The New Age of Scientific Partnerships: 
Acoustic Capabilities and Facilities 
at NUWC Division, Newport -- 
Surface ASW Directorate Outlook 

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Cambridge, Massachusetts

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PREFACE

The work described in this document was performed in support of two efforts: the Shallow Water Active Classification Project and the Surface ASW Directorate Plans and Analysis Initiative. The Shallow Water Active Classification Project is part of the Submarine/Surface Ship USW Surveillance Block Program sponsored by the Technology Directorate of the Office of Naval Research (ONR); Program Element 602314N, ONR Block Program UN3B, Project No. RJ14B85, NUWC Division Newport Job Order No. B64600; Principal Investigator Joseph M. Monti (Code 33A), Program Director G. C. Connolly (Code 2192). The ONR Associate Director, Undersea Surveillance Division is T. G. Goldsberry (ONR-4510). The Plans and Analysis Initiative is part of the Surface ASW Directorate NUWC Division Newport Detachment New London under Job Order No. 630K12; Principal Investigator/Program Manager Peter D. Herstein (Code 304).

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**Title and Subtitle:**
The New Age of Scientific Partnerships: Acoustic Capabilities and Facilities at NUWC Division, Newport -- Surface ASW Directorate Outlook

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**Abstract:**
THE NEW AGE OF SCIENTIFIC PARTNERSHIPS: ACOUSTIC CAPABILITIES AND FACILITIES AT NUWC SURFACE ASW DIRECTORATE OUTLOOK

PRESENTED TO THE 127TH MEETING OF THE ACOUSTICAL SOCIETY OF AMERICA

7 JUNE 1994

PETER D. HERSTEIN (PRESENTER)
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Naval Undersea Warfare Center, Div Newport, Det New London
NEW WORLD ORDER

How can NAVY RDT&E, Industry, and Academia help each other to find answers needed economically and efficiently?

How can we join together in new endeavors?
## COMBAT/SONAR SYSTEMS

- AN/SQQ-89(V) ASW SYSTEM
  - AN/SQS-53 B,C
  - AN/SQR-19
  - AN/SQQ-28
  - AN/UYQ-25
  - AN/SQQ-89 ON BOARD TRAINER

- AN/SQS-53A EC-16

- AN/SQR-18A(V)3 Towed Array Multi-Static Receiver

- Shallow Water Active Testbed (SWAT)

- Lightweight Broadband Variable Depth Sonar (LBVDS)

- AN/SQR-19 Towed Active Receiver System (TARS)

## SUPPORTING PROGRAMS

- Surface ASW Advanced Development (SASWAD)

- 6.2 Shallow Water Active Acoustics, Active Class, and Data Fusion

- Tactical ASW Integrated Trainer (TASWIT)

- Combatant Data Collection (CDC)

- AN/UYQ-65 Display Station

- Full Spectrum Processing-MAC DSP

- SPP-ADM (Sensor Performance Prediction - Advanced Development Model)

## SELF-DEFENSE

- KINGFISHER

- National Surface Ship Torpedo Defense (SSTD)

- US/UK Joint SSTD

- Torpedo Countermeasures (NIXIE, ATT, LEAD)

- AN/SQQ-89 Torpedo Recognition Processor (TRP)
NUWC SURFACE ASW DIRECTORATE:
SUPPORTING U.S. NAVY SURFACE COMBATANT
USW SYSTEMS WORLDWIDE

SUPPORT NAVY MOBILE OPERATIONS WORLDWIDE

PARTICIPATE IN TECHNICAL EXCHANGES WITH ALLIES

DEVELOP NEW AND MODIFY EXISTING SONAR CONCEPTS TO MEET CHANGING WORLD ENVIRONMENT

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NUWC DIVISION NEWPORT

NUWC SURFACE SHIP LEADERSHIP AREAS

- Sonar Systems
- Torpedo Countermeasures
- Helmounted and Underwater Weapons Systems
- Mine Avoidance Sonar Systems
- Undersea Warfare Modeling and Analysis
- Undersea Warfare Combat Systems
- Tactical Undersea Ranges
- Torpedoes
- Undersea Vehicles (UUVs & Targets)
- Tactical Warfare Trainers for Surface Ship USW

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TECHNICAL COMPETENCIES OF THE SURFACE ASW DIRECTORATE

SINCE JUNE 1990
OVER 105 ARTICLES PUBLISHED IN REFEREED JOURNALS
OVER 35 PUBLISHED AUTHORS

- 30 PhD's
- 103 MASTERS DEGREES

REPRESENTATIVE PATENTS APPLIED FOR SINCE 1990
- ENVIRONMENTAL ACOUSTIC PROBE PULSE TECHNIQUE
- ELECTRO-OPTICAL COAXIAL TOW CABLE
- ANTENNA CABLE SUPPRESSION SYSTEM
- METHOD AND MEANS FOR ISOLATING EQUIPMENT FROM SHOCK LOADS

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NUWC HAS A LONG HISTORY OF COOPERATION WITH THE NON-MILITARY RESEARCH COMMUNITY

GENERAL ADMINISTRATION

NAVAL UNDERSEA WARFARE CENTER (NUWC)

TECHNICAL COORDINATION

NAVAL OCEANOGRAPHIC OFFICE

SMITHSONIAN INSTITUTION (ECOLOGY)

(NAVOCEANO) (MILITARY ASPECTS)

ACOUSTICS

NUWC

NAVOCEANO

BIOLOGICAL OCEANOGRAPHY

SMITHSONIAN INSTITUTION

UNIV. OF RHODE ISLAND

NAVOCEANO

NUWC

EXAMPLE: OCEAN ACRE

1967-1978

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INDUSTRY IR&D TRANSITIONED TO NAVY PROGRAMS:
ADAPTIVE CLUTTER FILTER (ACF) TECHNOLOGY EXAMPLE

- DEVELOPED ADAPTIVE CLUTTER SUPPRESSION FILTER TECHNOLOGY FOR AN INFRARED SENSOR APPLICATION
- ENHANCED AND COMPREHENSIVELY EVALUATED ADAPTIVE CLUTTER FILTER TECHNOLOGY
- TRANSITIONED AND MODIFIED ACF TECHNOLOGY FOR ASW DETECTION AND CLASSIFICATION APPLICATION
- Refined and evaluated ACF technology with USS Stump SOS 53C shallowwater sonar data
- Introduced an environmental target estimation model into the ACF design and demonstrated performance with heavy clutter in shallow water
- Enhance target estimation model and comprehensively evaluate ACF performance develop and demonstrate ACF extensions
TECHNOLOGY RELEVANCY
ACTIVE CLUTTER FILTER EXAMPLE

- COMMERCIAL/ACADEMIC APPLICATIONS
  - BIO MASS ESTIMATION
  - BATHYMETRIC FEATURE MAPPING
  - WARNING FOR HAZARDS TO NAVIGATION

- MILITARY NEED
  - DETERMINATION OF TARGETS WHICH ARE NOT SUBMARINES
• SONAR PERFORMANCE VARIABILITY ASSOCIATED WITH SHALLOW WATER REQUIRES UNDERWATER ACOUSTIC IN SITU DATA COLLECTIONS FOR REALISTIC PERFORMANCE PREDICTIONS

• COMPONENTS
  - ENVIRONMENTAL MONITORS
  - HIGH FIDELITY AND HIGH SPEED ACOUSTIC MODELS
  - USE OF "PROBE PULSES"
  - DIGITAL RECORDERS
  - HIGH SPEED PROCESSORS
  - RAPID PARAMETRIC EXTRACTION AND PERFORMANCE ASSESSMENTS
  - DISPLAY ENHANCEMENTS

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NUWC DIVISION NEWPORT

NUWC PROVIDES "CRADLE TO GRAVE" SMART BUYER FUNCTIONS

SCIENCE & TECHNOLOGY
WARFARE ANALYSIS
ADVANCED DEVELOPMENT
SYSTEMS ENGINEERING

ACQUISITION PHASES & MILESTONES

CONCEPT STUDIES
APPROVAL

CONCEPT DEMO/
VAL APPROVAL

DEVELOPMENT
APPROVAL

PRODUCTION
APPROVAL

MAJOR
MODIFICATIONS
APPROVAL

PHASE I
DEMONSTRATION
DEPLOYMENT

PHASE III
ENGINEERED
DEPLOYMENT

PHASE IV
OPERATIONS/SUPPORT

6/3/94
WHY WE MUST WORK TOGETHER

MORE HARSH OPERATING ENVIRONMENT

MORE COMPLEX PHYSICS

NEW THREATS

NEW MISSION REQUIREMENTS

MORE SIMULTANEOUS FUNCTIONALITY

ADAPTATION OF EXISTING RESOURCES

A PART OF THE SOLUTION

INCREASED GOVERNMENT / INDUSTRY / ACADEMIA COOPERATION

6/3/94
• LBVDS CAPITALIZES ON RECENT SYNERGISTIC INDUSTRY–NAVY TECHNOLOGY BREAKTHROUGHS TO DEMONSTRATE A NEW SONAR SYSTEM BY COMBINING AND APPLYING NEW TECHNOLOGIES IN:
  - BROADBAND SIGNAL GENERATION AND PROCESSING
  - ENERGY DENSE TRANSDUCER MATERIALS
  - SPARSE RECEIVER LINE ARRAYS
SUMMARY

- CHANGING NATIONAL AND WORLD PRIORITIES HAVE INCREASED THE NEED FOR CREATIVE AND EFFICIENT JOINT ENDEAVORS BETWEEN NAVAL RDT&E CENTERS, INDUSTRY, AND ACADEMIA

- THE SURFACE ASW DIRECTORATE SUPPORTS THE U.S. NAVY FROM "CRADLE TO GRAVE" IN ALL ASPECTS OF SURFACE SHIP SONARS AND THEIR INTEGRATION AS COMBAT SYSTEM ELEMENTS

- THE DIRECTORATE HAS A HISTORY OF ENCOURAGING MUTUAL EFFORTS AND WE ESPECIALLY WELCOME THEM NOW

FOR FURTHER INFORMATION CONTACT:
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