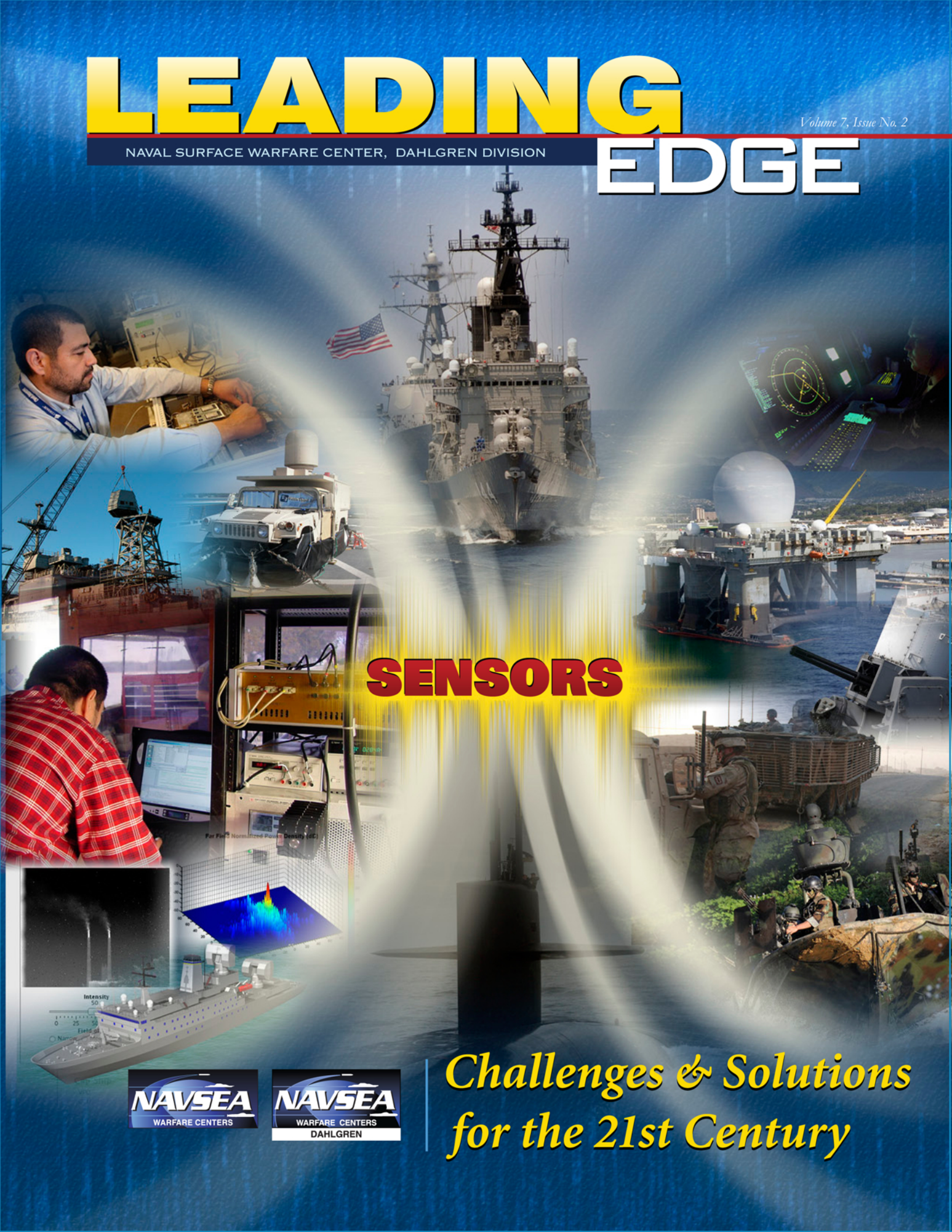
LEADING EDGE

NAVAL SURFACE WARFARE CENTER, DAHLGREN DIVISION

Volume 7, Issue No. 2



SENSORS

NAVSEA WARFARE CENTERS

NAVSEA WARFARE CENTERS DAHLGREN

Challenges & Solutions for the 21st Century

LEADING EDGE
Volume 7, Issue No. 2

SENSORS – Challenges & Solutions for the 21st Century

This Sensors Systems issue of the Leading Edge is the second in a trilogy dedicated to describing the readiness and the challenges facing our team of scientists and engineers in their support of our warfighters.

The previous issue in our trilogy looked at ways we are tackling the problems inherent to harsh electromagnetic effects on the environments at home and abroad. Our upcoming Directed Energy issue will focus on directed energy warfare systems.

We invite you to read more about our success in meeting the challenges and finding solutions for the 21st Century as presented in each edition of the Leading Edge magazine.

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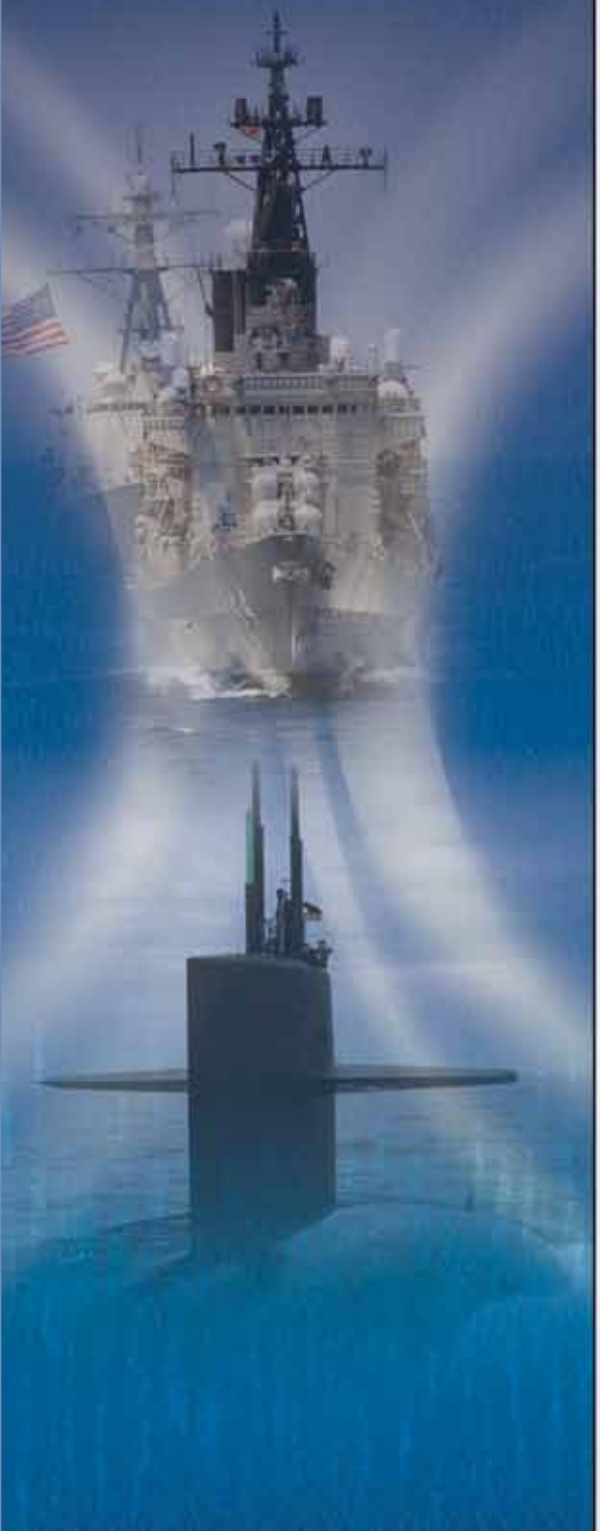

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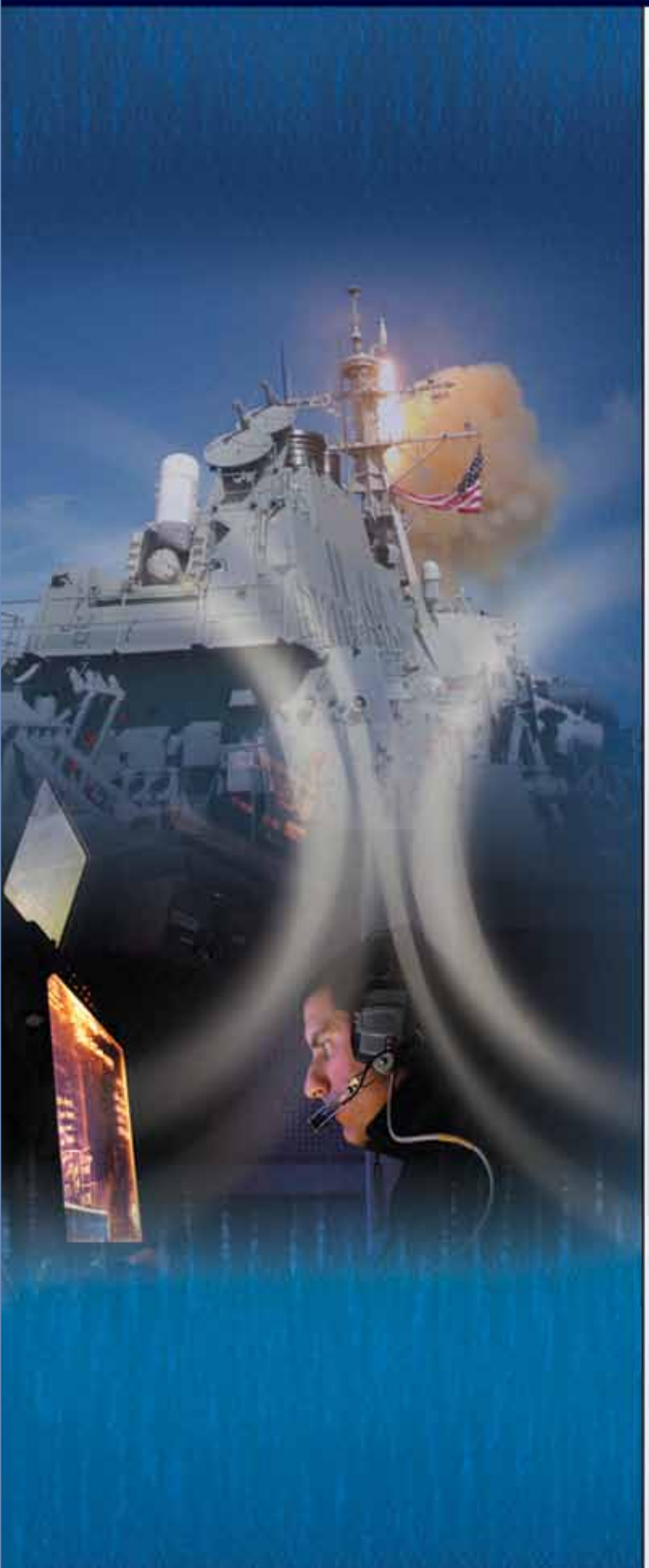

The Leading Edge Magazine is an official, authorized publication of the Naval Warfare Center Enterprise. The purpose of the publication is to showcase technical excellence across the Warfare Center Enterprise, and promote a broader awareness of the breadth and depth of knowledge and support available to the Navy and DoD at NSWC/NUWC.

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Sensors

Challenges and Solutions for the 21st Century

Introduction

Sensors—Challenges and Solutions for the 21st Century

Rear Admiral James J. Shannon
Commander, NSWC

To engage an enemy, you first must be able to detect it. Consequently, all the firepower in the world won't do our naval warfighters any good if they don't know who or what to engage or where to fire. That's what makes radars and other sensors so critically important. Moreover, these highly technical systems are needed for much more than detecting and engaging an adversary. They are also required for things such as controlling aircraft and missiles, maritime navigation, sensing abnormalities, and tracking the weather. Without these critically important systems, a captain's eyes and ears would be lost at sea.

I am extremely pleased to introduce this edition of *The Leading Edge* magazine, sponsored by the NAVSEA Warfare Centers. The theme for this edition is *Sensors–Challenges and Solutions for the 21st Century*. Indeed, our Navy faces a great many challenges in the coming years. Enemy technological advancements require new countermeasures. New, more capable systems that are interoperable with joint and coalition systems will need to be designed, developed, and deployed, while older systems will need to be replaced. Littoral and riverine warfare require smaller and lighter sensors for the Navy's smaller platforms.

The NAVSEA Warfare Centers welcome these challenges, because we're in the business of providing solutions. We research, develop, test, and evaluate cutting-edge technologies and systems to equip the Navy with sensors on the sea, under the sea, in the air, and on the ground. It is a job that requires a tremendous amount of technical knowledge, as well as strong synergy among our joint warfighters, industry, and academic partners.

I invite you to read about the exciting and important work being accomplished by our Warfare Center scientists, engineers, technicians, and professional support personnel. Due to their tireless efforts and unwavering dedication, they are meeting our constitutional mandate to "provide and maintain a navy." Readiness is our greatest challenge for the 21st century. Readiness is what we ultimately deliver!

Introduction

Developing Innovative Solutions in Sensors Technology

Captain Sheila A. Patterson, USN
Commander, NSWCDD

Sensor systems have come a long way since early radar that centered on basic detection of ships and aircraft for self-protection. Application of sensor technology today spans all areas of theater. Well beyond detecting and tracking ships and submarines, sensors allow us to search for and locate mines, discern lethal environments, and track ballistic missiles. Thanks to expert analysis and engineering, sensor systems are providing accurate tracking at expanded ranges and are being utilized for a broad spectrum of applications. The result is better protection for our men and women in uniform.

From our involvement throughout the years with virtually every phase of development of the SPY-1 radar systems, to our application of open-architecture concepts across systems, NSWC Dahlgren has become a recognized leader in sensor systems integration. Together with our Warfare Center partners represented in the articles that follow, our team is applying state-of-the-art sensor technology and providing at-sea testing to support surface, air, and undersea Navy combat systems.

As ships' designs change and systems become more complex, it becomes increasingly challenging to provide worldwide, high-quality, high-resolution, multiwavelength radar data. We face additional challenges as we face new terrorist threats and ever-changing combat scenarios. From infrared sensors and image processing used for tracking chemical agents, to air traffic control systems, our sensor engineering specialists are diligently working on ways to ensure safety both for the warfighter abroad and for citizens at home.

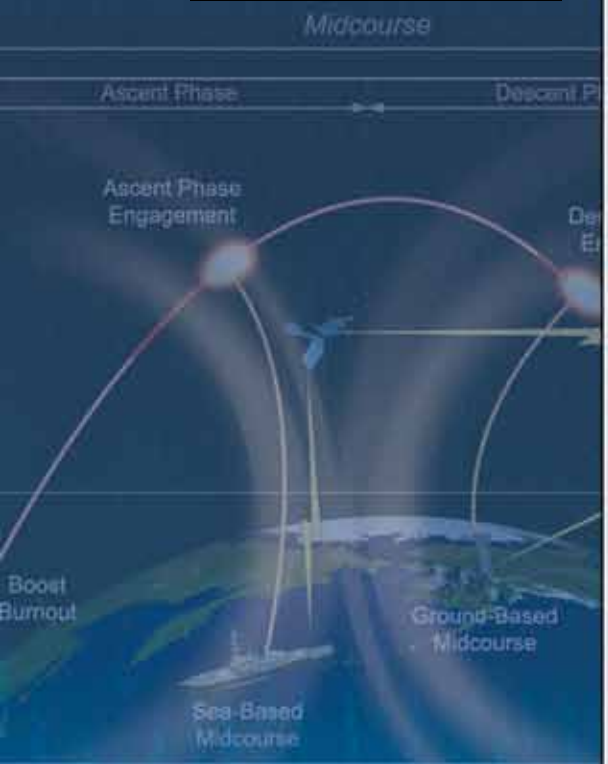
The task of meeting these new challenges and upgrading aging shipboard electronic radar systems has been a continual challenge; but as you will read in this Sensors issue of *The Leading Edge*, our engineers and scientists have found robust solutions and effectively controlled costs. You will also gain a better understanding of the role the warfare centers play in addressing the needs of our warfighters.

I am proud to be Commander of one of the Navy's premier research and development facilities for sensor technology and am confident that NSWCDD will continue its legacy as a leader in sensor systems integration and will meet the needs of the Navy and the nation in the 21st century.

Introduction

Providing Our Navy and Our Nation with the Best Electromagnetic Sensor System Solutions

Mrs. Virginia S. Hudson
Head, Electromagnetic and Sensor Systems Department



Welcome to our Sensors issue of *The Leading Edge*. In the Electromagnetic and Sensor Systems Department at NSWC Dahlgren, Virginia, we are responsible for ensuring that the Navy's surface ship and ground-based radars operate effectively in the operational electromagnetic environment. It's a critically important responsibility necessary for providing naval warfighters with the tools they need to fight, win, and come home safely. It's a responsibility that needs to be done right—right from the start.

With that responsibility in mind, I would like to take this opportunity to highlight the importance of warfighters involving electromagnetic systems engineers in fleshing out sensor system requirements—even before requirements are formally documented. That means warfighters and systems engineers working closely together to develop a common understanding of naval sensor problems and needs driven by operational requirements. It means helping warfighters translate their operational needs into formal, technical systems requirements to increase the likelihood that they will end up with effective sensor systems as a result of moving through the acquisition process. And it means supporting warfighter systems throughout the entire systems' life cycle.

Working together with warfighters ensures that systems are engineered to work well together with other systems. That's what systems engineering is all about. It's not just about the operation of the systems working together in the laboratory environment, but also systems working together in the operational electromagnetic environment. Involving warfighters in the design, development, testing, and evaluation of sensor systems further increases the likelihood that their systems will interoperate with systems from the other services, coalition navies, and other departments and agencies, such as the Department of Homeland Security, the U.S. Coast Guard, and the Federal Aviation Administration.

Warfighters and systems engineers working together helps us better anticipate warfighter needs. So, while they are busy fighting wars and defending our nation, we can best serve their interests by continuing to explore more effective sensor capabilities, systems, and tactics to better arm them for current and future threats. In the end, working together, we provide our Navy and our nation with the very best technologies, systems, and solutions possible, while strengthening our country's national security posture in the process.