Naval Information Warfare Center PACIFIC

SCIENCE AND TECHNOLOGY

Science and Technology (S&T) initiatives are part of the research and development (R&D) fabric of the Naval Information Warfare Center Pacific (NIWC Pacific). These S&T initiatives represent "venture capital" investments in future warfighting capabilities by advancing basic and applied research concepts to experiment, prototype, and deliver mature technical solutions for naval operational use. In addition, partnerships with industry and academia provide mechanisms for transferring technologies from the laboratory to the fleet.

NIWC Pacific's Unique S&T Capabilities

- Basic and applied research
- Modeling and simulation, test and evaluation
- Support to Office of Naval Research(ONR), Defense Advanced Research Projects Agency (DARPA), and other agencies
- Partnerships with industry and academia

Current NIWC Pacific Focus Areas

•Autonomy, artificial intelligence/machine learning •Decision optimization •Marine mammals •Ocean-atmosphere interface •Communications and networks •Energy harvesting •Materials science, and •Additive manufacturing

NIWC Pacific has a long history of discovering and inventing technical advantages that translate to naval operational superiority. This legacy is sustained through a strong workforce maintained by a dynamic recruitment and development program in the areas of science, technology, engineering, and math (STEM).

Current Research and Development Initiatives

- **Strategic Technologies:** Integrate underwater and cross-domain systems, design enterprise architectures for space systems or communications and networks, develop distributed maneuverable systems, and optimize systems-of-systems engineering
- **Tactical Technologies:** Advance optical communications systems, navigation solutions, intelligent sensors, decision support systems, and rapid prototyping
- **Autonomy:** Develop core technologies that, by minimizing human intervention, enable better sensor or system performance, software behavior, asset control, and human-machine teaming
- **Artificial Intelligence/Machine Learning:** Develop and employ dynamic, self-improving software, improve autonomous systems performance, accelerate data-to-decision processes, and improve signal processing through utilization of massive data sets
- **Space:** Develop the infrastructure that enables the launch of low, rapid design-to-completion, multi-mission nanosatellites with numerous naval applications
- **Information Innovation:** Enhance computing power, improve network design and bandwidth, and utilize modern sensing and measurement technologies
- **Augmented/Virtual Reality:** Merge heads-up display technologies with real world data science for a multitude of control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) applications

- **Cyber:** Develop products that result in software immunization, autonomic cyber defense, secure and resilient cloud computing, homomorphic encryption, anomaly detection, supervisory control and data acquisition for industrial control systems protection, tactical operations, and resilient computing and networking
- **Kinetic energy harvesting:** Use microbial fuel cells and microturbines to capture energy from sea floor sediments or underwater currents that can support the energy requirements of Navy missions
- **Graphene-based devices:** Develop photonic detectors, antennas, and transistors that leverage graphene's flexibility, transparency, and scalability for better sensor design
- **Cryogenics:** Develop superconducting technology with the potential to transform electronic devices

NIWC Pacific leads experimentation efforts that routinely test advanced concepts, significantly mitigate the risk in transferring capabilities to the field, and directly contribute to building the Fleet of the Future. These notable efforts and innovative achievements have resulted in hundreds of publications and patents each year.

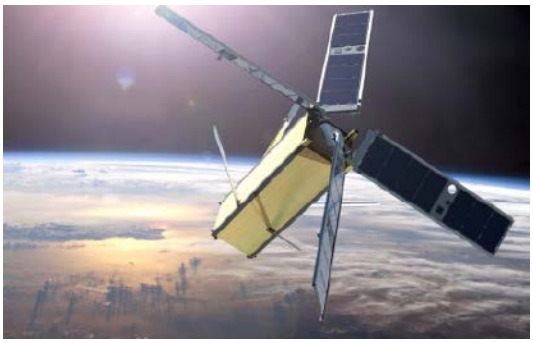
Impact to the Warfighter

NIWC Pacific works closely with the warfighter to better understand the operational environment and its limitations. Gaining operator feedback is a critical element in delivering optimal technical solutions. Participation in fleet experiments and leveraging the lab's proximity to the nation's largest fleet concentration area in San Diego enables this interchange with the warfighter.

As NIWC Pacific develops the tools of tomorrow, emphasis is placed on increasing speed to capability, reducing complexity, streamlining processes, and adopting best work practices. This results in more efficient systems, more intuitive human-system interfaces, better and more expedient decision making, yielding a warfighter advantage over adversaries in all environments.

Biologically inspired autonomous systems leverage neural computing and machine learning, analogous to biological vision or hearing, to sense and perceive the electromagnetic environment.

Human-autonomy teaming injects human intelligence into the machines' artificial intelligence goal-based decision-making processes, so that together the humans and machines accomplish complex tasks together.



Space command and control looks at the space technologies of tomorrow to rapidly produce low-cost, rapid response, multi-mission systems and to fuse the generated data sets into user-defined operational pictures.

User-centered design enables operators to better interact with large information content to improve decision making by using science-driven processes and disciplines.

For more information
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