Office of Naval Research

S&T Strategy for Power Projection

Mr. Michael Deitchman, SES

Deputy Chief of Naval Research

Naval Air Warfare and Weapons (Code 35)

23 October 2007

DoN S&T Corporate Board Approval

Revolutionary Research . . . Relevant Results

DEPARTMENT OF THE NAVY
ASSISTANT SECRETARY OF THE NAVY
RESEARCH, DEVELOPMENT AND ACQUISITION (20350-1000)
OFFICE OF THE VICE CHIEF OF NAVAL OPERATIONS (20350-2000)
HEADQUARTERS UNITED STATES MARINE CORPS (20350-3000)
WASHINGTON, DC
JAN 19 2007

MEMORANDUM FOR THE CHIEF OF NAVAL RESEARCH

Subj: SCIENCE AND TECHNOLOGY CORPORATE BOARD DECISION MEMORANDUM

1. The Corporate Board endorses and approves the Naval Science and Technology Strategy presented at the 12 December 2006 Science and Technology Corporate Board meeting and directs the Chief of Naval Research to implement the strategy.

R. Magnus	R. F. Willard	Dr. Delores M. Etter
General, U. S. Marine Corps	Admiral, U.S. Navy	Assistant Secretary of the Navy
Assistant Commandant of	Vice Chief of Naval Operations	Research, Development and
the Marine Corps		Acquisition

DoN S&T Strategy Objectives

- **Ensure alignment of Naval S&T with Naval missions and future capability needs**
- **Communicate S&T vision and approach to senior decision makers, key stakeholders, S&T partners, customers and performers**
- **Balance and manage S&T portfolio based on key tenets:**
  - **Strive to touch intellectual capital worldwide**
  - **Leverage U.S. and global technology insights**
  - **Sponsor primarily external performers**
  - **Maintain NRL in-house research capability as the Navy/Marine Corps Corporate Laboratory**
  - **Manage a balanced portfolio with technical Program Officers**

Naval Warfighting and Support Functions

Revolutionary Research . . . Relevant Results

Naval S&T Focus Area	Naval Warfighting and Support Functions
Power & Energy	• Power Generation and Storage • Assured energy sources• Man Portable & Lightweight • High-Density Power
Operational Environments	• Oceanography & Survey (Ocean/Hydro/River) • Meteorology • Space Environmental Effects
Maritime Domain Awareness	• ISR collection & integration • CBRNE (Explosives & WMD Detection) • Port/Base Security • Swimmer Detection • Wide Area & Battlespace Surveillance • Social/Cultural Understanding • MIO Sensing • HLS Ship Tracking
Asymmetric & Irregular Warfare	• Operational Adaptation • Maritime/Riverine Interception Operations • Expeditionary Security • Boat/Vehicle Disabling (Apply Non-Lethal Systems & Effects) • Forensic Site Exploration • Tactical Evidence Collection • Counter IED/Snipers • Riverine Operations • Regional Domain Awareness • Homogeneous Cultural Integration of Forces • Tactical Tagging and Tracking
Information, Analysis and Communication	• Assured and Secure Communications • Electronic Warfare • Computer Network Ops • Operations Security • Military Deception • Cross Cultural Communications • Threat Intent Determination • C4
Power Projection	• **Rapid Tactical Precision Targeting • Time-sensitive strike • Neutralization (lethal/non-lethal) • Effects-scaled weapons • Integration & Control of Naval fires • Maneuver**
Assure Access and Hold at Risk	• Persistent Surveillance & Monitoring • Tagging/Tracking & Locating • Shaping and Information Operations • Strategic Target ID/Tracking • Information Verification • Vessel/vehicle-stopping • MIO/Boarding • ASW & MCM • Spoof/Decoy
Distributed Operations	• Distributed Logistics • Small Unit ISR/Intel Collection/Dissemination/Fusion & Engagement • Tactical Maneuver & Mobility • Control of Integrated Fires • Training Operations in Urban/Extreme Environments • Large target lethality with reduced combat loads • Control Collateral Damage
Naval Warrior Performance and Protection	• Personal Protection • Endurance • Decision-Making Tools • Decision/Training Tools • Casualty Prevention/Care • Undersea Medicine • Enhanced Human Performance • Operating in Extreme/Austere Environments • Expeditionary Security • Training Operations in Urban Environments
Survivability and Self-Defense	• Missile Defense • Torpedo Defense • LO/CLO • Tactical EW • Damage Control/Prevention • Force Protection • Time-Critical Terminal Defense
Platform Mobility	• Platform Performance & Agility • Power-Dense Propulsion • Operational Adaptation • Tactical Maneuver Mobility
Fleet/Force Sustainment	• Seabasing • Operational Logistics • Maneuver
Affordability, Maintainability, and Reliability	• Increased warfighting capacity• Reduced logistics cost optimization reduced failure rates • Automate Naval engineering • Aircraft Propulsion Design • Reduce Manning • M&S Automation • Reduce Upgrade Costs

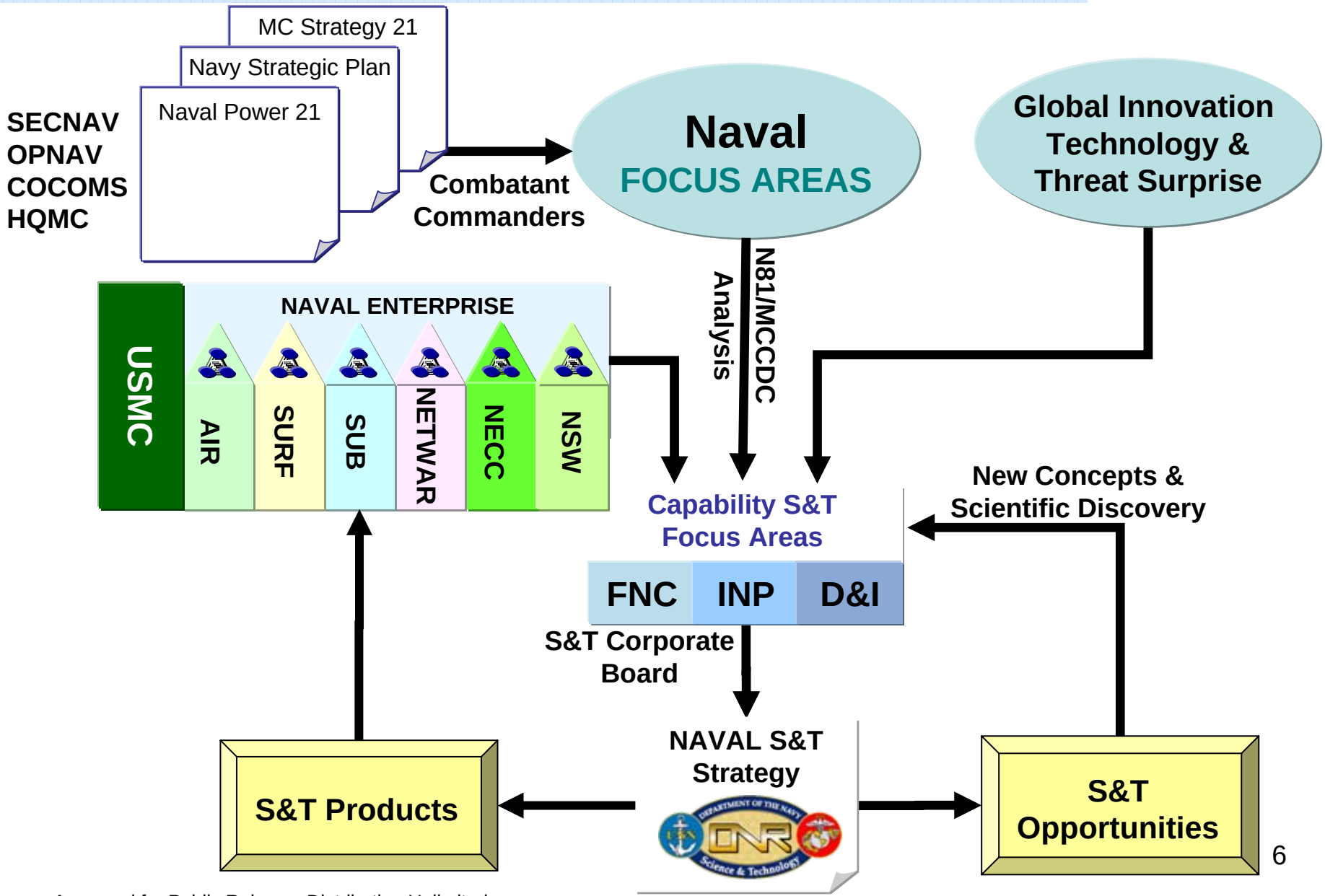
Results of S&T Strategy

Revolutionary Research . . . Relevant Results

Navy and Marine Corps will have:

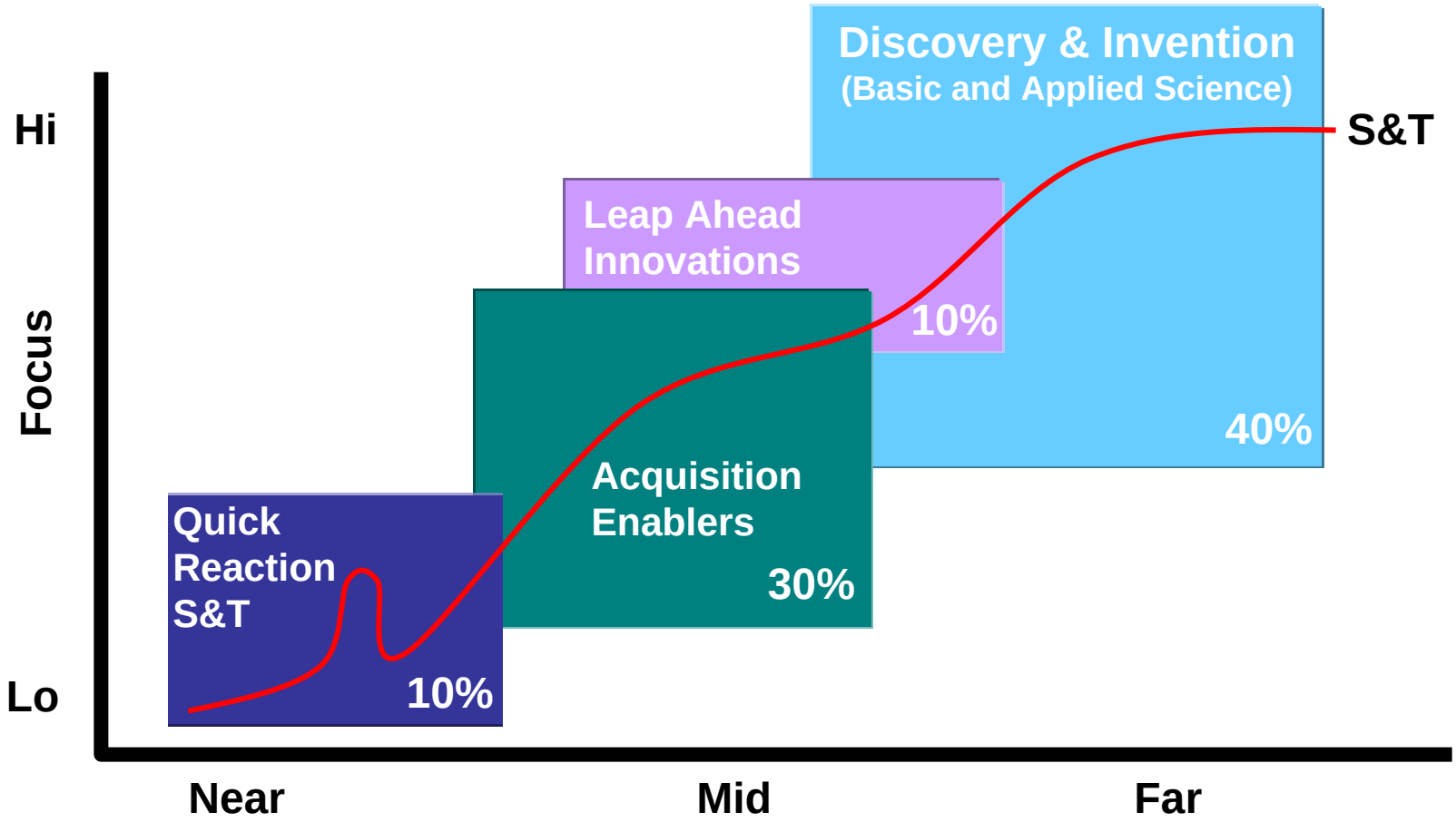
- Domination of the Electro-Magnetic spectrum and cyber space
- Implemented Directed Energy – Fighting at the Speed of Light
- Achieved persistent, distributed surveillance in all domains
- Achieved comprehensive MDA with large vessel stopping and WMD detection for EMIO
- Incorporated affordability into platform design and construction
- Adaptive, wireless communications networks
- Decision tools for Commanders that provide tactical advantage
- Determination of threat intent thru social / cultural understanding
- Lighter, faster, more lethal Marine forces
- Accelerated team training & skill development
- Increased operational effectiveness thru more efficient power/fuels
- Responsive / visible logistics to enable distributed forces
- Greater tactical advantage through superior knowledge / use of operational environments

Naval S&T Strategy Process



DoN S&T Portfolio Balance

Revolutionary Research . . . Relevant Results



S&T has a long-term focus but is responsive to near - term Naval needs

Types of ONR programs

Revolutionary Research . . . Relevant Results

	Discovery and Invention	Future Naval Capability	Direct Fleet Support / Quick Reaction	Innovative Naval Prototype
% of Portfolio	**40**	**30**	**10**	**10**
Focus	**Expanding frontiers of knowledge in areas of naval interest**	**Transitioning mature S&T to acquisition program of record**	**Solving emergent fleet / force needs**	**Demonstrating Leap-ahead technology**
Motivation	**Broad Naval needs and opportunities**	**OPNAV-identified capability gap**	**Fleet-identified need**	**Significant military advantage**
Example	**Ocean Acoustics**	**Improved water jet propulsion for JHSV**	**IED Jammer**	**Electromagnetic Railgun**
Type of Innovation	**Disruptive or sustaining.**	**Sustaining - makes an existing capability better**	**Disruptive or sustaining.**	**Disruptive - makes an existing capability obsolete**
Time frame	**continuing**	**3-5 years**	**1-2 years**	**4-8 years**
Typical TRL entry point	**TRL-0 to TRL 2**	**TRL-3**	**TRL-4 to TRL-5**	**TRL-2 to TRL-3**
Typical TRL end point	**TRL-3 to TRL-4**	**TRL-6**	**TRL-7**	**TRL-6**
Technical Difficulty	**High**	**Medium**	**Medium**	**High**
Operational Integration Complexity	**N/A**	**Usually straightforward**	**Medium**	**High**
Approval Level to start a program	**ONR Department**	**Technology Oversight Group (3-Star)**	**ONR Corporate**	**DON Corporate Board (4-Star)**

Power Projection

Revolutionary Research . . . Relevant Results

Vision: Precise extended range indirect fires, time-critical power on target and control of collateral damage through electromagnetic kinetic projectiles, hypersonic missile propulsion and scalable effects weapons.

Objectives

Future Navy Fires
- Increased fires volume & accuracy
- GPS denial compensation
- Indirect fires to 250 miles from safe offshore locations

Control Collateral Damage
- Scalable effects weapons
- Selectable/directional lethality

Time Critical Strike
- Hardened target/moving target reach & destroy
- Worldwide to meet warfighter requirements

Small Unit Combat Power
- Increased small unit weapon lethality
- Neutralize larger hostile forces

Combat Insensitive Munitions:
- Reduce system sensitivity to sympathetic detonation
- Maintain payload range & lethality

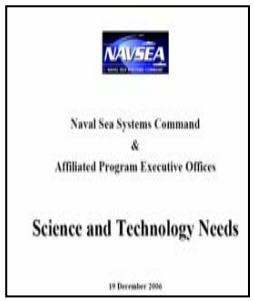
Key Research Topics

Advanced Energetics
Directed Energy
Electromagnetic Guns
High Speed Weapons Technologies
Precision Strike
Undersea Weaponry
ASW Rapid Attack
Mining
Non-Lethal Weapons
Signature Control & Sensors (LO/CLO)
EW Attack
Expeditionary Firepower

Power Projection S&T Needs

Revolutionary Research . . . Relevant Results

Power Projection Needs



Naval Sea Systems Command & Affiliated PEOs

- Science and Technology Needs 19 December 2006
- Surface Community POM08 Investment Guidance

NETWARCOM

- Top 10 Fleet Requirements Sep 2006
- PEO C4I Science and Technology Alignment and Transition CONOPS

  29 Sep 2006

Marine Corps

Science and Technology Strategic Plan
August 2007

Undersea Enterprise (USE)

SCIENCE AND TECHNOLOGY (S&T) PRIORITY TECHNICAL CHALLENGE AREAS OF INTEREST
07 APR 2006

Naval Aviation Enterprise

Science and Technology Strategic Plan
Commander Naval Air Forces
Commanders Naval Air Systems Command
Director, Air Warfare
01 July 2006

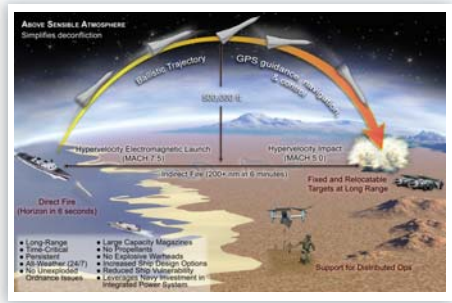
Navy Expeditionary Combat Command

Science and Technology Objectives (STOs)
DRAFT as of 05 June 2007

- **N8F FNC Gaps (PR 09, POM 10)**
- **Communication with N8F, N81, N85, N86, N87, N88 Science Advisors**

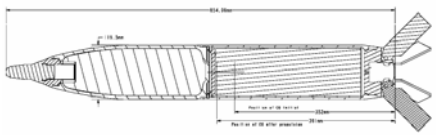
Future Naval Fires

Advanced Gun Barrel



EM Railgun

HyFly



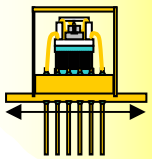
Enhanced Lethality & Range Munition

Increased Fires Volume and Accuracy

Indirect Fires to 250 miles from Safe Offshore Locations

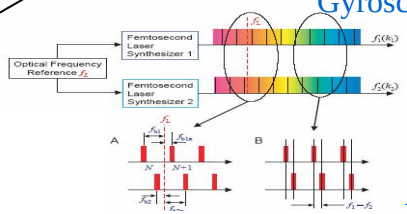
RATTLRS

GPS Denial Compensation



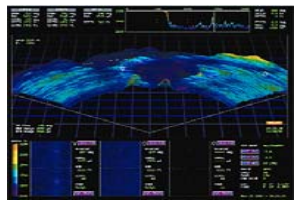
Tactical Grade Gyroscope/Accelerometer

Celestial Navigation System



Optical Frequency Standards

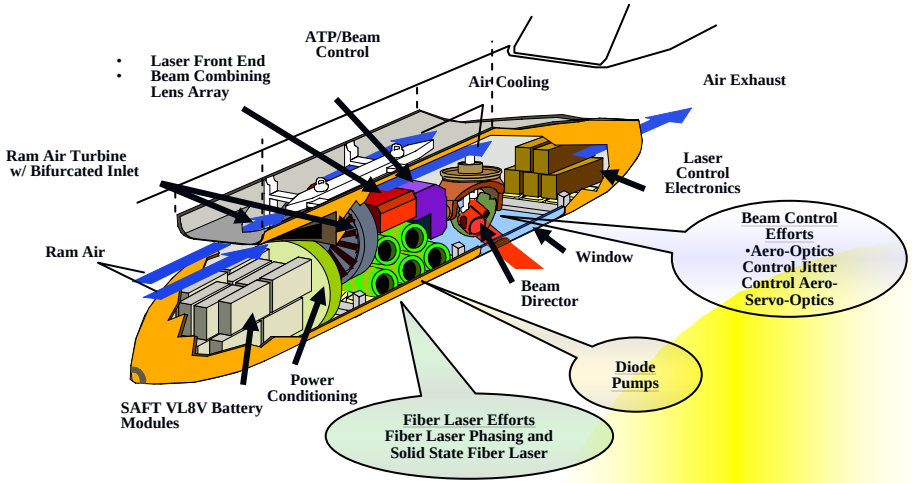
Anti-Jam/Anti-Spoofer System



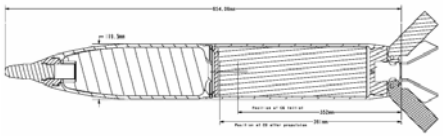
Adaptive Bathymetric Estimator (ABE)

Tactical COTS Rb Atomic Clock

Control Collateral Damage



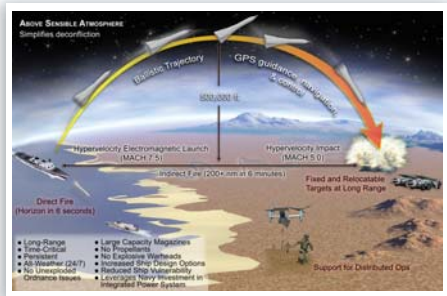
HEL for Tactical Air Applications



Enhanced Lethality & Range Munition

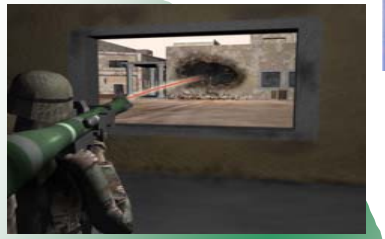
Next Generation Airborne Electronic Attack (AEA) Enabling Capability

Selectable/ Directional Lethality



EM Railgun

MEMS Fuze



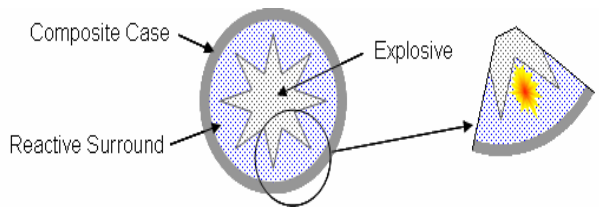
Future Assault Weapon Munition

Scalable Effects Weapons

Modular Scalable Effects Weapon

Advanced Energetic Materials

Future Mortar Munition



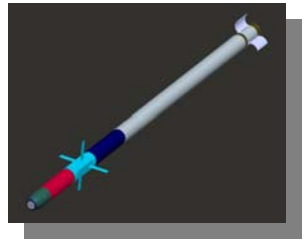
Enhanced Blast/ Scalable Effects Bomb

Time Critical Strike

RATTLRS

Combustion Light Gas Gun

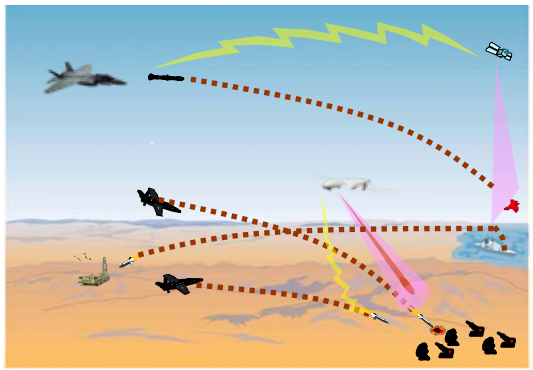
HyFly



Low Cost Imaging Terminal Seeker

Free Electron Laser

Weapon Data Link



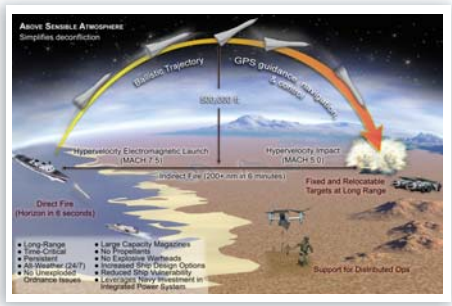
Enhanced Weapons Technologies

Worldwide to meet Warfighter Requirements

Hardened Target/ Moving Target Reach & Destroy

Direct Attack Seeker Head

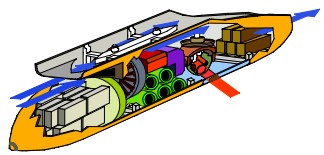
M-VIVID



EM Railgun

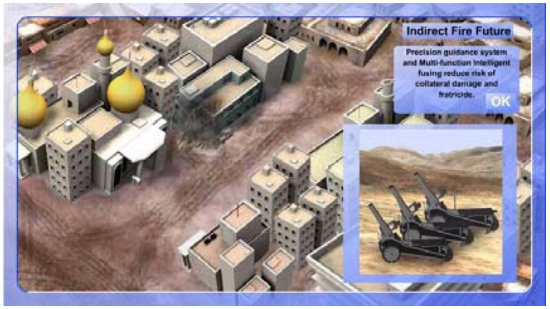
Multi-Mode Sensor Seeker

Advanced Propulsion Concepts (Pulse Detonation Engine shown)



HEL for Tactical Air Applications

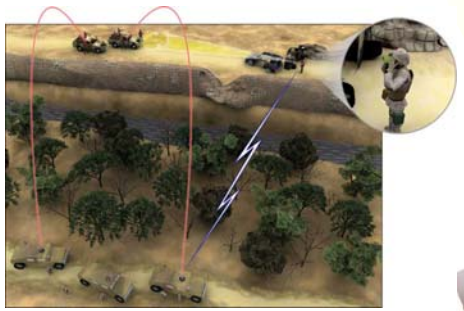
Small Unit Combat Power



Modular Scalable Effects Weapons

Enhanced Lethality & Range Munition

Future Assault Weapon Munition



DO Precision Engagement

Advanced Energetics Materials

Neutralize Larger Hostile Forces

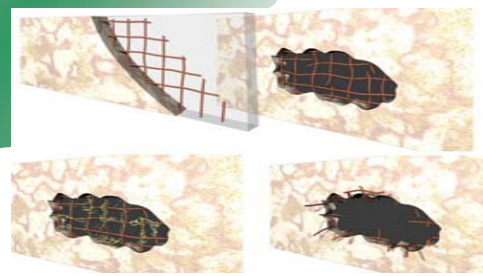
Increased Small Unit Weapon Lethality

MEMS Fuze

Energetics D&I

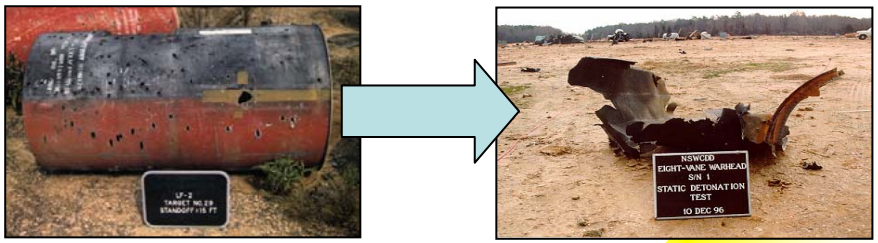
Future Mortar Munition

Assault Weapon Propulsion

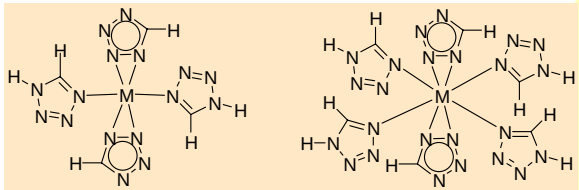


Tactical Urban Breaching Munition

Combat Insensitive Munitions

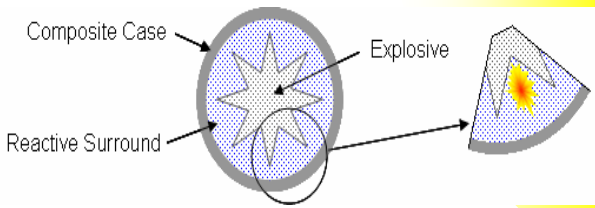


Reactive Materials



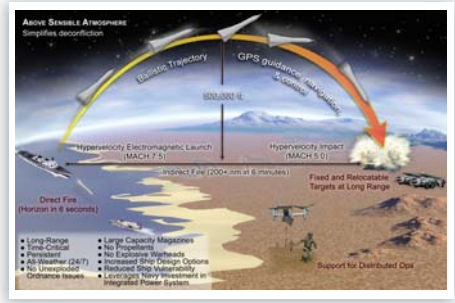
Emerging Energetic Materials

Maintain Payload Range and Lethality

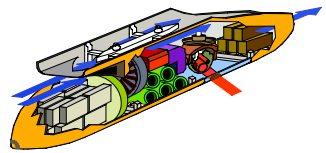


Enhanced Blast/ Scalable Effects Bomb

Advanced Energetics Materials



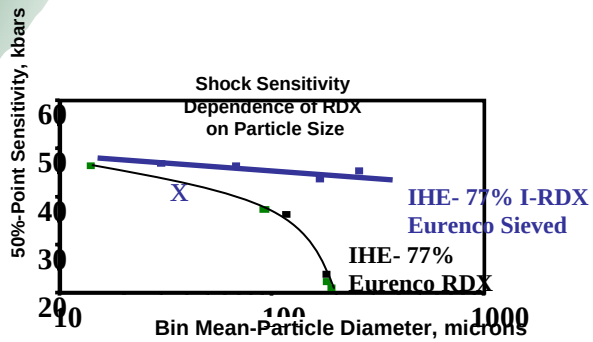
EM Railgun



HEL for Tactical Air Applications

Reduce System Sensitivity to Sympathetic Detonations

Free Electron Laser



CSIM Sensitivity

Naval Precision Strike Futures

Future Options

Tomahawk

Harpoon

Today's Cruise Missiles

1.0 3.0 5.0 7.0 Speed of Light

MACH