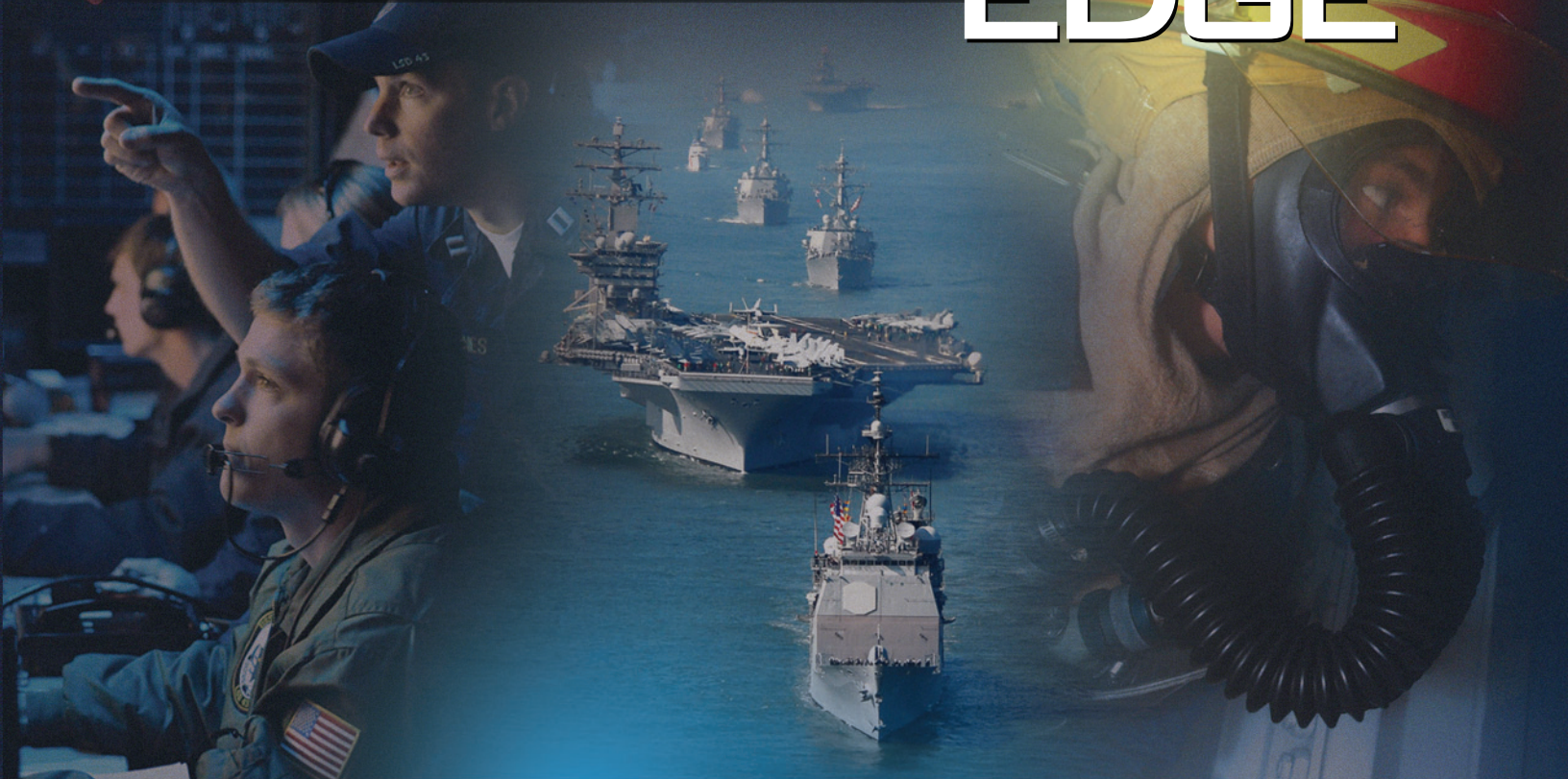


# LEADING

Volume 7, Issue No. 3

NAVAL SURFACE WARFARE CENTER, DAHLGREN DIVISION

# EDGE



PLATFORM SYSTEMS

COMBAT SYSTEMS

ENGAGEMENT SYSTEMS

# Systems Safety

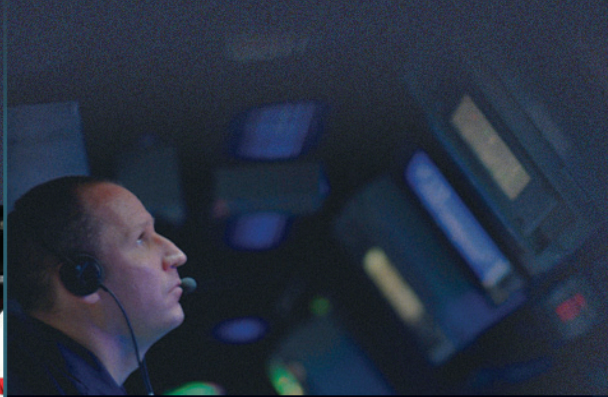
## ENGINEERING

*"Safety is a primary measure of the effectiveness of an organization, and it directly impacts readiness. Our culture must never accept accidental death, injury, or occupational illness as a cost of doing business."*

SECNAV







### *Systems Safety Engineering*

*System safety is the process of “designing in” safety by “designing out” hazards or intentionally reducing the probability and severity of hazards.*

Laura M. DeSimone  
*Executive Director,  
Naval Ordnance Safety  
and Security Activity*

*Deputy for Weapons Safety,  
Naval Sea Systems Command*





## TABLE OF CONTENTS

## Systems Safety Engineering

**5** INTRODUCTION: DEPUTY SECRETARY OF THE NAVY (SAFETY) STATEMENT  
*Tom Rollow*

**6** INTRODUCTION: NAVAL SURFACE WARFARE CENTER, DAHLGREN DIVISION (NSWCDD) PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING  
*Captain Sheila A. Patterson*

**7** INTRODUCTION: NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY (NOSSA) PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING  
*Laura M. DeSimone*

**8** INTRODUCTION: ENGAGEMENT SYSTEMS DEPARTMENT PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING  
*Thomas C. (Craig) Smith*

**9** INTRODUCTION: SYSTEMS SAFETY ENGINEERING DIVISION PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING  
*Melissa A. Lederer*

### DEFINING SYSTEM SAFETY

**10** SYSTEM SAFETY: WHAT, WHY, AND HOW WE GOT THERE  
*Clifton A. Ericson II*

**18** DETERMINING THE DIFFERENCES BETWEEN SAFETY AND OPERATIONAL CONCERNS  
*Jason Taubel, Shawn T. Thumm, and Steven Gainer*

**22** THE ROLE OF ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH (ESOH) IN THE SYSTEM SAFETY PROCESS  
*Jessica Delgado and James Engbert*

**30** THE CASE FOR PROVIDING ACTIONABLE SAFETY HAZARD, NEAR MISS, AND MISHAP INFORMATION TO THE ACQUISITION COMMUNITY  
*James H. Yee, Billie Jo Hynson, and Nga Pham*

**36** DOD ACQUISITION AND TECHNOLOGY PROGRAMS TASK FORCE: PROMOTING SYSTEM SAFETY THROUGHOUT THE LIFE CYCLE  
*Elizabeth Rodriguez-Johnson and Mark Geiger*

### THE PLAYERS

**44** DEPARTMENT OF DEFENSE SAFETY PROGRAM GUIDANCE AND POLICIES FOR THE PRINCIPAL FOR SAFETY (PFS)  
*Peggy L. Rogers*

**50** TRAINING THE SYSTEMS SAFETY ENGINEER  
*Mike Zemore and Etienne (Steve) Boscovitch*

**56** ESTABLISHING AND TRAINING BEST PRACTICES IN SYSTEMS SAFETY ENGINEERING  
*Robert C. Heflin Jr.*

**60** NAVY SAFETY REVIEW BOARDS: WSESRB, SSSTRP, AND FISTRP  
*Mary Ellen Caro, David Shampine, and Jack Waller*

**62** THE NAVY'S WEAPON SYSTEM EXPLOSIVES SAFETY REVIEW BOARD (WSESRB)  
*Mary Ellen Caro*

**66** THE NAVY'S SOFTWARE SYSTEM SAFETY TECHNICAL REVIEW PANEL (SSSTRP)  
*David Shampine*

**68** U.S. NAVY FUZE AND INITIATION SYSTEM TECHNICAL REVIEW PANEL (FISTRP): DUTIES, RESPONSIBILITIES, AND PROCESSES  
*Jack Waller*

# LEADING EDGE

## TABLE OF CONTENTS (Continued)

### THE PLAYERS (CONTINUED)

- 72** JOINT SERVICE WEAPON SAFETY REVIEW PROCESSES  
*Robert Gmitter*

- 78** UNITED STATES SPECIAL OPERATIONS COMMAND SYSTEM SAFETY  
*Cathi Crabtree*

### TYPES OF SYSTEM SAFETY EFFORTS

- 80** EXPLOSIVE ORDNANCE SAFETY  
*Bill Hammer*

- 86** THE EXECUTION AND EVOLUTION OF COMBAT SYSTEM SAFETY  
*Mike Zemore*

- 92** COMBAT SYSTEM SAFETY  
*Kevin Stottlar*

- 100** SHIPBOARD COMBAT SYSTEM TRAINING RESTORATION  
*Michael Zemore, Rachael Carroll, and Brian Schwark*

- 104** ASSESSMENT FOR THE USE OF MOTOR GASOLINE ON NAVY  
COMBATANT AS AN EXAMPLE OF TOTAL SHIP SAFETY  
*Eric Weissman, Jon Frederick, and Joe Janney*

- 108** IMPLEMENTATION OF POINTING AND FIRING CUTOUT ZONES  
*David Morgan and Greg Sellers*

- 116** SYSTEM SAFETY FOR RAPID INTEGRATION PROJECTS  
*Carolyn Blakelock*

- 124** NSWCOOD'S ROLE AS THE LEAD NAVY TECHNICAL LABORATORY (LNTL)  
FOR LASER SAFETY WITHIN THE DEPARTMENT OF THE NAVY (DON)  
*Sheldon Zimmerman, Robert Aldrich, and Thomas Fraser*





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# LEADING EDGE



COMBAT



ENGAGEMENT



PLATFORM

## Systems Safety ENGINEERING





# Introduction

DEPUTY ASSISTANT SECRETARY OF THE NAVY (SAFETY) STATEMENT



Mr. Tom Rollow  
Deputy Assistant Secretary of the Navy (Safety)

Our men and women in uniform are putting their lives on the line every day in defense of our freedoms and way of life. Hence, we all have an inescapable duty and responsibility to equip them with the absolutely best capabilities possible, with safety as a primary and enduring factor. System safety is not nice to have; it is an integral and essential part of the systems engineering process. To that end, the Department of the Navy (DON) is focused on integrating system safety into the overall acquisition, systems engineering, and management process—eliminating hazards where possible and making sure that serious and high risks are brought to the attention of the leadership that can provide resources or alter operations to prevent mishaps. DON manages mishap risk using MIL-STD-882D, *Standard Practice for System Safety*, to identify, analyze, and mitigate hazards, and reconcile residual risk. Our sustained involvement of system safety in acquisition programs is indispensable toward mitigating hazards, avoiding preventable mishaps, and providing sustained affordable readiness for the fleet. System safety is a key enabler in the acquisition and systems engineering process.



# Introduction

NAVAL SURFACE WARFARE CENTER, DAHLGREN DIVISION (NSWCDD)  
PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING



Captain Sheila A. Patterson, USN  
Commander, NSWCDD

At the Naval Surface Warfare Center (NSWC) Dahlgren, we proudly boast that we have in some way touched every weapon system deployed by the U.S. Navy, as well as many deployed by the other services. One of the most important contributions we make is ensuring that these systems are safe in the hands of the warfighter. Over the years, we have tested and certified thousands of weapons and combat systems and fully comprehend the need to integrate safety in every phase of development from design to fielding.

Our systems safety engineers are second to none and have established processes that ensure that safety is an integral factor in the development of the system. Thanks to our outstanding leadership and the dedication of our systems engineers and support staff, we are now able to avoid mishaps and mitigate risks to the greatest extent possible.

In this edition of the *Leading Edge*, you will have an opportunity to see how safety standards and practices have evolved. You will get an inside view of the safety review boards, whose ultimate goal is to ensure that the weapons and weapon control systems that the Navy and Marine Corps field are safe for the users. You will also gain a better understanding of the board's role in evaluating weapon systems developed by other services and ensuring that they are also safe to carry and operate from Navy platforms.

As evidenced in many of the examples cited in this Systems Safety Engineering issue of the *Leading Edge*, incorporation of safety requirements and allocation of resources for safety analysis and testing early allows a program to plan and execute the weapon system safety program and uncover safety issues early, when they are less expensive, and solutions are easier to incorporate into the system design. Late identification of safety issues not only can have significant impact on cost and schedule, but more importantly, they can result in serious safety risks for individuals.

This Systems Safety Engineering issue of the *Leading Edge* demonstrates how seriously we take system safety at NSWC Dahlgren. Without exception, we are deeply committed to ensuring that the systems we provide are safe to use and perform consistently and accurately to keep our men and women in uniform out of harm's way. I am proud to stand at the helm of a Command where, through the innovation and tireless dedication of our safety engineering teams, we are making such a significant impact on today's warfare systems at sea and combat systems in theater.



# Introduction

NAVAL ORDNANCE SAFETY AND SECURITY ACTIVITY (NOSSA)  
PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING



Laura M. DeSimone  
Executive Director,  
Naval Ordnance Safety and Security Activity

Deputy for Weapons Safety,  
Naval Sea Systems Command

The ever-increasing complexity of today's weapon and combat systems present unique challenges to the system safety community. As weapon system complexity increases, so does the potential for a minor design flaw or human error to evolve into a mishap. The use of weapons, especially aboard ships, is inherently hazardous, and it is unlikely that all hazards can be prevented. However, the mishap risk associated with weapons and explosives can usually be mitigated to an acceptable level. It is therefore imperative that weapon systems be systematically analyzed, using the most advanced techniques appropriate, in order to reduce the mishap risk associated with hazards. System safety is the process of "designing in" safety by "designing out" hazards or intentionally reducing the probability and severity of hazards.

The Weapon System Explosives Safety Review Board (WSESRB) was established in 1967 following two destructive and deadly explosives mishaps aboard U.S. Navy aircraft carriers USS *Oriskany* and USS *Forrestal*. The WSESRB is chartered by the Chief of Naval Operations to provide independent oversight of the Department of the Navy weapon programs' safety efforts. From the very onset of the WSESRB, it has been accepted that explosives safety oversight is best accomplished by ensuring maximum compliance with longstanding safety requirements through the life-cycle development of each weapon system.

WSESRB reviews provide program managers an objective, independent assessment of their safety program. The system safety program ensures identification of hazards to the fullest extent possible, and provides for the introduction of protective design measures to mitigate the hazards early in the system development process. The ultimate goal of a WSESRB review still stands as the Navy's focal point for the prevention of mishaps involving ammunition, explosives, and related systems, thereby eliminating deaths, injuries, lost workdays, and property and environmental damage. Mishap prevention costs are generally less than the mishap costs; therefore, a robust safety system program reduces the total expected system costs.

The Department of Defense has adopted system safety as a primary engineering discipline, within systems engineering, stressing preventive measures. The results of a thorough and rigorous system safety program are generally not visible, because the system safety program has been successful in preventing mishaps, and prevented mishaps are not a quantifiable metric. Through the collective efforts of our dedicated system safety professionals, the Navy and Marine Corps weapon and combat system developers deliver safe, effective, and affordable systems to our warfighters.



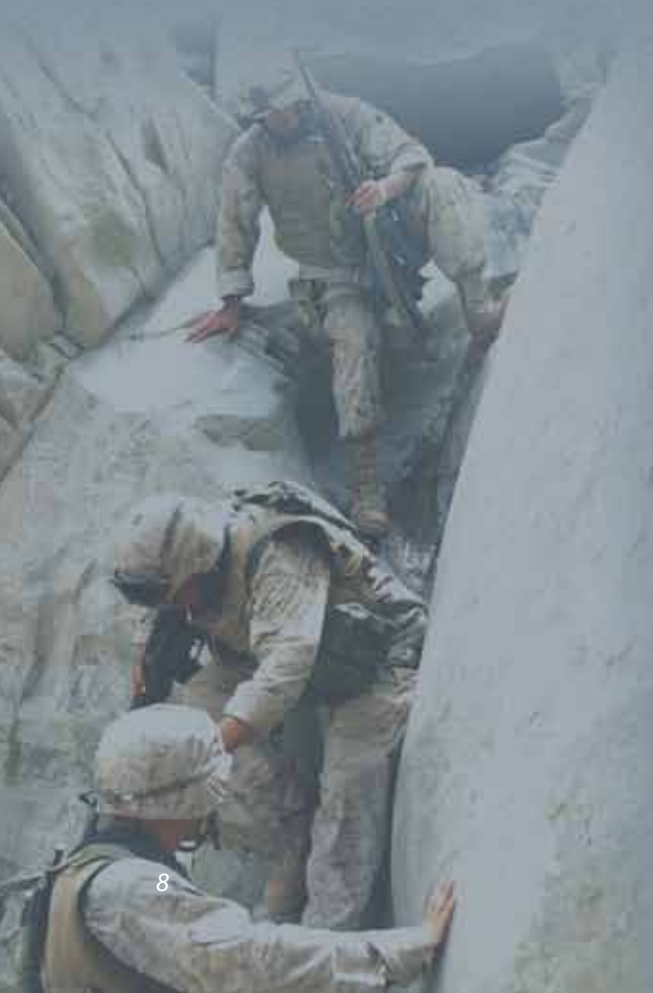
# Introduction

ENGAGEMENT SYSTEMS DEPARTMENT PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING



Thomas C. (Craig) Smith  
NSWCDD  
Head, Engagement Systems Department

In an era of increasingly irregular warfare and sophisticated enemy tactics, it is more important than ever that we maintain a technological edge in the engagement systems we provide to the warfighters who defend our nation's freedom. Integral to that premise is the precept that those engagement systems be designed to fulfill their mission as reliably and efficiently as possible. Concurrent with that premise is that our engagement systems are designed and fielded such that they maintain the highest degree of safety possible for the people who use them in the conduct of their duties. Meshing these two objectives sometimes presents a set of complex obstacles. It is often the paradox of modern weapon systems that safety and reliability are at odds. The highest degree of one may preclude the highest degree of the other. Therein lies the challenge of systems safety engineering, and we at the Naval Surface Warfare Center (NSWC) are meeting that challenge. Systems safety engineering is devoted to meeting the needs of our men and women in uniform by providing them with weapon systems that are safe to manufacture, store, transport, field, operate, and maintain, while simultaneously ensuring that they maintain high reliability in their functionality. From Marine Corps infantry weapons to major naval combat systems, systems safety engineering strives to ensure that those who volunteer to risk their lives in the face of enemy fire on behalf of this nation need not fear any consequence in the use of their own systems.





# Introduction

SYSTEMS SAFETY ENGINEERING DIVISION PERSPECTIVE ON SYSTEMS SAFETY ENGINEERING



Melissa A. Lederer  
NSWCDD  
Head, Systems Safety Engineering Division

This issue of the *Leading Edge* showcases systems safety engineering. It introduces the history of the discipline, explains what system safety is, the roles of review boards, and how it is executed. While a significant chain of policy requirements does exist for performing system safety, the real justification for the exercise of safety analysis is that it simply makes sense. Ensuring that systems are safe helps to save lives, prevent the loss of costly military assets, and prevent damage to the environment. In this issue, you will learn about the numerous ways that system safety is supporting the warfighter.

The system safety practitioner is a unique individual. In addition to being system safety experts, they must be educated in a variety of scientific and engineering disciplines, as well as maintain a significant level of proficiency in program management. Their required level of overall knowledge about the system that they support is exceeded by very few. These professionals face tremendous challenges in their efforts to provide innovative, proactive, and reliable systems safety engineering services. Traditionally, and even more so in the current wartime environment, they are often faced with conflicting requirements, insufficient budgets, and the stress of compressed timelines. As you read the articles in this issue, I hope you will gain an understanding for the complexity of the discipline and an appreciation for the people who have dedicated their careers to ensuring that warfare systems have been subjected to a quality system safety analysis.

The bottom line is that keeping warfighters safe from injury, safeguarding the environment, and protecting equipment is what system safety is all about.

