Expeditionary Warfare Science and Technology Team: Enabling the Future Warfighter

Office of Naval Research

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Perspective

Building a science and technology portfolio is ***value investing, <u>not</u> speculation.***

Naval Nobels–50 and counting

NRL's Jerome Karle receives his Nobel

First Principles

13 MEU aboard USS Mount McKinley

The Navy and Marine Corps are a naval expeditionary team.

That expeditionary team is forward-deployed and combat ready.

The expeditionary team is America's "first responder."

The expeditionary team is a direct extension of national sovereignty.

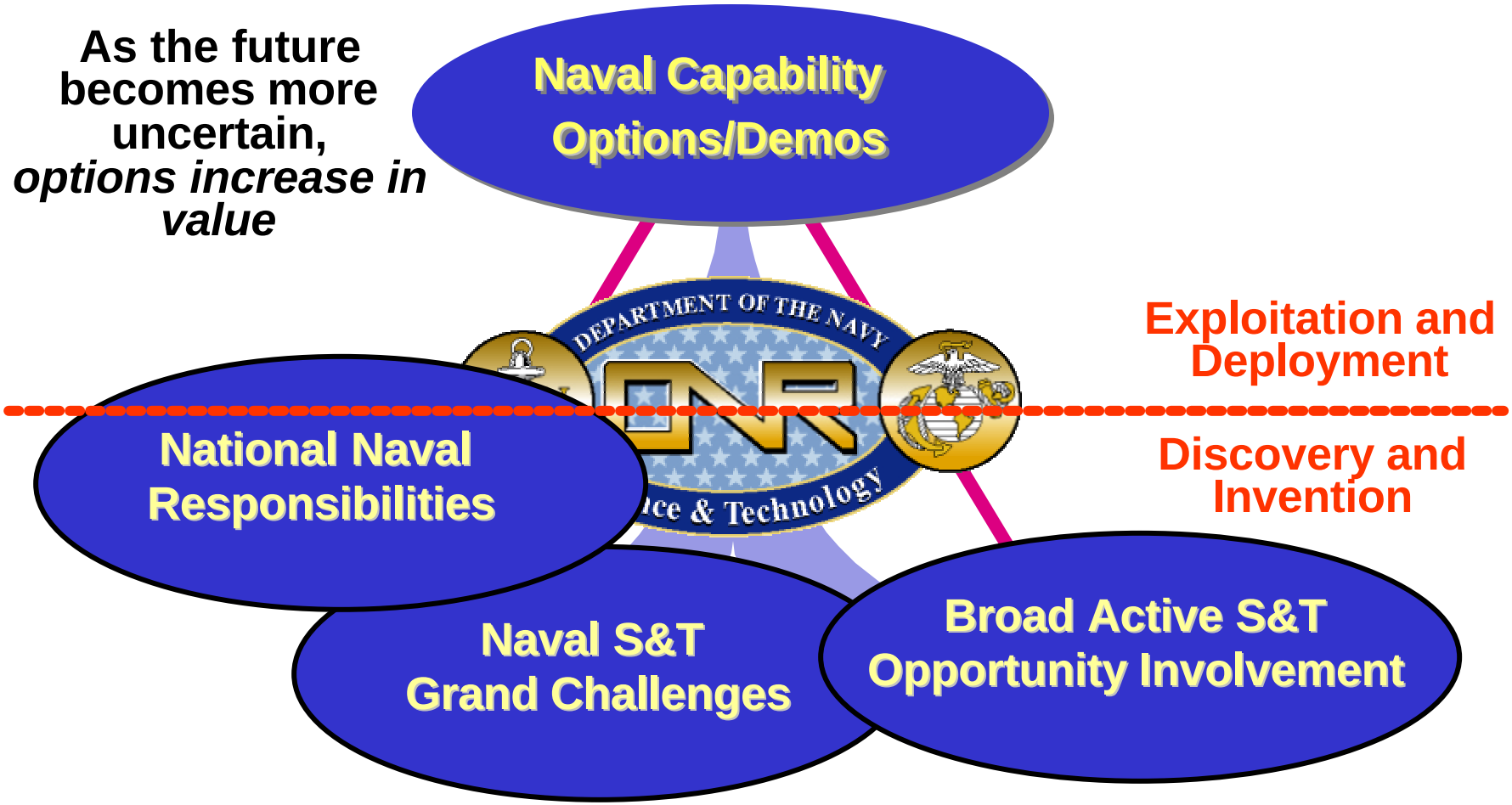
…These have implications for the strategic direction of Naval science and technology.

New Themes

- RESPONSIVENESS
- FOCUS ON EXPEDITIONARY WARFARE
- INTEGRATION OF MARINE CORPS
- TEAMWORK WITH EXPERIMENTATION

A Balanced S&T Portfolio

As the future becomes more uncertain, *options increase in value*



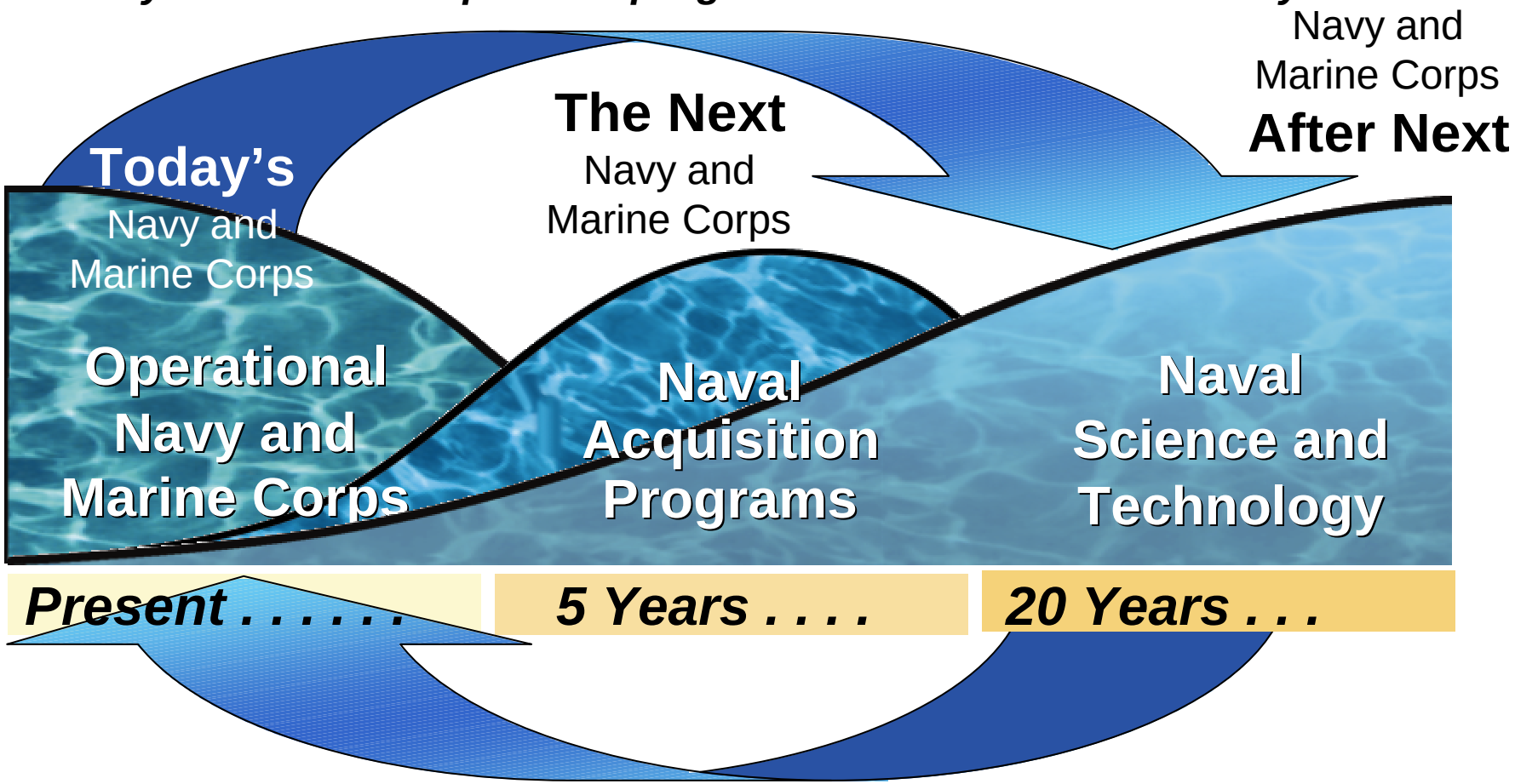
A balanced portfolio is as important to Naval technology as it is to your 401k

"DISCOVERY TO DEPLOYMENT"

S&T CREATE US ASYMMETRIC ADVANTAGE

Leap ahead for transformation

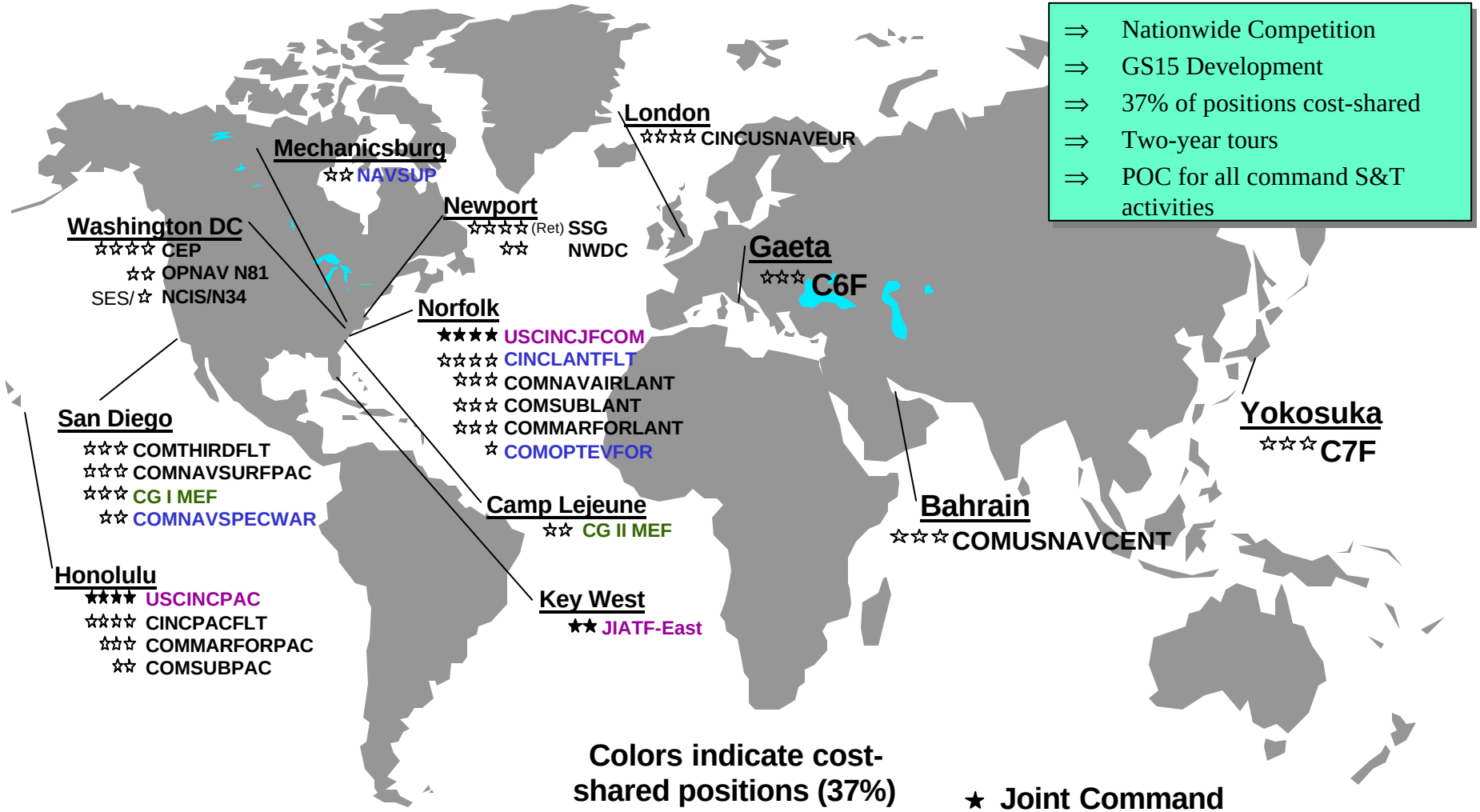
Look beyond current acquisition programs to achieve revolutionary advance



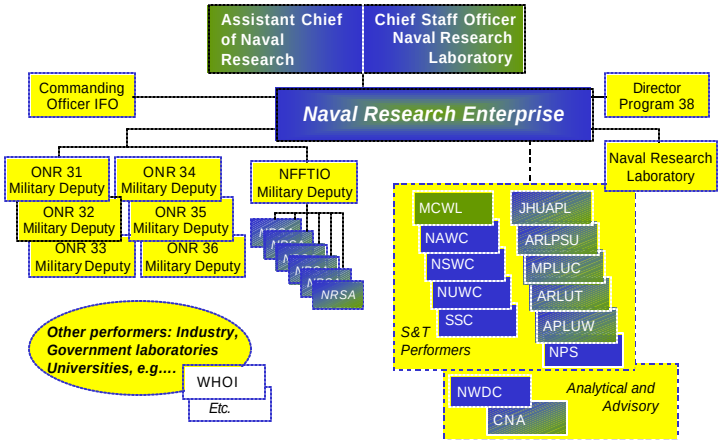
Exploit S&T for Warfighting Capability

Team Tango, NRL, Naval Research-Science and Technology Action Team

Science Advisors Geographic Locations



Naval Research - Science & Technology Action Team (NR-STAT)



Accomplishments

- Beta-tested with SIXTH Fleet, Aug 01
- Knowledge captured for future inquiries
- Re-engineered business process for connecting NRE & warfighters
- 95 requests processed since 17 Sep 2001

S&T Request:
Running Gear Entanglement System
Request: Need 3500' of RGES to provide a 100m perimeter around a ship at anchor
Requestor: COMSEVENTHFLT

STAT Action:
- **31 Jan 02 urgent request fromC7F (secure VTC)**
- Developed plan of action to deploy to C7F for T&E
- **Delivered to USS Blue Ridge 22 Feb 02**

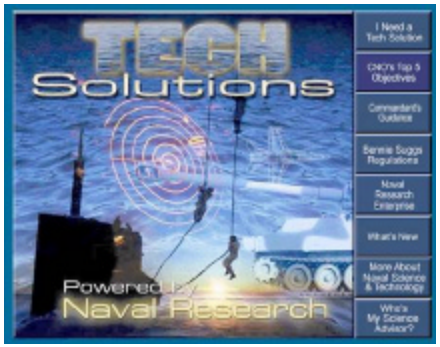
NR STAT is enabling Naval S&T to support forward-deployed Fleet/Force.

Tech Solutions

"Get on-line . . . not in line"

Concept:

- Direct connection to Sailors and Marines: "EMPOWER THE CUSTOMER"
- Goal of 40 working days from submission to funding
- Funding range $30K - $1.1M
- Customer feedback is a priority
- Quality of life, quality of service



#11 Non-Skid Deck Scrubber

Savings:

- $1.5M/year
- 32 man-years redirected
- Prevent black water run-off
- Enables deck-cleaning in port (not possible today)

#17 Paveway Munitions Planning

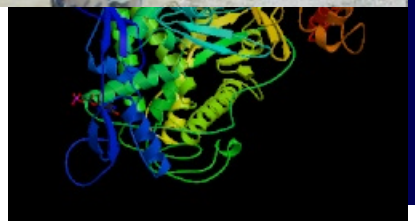
- Overhead view of weapon release point
- Integrates data with Navy Portable Flight Planning System (N-PFPS)
- Undergoing certification for use in N-PFPS

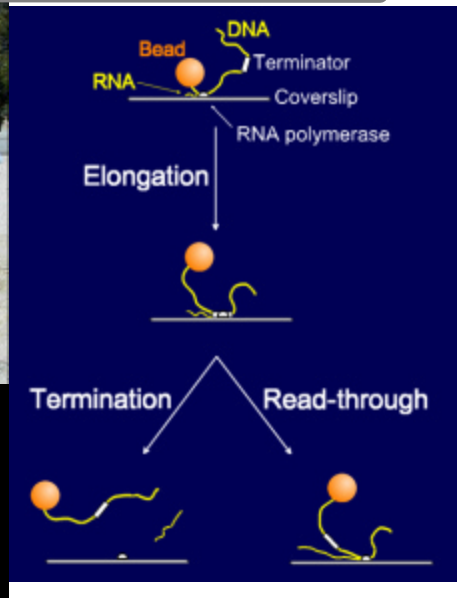
Combating Terrorism Technology Task Force (CT3F-"Team Tango")

Background:

DDR&E (Dr. Sega) established *Team Tango* to produce DoD integrated plan for technology against terrorism (17 Sep 01):

- Detection, Indications & Warnings
- Survivability & Denial
- Consequence Management & Recovery
- Attribution & Retaliation





Naval deliverables vetted by JCS:

- 8 (of 23) near-term (≤ 30 days)
- 5 (of 15) mid-term (≤ 1 year)
- 12 (of 38) long-term (≤ 5 years)

…projected at more than $225M

ONR/NRL/MCWL Rapid Execution:

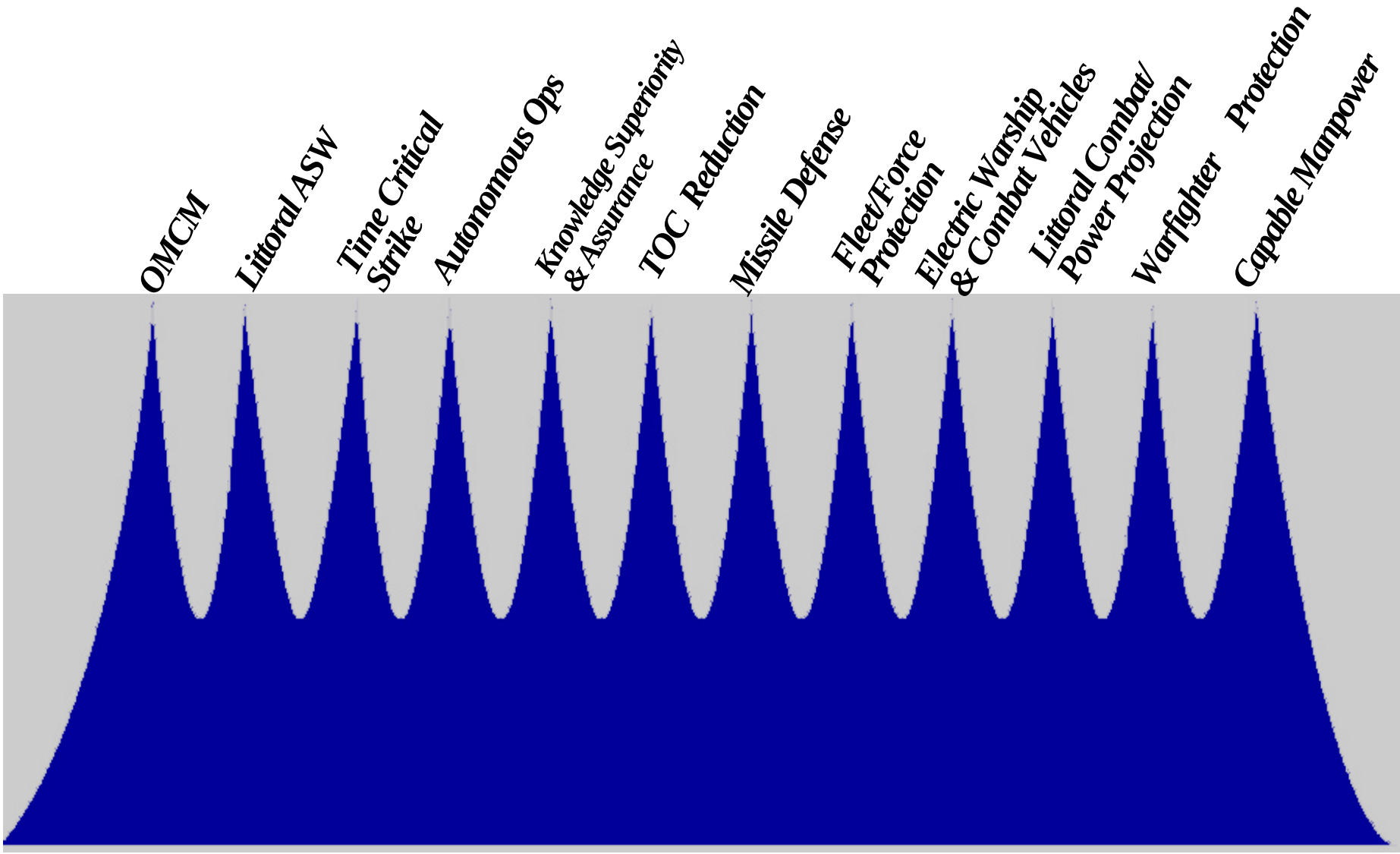
- Advanced Sensors for Tactical Naval UAV
- Chemical Agent Detection and Biological Agent Collection using small UAVs
- ***Deployed to Southwest Asia for maritime interdiction service, January 2002.***

FNC Rationale

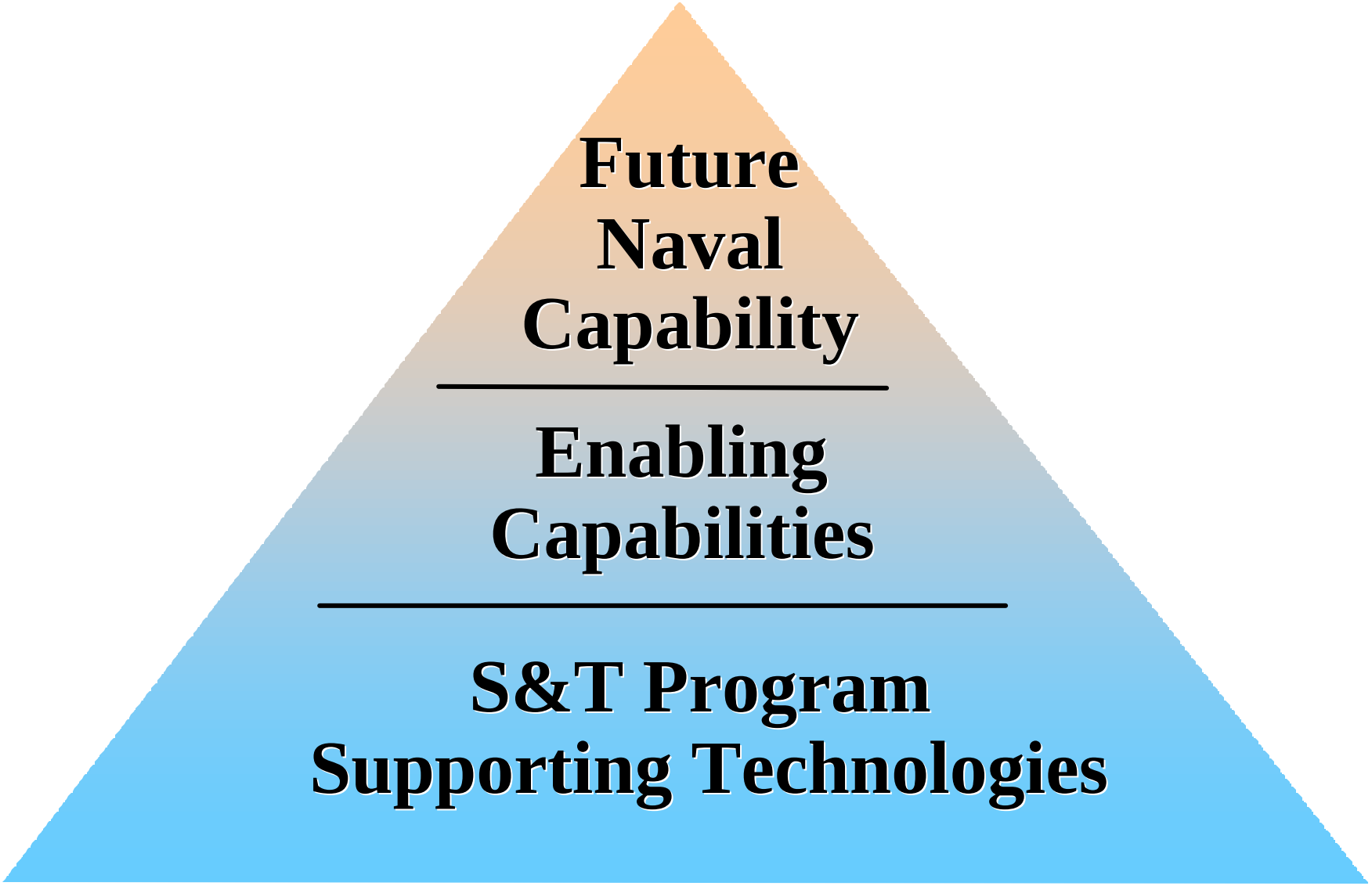
Future Naval Capability (FNC):

- S&T response to a DoN top priority capability that:
  - –Provides significant technology options for the DoN capability
  - –Has a significant budget
  - –Has definite milestones & objectives
  - –Has concrete deliverables and a finite end state
  - –Executes well defined demonstrations
  - –Culminates in firm transitions

12 Currrent FNCs



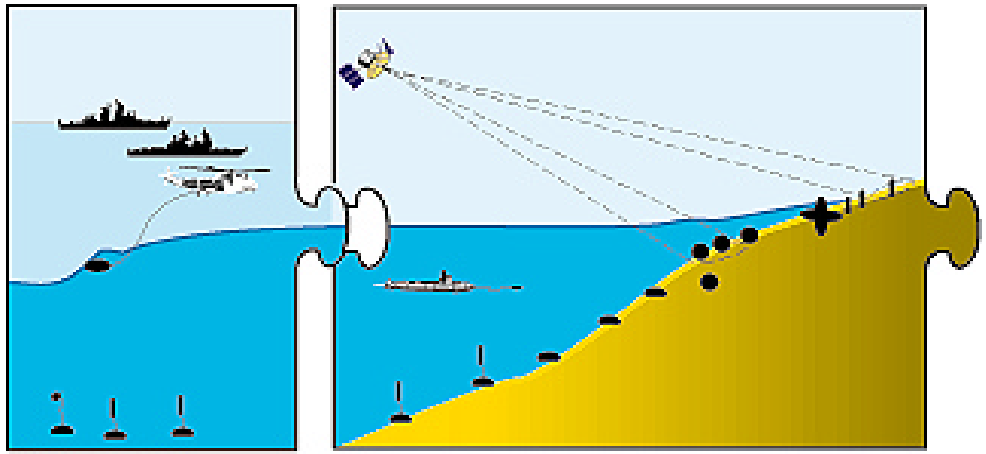
The FNC Taxonomy



Successful Power Projection From the Sea to the Objective Requires an End-to-End Naval S&T Plan

Focus of original 12 Naval FNCs Has Shifted from Open Ocean to Littoral Warfare

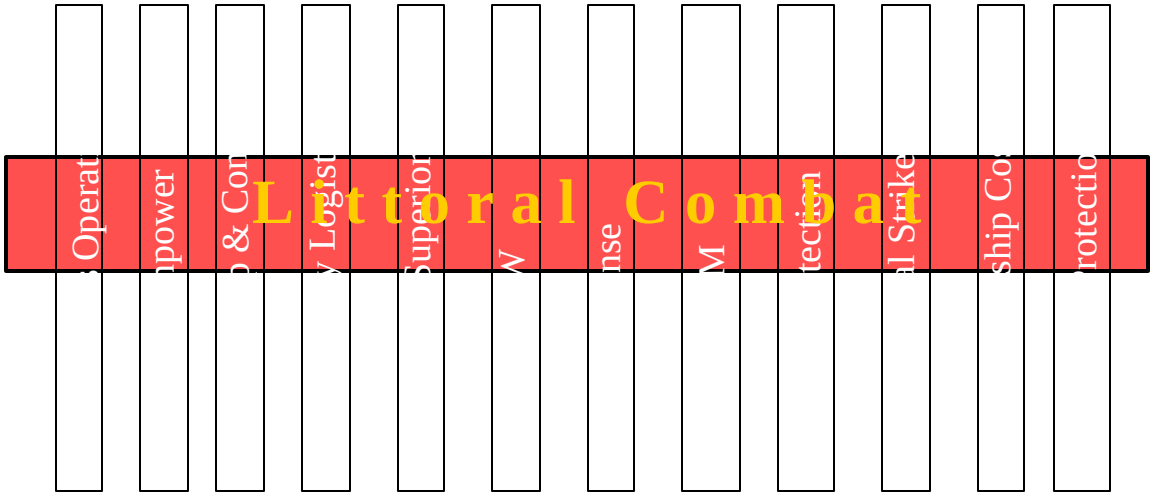
Littoral Combat FNC Provides Link



Next Step Link..

Littoral Combat FNC Interfaces

Littoral Combat FNC cuts across other FNCs



Littoral Combat is an expansive warfighting problem set

Littoral Combat is not a "Green" only concern

Littoral Combat is a Naval concern - It is where the future fight is

Littoral Combat FNC
Goal and Enabling Capabilities

Goal: Support the development of Naval Expeditionary Maneuver Warfare via the application of technologies which enhance the ability of the Navy-Marine Corps team to achieve assured access and sustained operations in the littorals as the naval portion of a joint campaign.

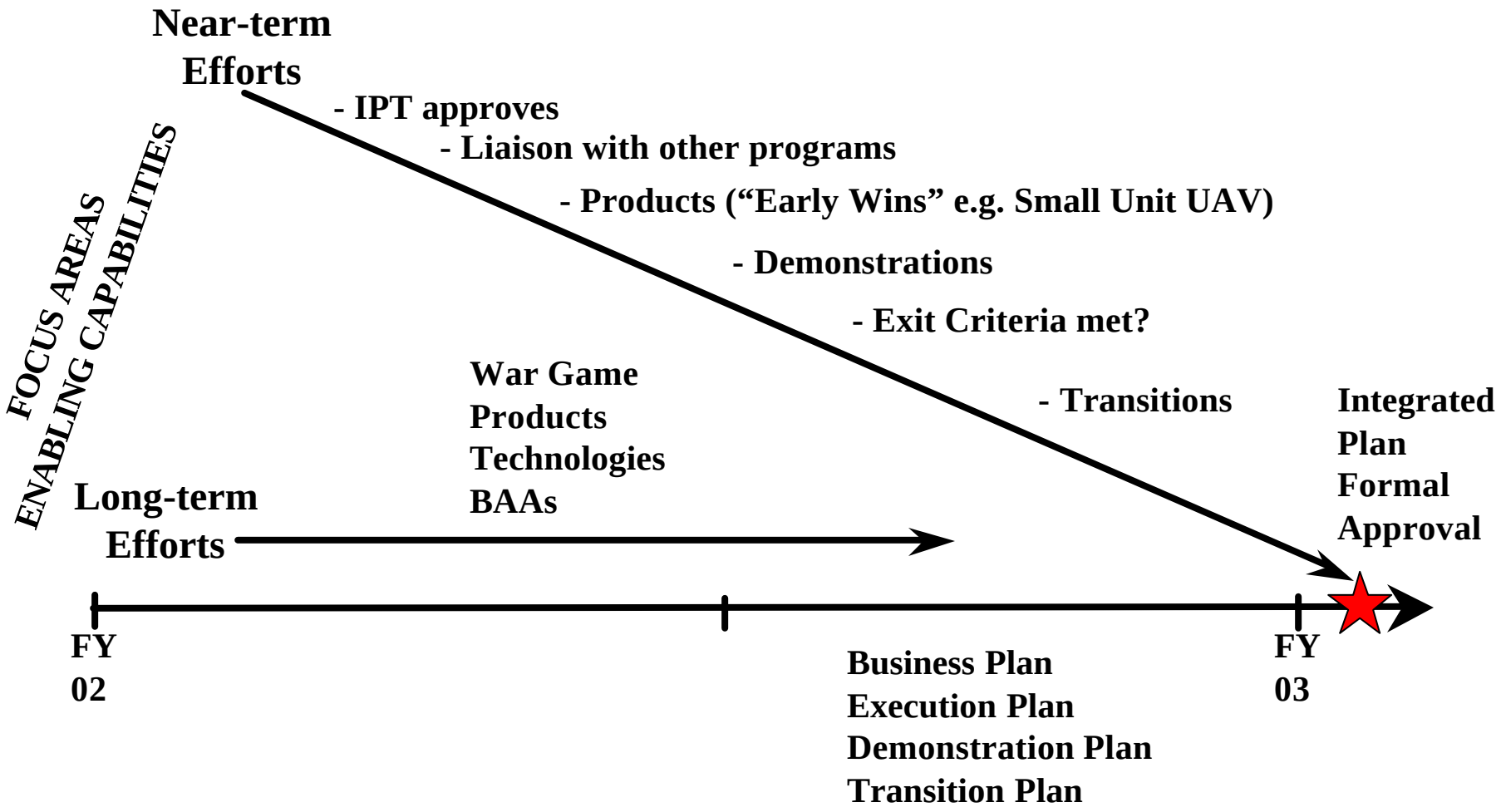
Enabling Capability #1 - Provide Enhanced Expeditionary ISR for the Amphibious Force (AF)

Enabling Capability #2 – Provide Enhanced Expeditionary Fires Support for the MAGTF

Enabling Capability #3 – Enhance the ability of the MAGTF to Maneuver in the Littorals

Enabling Capability #4 – Provide Enhanced Expeditionary Task Force Command & Control in the Littorals

Littoral Combat FNC Stand-up Dual Track Process



Littoral Combat Gaming and Analysis

- **April 2002 LC FNC Expeditionary Maneuver Warfare Game**
  - Identified prioritized list of operational capability shortfalls for which technology solutions were necessary
- **May 2002 Technologists' Panel**
  - Reviewed candidate technology list from EMW game and provided insights into most beneficial technologies to pursue
- **August 2002 Broad Agency Announcement**
  - Sought industry proposals to solve operational capability shortfalls
  - White Papers Reviewed
- **September 2002 Technology Insertion Game (TIG)**
  - Operators' opportunity to prioritize their desires for technologies to transition
- **October 2002 LC FNC Onsite Offsite**
  - Operators' priorities from TIG
  - Technology assessment (risk, feasibility, etc.)
  - Funding constraints
  - Transition Ability

Sea Base Wargame

- **Who -**
  - Sponsor – ONR / MCCDC / OPNAV (N7)
  - Players – USN / USMC / Joint (0-4 to 0-6 level)
  - Senior Mentors - Gen Wilhelm / Adm Lopez
  - Flag Panel - LtGen McKissock, MGen Humble, MGen Krupp, RADM Whisler, RADM Mixson
  - Junior Officer Panel (EWS and SWOS)
  - Analytical Support - Mr. Erv Kapos (ONR) and CNA
  - Game Design/Facilitation - Arete Associates
- **What** - Operations from the Sea Base Wargame
- **When** - 29 Oct - 1 Nov 2002
- **Where** - Newport, R.I.
- **Why** - to ***validate*** sea basing required capabilities and to ***identify*** and ***prioritize*** sea basing required capability shortfalls of the 2015 JTF.
  - These shortfalls will support the development of a science and technology investment plan and an experimentation plan that supports seabasing in the year 2020.

Marine Corps Integration into ONR

BGen (Sel) FRANK A. PANTER

31 INFORMATION, ELECTRONICS & SURVEILLANCE S&T	32 OCEAN, ATMOSPHERE & SPACE S&T	33 ENGINEERING MATERIALS & PHYSICAL S&T	34 HUMAN SYSTEMS S&T	35 EXPEDITIONARY WARFARE S&T	
John Moniz GM14 LtCol Gerry Nalepa	LtCol Melvin Ingram	Maj Craig Penrose Maj Ira Campbell	George Solhan GM15 William Ellis	Maj Pat Lavigne John Beadling	Jeff Bradel Maj Tom Young
C4ISR	MINE COUNTERMEASURES	LOGISTICS	TRAINING AND EDUCATION	FIREPOWER	MANEUVER

FNC
LITTORAL COMBAT
POWER PROJECTION

Tom O'Leary IPA
LITTORAL COMBAT

Lynn Torres GM15
EXPEDITIONARY LOGISTICS

DIRECTOR
FRED BELEN

DEPUTY DIRECTOR
COL EUGENE DANIELS JR.

ONR 353
EXPEDITIONARY WARFARE
OPERATIONS TECHNOLOGY
DIVISION

FY02 USMC Basic Research (6.1) Focus Program

Communications

- Ultra-Wideband Radio Ranging Studies, USC
- Channel Coding and Estimation for Ultra-Wideband Impulse Radios, U.Michigan
- Low Power CMOS Implementation of Ultra-Wideband Radios, UC Berkeley

Sensing

- Impulse/Ultra Wide Band Radar Research, ARL
- Fluorescent Rare Earth Chelates, NAWC WD
- AFM Determination of Radiation Exposusre, NSWC
- Environmental Issues for Seismic Mine Detection, GTRI
- False Indicators to A/S Landmine Detection, U Miss
- Acoustic Detection of Landmines, NRL

Lightweight Power Sources

- Thin Film Lithium Polymer Batteries, MIT
- Direct Oxidation of Logistic Fuels in Solid Oxide Fuel Cells, U. Pennsylvania
- Polymer Moderated Electrodes, NSWC CD
- Modeling of Power Systems, U. South Carolina

Enhanced Lethality

- Metal-Metal, Metal-Oxidizer Energetics, NSWC IHD
- Triazole Cure Energetic Binder, NAWC WD & U. Florida

Corrosion Prevention

- Corrosion Fatigue Cracking in Friction Stir Welded 2519 Al, NRL
- Stress Corrosion Cracking in FSW 2519 Al, Rockwell Sci Ctr

Information Efficiency

- The Information Theory for Optimal Aimpoint Selection via Multiple Sensors, Johns Hopkins University
- Multi-Source Information Processing in Mobile Environments, NAWC WD
- Information Mgt. in a Mobile Environment, UCSB
- Compression of Digital Elevation Maps Using Non-Linear Wavelets, New Mexico State University

Laser Eye Protection

- Nonlinear Nanolayered Polymers, NRL
- Nanostructured Optical Limiters, Case Western

C4ISR

Code 353 seeks to develop and leverage advanced technologies for applications in future command, control, communications, computers, intelligence, surveillance and reconnaissance. Enhanced situational awareness and tactical decision making, low probability of intercept/detection comms, weight reduction and quality of service gains, increased capability and cost reduction are all goals of the program.

Projects include:

- **C2 software S&T testbed located at MCTSSA, Camp Pendleton, with mobile Command and Control testbed**
- **Joint Tactical Radio System (JTRS) standards development**
- **Ultra-Wideband Waveform development to enhance LPI/LPD radio transmission**
- **High density, solid state, data storage development (M-RAM)**
- **Improved Mobile Direction Finding capabilities**
- **Low profile Wearable Antenna development**

Mine Countermeasures

ONR 353 is working to establish an expanded and robust thrust area in MCM to include detecting, localizing, identifying, and neutralizing mines in both the littoral and land environment.

Projects include:

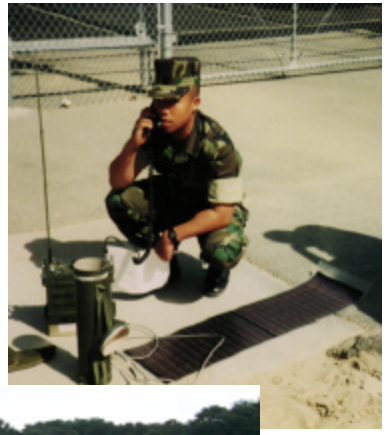
- **Nuclear Quadrupole Resonance (NQR)**
  - **Land Mine Detection**
- **Study of MCM for Beach Exit Zone to Objective**

Logistics

Code 353 seeks to develop advanced technologies for application to current and future Marine Corps expeditionary systems. This thrust area focuses on emerging technologies for improved distribution, reduced demand (fuel, water, energy), and improved maintenance capabilities.

Projects include:

- **Expeditionary Energy Generators and Alternative Power**
- **Expeditionary Water Generation & Distribution**
- **Rapidly Deployable Non-Standard Composite Bridging**
- **Improved Fuel Efficiencies for Tactical Vehicles**
- **Advanced Maintenance Technologies for Logistics Depots**

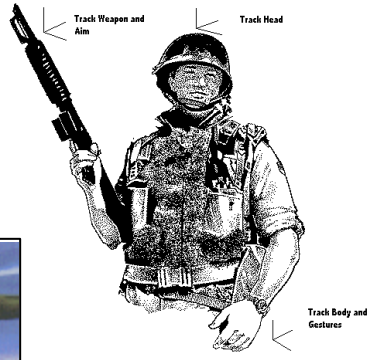


Training and Education

Code 353 seeks to enhance human performance and warrior capability through augmented cognition and training and education.

Projects include:

- **USMC family of tactical decision games (TDG)**
- **Training Instrumentation and situational awareness (SA) technology**
- **Synthetic environments generation capability for virtual training**
- **Augmented cognition/enhanced human performance technology**

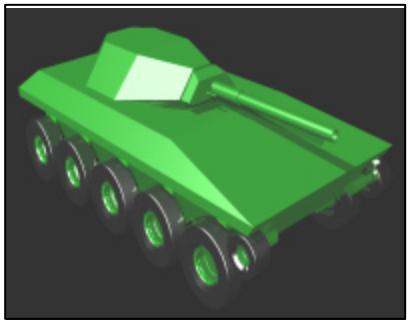


Maneuver

Code 353 seeks to develop advanced technologies for application to current and future Marine Corps expeditionary systems. This thrust area focuses on emerging technologies for tactical and combat vehicles in the areas of mobility, survivability, electric technologies, and unmanned ground vehicles.

Projects include:

- **MAGTF Expeditionary Family of Fighting Vehicles (MEFF-V)**
- **Reconnaissance, Surveillance & Targeting Vehicle (RST-V)**
- **Electric Tactical and Combat Vehicle Technologies**
- **Tactical Unmanned Ground Vehicles (TUGV)**
- **AAAV Band Track**



Firepower

Code 353 seeks to develop advanced technologies for application on current and future Marine Corps expeditionary weapons and reconnaissance, surveillance and/or targeting systems. Emerging capabilities requirements include improved vehicle weapons systems lethality, individual and crew served weapons lethality, non-lethal weapons and enhanced reconnaissance, surveillance and/or targeting.

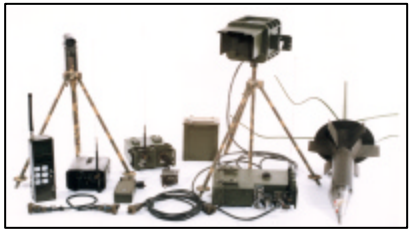
Projects include:

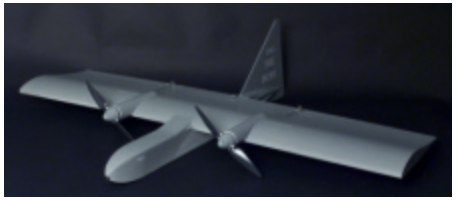
- **Objective Crew Served Weapon (OCSW)**
- **Enhanced Electro-Optic Signal Processing**
- **High Performance, Low Cost Uncooled FLIR**
- **Long Range Electro-Muscular Disrupter**
- **Dragon Warrior UAV**
- **Dragon Eye UAV**

Service Experimentation Core Competencies

Experimentation

Technology Development





Wargaming

The Wargaming Program is a comprehensive and innovative effort focused on advanced policy, concept, and operational exploration at several levels.

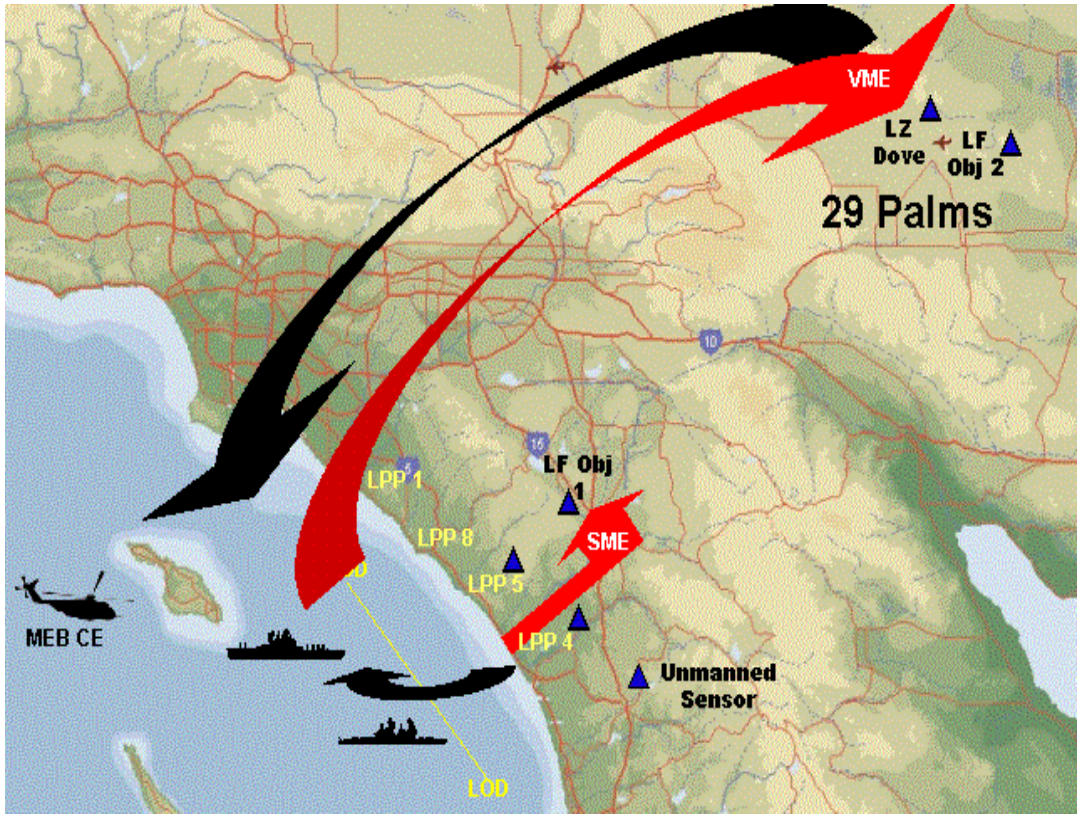
"Think Tank"

Identify emerging threats, explore concepts, and determine capabilities and solutions to meet future challenges

Olympic Dragon 04 - “Main Effort”

GOAL: Support a 2004 deploying MEU and DOTMLPF development of STOM

- **Live Force Experimentation**
  - **MEU + “Fly-in” MEB CE**
    - **GCE/CSSE focus**
  - **“Digital Divide”**
    - **OTM/OTH C2**
    - **Common Tactical Picture**
      - **Real time PLI**
  - **Collaborative Planning**
  - **Pathfinder Enhancements**
- **Supporting Efforts (Wargames, M&S)**
  - **Experimental and POR Systems**
    - **Limited/unconstrained bandwidth**
  - **ESG/MEB CE**
    - **MFOC: Command relations and organizational issues**



Support the Operating Forces and Future Capability Development

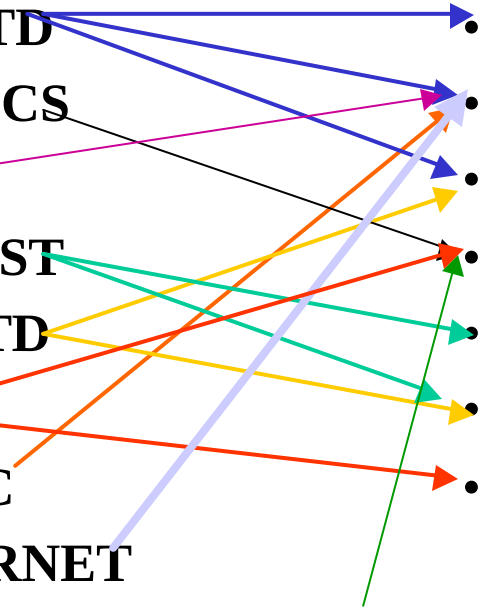
Marine Corps S&T and Experimentation

S & T Programs

- ELB ACTD
- PRE-FICCS
- RST-V
- FUEL DIST
- SUL ACTD
- IAC3
- KSA FNC
- JTF WARNET
- LITTORAL COMBAT FNC

Experiments/Exercises

- URBAN WARRIOR/FBE
- CABABLE WARRIOR/FBE
- MILLENIUM CHALLENGE 01
- MILLENIUM CHALLENGE 02
- FOAL EAGLE/ARMY FUELS
- LOE 6/STEEL KNIGHT
- MAWTS



USMC Science and Technology

Experimentation

Requirements

Acquisition

Science for Victory

A long anticipated war is now upon us

Challenge: Shifting, asymmetric threats

Response: Technological superiority is the key American asymmetric advantage.

Naval Research supports the warfighter:

- Stay close to the warfighter
- Respond quickly to emergent needs, challenges, and opportunities
- Continue to work jointly with other Services and OSD
- Keep a steady hand and increase "peripheral vision" for S&T–*don't sacrifice the future*

Sea-ALL/Dragon Eye:
Marine-portable UAV

Naval Research has made a difference in Afghanistan