The Naval Research Enterprise

SPAWAR

NWDC

NAVAIR

SSC-SD

MARCOR SYSCOM

NAWC-WD

NPS

NAWC-TSD

NRL

MCWL

ARL/UT

NAWC AD

CNA

ARL/PSU

NAVSEA

NSWC Dahlgren

NSWC Port Hueneme

NFESC

APL/JHU

NAVOCEANO

NSWC Carderock

NUWC Newport

WHOI

NSWC CSS Panama City

NSWC Indian Head

APL/UW

NSWC Crane
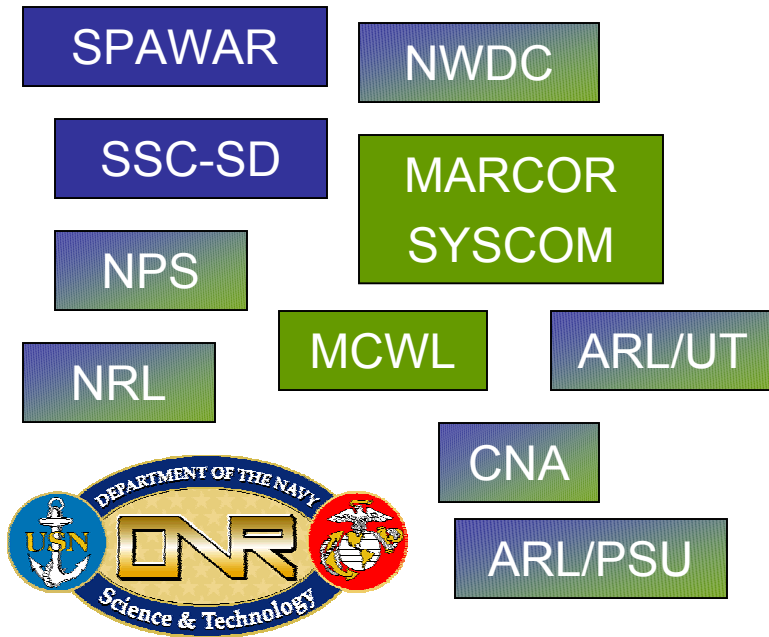
CNR coordinates a consortium of S&T elements in System Commands, Warfare Centers, Naval Laboratories, UARCs, FFRDCs, other Naval organizations

ONR Global Web Project

Web Services   4/07/2003

ONR Global Web Public Area

Marketing Space

Publicly Accessible
Publications and Documents

NRE IP Showcase

**Naval Needs Area
List, Brief Description,
and Input/
Feedback Form**

Naval Needs
Innovation
Repository

**Input from Vendors / Contributors is reviewed
by Government ONR Global Members
Selected contributors are invited
to the Collaboration Area**

**Guest Receives Invite from Naval Community/
ONR GLOBAL Member**

ONR Global
Web Collaboration
Login Area

Guest Registration   Member Login

Successful Login
Moves
To Collaborative
Workspace

ONR Global Web Portal
(restricted to government/.mil)

Naval Needs Group/Communities

**Discussion Areas
IM/ Chat and Thread Discussions**

Intelligent Search Capabilities
throughout the Communities
(External and Internal Repositories)

External
Information
Repositories/DBs

ONR Global Web Collaborative Workspace
- Restricted -

Invited Vendor/Colleague / Government

**Document/Content
Management for each
Community**

Community #1
Community #2
Community #3

Collaborative Area

Chat/Whiteboarding
Document Sharing

Communities/
Naval Needs Areas

**Expand Naval Need Inovative Process utilizing
the ONR Global Web Collaboration System**

ONR Global
Web
Repository

**Schedule Face-to-Face or VTC Meeting
Expand the Collaboration Effort
Beyond ONR Global Web**

Virtual Environment Training

- **Simulation for training and rehearsal of Marine fire teams in combat tactics, techniques, and procedures**
  - Support real-time interaction of teams in a variety of simulated urban environments

  - Support Virtual training situations that are too dangerous, costly, or unavailable in the real world

  - Support near real-time mission planning/rehearsal

SHADOW WARRIORS

One of the Navy's most advanced training systems, VAST uses computers that create a virtual island (or any other venue), based on photography of actual locations. Though military personnel involved in the exercise will see the island on their computer screens, their actual target is cordoned off by up to five sonar buoys far out at sea. These buoys pinpoint ordnance hits, calculate where they would have struck the island and provide smoke and explosions to signal the impacts. A predator drone is used to provide a simulated view of the target area.

VAST

Predator drone

Virtual airburst to illuminate area

Virtual hit

Destroyer

Sonar buoy

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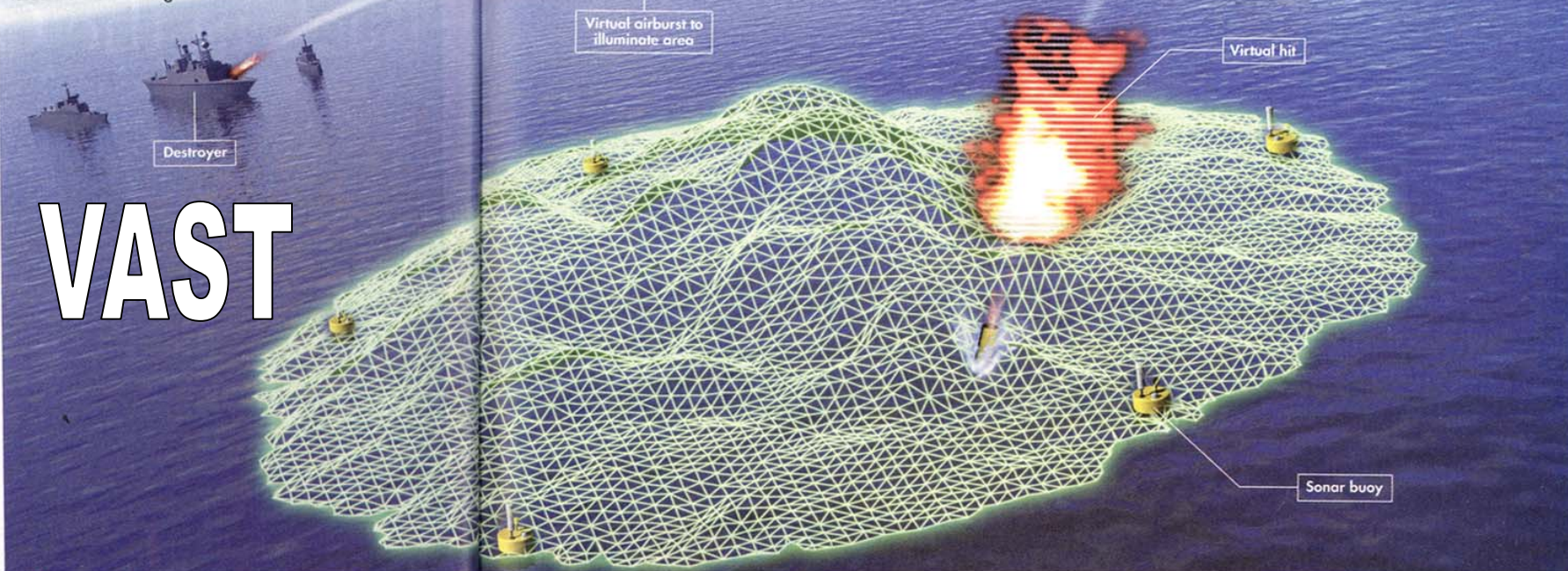
military training

THE NAVY'S PHANTOM BOMBING RANGE

A MARINE FORWARD OBSERVER finds the target with his binoculars. He radios the coordinates to a Navy gunner aboard a destroyer, who fires a 5-inch shell toward an enemy weapons depot—located just outside a small island's largest city. The projectile flies 12 miles and scores a direct hit. The marine observer watches the explosion and radios a confirmation back to the ship. Then it's on to the next target: enemy headquarters.

Welcome to Virtual At-Sea Training (VAST), in which the shots are real but neither the target nor the island actually exist. Digitally rendered virtual targets on computer screens offer the marine, the gunner and other military personnel the experience of shooting at real targets without the costs of doing so. Though in development for years, VAST was accelerated in 2002 after the Navy decided to find an alternative to Vieques, the Puerto Rican island that aircraft carrier battle groups have prac-

ticed bombing for nearly half a century. Local protests there have been a public relations disaster for the service, rippling back to cities with large Puerto Rican populations like New York.

Last November, the Navy conducted a successful full test of the system in the Gulf of Mexico. "In many ways, VAST is really an improvement over Vieques," says Michael Dunaway of the Office of Naval Research in Arlington, Virginia. "Not only are VAST exercises cheaper, we can set them up wherever we want without transporting equipment and personnel long distances." He adds that most munitions used nowadays are fired from very long ranges, so seeing a real hit isn't always necessary. Vieques and other land-based ranges, where a stray shot could result in catastrophe, are too small for guided missiles anyway.

VAST's virtual environments are created with photography-based digital imagery, viewed as video feeds. When a round strikes the water in the target area, GPS-equipped sonar buoys can pinpoint its location. VAST's computers, which have the coordinates and topography of the virtual island, then trace the round's trajectory back to where it would have passed through the island's surface. Forward observers—who might actually be at bases thousands of miles away—then see a realistic explosion or puff of smoke to signal the impact.

A VAST target area may be as wide as 3,000 yards across and can be established almost anywhere at sea. Eventually, the U.S. military will use the system to hold joint operations with other services or foreign allies, who can participate through computer linkups, without even leaving their bases. (In fact, the system also permits exercises to take place without any live firings at all—they're only necessary when weapons crews are being trained.) Though VAST can simulate such factors as crosswinds, fog, daylight and obscured vision, it is not yet a complete substitute for real-world training. The Navy will continue to conduct live-fire training at its other bombing ranges in Hawaii, Florida and other locales.—ERIC ADAMS

Technologies

- **Locomotion Platforms**
- **Accurate tracking systems for both humans and weapons**
- **Visual Display Systems**
- **Weapon modeling**
- **Realistic and "intelligent" Computer Generated Forces**
- **Man machine interface (human factor**
- **Communication (verbal and non-verb**
- **Rapid database generation, dynamic terrain and structures**
    - **Networking/Interoperability**
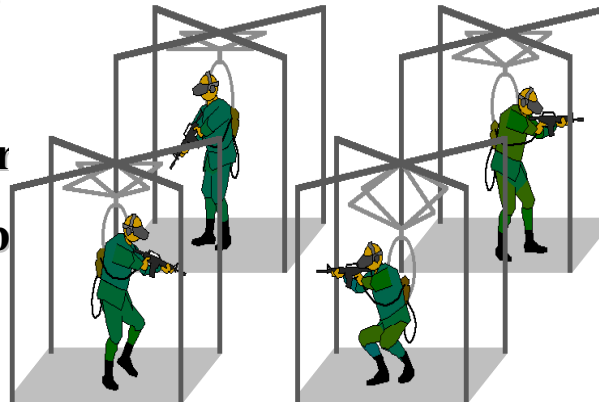
What it looks like

1st-Person View
- **Real Time Interaction**
- *Look - Move - Shoot*

Physical Set-Up
- **Cameras track markers**
- **Head-Mounted Display**

"Those that attended the virtual demo were very impressed. We all agree that this is something that will greatly enhance our training and overall combat readiness."

Captain Black, lead MOUT instructor at Quantico

Naval Research Opportunities for NMCI

- S&T Gigabit Ethernet Transport (CLIN 38) Supports Modeling & Simulation
  - Benefits Derived:
    - Brings the Work of Discovery & Invention to the Desktop
    - High Speed Connectivity to the Defense Research & Engineering Network (DREN)
    - Enhances the Development of Virtual At-Sea Training (VAST)

- Global Partnerships with Industry & International Scientific Community
  - NMCI lays the Supporting Foundation for ForceNet
  - Provides the Connectivity for the Naval Industry R&D Partnership on Manufacturing Technologies
  - BLII Offers Naval International Cooperative Opportunities Program (NICOP) Shared Knowledge Base

Naval Research Opportunities for NMCI

- Ubiquitous/Wireless Computing Presents all Sorts of Challenges & Enabling Opportunities
  - RF/IR is a Challenge that can be an Enabler with BackOffice Configuration Control
  - "Road Warriors" need NMCI Kiosks and/or Wireless Café's

- Extranets to Enhance Knowledge Sharing with Academia/Research Institutes
  - ONR's Work with National Oceanographic Partnership Program (**NOPP)**
  - Small Business Innovative Research Transition to Discovery Programs

- Next Generation Collaboration Laboratory NGCL
  - Creating a Markedly Enhanced Capability for Innovation with Naval Relevance
  - Laboratory for Exploring New Applications that Integrate Technology, Processes, & People
  - Moves the Discovery Paradigm Beyond "Publish or Perish"

- IT Infrastructure with Security Requirements Addressed First and Foremost.
  - Preserve/Protect Naval Intellectual Property
  - Build a Foundation for Trusted/Non-Attributable Collaboration Centers