

NAWCTSD RESEARCH & TECHNOLOGY ROADMAP

KEY:

Upcoming Projects/Programs
Current Programs
Possible Projects/Programs

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Disclaimer: This Human Systems Technology Roadmap is a living document and is subject to change. Significant portions of the information are planning in nature and are subject to change throughout the acquisition planning and acquisition strategy approval process, and in response to peer reviews.

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		Current		Near-Term		Long-Term		
CC1 - Human Systems Engineering, Integration, and Acquisition	Research, design, and development of integrated Human Systems products	Develop tools and methodologies for deriving and managing SoS requirements		Tools and Methodologies to derive and manage SoS requirements				
				Deploying Mobile Devices for Navy Training (TSD:219SG)				
			Simulation Standards for Interoperability of Human Performance and Debrief Data in Training (TSD: 219:SG)					
		Human performance metrics and training solutions that support Integrated Warfare Capabilities (IWC)		Human performance metrics and training solutions that support IWC				
		SoS/Big Data Human performance analysis tools		A hybrid classification approach using down-sampling techniques and tuned hyper parameters on imbalanced datasets (TSD: 219BAR)				
Human-Machine Interfaces	Enhance collaborative and autonomous unmanned surveillance and strike capabilities	Adaptive Training for Maintaining Attention during UAS Operations (TSD - SBIR)						
		Identification and Definition of Unmanned Aerial System Air Vehicle Operator Performance Metrics (TSD-219BAR)						
		Unmanned Systems - Training Experimentation & Simulation (US-TES) Lab (TSD-CIP)						
		User Interface Strategies for Human-Machine Team Training in a Simulated Swarm Task (TSD:219BAR)						
		Evaluating Robot User Displays to Investigate Team Effectiveness (ERUDITE) (TSD:219BAR)						
		Stay Woke and Stay Vigilant: An Examination of Unmanned Operator Performance (TSD: WFD SG)						
		Management of multiple UAVs and payload systems by a single operator (PAX)						
		Factors involved in operator trust of automation						
		Novel methods to represent machine state to the operators						
		Techniques and approaches to represent, vary, and adapt the autonomy of controlled/monitored unmanned systems						
		Enhance data representation and visualization for decision support	Complex-Knowledge Visualization Tool (TSD: SBIR N17A-T004)					
			End-User Speech Recognition Support Tools for Crew Resource Management Training Systems (TSD: SBIR)					
			Enhance instructor understanding and assessment of team performance during live virtual constructive (LVC) training exercises					
			Enhance maintainer understanding of complex system functionality to enhance troubleshooting					
			Enhance acquisition decision maker understanding of training system capabilities and tradeoffs					
	Develop decision-support tools capable of operating on very large datasets aid and expedite decision-making							
	Analysis / analytic tools to log, store and convert very large data sets into useful information to expedite decision-making and reduce transmission bandwidth							
	Improve mission planning and real-time re-planning	Pre-FNC Fleet 2 Effort (TSD: ONR)						
		Incorporate multi-data vehicle "self-awareness" into route following and real-time re-route planning						
		Provide means to prioritize pre-mission and during the mission factors for auto-calculation of route hazard analysis						
		Develop tactics packages applicable to single asset, multiple assets, and swarms						
		Develop rules for governing no-comm/link situations and user interface for helping maintain operator and battle command SA						
		Develop tool(s) for instantiating "intent" to the machines for purposes of tactics planning & continuing missions during no-comm						
	Provide actionable tactical situational awareness	Aircrew Control of Remote Asset Using an Electronic Kneeboard (UAV ctd with EKB) (PAX-BAR)						
		Application of Virtual / Augmented Reality Systems in Manned and Unmanned Systems HMI (VR-AR TACTICAL HMI) (TSD)						
		Spatial Augmented Reality Training Utilizing a Transparent Display (TSD: WFD SG)						
		Enabling technologies for organizing, fusing, and mining data sets to label, organize, and compare diverse more dynamic and automated abilities for rank data types						
		Provide 3D visual and spatial audio for presentation of mission space to operators in manned and unmanned platforms; included augmented reality						
	Improve manned platform information management and payload, systems, and vehicle control	Eye-controlled cursor for display interaction (PAX-BAR)						
		Impact of Low-Cost Haptic Cueing on User Performance and Workload (TSD:ILIR)						
		Methods for Actionable Measures of Absolute Cognitive Workload (TSD:SBIR)						
		Techniques to minimize computational run times that can integrate HPMs within larger M&S systems and enhance the computational speed and interoperability of HPM tools						
		Investigate technologies to enable voice actuation of commands to single and to multiple assets						
	Improve decision making and ability to detect and manage Command and Control (C2) in Degraded-Denied Environments	OPNAV N91 AI Initiative for command and control						
		Improve user interface for automatic first-pass detection, data collection and analyses, and conclusion of what is in the area of responsibility						
Construct Correspondence of Physiological and Subjective Measures of Hypoxia (TSD-ILIR)								
Incorporate smart systems management aboard assets where actions are initiated without operator consent								

		Current	Near-Term	Long-Term				
CC2 - Optimized Human Performance and Decision Support	Instructional Strategies for Training Effectiveness	Improve training outcomes through application of neurophysiological data	Squad Overmatch (TSD: DHA)					
			Cognitive models and objective measures of cognitive decision-making, visual, and auditory workload, and the associated cockpit and collaboration tools					
			Improved modeling of cognitive neuroscience and social or cultural activity					
			Neurocognitive and competency-based assessment data consolidation and interpretation tools					
		Improve warfighter performance through application of psychometric theory	Techniques to Adjust Computational Trends Involved Changing data (TACTIC) (TSD: STTR N17B-T032)					
			Improving Cognitive Flexibility via Working Memory Training (TSD)					
			Develop performance models reflecting requirements under realistic work conditions (individual, team, and team of teams)					
			Develop and differentiate individual and team measures to support R&D in addition to training and feedback.					
		Enhanced techniques for individual, team, and multi-team performance assessments	Electronic Warfare (EW) Tactical Decision Aid (TACAID) (TSD-FNC)					
			Squad Overmatch and Team Overmatch – Tactical Combat Casualty Care (TSD-ATD-Joint)					
			Performance Measurement (PM) Engine (TSD-AWTD)					
			Personal Assistant for Life Long Learning (TSD-ONR ADV. TECH.)					
			Training Expansion Package - (TSD: ONR Tech Solutions)					
			Techniques to Adjust Computational Trends Involved Changing data (TACTIC) (TSD: STTR N17B-T032)					
			Complex Knowledge Visualization Tool (TSD: STTR N017A - T004)					
			USMC Adaptive Joint Terminal Attack Controller (JTAC) training (ONR)					
			Adaptive Training for USMC Close Air Support Tactics and Decision-Making (ONR30: ATD)					
			FAMOUS (Fleet Adaptive Multilevel Measurement for Operators and Unit Systems) (ONR & PMA205)					
			EDUCATE (Environment Designed to Undertake Counter A2AD Tactics training and Experimentation) (ONR)					
			FleeT2 (Fleet Training Technologies) (ONR34: Pre-FNC)					
			Transition of Crew Role-Player Enabled by Automated Technologies to Maritime Patrol Training (TSD: 219TT)					
			Investigation of Micro-Adaptation Schedules to Support Electronic Support Measures Operator Adaptive Training (TSD: ONR34-D&I)					
			Modular Advanced Technologies Marksmanship Proficiency (MAT-MP) (TSD-Tech. Transfer)					
			Develop tool for individual assessment capabilities to support authoring, storing, selecting, implementing, and exporting performance measures, metrics, methodologies, and measurement results					
			Develop tools to define new measures and assessments rapidly and then configure them for specific training missions					
			Develop advanced methods to assess instructor and/or trainee workload, performance and training effectiveness					
			Develop Synthetic Crew/Team role player					
			Develop LVC performance assessment technologies and after-action review strategies					
		Develop LVC performance assessment technologies and after-action review strategies	Operation Blended Warrior (TSD:ITSEC)					
			Integrate individual assessments (i.e., industry, academia, government) into an automated aggregated methodology					
		Develop data analyses to facilitate trainee feedback and identify novel performance trends	Basic Electronics and Electricity Learning Environment (BEETLE) II Transition (TSD-219TT)					
			Empirical Support for the Benefits of Performance Measurement Tools (TSD-219TT)					
			Determine the frequency that task difficulty and/or feedback should be adapted to produce the most efficient training outcomes					
		Develop scenario authoring tool sets that use training network assets and integrated training	Determine how "Big Data" can be used to improve effectiveness and ROI of AT systems					
			Develop tools for rapid scenario generation with appropriate key triggering events to ascertain skill levels					
		Integrate instructional interventions into virtual and mixed reality environments	Investigating Low-Cost Untethered Virtual Reality Technologies and the Role of Affordances on Training Effectiveness in an Immersive Environment (TSD-219BAR)					
			Distributed Virtual Reality Testbed (TSD: WFD:SG)					
			Accelerating the Development of Small Unit Decision Making (ADSUDM) (TSD-FNC)					
			Naval Integrated Fire Control- Counter Air (NIFC-CA X) Mission Visualization Tool (TSD-FNC)					
			Mishap Awareness Scenarios and Training for Operational Readiness Responses (TSD: SBIR)					
Sexual Assault Prevention and Response (SAPR) Virtual Immersive Training (TSD: DoN SAPR Office)								
Dynamic Flight Simulation as a Supplement to In-Flight Pilot Training (TSD: SBIR N08-012)								
Virtual Reality for Training: Do Task Type and Method of Interaction Matter? (TSD)								
Cockpit Geometry for Virtual Environments (PAX)								
Develop tools to determine the optimal methods of data presentation to learners to maximize the effectiveness of learning and encoding content consistent with cognitive processing requirements								
Determine optimal methods to incorporate mixed reality interfaces to enhance training effectiveness								
Post Mission Assessment for Tactical Training & Trend Analysis (PMATT-TA) (TSD-AWTD)	Systematic Team Assessment of Readiness Training (START) applied to Medicine: Medic/Corpsman Proficiency Model (MED-PM) (TSD-DoD S&T)							
	Augmented Training for Experiential Learning for Signal Officers (TSD-219TT)							
	Tutoring Effectively: An Assessment of Common Heuristics (TEACH) (TSD-ONR D&I)							

		Current			Near-Term			Long-Term			
Advanced Instructional Techniques	Develop methods to diagnose and deliver instructional interventions to remediate knowledge and skill deficiencies	Electronic Warfare (EW) Tactical Decision Aid (TACAID) (TSD-FNC)									
		Personal Assistant for Life Long Learning (TSD-ONR ADV. TECH.)									
		Learning Continuum and Performance Aid (LcPa - ONR FNC)									
		Measuring Intuition and its Relationship to Somatic Markers and Individual Differences (TSD: ILIR)									
		Team-Based Advanced Resilience Accelerator (TARA) (TSD: AWTG)									
		Increase the efficiency and effectiveness of the aircraft maintainer through Human Systems Integration (HSI) research (PAX)									
		Identifying Training Technology for Enabling Deployable, High Impact Capabilities (TSD)									
		Develop advanced intelligent tutoring methodologies, including machine learning, to provide real-time performance feedback to individuals and teams in a distributed team environment									
	Employ game-based training to improve performance	Examining the Effects of Game Features on Learning Scenario Based Training (TSD-BAR)									
		Research Exploring Multi Operator Training Environments (REMOTE) (TSD-WFD-SG)									
	Determine value of gaming features to augment training										
	Develop mobile training technologies	Effectiveness assessments of mixed and immersive reality for aviation training (SBIR N171-201)									
Deploying Mobile Devices for Navy Training: Low Cost Mobile Device Management Alternatives (TSD-WFD-SG)											
Proximal Engagement Education Resources (TSD: ONR - STEM)											
Determine value added and potential confounders of providing just in time training in the field											
Applied Human Behavior Modeling	Develop computational models of human performance	Maintainer – Proficiency Model (MAIN-PM) (TSD-BAR)									
		Decision Making for Human Machine Collaboration in Complex Environments (ONR Basic Research Challenge)									
		Machine learning algorithms that mimic human behavior and performance to recognize, synthesize, and predict patterns in data or sensory stimuli									
		Human learning optimization predictive algorithms									
	Develop standards for verification, validation, and accreditation (VV&A) of human performance models	Develop means to accelerate VV&A of HPM to support acquisition									
	Develop Semi-automated Forces (SAF) models with human-like performance	CREATE (Crew Role Player Enabled by Automated Technology Enhancement) (SBIR N14-2-090) & CREATE for Maritime Patrol Training (219TT-18-003 - PMA-290)									
		Transition of Crew Role-Player Enabled by Automated Technologies to Maritime Patrol Training (TSD: 219TT)									
		DYADEM (Dynamic Adaptive and Modular Entities for UAS) behavior models for UASSIST (also in CC3)									
		Tactics and Speech Capable Semi-Automated Forces (TACSAP) (ONR LVC FNC)									
		V&V of higher fidelity constructive entities (TSD: LVC SV)									
		Real time processing of live data to automatically update SAF models for training									
	Create repository of assets and metrics to design and maintain high-fidelity trainers	Database management systems and methods to support rapid or automated database configuration									
M&S to train and provide engineering test beds in support of research efficacy of various approaches to simulation for training											
Sound measures of trainee outcomes and rigorous experimental methodologies											
Develop real-time flight aerodynamic and visual simulation technologies	3D Interactive Aircraft Carrier Operations Planning Tool Prototype (TSD-BAR)										
	Virtual Environment Motion Fidelity Model (TSD-BAR)										
	Effective Measures of Training Display System Performance (TSD-SBIR: N142-104)										
	Extended Field of View (FOV) Video Aviation Training Aids (PAX)										
	Flight Deck Crew Refresher Training Expansion Packs (TEP) (TSD: ONR Tech Solutions)										
	Dynamic Flight Simulation as a Supplement to In-Flight Pilot Training (TSD: SBIR N08-012)										
	Innovative Collimated Displays (TSD: SBIR N121-041)										
	Small Projector Array Display System (TSD: SBIR N121-041)										
	Integrate large terrain data engines into gaming machine to replicate large dome sim to reduce cost										
	Visual systems that support high-resolution and multispectral data										
	Investigate LED panel displays w/higher dynamic range for trainers (following industry developments)										
	Characterize near-eye displays, e.g., HMD, and light field displays (projecting imaging onto retinas)										
	Investigate incorporating aerodynamic real-time modeling of dynamic interface										
	Multimedia and multisensory interactive displays and environments										
	Immersive Parachute Descent Procedure, Malfunction and Decision Making Training System (TSD: SBIR N161-007)										
	Transition of a Pressure on Demand Normobaric Hypoxia Training device for Survival School Houses (TSD: 219BAR)										
	Mask-on Hypoxia Training Device (TSD SBIR N132-093)										
		H-60R VR ATO Weapons Procedures Trainer prototype (TSD: G0)									

		Current			Near-Term			Long-Term			
High-Fidelity Training Environments	Advanced Training System Prototypes			NIFC-CA X Laptop Trainer (TSD: G0)							
				Bohemia VR F/A-18 PTT VFA-106 eval (TSD: CRADA)							
				Course Rules Part Task Trainer Study (PMA205: AWTG)							
				H60S VR HDTS Trainer (TSD: 219-RPC)							
				Fire Fighting Trainer Modification and Enhancement (SWOS)							
	Develop speech recognition, synthesis functionality, and computational methods to recognize the difference between relevant and irrelevant speech	End-User Speech Recognition Support Tools for Crew Resource Management Training Environments (TSD: STTR)			Natural language interfaces for training						
					Optimal modeling techniques to improve the understanding of natural language interfaces for military training and human performance measurements						
					Incorporate a natural language interface capable of covering large, bounded problem spaces						
					Improve intelligibility of synthesized voices						
	Develop multi-modal sensory simulation systems and integrate into Tactical Software training applications			Spatial Augmented Reality Training Utilizing a Transparent Display (TSD:219SG)							
				Exploration of Kinesthetic and Haptic Technologies in Virtual Training Environments							
			11F12 Catapult Launch System Trainer Replacement (TSD: PMA 205)								
			Multimedia and multisensory interactive display and environments for real-time simulation								
Develop multi-touch interaction and 3D models			Flight Deck Crew Refresher Training Expansion Packs (TEP) (TSD: ONR Tech Solutions)								
				Exploration of Kinesthetic and Haptic Technologies in Virtual Training Environments							
Simulation Interoperability and Distributed LVC Technology	Develop interoperable LVC and Cyber Warfare training simulation and technologies	Crew Role Player Enabled by Automated Technology Enhancements (CREATE) (TSD-SBIR:N142-090)									
		Environment Designed to Undertake Counter AZAD Tactics Training & Experimentation (EDUCAT2E) (TSD-FNC)									
		Network Effects Emulation System (NE2S) (TSD-BAR)									
		Integrated Warfighting Capabilities (IWC) Fidelity Investigation (TSD-BAR)									
		Live, Virtual & Constructive (LVC) Training Fidelity (TSD-FNC)									
					TEMPEST Modeling and Blackbody Testing for Voice Comms Headsets (TSD)						
					Real-Time RF Propagation Modeling in Urban Environments for Virtual and Constructive Training(TSD-BAR)						
					Designing /architecting large scale training events						
					Verification and Validation of Higher Fidelity Constructive Entities for UAS Training (TSD-BAR)						
					Distributed Virtual Reality Testbed (TSD: WFD:SG)						
		Cyberspace Operations Degraded Exercise & Synthetic Training Architecture (CODESTAR) - ONR34									
					Offensive cyber training capabilities						
					Cyber Security vulnerability (penetration) assessment tools						
					Training system Cyber monitoring tools						
					Low-cost and scalable training solutions						
				Broad RF spectrum analysis test and development capability							
				Scripting and Sequencing Control Components within Electromagnetic Spectrum Proficiency Modeling (219 RPC)							
				Standardized approach for integrating training systems into any type of distributed training event							
				Ensure the Common Training System Architecture (CTSA) will support crew skill training (Proficiency) as well as unique services and joint services training (Distributive Mission)							
				Develop Cyber-Operations Training							
				Design and implement a research test bed to perform needed S&T/R&D in order to determine the best method to train the cognitive tasks required for UAV operations							
				Develop database management systems and methods to support rapid or automated database configuration to support global distribution and access of database and available technology assets							
				Defensive cyber training capabilities							
	Develop Multi-Level Security Methods to safeguard classified information in the LVC environments				Cross domain solutions						
					Enterprise Network Guard (ENG) CT&E - NSA certification test and evaluation (TSD: LVC)						
					Enterprise Network Guard (ENG) TENA and HLA extension efforts - FY18 and FY19 (TSD: LVC)						
					Distributed Training Network Guard (DTNG) (AWTD: JSF)						
			Advanced Enterprise Network Guard (ENG)								
Develop Mission Rehearsal Enabled Database Methods for collecting and packaging authoritative data feeds				Multi-Integrated Domain Administrative Support (TSD-SBIR)							
	Distributed Synthetic Environment Correlation Architecture and Metrics (TSD-SBIR:N141-006)										

		Current			Near-Term			Long-Term			
CC4 - Human Systems Analysis, Design, and Evaluation		Develop tools for Enhanced Constructive Environments	Cross Domain Maritime Surveillance and Targeting (CDMAST) (TSD-DARPA)								
			Dynamic Adaptive and Modular Entities for UAS (DYADEM) (TSD-FNC)								
						Improved tools for technology support of Fleet Synthetic Training (FST) and LVC for DMT (distributed mission training)					
						Distributive training research, development and test capability for realistic SAFs					
		Develop Information Load Management methods, technologies, and tools				Develop state-of-the-art rapid prototyping technology for training design and development					
		Develop Navy Continuous Training Environment (NCTE) voice communication technologies to support FST exercises for distributed environments				Next generation virtual radio technologies					
	Content Design	Develop advanced technologies and methodologies for training delivery	Utility and effectiveness of using Fleet produced maintenance videos as job performance aids (219BAR-18-049)								
			Spatial Augmented Reality Training Utilizing a Transparent Display (TSD:219SG)								
			Advanced Instructional Media Attribute and Interactivity Model (Sailor 2025; FY17-18+)								
			Explosive Ordnance Disposal maintenance videos effort								
					Multi-media Knowledge Capture (MKC) Engine (SBIR ONR181-111)						
					Total Learning Architecture (TLA) Learning Technology Roadmap with Concept Pilots (DHA: Applied Res.)						
	Training Optimization Analysis	Optimize training event sequencing and media utilization	Medical Training Validation 2 (MTV2) (TSD - DOD S&T)								
					Investigation of Training Fidelity for Carrier Qualification and Precision Landing Modes (TSD: 219BAR)						
Develop Improved Tools and Techniques for Training Requirements Analysis		Requirements Traceability Tool /Systems Engineering Test Tool (RETT / SETT)									
		MEDPM (Medical Proficiency Measurement Model) (DHA)									
				Training System Requirements Analysis (TSRA) traceability automation tools							
				Automate the traceability of training requirements to system specification requirements and then link system requirements to test plans							
				Improved methods for TSRAs to support IWC analyses							
		Improved methods for TSRAs to support maintenance training analyses									
Training Effectiveness Evaluation (TEE)	Determine level of training effectiveness and outcome improvement strategies	Multi-purpose Reconfigurable Training System (MRTS) Effectiveness (TSD Overhead)									
				Developing and improving tools, templates, methodologies, and infrastructure to support training effectiveness evaluation FY17-20+							
		Effectiveness Assessments of Mixed & Immersive Reality for Aviation Training (TSD:SBIR N171-021)									
		Course Rules Part Task Trainer Study (PMA205: AWTD)									