

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-5915-19/43-6031-19

Topic # N171-091

Synthetic Vision System for Ground Forces  
VR Rehab, Inc. (VRR)

WHO

**SYSCOM:** ONR

**Sponsoring Program:** WAR (Warfighter Augmented Reality) Project

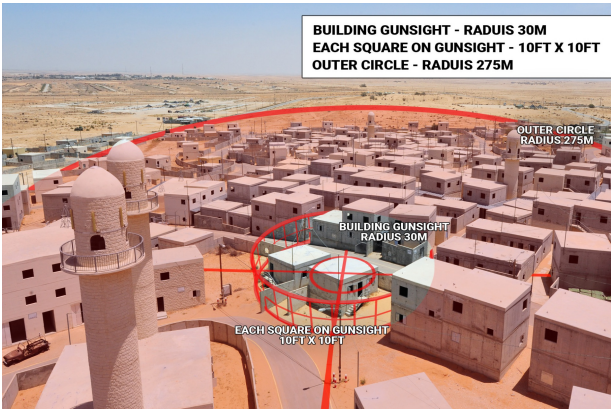
**Transition Target:** JTAC and JFO Programs of Record

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**Other transition opportunities:** FAR-UI's JTAC & JFO visualizations will beneficially enhance the situational awareness along with faster/better decision-making processes for SAFELY performing CAS and CFF for missions! At the end of Phase II Option, FAR-UI becomes GOTS with unlimited free use within ONR's WAR project as well as other Joint PORs, projects, and organizations.

**Notes:** Features: 3D AR Splash Zones provide intuitive visualizations of the target zone inclusive of visual grids to aid targeting and ensuring safety, enhanced Situational Awareness, and Faster/Decision-Making Visualization Contexts. Disruptive new beneficial innovations include Fused AR Real-World 3D with 2D Mini-Map a semi-transparent in the fore-ground with Gaze Guidance Lines (GGL) from the same object within the Mini-Map to it's Real-World 3D view of the same object; AR Textual Information & 'At a Glance' Graphics on the 'HUD' Layer optimized for JTAC & JFO performance without 'Clutter'. AI & Automated Real-World 3D Layout of AR Textual Information such as Semi-Transparent BillBoards on Flag-Poles to provide building numbers and other critical cues.



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WHAT

**Operational Need and Improvement:** Close Air Support and Call For Fire missions continue to grow in frequency and precision. Fused Augmented Realities – User Interface (FAR-UI) enable large scale benefits with enhanced Situational Awareness along with Faster/Better Decision-Making Benefits for JTACS and JFOs. Key improvements are based on innovative fusions of Augmented Reality(AR) combined with Synthetic Vision exploiting human perception and cognitive abilities. FAR-UI provides 'at a glance' visualizations that ensure the safety of our forces, minimize collateral damage, and lethality to our enemies. FAR-UI is an end-to-end solution, including embedded simulation training, mission planning support, mission rehearsal, and operational uses (priority). FAR-UI supports ONR's Warfighter Augmented Reality (WAR) Project in development of new long-range very accurate Augmented Reality systems (e.g., AR-HMDs and Monocular).

**Specifications Required:** FAR-UI runs on smartphones, tablets, and laptops without AR-HMDs and with AR-HMDs at the user's option. Also, includes support and control of Drones and Robotic systems being remote eyes and ears for CAS & CFF. FAR-UI is an optional add-on visualization enhancement interoperable with operational applications such as Marine Fires App, Nett Warrior, WinTAK/ATAK, and multiple other GOTS and COTS systems. FAR-UI becomes GOTS and unlimited government use at the end of Phase II. Navy/USMC will use our software directly from VRR on our FREE and Unlimited Biz model.

**Technology Developed:** Our Fused Augmented Realities User Interface (FAR-UI) already provides Synthetic Vision Augmentation of head-mounted displays (HMDs) for enhanced situational awareness (SA) visualizations for dismounted warfighters. Situational awareness enhancements for 3D Splash Zone reasoning with intuitive faster/better decision-making benefits, eliminating 2D to 3D transitions. Fused users can pick a place on the map and via GGL see the same point in the 3D world, and vice versa, pick a point in the 3D world and via GGL see the same point on the map.

**Warfighter Value:** VRR's Fused Augmented Reality – User Interface (FAR-UI ) innovative 3D visualizations enables faster better decision making supporting Close Air Support and Call For Fire missions. Operational enhancements are enabled by wearing an AR Helmet Mounted Display (HMD) displaying intuitive augmented reality visualizations combined with synthetic vision.

WHEN

Contract Number: N00014-19-C-2026

Milestone	Risk Level	Measure of Success	Ending TRL	Date
R&D of JTAC and JFO Augmented Reality Visualizations	Low	Pilot Studies with SMEs in Cognitive Science	4	4th QTR FY19
Augmented Reality Initial Integration with WAR	Low	VRR Visuals Integrated into ONRs WAR Project	4	4th QTR FY19
AR Marine Fires from App Net Warrior and Tak	Low	JTAC/JFO Acceptance and Empirical Testing to Quantity Benefits and Trade-offs	7	1st QTR FY20
Textual Information on HUD Level and Within 3D AR MFA Net Warrior and Tak	Low	JTAC/JFO Acceptance and Empirical Testing to Quantity Benefits and Trade-offs	6	1st QTR FY22
3D AR Linked with Gaze Guidance Lines to MFA 2D Maps	Low	JTAC/JFO Acceptance and Empirical Testing to Quantity Benefits and Trade-offs	8	1st QTR FY23
Control Measures and Synthetic Vision Augmentation	Low	JTAC/JFO Acceptance and Empirical Testing to Quantity Benefits and Trade-offs	6	2nd QTR FY23

HOW

**Projected Business Model:** VRR has been developing innovative AR visualizations for military uses for OSD/Army, NAVAIR, and most recently for ONR. Our use of Fused Augmented Reality visualizations with underlying 3D correlated synthetic vision terrain linked to the real world imagery through the AR-HMD or monocular enhances situational awareness, increases situational awareness, accuracy, reduces clutter, and provides solutions to long-standing AR challenges with degraded visual conditions, 'looking through a straw' especially at high magnifications. VRR's control of UAS and UGVs provides the basis for future remote robotic assets where the JTACs and JFOs are still the guiding brains, but their bodies are not in danger nor being exposed to the elements. This ONR project includes free unlimited use of the resultant visualizations and software. Venture Capitalist firms have already licensed VRR's FAR-UI tech to support our for-profit from the civilian sector biz model.

**Company Objectives:** VR Rehab Inc. is a woman-owned small business (WOSB) with over 25+ years of researching and developing technologies to help improve our military's effectiveness and safety. Developing augmented reality interfaces to provide advantages for our warfighter with enhanced situational awareness and faster/better decision-making support. Winner of 2018 IITSEC Best Paper in Emerging Concepts & Innovative Technology. VRR objectives include intuitive augmented reality visualizations and controls that augment or place existing hardware-based systems.

**Potential Commercial Applications:** Dual Use Civilian Applications include controlling water and fire-retardant drops by Firefighting Aircraft, avalanche prevention delivery of munitions. Additional Private Sector design methods, principles, and proof of concept visualizations will be applicable to high risk/high demand work domains with large amounts of integrated information demands, such as law enforcement, emergency response, healthcare, and manufacturing. General findings of this effort will contribute broadly to our understanding of the design of AR information and data visualizations that will have broad implications relating to the implementation of AR interfaces outside of the military. Phase II option will produce a draft handbook for the guidance of AR visualizations with the first author as Dr. Chris Wickens (Famous World Class Cognitive Scientist).

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