

Accelerating Navy readiness with mobile VR and handheld gaming PC simulations in the Fleet

Executive summary

America's naval readiness is at risk as ships sail undermanned and undertrained. The Navy needs to move beyond the industrial model of sending Sailors to schoolhouses and embrace a modern approach that brings 3D immersive training directly to the Fleet. Shipboard learning establishes a critical "battle rhythm," empowering Sailors to achieve and sustain peak combat readiness through consistent, targeted practice where it counts most—at sea.

The transition is less about thinking big and more about thinking small, in terms of device size, not ambition. Today's mobile gaming consoles pack the power of full-fledged simulations with the ease and convenience of compact, shipboard-friendly sizes. Virtual reality (VR) provides embodied immersion that builds muscle memory, while handheld gaming PCs boost the frequency of practice sessions seamlessly within Sailors' daily routines. Small enough to fit in a drawer and be played in the Mess Hall, this combo of portable Commercial-off-the-shelf (COTS) devices offers the perfect form factors for a generation of Sailors reared on video games.

Harnessing the force multiplier effect of modernized shipboard training requires a fresh approach from a small, agile team outside the traditional DoD vendor pool. Learning innovation leader Gronstedt Group is uniquely positioned to lead this disruption. Our team of 3D artists, game designers, and learning specialists has a proven track record of bringing innovations from the gaming industry to some of the world's largest employers. We transformed a legacy touchscreen classroom program into a self-paced simulation for affordable handheld gaming PCs and untethered VR headsets that provide practice reps directly to Sailors when and where they need them: ashore, afloat, or submerged. The VR program earned perfect scores from Sailors and drew enthusiastic feedback from Navy leadership. Our breakthrough technology amplifies Fleet readiness to 'fight tonight' while slashing training costs.

AMERICA'S NAVY

From classroom...

Training pipeline congestion costs \$400M/year

Forgetting curve

... to Fleet learning

Reps & sets of hands-on practice at the moments of need

VR builds muscle memory

Spaced reinforcement

Handheld gaming PC addresses space, comfort, and cyber security constraints

GRONSTEDT GROUP

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The infographic features a central image of a sailor in VR gear. To the left, a sailor is shown in a classroom setting. To the right, a sailor is shown using a handheld gaming PC. Two line graphs are included: one showing a 'Forgetting curve' with a steep decline, and another showing 'Spaced reinforcement' with a more gradual decline. The background is a dark blue with a grid pattern.

The opportunity

The Government Accountability Office (GAO) reports that Navy ships are operating with just 84% of their required enlisted Sailors, revealing significant readiness challenges. Compounding this personnel shortage, many Sailors are filling roles without the necessary skills and experience, often due to misaligned training schedules—a problem that costs the Navy \$400 million annually, according to Navy Personnel Command. The situation is exacerbated by the Navy's reliance on traditional classroom training, where the "forgetting curve" shows that skills decay rapidly, sometimes within hours of instruction. Beyond efficiency concerns, centralized training facilities present strategic vulnerabilities, as evidenced by Russia's missile attack on Ukraine's Lviv military training center. In response, the Navy's "Ready Relevant Learning" initiative aims to enhance proficiency through modernized, continuous learning delivered directly to Sailors in their work environment, replacing rigid classroom schedules with flexible digital training that mirrors real-world scenarios.

Through a self-funded Cooperative Research and Development Agreement (CRADA) with the Naval Air Warfare Center Training Systems Division (NAWCTSD) we converted a module of its Multipurpose Reconfigurable Training System (MRTS) 3D® program. MRTS 3D® features a detailed 3D environment on 55" touchscreens in a classroom setting that allows Sailors to engage in various simulated scenarios to practice real-time troubleshooting and maintenance procedures. The NAWCTSD team recognizes the potential of VR to provide immersive training at the time and place of performance in the Fleet. If you've ever polished your language skills with Duolingo, you know the power of "spaced repetition." Now imagine that in 3D gameplay!

VR program

We created a VR simulation that completely engulfs users. Sailors step into a virtual submarine machinery room of such convincing fidelity that they experience a real sense of being there. Turning valves and tightening bolts, they feel tactile vibration in their hands and hear the diesel engine roar to life when started. It can be experienced in stand-alone VR headsets (such as Meta Quest 3, HTC Vive XR Elite, or Apple Vision Pro) that are portable and easily deployable to ships. No cords or PC are needed. Users can sit or stand, and play alone or with others.

Anyone who hasn't experienced the startling sensation of being transported to a virtual environment and performing hands-on tasks under stress, like troubleshooting a flooded diesel engine in a submarine machinery room, probably won't appreciate how far VR technology has come already. The feeling of presence is so convincing that students forget that they're not actually there. Users directly pick up a wrench with their hands, fit it onto a bolt, and turn it, just as they would in the real world. The hyper-realistic 3D models, directional sound, and vibrating hand controllers "hack their senses" of sight, feeling, and hearing. Fully absorbed, Sailors lose track of time and enter a state of "flow" as they learn and practice skills in a safe environment.



Step into our hyper-realistic machinery room, multiplying practice reps and sets right before tackling real-world tasks.

Working in close partnership with [Dan Beran and Todd Estes](#) and team at NAWCTSD, we developed a demonstration project that puts Sailors into a high-fidelity submarine machinery room. An instructor screen follows Sailors through every step as they navigate the virtual 688-Class diesel engine, providing videos and text instructions to guide them through the process of starting up the engine. Students grab the instruction screen and position it in mid-air at a location that is most suitable for the task they're performing. Just like in real life, they use their hands to turn valves, push buttons, check gauges, tighten bolts, and pull levers. If they make a mistake, the sim scenario can easily be reset, as there are unlimited redo's in VR. Arrows at the user's feet show them where to walk to their next task. They have the option to physically walk around the simulated submarine if their real-world space is large enough, or use controller thumbsticks to navigate the virtual space while seated or standing stationary.

Handheld gaming PC version

When comfort, space, or cyber security aboard ships make VR usage challenging, Sailors can still engage with simulations on handheld gaming PCs. These devices have skyrocketed in popularity and offer an ideal form factor for training aboard a moving ship with limited physical space. Popularized with the Game Boy in the 1990s, the recent success of the Nintendo Switch and the Valve Steam Deck has paved the way for a new era of powerful handheld gaming. The new Windows 11 gaming devices can now deliver advanced learning simulations onboard ships. Similar to the VR version, the PC program we developed is self-paced with tutorials, corrective feedback loops, and scaffolding. Navigating a virtual

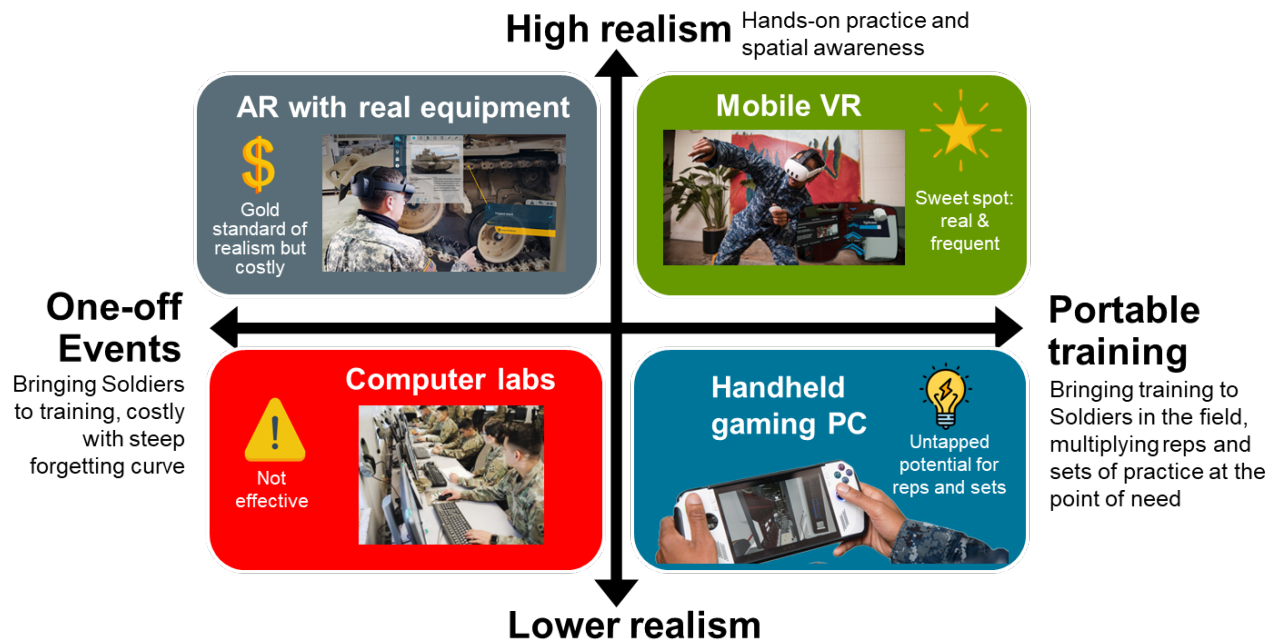


We also pioneered a handheld gaming PC version when space, comfort, or cyber security make VR impractical.

submarine with game controllers provides a user experience similar to the handheld gaming they grew up with. The same program developed for the handheld can run on standard PCs with game controllers and Xboxes as well. These handheld companions let Sailors log countless practice rounds and repetitions, perfectly complementing the deep immersion and hands-on practice of VR. Gronstedt Group was recently awarded a funded Other Transaction Authority (OTA) for developing a full simulation for the ROG Ally X handheld gaming PC.

The analytics gleaned from the sim can track everything the users do in the simulation; their mistakes, pain points, and proficiencies. While the system can capture an overwhelming amount of metrics, the magic happens when meaningful data is fed back into the MRTS 3D®'s Instructor Operator Station (IOS) learning management system. These reports can then be used to suggest dynamically created scenarios to focus on skills where students need improvement.

Develop once - Deploy everywhere

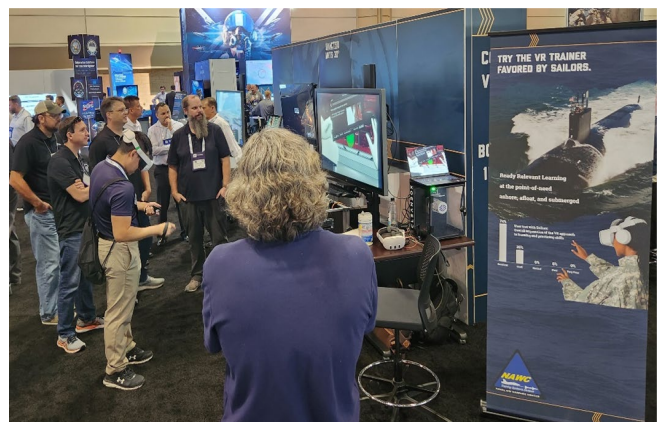


The quadrant above showcases the Navy's training options. Physical simulators provide unmatched realism but are costly and infrequent, while computer labs lack both realism and accessibility. Mobile VR offers the perfect balance with hands-on, frequent, shipboard-friendly training, and handheld gaming PCs unlock flexible, repeatable practice. High-fidelity 3D simulations can be developed once and deployed across all these devices, enabling Sailors to complete up to 10 times more practice sessions and accelerate mastery.

Navy leadership support

Our demonstration project has captured significant attention from Navy leadership, leading to showcase presentations across key naval training events—from I/ITSEC 2023's Navy booth to the Team Trainer Design Review Group at Bangor Trident, the Submarine Forces Training Conference in San Diego, and the Navy Training Systems Program Office Summit in Norfolk.

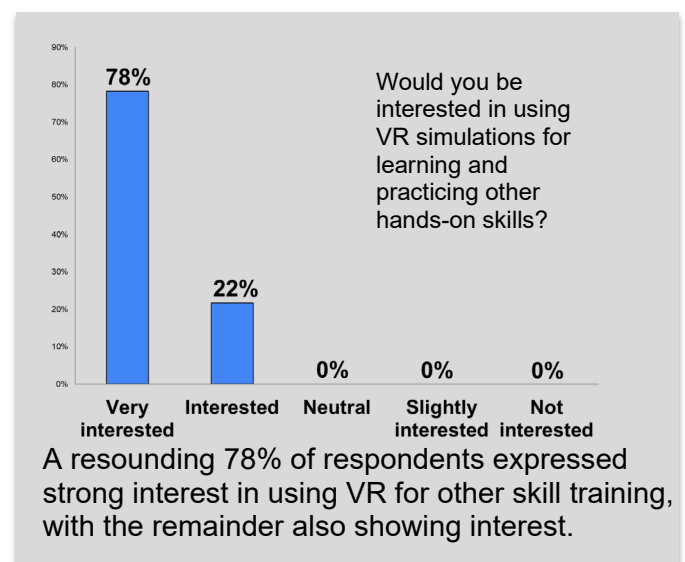
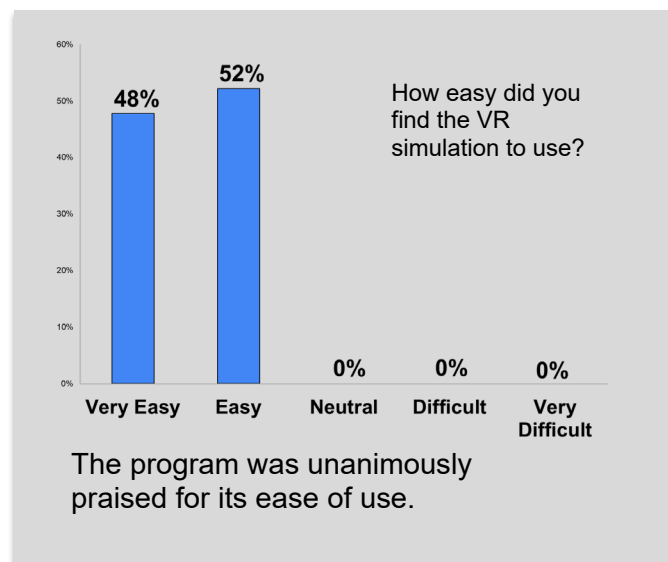
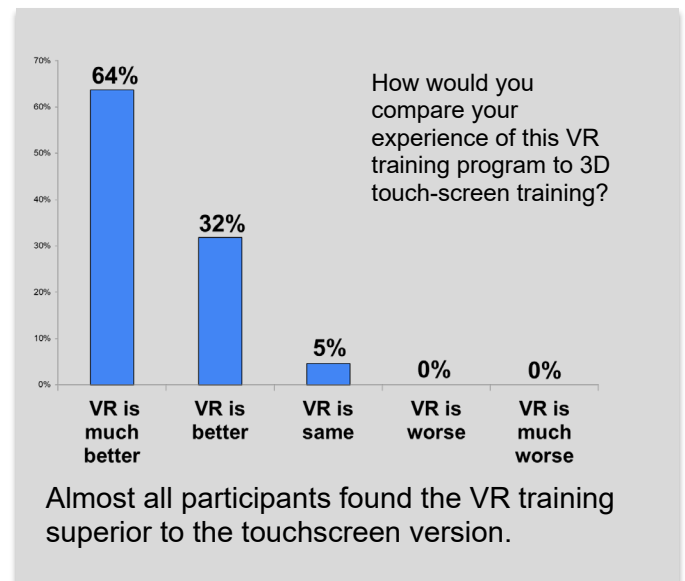
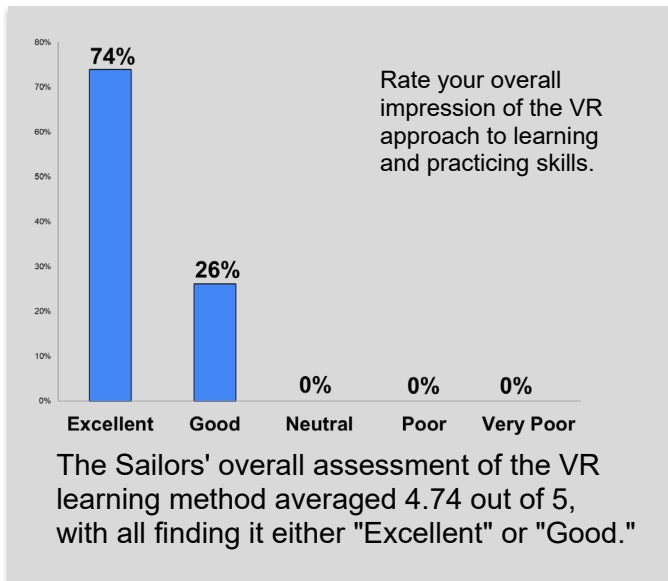
Preparing Sailors for the demands of the Fleet requires both innovation and strategic investment. To meet these challenges, the Navy must reimagine shipboard learning by leveraging emerging technologies and engaging non-traditional vendors. With a new generation of head-worn and handheld gaming devices and simulations, Sailors can seamlessly transition from the deck plate to virtual practice spaces, where they can build muscle memory and achieve mastery. These affordable, portable, scalable, and self-paced training solutions enable Sailors to train at the point of need—whether in port or underway—making them essential for modernizing Navy readiness.



I/ITSEC 2023 demo of the VR sim

User Test: Sailors unanimously prefer VR over legacy touchscreen training

Feedback from an anonymous, voluntary user test of the VR program by 23 Sailors at the Trident Training Facility – Bangor on November 15, 2023 was exceptionally favorable.



Sailor feedback:

"Using the tools was very accurate. I think this will be very helpful for training junior sailors and sailors lacking experience with engines"

"Easier to operate compared to the monitor."

"Easy to walk around, realistic tool movement"

"Actually seeing what I'm doing vs. reading a procedure or looking at a PC screen."

"You felt like you are actually working on the system and not just a screen."

Gronstedt Group: Accelerating learning at scale

The project required a team of 3D artists and game designers to optimize a high-fidelity experience for mobile headsets, along with spatial learning experts to develop guided practice with tutorials and feedback. This new breed of learning design talent is typically found outside of the DoD legacy vendor pool. Gronstedt Group has developed such VR learning for enterprise clients since the first days of consumer VR. Additionally, we've just secured an SBIR grant to create an AI-powered undersea wargame in partnership with the Naval Postgraduate School (N242-087 Theater Naval Wargame for Strategy Refinement), with plans to deploy these onboard ships as well. Colorado-based for 25 years, we blend a team of seasoned game developers and learning designers. Together with our forward-looking clients, we are transforming learning with digital practice spaces that mirror their real-life workplaces. Our dual-use approach fosters a virtuous cycle where innovations developed for our corporate clients enhance military applications. Feel free to contact us, we're happy to set up a web call or meet up in our VR demo space.



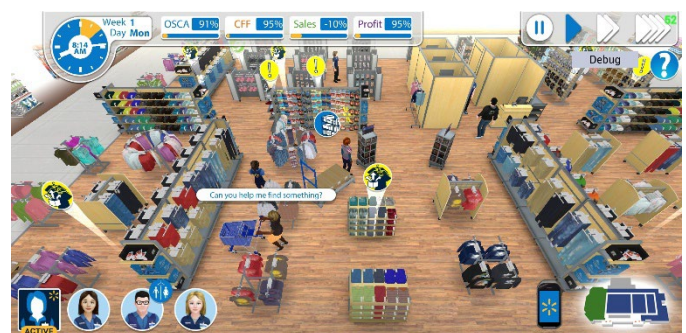
Pfizer, Bristol Myers Squibb, Takeda, and Novartis learn life-saving skills in our VR pharma labs.

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