



Navy Warfare Development Command



Agenda

- **NWDC**
 - **Command Background**
 - **Concepts & Experimentation**



NWDC Mission

- Develop Navy operational and warfighting concepts.
- Plan and coordinate experiments based upon concepts.
- Represent Navy with Joint and Service Labs and tactical development commands.
- Primary POC for all naval and joint/combined doctrine and experimentation







NWDC Organization

NAVY WARFARE DEVELOPMENT COMMAND



**Commander
NWDC**

**Concept
Development**

Officers: 8
GS: 2

**Maritime Battle
Center**

Officers: 12
GS: 2

**Doctrine
Department**

Officers: 16
GS: 9

**Operations
Department**

Officers: 3
GS: 2

**NWDC Det.
San Diego**

Officers: 3
GS: 0

**NWDC Det.
Norfolk**

Officers: 3
GS: 2

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Innovation and Concepts

Vision

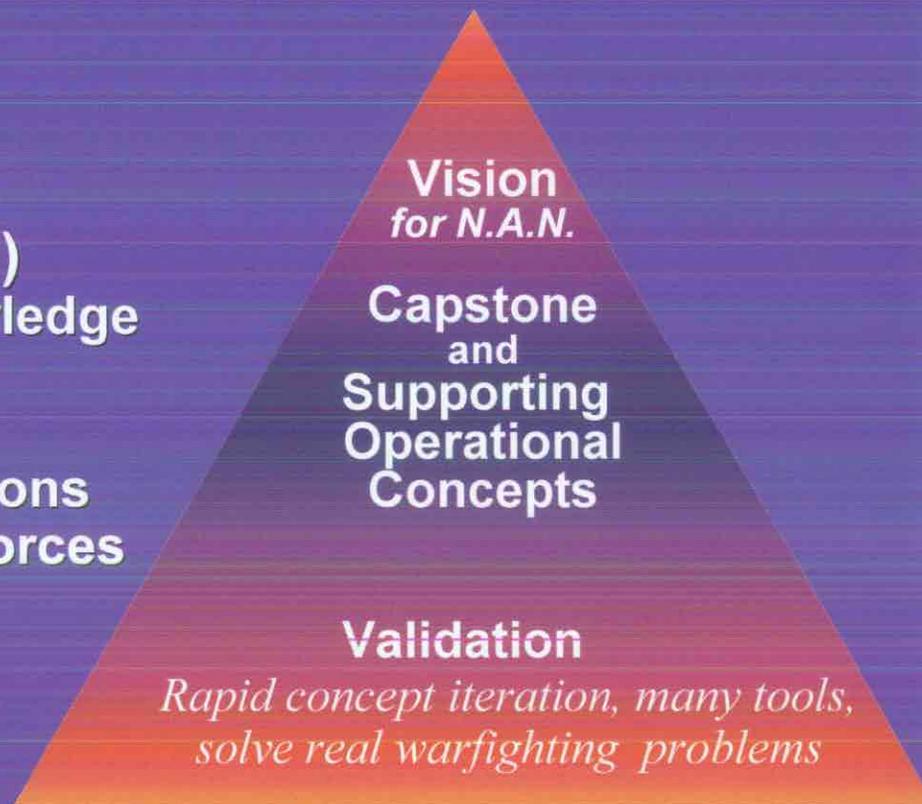
- Navy Vision
- ...FTS, F...FTS
- The Maritime Concept

Capstone Concept (NCO)

- Information and Knowledge Advantage
- Assured Access
- Effects-Based Operations
- Forward Sea-Based Forces

Validation

- Global Wargame
- M&S/Analysis
- Fleet Interaction
- FBEs



***Innovation is a Navy Warfighting Skill and
Experiments are Exercises in Innovation***



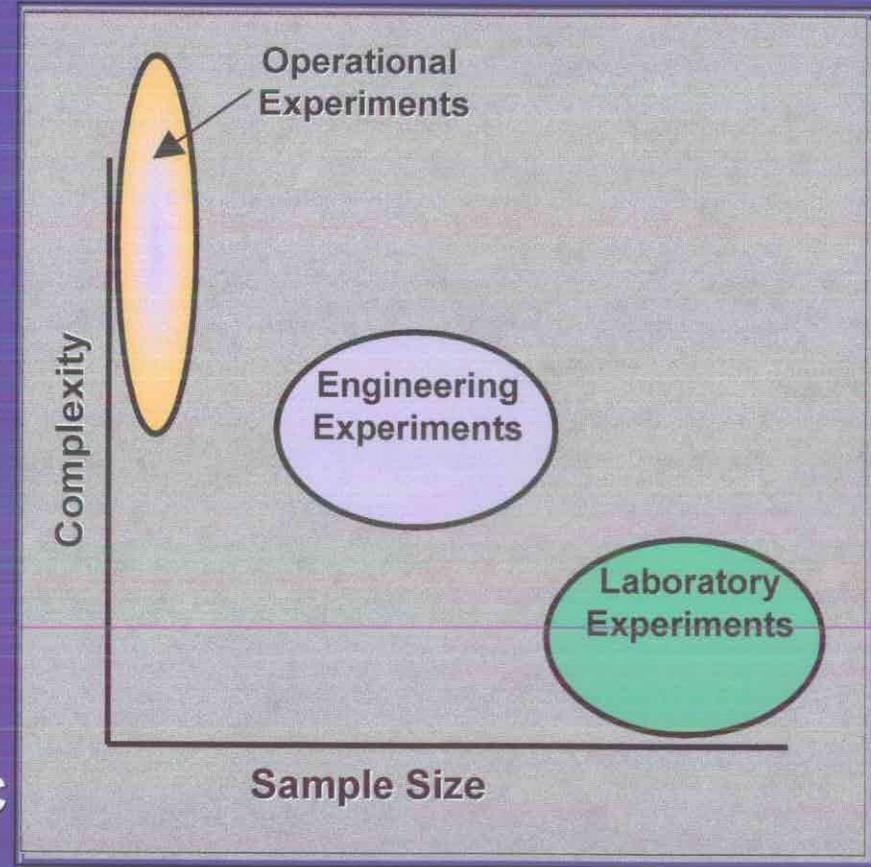
Approach to Experimentation

- Limited Objective Experiments (LOEs)
- War Games
 - Navy Title X - Global
- Fleet Battle Experiments / Joint Experimentation
 - Rapid Experimentation Cycle
 - Organizational and Process Agility
 - Learn to experiment
 - Rapidly mature concepts
 - Iterative Experiments
 - Innovation continuum
 - Experiments not demonstrations
 - Freedom to fail
 - Partner with Numbered Fleets
 - Forward as well as CONUS
 - Inherently Joint and Combined (Millennium Challenge Series)



Field Experiments

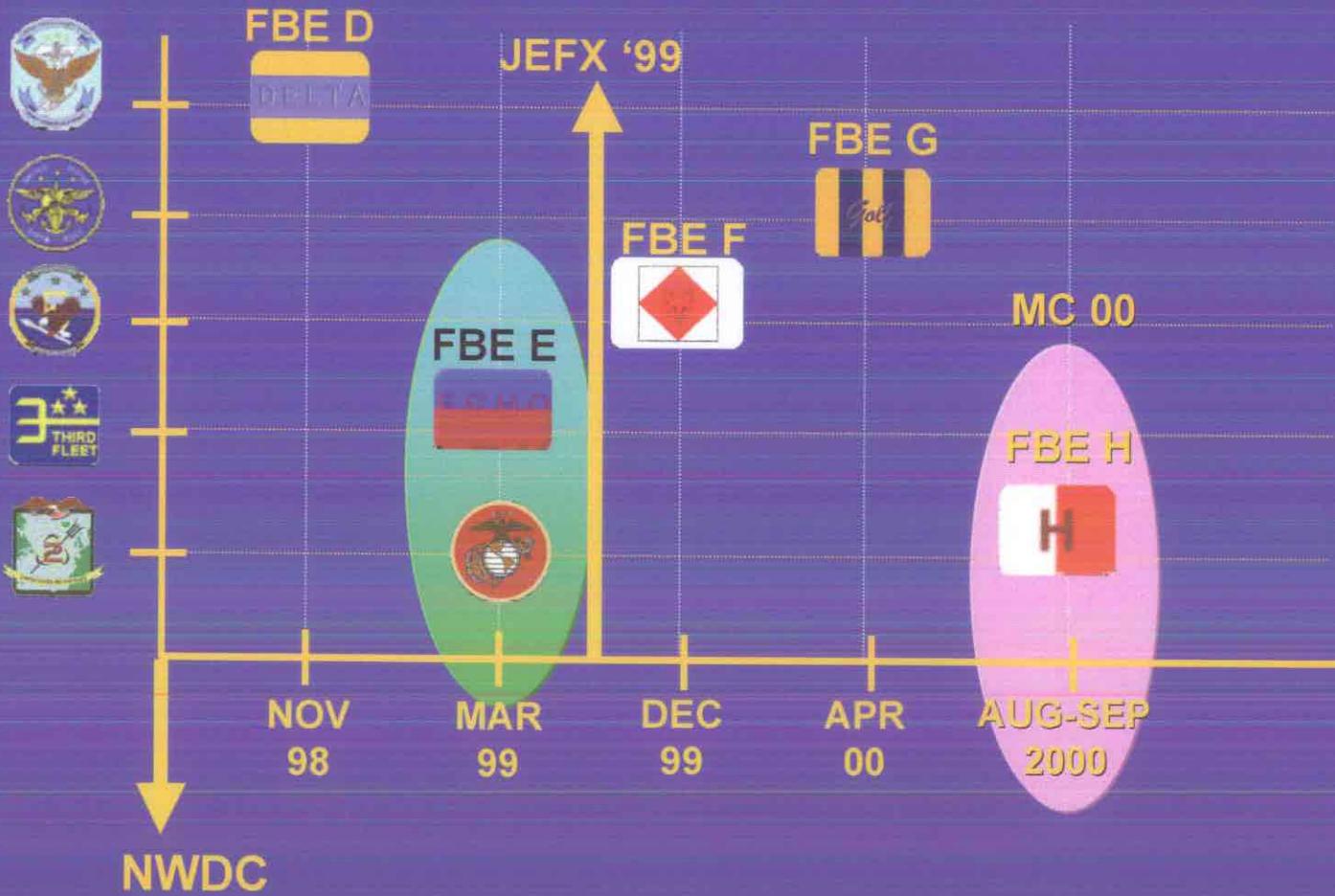
- *Concepts based experimentation*
- *Live Forces, M&S, **Surrogates**, Emulations*
- *Venue for Prototype Development*
- *Analysis of Results*
 - MOPs / MOEs
- *Timeline*
 - CDC/TDC/IPC/MPC/FPC





Completed Fleet Battle Experiments

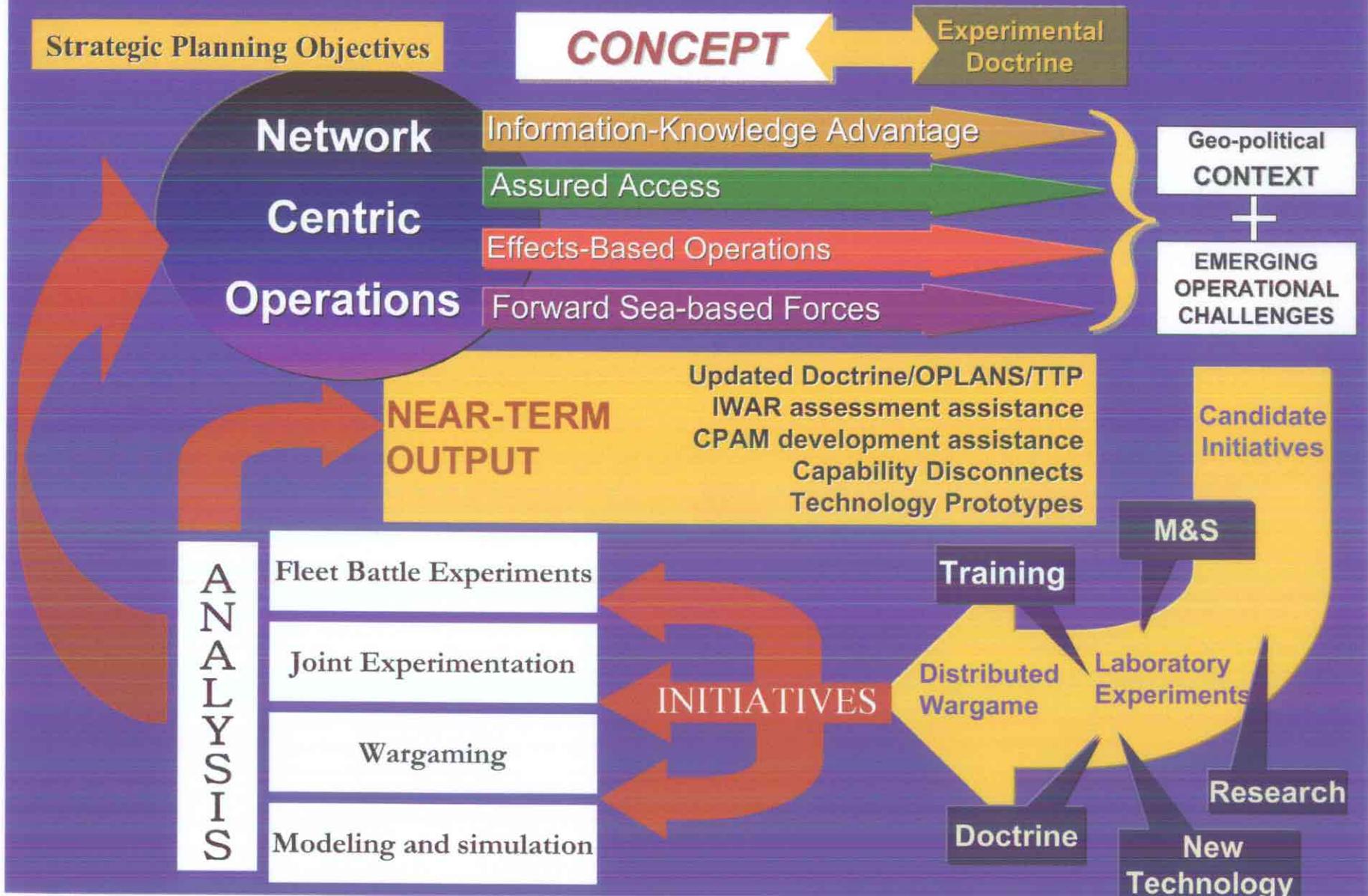
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NWC GLOBAL WARGAME SERIES

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NWDC Innovation Process





Tenets of NCO

- Knowledge of Adversary
- Pervasive Sensor Operations
- Commander's Intent
- Decentralized Execution
- Self-synchronization of Forces
- Combined Arms including Sensors
- Effects-Based Operations
- Hardware Backplane for Networking

“Naval Forces have no choice but to go in this direction because of the threat and the opportunity. US is technology’s leader and NCO is Navy’s chance to get further ahead, decisively, for a long time.”

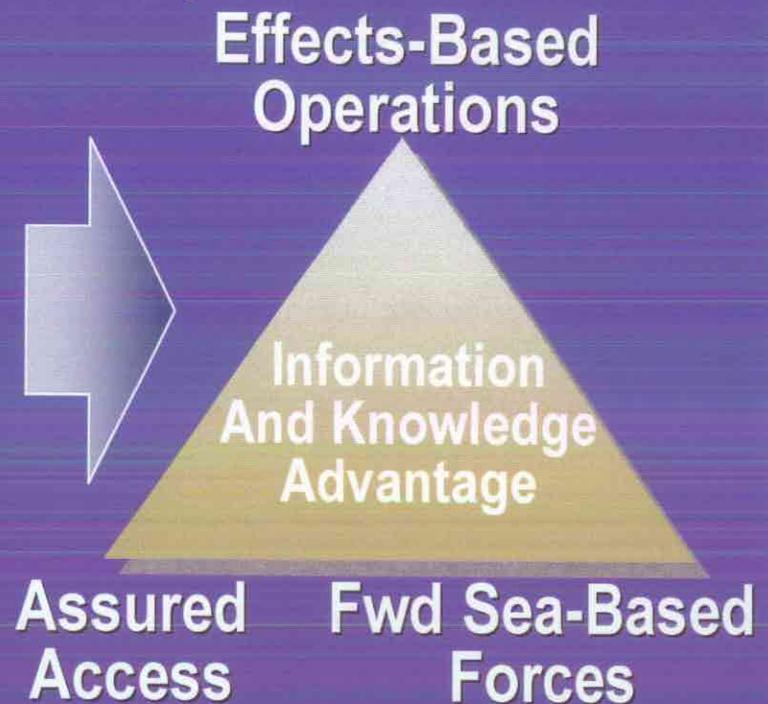
Naval Studies Board



Network Centric Operations

Warfare deriving power from robust rapid networking of well-informed geographically dispersed forces

- Warfare Not Hardware
- Networked Warfighters Not Just Nets
- Real-Time Shared Knowledge
- Dispersed Forces/ Concentrated, High Volume Effects
- Integrates Surveillance, Strike and Maneuver



***Dominate Tempo and Foreclose Enemy Options
Agile, Anticipatory Operations Using High Rates of
Change to Shock the Enemy and Lock Out His Options***



Information and Knowledge Advantage

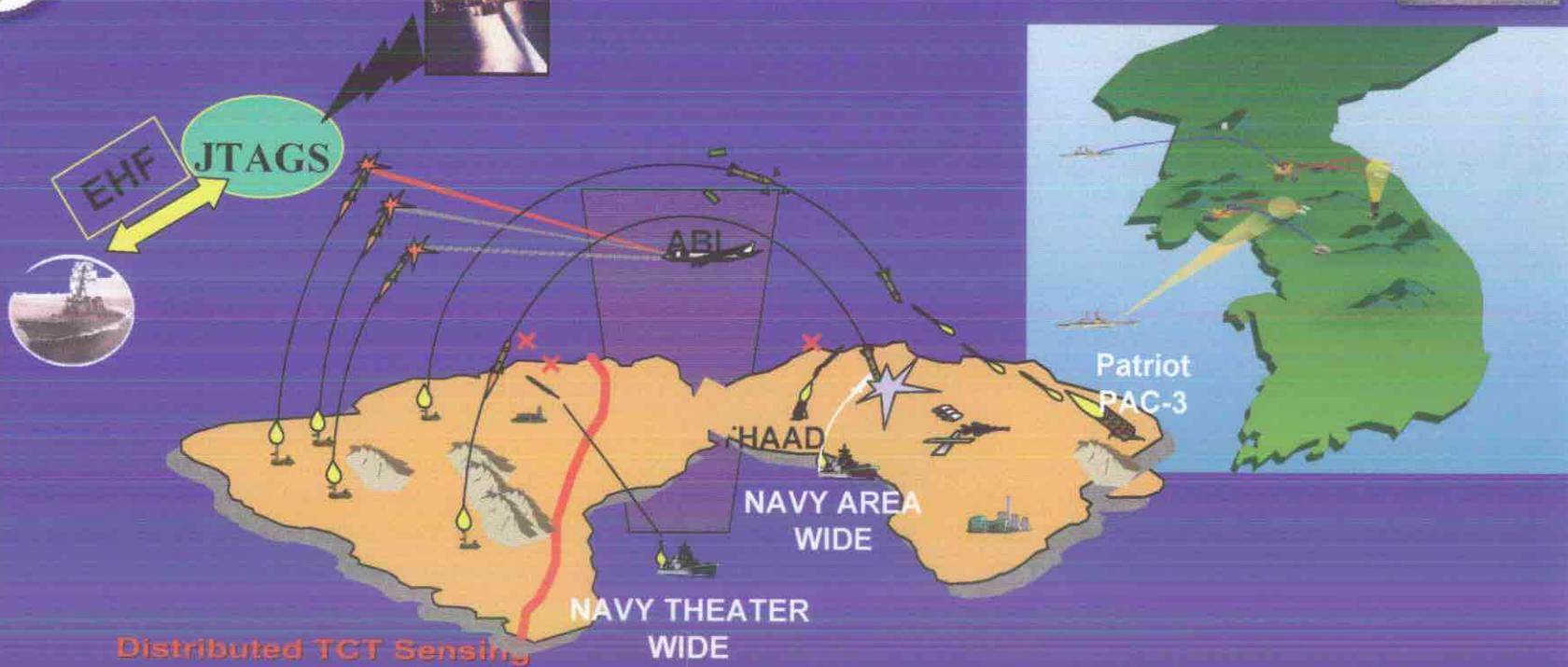
- **Based on**
 - Historical regional knowledge
 - *Real-time battlespace awareness*
- **Create a competitive advantage**
 - Enable increased speed of effects through
 - Shared awareness of battlespace
 - Shared knowledge of commander's intent
 - Minimize adversary's information

IKA: An Essential Prerequisite for Assured Access and Effects Based Operations

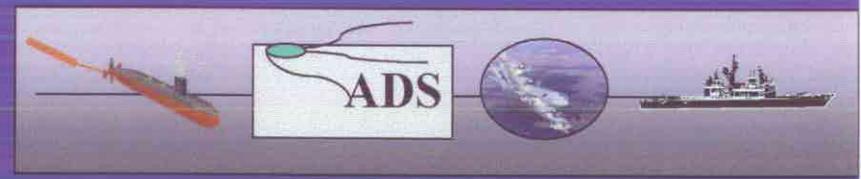
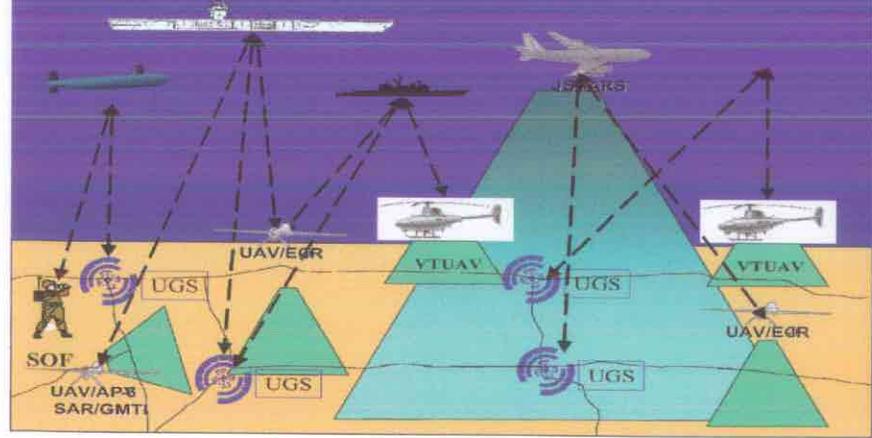
First Supporting Concept



NAVY WARFARE DEVELOPMENT COMMAND



Distributed TCT Sensing



IKA Sensors Network

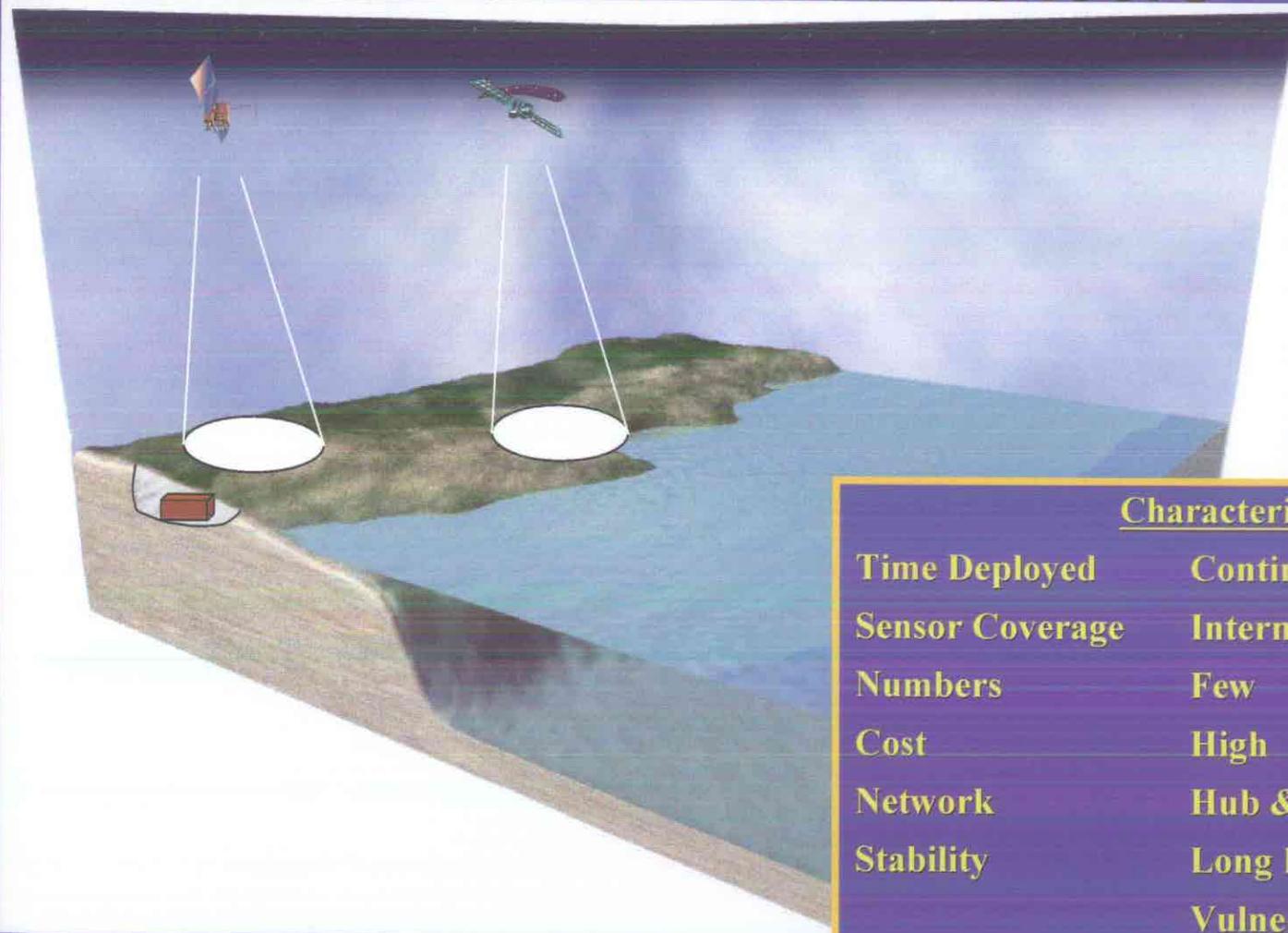


Building Battlespace Awareness

NAVY WARFARE DEVELOPMENT COMMAND



Space-Based Sensors



Characteristics

Time Deployed	Continuous
Sensor Coverage	Intermittent
Numbers	Few
Cost	High
Network	Hub & Spoke
Stability	Long Endurance
	Vulnerable to Jamming & Dazzling
	Limited by CCD

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Building Battlespace Awareness

NAVY WARFARE DEVELOPMENT COMMAND

Large Platform Based Sensors



Characteristics

Time Deployed	When Committed
Sensor Coverage	Intermittent
Numbers	Limited (10's)
Cost	High
Network	Hub & Spoke
Stability	Hours to Weeks
	Platforms Vulnerable
	Limited by CCD

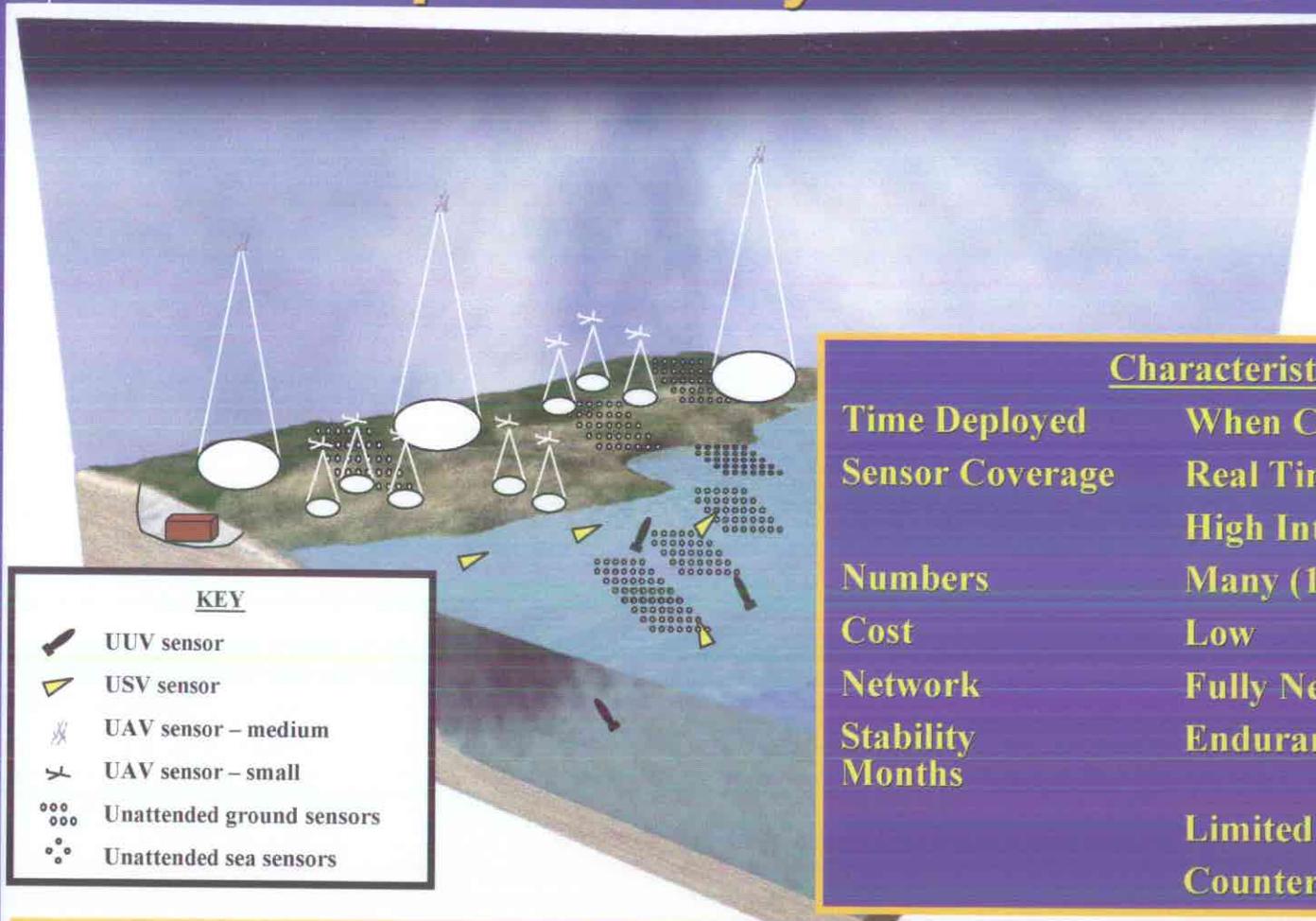


Building Battlespace Awareness

NAVY WARFARE DEVELOPMENT COMMAND



Expeditionary Sensor Grid



Characteristics

Time Deployed	When Committed
Sensor Coverage	Real Time
Numbers	High Interest Areas
Cost	Many (100's – 1,000's)
Network	Low
Stability	Fully Netted (FORCEnet)
Months	Endurance – Hours to
	Limited Vulnerable
	Counters CCD

Get in close to counter stealth, mobility, cover, concealment, and deception
Provide sensors controlled by tactical warfighters.



The Expeditionary Sensor Grid

- **Purpose**
 - Provide real-time battlespace awareness – especially overland and under the sea
 - Get in close to defeat Stealth, Mobility, Cover, Concealment and Deception
 - Integrate information from national and theater sensors
 - Provide sensors controlled by tactical warfighters



Building an ESG Requires:

- **Sensor and network design**
 - Identification of the phenomena of interest
 - Sensors to exploit phenomena
 - **Network transport layer for 100's – 1,000's of sensors**
- **Integration of space-based, platform-based, and expeditionary sensors and networks**
 - **Backward compatibility with stand-alone and proprietary networks and protocols**
 - Integration of hub & spoke architectures with FORCEnet to achieve network centric operations
- **Balancing investment: networks and sensors**
 - Sensor coverage of phenomena in five battlespace domains
 - **Network stability and robustness**
 - Moving situational awareness to actionable knowledge



Massive Sensor Grid May Reshape U.S. Navy Tactics

By Robert Holzer, Defense News Staff Writer

WASHINGTON — U.S. Navy officials plan to begin experimenting this summer with the idea of dispersing thousands of networked sensors across land, sea and air. The experiment could dramatically alter the types of naval forces required for future operations, officials say.

Called the Expeditionary Sensor Grid (ESG), the nascent concept has been formulated during the last year at the Naval Warfare Development Command, Newport, R.I., which is charged with investigating future approaches to naval warfare.

Under the concept, as many as 10,000 sensors, ranging from unmanned aerial vehicles to unattended underwater weapon canisters, could be distributed across a large area to provide military operations with enormous amounts of data, Navy officials said.

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Defense News
May 14, 2001
Pg. 4



Assured Access: Entry Fee for Power Projection

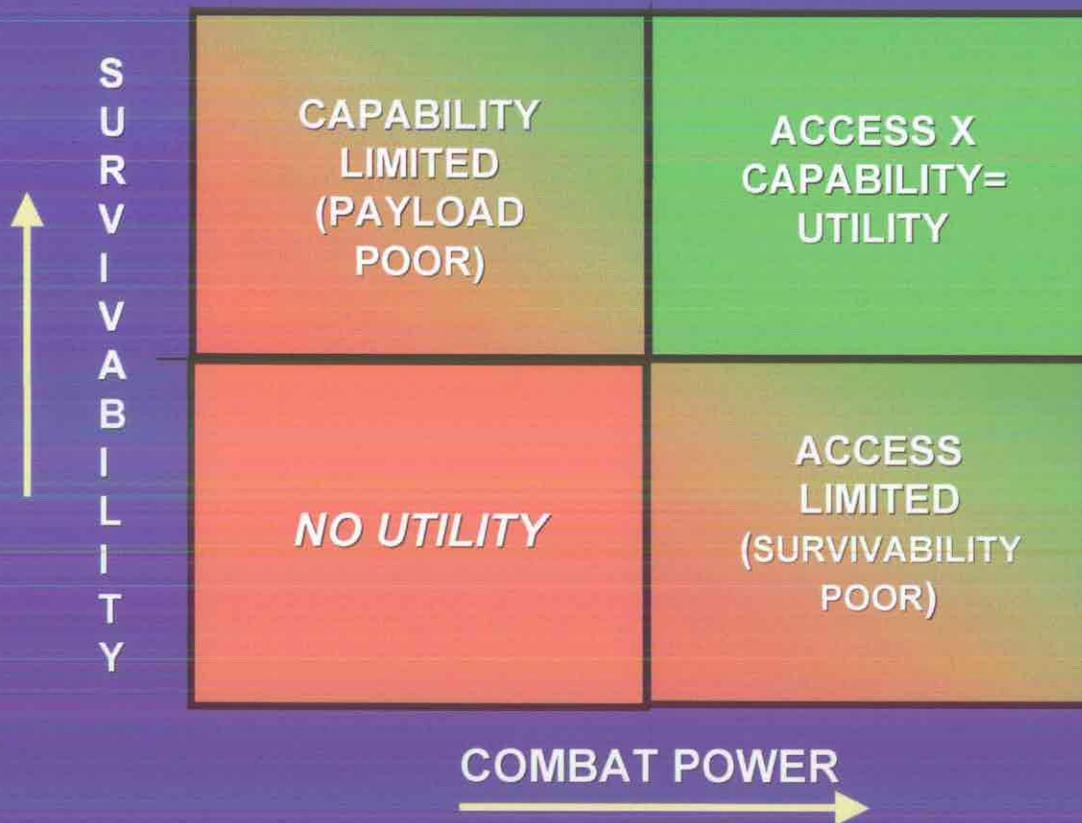
- FUTURE ENVIRONMENT
 - Sophisticated Systems
 - Overlapping threats
- EXPANSION OF CONTESTED LITTORALS
- DIMENSIONS OF WAR
 - Traditional
 - Space
 - Cyberspace
- TACTICAL STABILITY





Assured Access

TACTICAL STABILITY

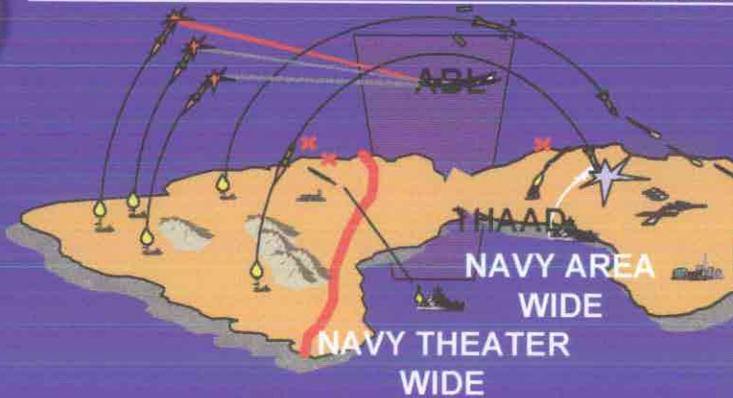


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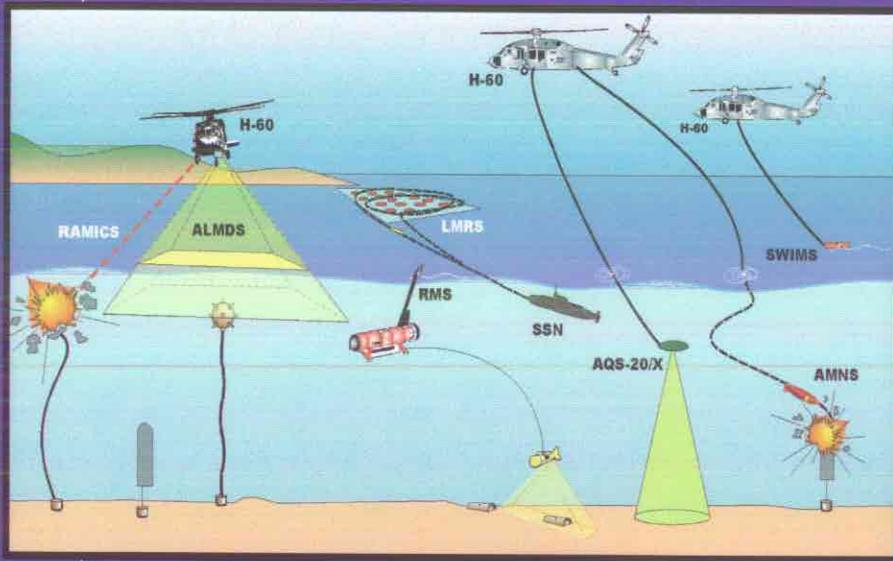
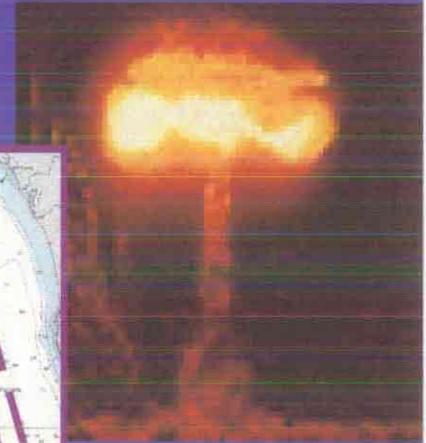
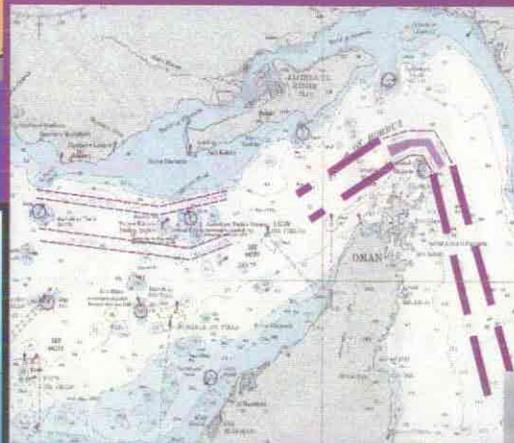
TACTICAL UTILITY = ACCESS X CAPABILITY

Second Supporting Concept

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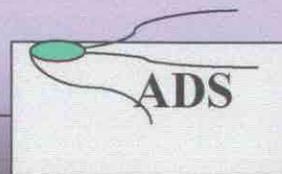
Patriot
PAC-3



Assured Access



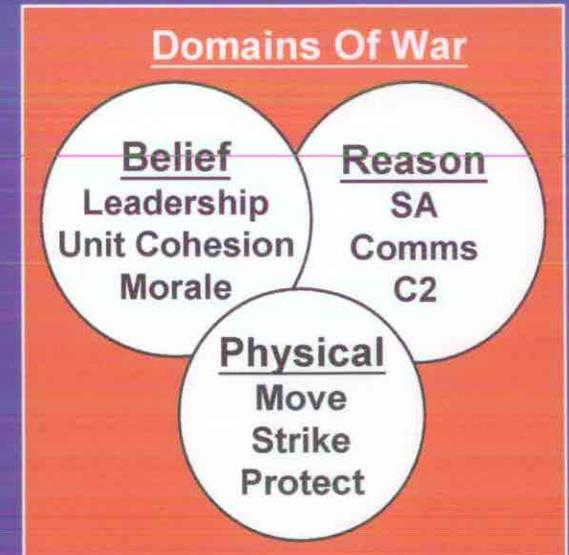
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Effects Based Operations

- **Balanced Across Domains of War**
- **Enabled by Foundation of Information**
 - Regional + Real Time
 - Commander's Intent
- **Network Centric Combined Arms**
 - All Sensors and Weapons
 - All Domains
- **What's New in EBO?** 
 - Better Knowledge
 - Regional?
 - Operational/Tactical (Nodal Analysis)
 - Real-Time Shared Awareness
 - More "Effects" Options
 - New BDA Techniques/MOEs





Enabling Effects Based Operations - Future Naval Fires

