunately, the very foundation of culture and warfighting readiness of the US Navy is threatened by counterproductive workplace behaviors (CWB) and destructive behaviors.

CHAMPS is a comprehensive data repository covering decades worth of service members' personnel records to include medical treatments and diagnoses. The combination of career milestones (e.g., training completions, duty stations, promotions, etc.) and medical record provides a unique resource to identify contributing factors to CWB. The data was recently organized to support advanced statistical analysis but requires coordinated data curation and management to support investigation into the longitudinal and contextual factors that may impact CWB prevalence. Preparing the dataset for examination of CWB will support developing frameworks and pathways to aide in prevention and mitigation. This will deepen Navy's comprehensive understanding for the mitigation of CWB, prevention of harmful behavior incidents, and allow more accurate determination of the effectiveness of prevention activities through clear, measurable outcomes.

Research Challenges and Opportunities:

- Develop a process and specific criteria for constructing prospective, objective metrics indicating CWB precursors and risk factors.
- Collect, curate, and manage necessary datasets to support longitudinal analytics investigating precursors and risk factors to CWB.
- Develop protocol and obtain Institutional Review Board (IRB) approval to prepare CHAMPS data and evaluate prospective metrics of CWB.

GAIMA: Generative AI for Micro-Tailored Adaptation

AT A GLANCE

WHAT IS IT?

Problem: Training should be personalized to many factors: prior risks, current issues, and local resources. However, to develop and maintain this remains infeasible.

GAIMA personalizes training with:

- Generative AI workbench tools to micro-tailor learning content.
- LLM Agents target changes that increase relevance to the learner (e.g.., risks / goals) and their context (e.g., living situation).
- SME review for high-risk topics, such as suicide prevention common military training (CMT).

HOW DOES IT WORK?

GAIMA adaptation has three steps, as shown in the figure:

1. **Gold Standards:** Add SME-validated content to GAIMA.
2. **Learner Types**: Experts define key learner types and GAIMA personalizes content for each.
3. **Adaptive Learning**: SAFER, an adaptive learning app, delivers personalized content based on each learner's profile.

WHAT WILL IT ACCOMPLISH?

- **AI Personalization**: Increase engagement in mandatory training with AI-tailoring.
- **AI Safeguards**: GenAI critic agents to verify content safety and quality of personalization.

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GAIMA: Quickly generate adaptive learning for different learner types and contexts

Project Progress and Use-Case

Current work studies personalization of suicide prevention CMT, which has high variation in sailor motivations and local resources. Upcoming user studies will collect responses by SMEs and Navy learners on tailored content. Our progress includes:

Sailor Situation Model: Adaptive intake survey represents a sailor's goals, primary concerns, and history based on their goals. This sailor model is used to represent learner types, and to match specific learners to their closest learner types.

GenAI for Personalized Training: Two GenAI pipelines created to adapt content (fast vs. deep). UI tools to review and approve content changes. Models use data sources for local context (e.g., retrieval-augmented generation; knowledge bases).

AI Critic: Research developing LLM moderator agents, which report a safety check against standards and policies (e.g., do-no-harm) and verify that content retains equivalent learning objectives (i.e., trains the same core concepts).

Insights to Date:

- Content SME's indicate they would review up to 5 learner types, setting a limit on how many versions may be extensively tailored to specific learner types
- Adapting batches of content (multiple lessons in the background) with LLM agents has benefits over real-time tailoring by the AI. Batches allow higher quality (more iterations) and can generate while SME's review other generated versions.

Research Challenges and Opportunities:

- *Challenge*: AI tools must separate personalization that need human review (e.g., content coverage) versus changes allowed on-the-fly (e.g., closest medical center)
- *AI Screening*: AI "critics" offer reusable detectors for unsafe or low-quality content
- *SME Training Sets:* Content approvals and edits can tune smarter AI, long term
- *Domain-Agnostic Tailoring*: Relevant to a broad set of learner types & content

Robotics Rating & Designator Development

Performers

Dr. Ross Higashi & Mr. Jesse Flot

Contract: N0001423C2015

Project: "Robotics Training and Competition Validation"

Institution(s): Carnegie Mellon University

Dr. Dunn & Mr. Schrom

Contract: N0001424WX00441

Project: "Understanding Unmanned Maritime Systems (UMS) Training"

Institution(s): Naval Health Research Center

Mr. Wheeler, Ms. Blaschke, & Dr. Vogel

Contract: N0001424WX00544

Project: "ROKI: Robotic Combat Systems Operator Knowledge Skills & Abilities Investigation"

Institution(s): Naval Surface Warfare Center - Dahlgren

LCDR. Houst, PhD, LT. Albizu, PhD, Dr. Bowens & Dr. Scott

Contract(s): N0001424WX00443 & N0001424WX01819

Project: "Robotic Warfare Specialist (RW) Rating: Officer Considerations"

Institution(s): Naval Information Warfare Center – Pacific, Naval Research Laboratory, & Naval Air Warfare Center – Training Systems Division

Capability

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.

Guidance

- National Defense Strategy (2022)
  - Force Planning Construct; Transform the Foundation of the Future Force; Adapt and Fortify Our Defense Ecosystem; Cultivate the Workforce We Need
- SECWAR Priorities (2025)
  - Restore Warrior Ethos & Accountability
- SECNAV Priorities (2025)
  - Warfighter Culture & Recruiting; Shipbuilding & Industrial Base
- CNO 34 Campaign Plan (2025)
  - Battle-Ready Sailors; Battle Force Today and Tomorrow
- CNP Strategic Guidance (2025)
  - Ensure a Fleet-Aligned Talent Strategy; Build a Culture of Continuous Improvement; Drive Data-Informed Decision Superiority; Modernize the Sailor Experience

Training for Enlisted Robotics Operator/Maintainers

AT A GLANCE

WHAT IS IT?

A design-based research program co-evolving theory and effective training for robotic system operators and maintainers, starting with Robotics Warfare Specialists (RW), who must thrive as stewards of critical Naval robotics platforms at the forward edge amidst rapid technological change.

HOW DOES IT WORK?

In the latest iteration, students undergo four weeks of hands-on training with 8 different robots, building knowledge, skills, and confidence in and across all fundamental domains of robotics. In a fifth week, they solidify and prove their skills in a final challenge. Feedback and performance data are used to validate relevance of course methods and components.

WHAT WILL IT ACCOMPLISH?

- Refine/validate cost-effective small robot training that transfers rapidly to new platforms
- Validate how/whether/what kind of programming and ML/AI topic coverage impact performance
- Inform discussions around RW “A” School and related robotics training programs
- Create a proven interim training option that can continue to run in place while permanent training plans are put into place

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This project has recently completed the third iteration of its course offering as a joint training including participants from four services (Navy RWs, Marines, Army, and Coast Guard). This marks the beginning of its transition from a purely R&D endeavor to a scalable vehicle supporting both ongoing research and delivery of valuable fundamental training to real-world practitioners.

The training includes modules covering electrical, structural, drive, sensing, and control subsystems, integration of those subsystems, autonomy & AI, and routine operation of robotic platforms in different domains. Each module uses hands-on activities building from basic domain elements up to functional robotic systems. The pattern is repeated with increasingly sophisticated platforms across modules to emphasize common technical elements and optainer tasks while building up to a capstone challenge in the final week.

Participants have found this approach gives them a valuable holistic understanding of robots and their subsystems. Learning through this rapidly repeated process of familiarization with new systems also positions future system acquisition as a familiar and expected task. In end-of-course competition, course participants outperformed a comparison group at learning, troubleshooting, and operating novel robotic platforms that neither group had seen before.

Research Challenges and Opportunities:

- The experimental training is continuing to receive interest as an ongoing, partially self-sustaining vehicle for both training and research
- Significant improvements to training will likely result from reconciling ongoing misalignments around expectations of software coding knowledge – practitioners appear to need an understanding of code “one level deeper” than the code they manipulate directly. This enables them to verify they are doing their portion correctly. This principle also appears to apply to content around ML and AI.

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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NSWC Dahlgren Division, in collaboration with ONR Code 34 Cybernetics Portfolio, initiated the investigation of Knowledge, Skills and Abilities (KSA) to identify and validate a competency framework describing the future force Personnel requirements for the operational employment to include operator usage and in-field maintenance of representative novel robotic combat and autonomous systems (RxS).

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.

Our goal is to test the hypothesis that fundamental training focused on the identified KSAs on small-scale robotic systems could lead to knowledge transfer to larger-scale novel systems with only three hours of "just in time" training.

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 conduct PMA of vehicle data to identify mine-like objects in support of EOD.
- There is little knowledge of the human factors and reliable predictive variables underlying successful manning of platoons and mission performance.
- This effort will develop and transition an interactive dashboard that can be used for strategic and tactical risk planning for UMS missions.

HOW DOES IT WORK?

- Mixed methods research during training evolutions captures cognitive, physiological, and mission data and outcomes.
- Data is fed into a predictive model and interactive dashboard and produces a mission risk estimate following Navy ORM parameters.

WHAT WILL IT ACCOMPLISH?

- UMS platoons will be able to integrate dashboard usage during their development of pre-mission SMEACS and for on-the-fly use when mission parameters change.

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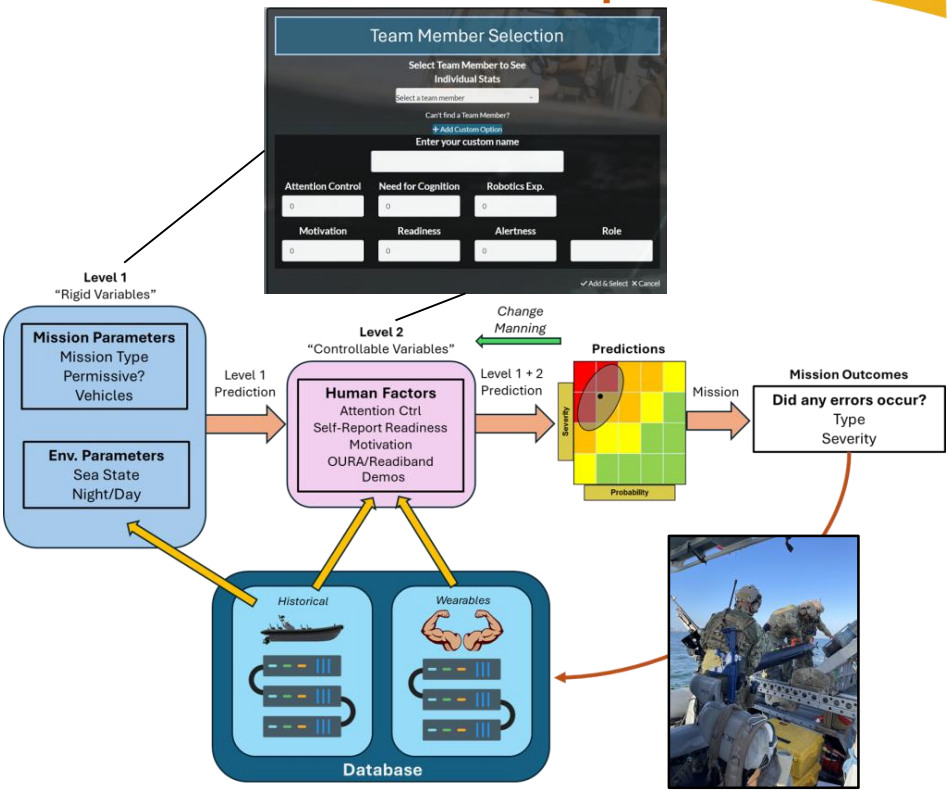
Dashboard Concept



Unmanned systems (UxS) are currently at the forefront of the Department of the Navy 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 personnel and training optimization are also critical aims.
Navy Unmanned Maritime Systems (UMS) platoons are an example of a group at the forefront of these efforts.

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, and little knowledge of the human factors and reliable predictive variables underlying mission success.

This study leverages relationships with operational partners focused on UMS training and performance, including EOD Training and Evaluation Units One and Two, to identify the cognitive, physiological, and mission variables most associated with errors and error severity. Current work is focused on leveraging these data streams and ML methods to build a statistical model that predicts mission risk (error likelihood x severity) following the Navy ORM framework. The initial predictive model is being currently being integrated into an interactive dashboard that will allow leadership to iteratively construct their platoon in a way that minimizes risk and maximizes success.

Research Challenges and Opportunities:

- Creating a comprehensive data set with mission types and outcomes
- Optimally down-selecting predictor variables to bring the most utility to the community
- Off-the-shelf wearables form factors create unique challenges for
- Recruitment is dependent on the availability of platoons training pipelines

Robotic Warfare Specialist (RW) Rating: Officer Considerations

AT A GLANCE

WHAT IS IT?

A 6.2 applied research project designed to determine the essential knowledge, skills, and abilities required for leadership in the Robotics and Autonomous Systems (RAS) community

HOW DOES IT WORK?

- Naval officers overseeing RWs or working in RAS/Robotic Platforms (RxS) environments were recruited to participate in a job task analysis
- Survey responses were analyzed to identify training needs, leadership structures, and operational requirements
- The results of the task analysis were used to provide empirical evidence of the RAS qualification criteria
- Given the findings of the task analysis, a NOOCS package containing Additional Qualification Designators (AQDs) and Navy Officer Billet Classifications (NOBCs) proposals was drafted to address critical qualification gaps and inform workforce development.

WHAT WILL IT ACCOMPLISH?

This project will develop a scientifically validated model of the KSAs required for the RAS community that will be used to create AQDs and NOBSs

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ABOUT

The rapid expansion of Robotics and Autonomous Systems (RAS) and Robotic Platforms (RxS) across naval and joint operations has outpaced the establishment of a standardized framework for officer qualification and professional development in these domains. Despite increasing integration of RAS technologies into mission-critical functions there remains no consistent pathway to credential officers with the requisite technical, operational, and leadership competencies. This lack of standardization introduces several systemic risks. Without clearly defined qualification criteria, officer expertise in RAS cannot be reliably assessed or sustained, leading to potential leadership gaps in emerging mission areas. Establishing a formalized qualification framework is therefore essential to ensure competent leadership, operational readiness, and the safe, effective integration of autonomous systems into naval operations.

Objective: Develop a comprehensive framework for outlining Knowledge, Skills, and Abilities (KSAs) for officers overseeing RW personnel or working in RAS/RxS environments

Framework for Understanding Competencies in RAS

To systematically define the competencies required for effective leadership in RAS domains, we conducted survey research to identify knowledge, skills, and abilities (KSAs) of RAS/RxS officers, and a job analysis to focus on their roles, responsibilities, and leadership responsibilities of officers. In the context of RAS, where technological evolution outpaces existing qualification structures, this approach allows for the identification of key themes that can inform the design of new qualification standards and training pipelines tailored to the cognitive and technical demands of RAS leadership. This ensures that the resulting framework reflects authentic Fleet experiences and operational realities, informing definitions of proficiency.

Defining Role-Specific Competencies through Job Analysis

Job analysis provides a structured method to understand RAS operations and the roles within them. This approach facilitates the identification of KSAs required for effective performance. Job analysis has long been used in various domains to identify role boundaries and training requirements. This makes job analysis an optimal choice for the domain of autonomous systems. Applying this framework to RAS operations enables the mapping of officer tasks against system capabilities and mission objectives, revealing gaps in training coverage, oversight responsibility, and leadership readiness. These data will serve as the empirical foundation for defining qualification milestones and proficiency standards within the emerging RAS designator pathway.

Integration with the Navy Officer Occupational Classification System (NOOCS)

The NOOCS provides the formal structure through which officer roles, qualifications, and billet requirements are codified within the Navy. Integrating Grounded Theory and Task Analysis outputs into the NOOCS process ensures that new Additional Qualification Designators (AQDs) and Navy Officer Billet Classifications (NOBCs) for RAS are not only conceptually valid but also administratively actionable.

RESEARCH CHALLENGES AND OPPORTUNITIES

- Challenge: Gaining access to officers in RAS/RxS environments
- Challenge: Catching up to prior delays in task completion
- Challenge: Ensuring AQD and NOBC compliance with NOOCS requirements
- Opportunity: Codifying RAS AQDs and NOBCs will assist with talent management and workforce development

Talent Management Nexus

Performers

Dr. Litchmore
Contract: N0001424WX00352
Project: "Talent Management Nexus"
Institution(s): Naval Surface Warfare Center - Dahlgren, Dam Neck Annex

Mr. Welch
Contract: N0001424C2427
Project: "Talent Management Analytics Ashore and Afloat (TMA3)"
Institution(s): Eduworks

Dr. Holly Baxter
Contract: N0001423C2009
Project: "Navy Leadership Behavioral Model"
Institution(s): Cognitive Performance Group

Dr. J.T. Folsom-Kovarik
Contract: N0001426C2401
Project: "Talent Management Nexus: Data Analytics"
Institution(s): SoarTech

Dr. Foroughi & Dr. Smith
Contract: N0001424WX00299
Project: "Leadership Development for AIRFOR & EOD"
Institution(s): Naval Research Laboratory & Peraton

Capability

The Talent Management Nexus (TM Nexus) Future Naval Capability (FNC) 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

- National Defense Strategy (2022)
  - Deterrence by Resilience; Force Planning Construct; Adapt and Fortify Our Defense Ecosystem; Strengthen Resilience & Adaptability; Cultivate the Workforce We Need
- SECWAR Priorities (2025)
  - Restore Warrior Ethos & Accountability
- SECNAV Priorities (2025)
  - Warfighter Culture & Recruiting
- CNO 34 Campaign Plan (2025)
  - Battle-Ready Sailors; Battle-Ready Force; Battle Force Today and Tomorrow; Fleet Readiness
- CNP Strategic Guidance (2025)
  - Ensure a Fleet-Aligned Talent Strategy; Build a Culture of Continuous Improvement; Drive Data-Informed Decision Superiority; Modernize the Sailor Experience; Empower People through Leadership Development

Talent Management Nexus

AT A GLANCE

WHAT IS IT?

TM Nexus is a scalable, evidence-driven solution designed to modernize how leadership potential is identified, and leadership skills are developed across the Navy and within unique warfare communities.

HOW DOES IT WORK?

By building its foundation on extensive, substantiated research, the Navy Leadership Behavioral Model (NLBM) and the Competency & Skills System (CaSS), TM Nexus is a powerful leadership measurement and development framework. Automation of the Navy Leadership Assessment Program (NLAP) processes, standardizing core competency determinants across Commands and providing sailors customized development maps are key practices TM Nexus will establish to support this framework.

WHAT WILL IT ACCOMPLISH?

- Modernization and strengthening of the Command Qualification process as well as cultivation of Leadership Skills with the NLBM 5.0
- Central, data-driven automation supporting 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 system 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 Navy's Career Waypoints (C-WAY) system.

TM Nexus involves 3 phases:

- During the ONR Technology Candidate period, the initial phase developed the Navy Leadership Behavioral Model (NLBM). This model was built over three years by collecting and compiling extensive research and evidence data. When integrated into TM Nexus, the NLBM will enforce Navy-wide core competency standards while remaining extensible enough for unique TYCOM customization with more specific competencies.

- Phase two focuses on building API connections to the Career Waypoints (C-WAY) system to retrieve current sailor demographic, recruiting, retention, training and behavior related data from authoritative Navy sources. TM Nexus will integrate this with NLBM-focused assessment data to build a more complete sailor profile. Additionally in this phase, functionality to support NLAP processes will be engineered, such as the frameworks to support tasks performed by the Operational Psychologists and Leadership Board Members in their evaluation and reporting processes.

- The third phase will continue NLAP process automation and include connection to internal and external assessments that provide additional insight into individual sailor's skills, behaviors and leadership abilities. These cognitive and non-cognitive assessment scores combined with data collected in prior phases will create a truly comprehensive sailor profile. This holistic view of the sailor will then be used to fine tune the leader selection process and to improve individual sailor recommendations for specific training and skill development.

The application is being constructed within a DevSecOps environment, managed and developed using agile, user-centered approaches and leveraging C-WAY for prototyping, development, testing, production, and operation.

Research Challenges and Opportunities:

- C-WAY's data framework and development environment is constantly maturing, requiring all parties to be adaptive

Navy Leadership Behavioral Model Assessment (NLBM-A)

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, assessing, retaining, and selecting future leaders.

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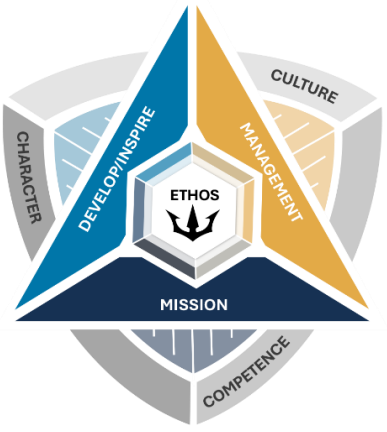
ABOUT

The U.S. Navy is making efforts to better understand and support the development of its current and future leaders. Individual commands are already developing leadership competency models in response, but no scientifically driven Navy-wide model exists that reflects common leadership competencies. These models will 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. The generated BARS and 360-assessment items allow for individualization across communities while still allowing for standardization across the Navy.



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) required for effective leadership 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 demonstrate behaviors that support mission accomplishment, enhance sailor development, 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) and specific leadership competencies within the command triad, consisting of Commanding Officer, Executive Officer, and Chief of the Boat/Command Master Chief.

Competency Management System

The Navy is implementing a profile-based technology solution to track career-long leadership development. A prototype profile viewer has been developed for the initial behavioral leadership 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

Behaviorally Anchored Rating Scales (BARS) and 360-degree assessment items have been generated based on KSAOs outlined in the NLBM. Three versions of BARS have been created to best align with the needs of the Navy Leadership Assessment Program (NLAP). Similarly, the 360 assessment for all NLBM factors include a minimum of 20 items per factor to serve as an item bank so all Navy communities can tailor the assessments to their individual needs.

RESEARCH CHALLENGES AND OPPORTUNITIES

- Challenge: Developing standardized leadership model to meet Navy-wide talent management needs while having flexibility to meet the distinct talent management needs of different Navy commands.
- 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.

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).

POINT OF CONTACT:

Dr. Foroughi
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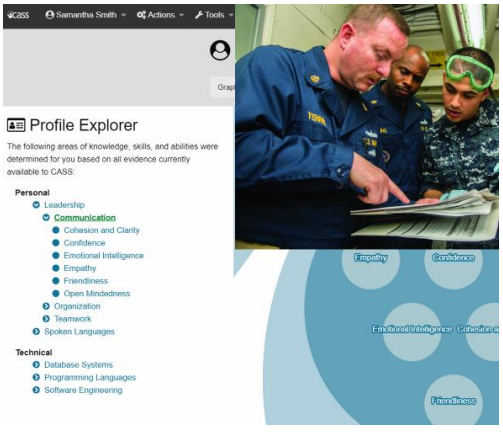
ABOUT

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

S&T OPPORTUNITY

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).

POINT OF CONTACT:

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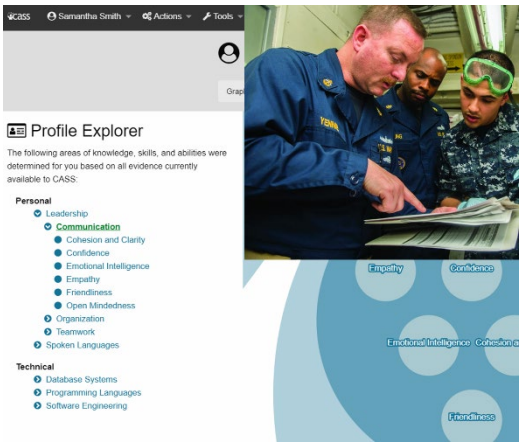
ABOUT

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: 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

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

POINT OF CONTACT:

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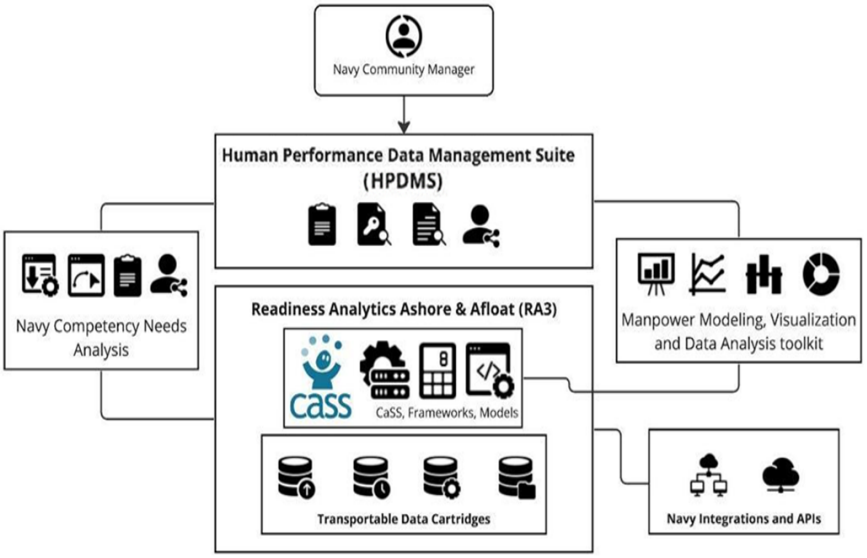

Four capabilities for digital chain of evidence providing actionable MPT&E insights

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

Research Challenges and Opportunities:

- New integrated deployment environment
- 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

Performers

Dr. Litchmore
Contract: N0001424WX00495
Project: "MyNavy Foresight"
Institution(s): Naval Surface Warfare Center - Dahlgren, Dam Neck Annex

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Contract: N0001424WX00495
Project: "MyNavy Foresight"
Institution(s): Applied Research Associates

Capability

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.

Guidance

- National Defense Strategy (2022)
  - Force Planning Construct; Adapt and Fortify Our Defense Ecosystem; Cultivate the Workforce We Need
- SECWAR Priorities (2025)
  - Restore Warrior Ethos & Accountability
- SECNAV Priorities (2025)
  - Warfighter Culture & Recruiting
- CNO 34 Campaign Plan (2025)
  - Battle-Ready Sailors; Fleet Readiness; Battle-Ready Force; Battle Force Today and Tomorrow; Global Battle Integration
- CNP Strategic Guidance (2025)
  - Ensure a Fleet-Aligned Talent Strategy; Drive Data-Informed Decision Superiority; Modernize the Sailor Experience

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 an Authoritative Data Source (ADS) and leverages its **abundant, centralized** data sources. ADS 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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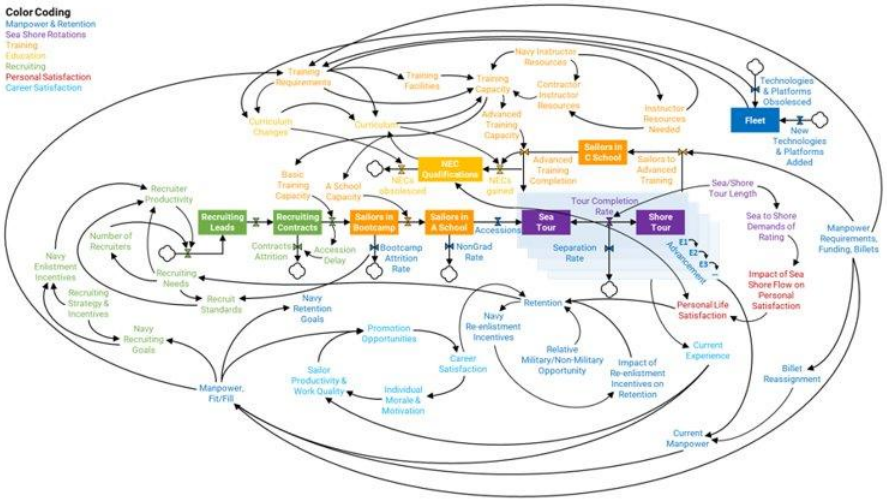

MNF has two on-going efforts: development of an in-house prototype and evaluation of a mature, Australia-developed solution.

The in-house (ONR & OPNAV N1 sponsored) prototype is one of the first applications being integrated in a ADS. This is significant because the ADS provides a centralized, authoritative source for Navy 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 Navy 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 Australian Defence Force (ADF). 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 software suite would eliminate the time required to build a similar, full-fledged application.

ONR has been proactive in assessing the Australian-built software suite. Activities include visiting ADF 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 ADS's development environment is constantly maturing, requiring all parties to be adaptive
- Future collaboration opportunities with ADF (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 and decision-support tool to enable force management, development, and enterprise support. It ensures 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?

MyNavy Foresight utilizes a discrete event simulation framework driven by existing personnel data and supplemented by models incorporating other factors affecting behavior within the MyNavy HR domain. This enables 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 explainability of model predictions.

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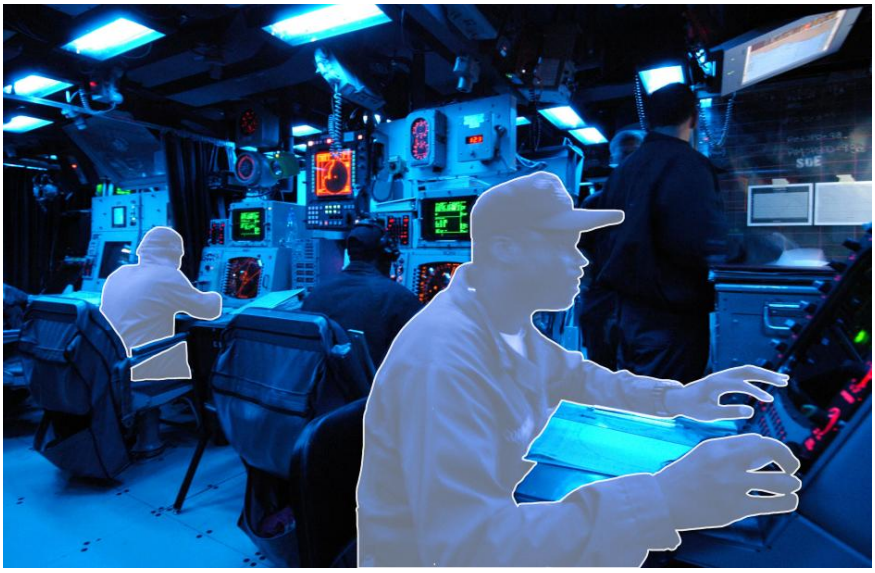

Critical fit/fill gaps persist across ranks and ratings. Current tools and processes take six months or more to assess only two to three outcomes and are unable to meet CNO NAVPLAN "SAILORS" and "READINESS" pillar requirements.

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 to develop even 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 explainability
- Integrate with analytic capability in the Navy's Authoritative Data Environment (ADE)

CONTACT INFO

ONR MPTE-IS Website