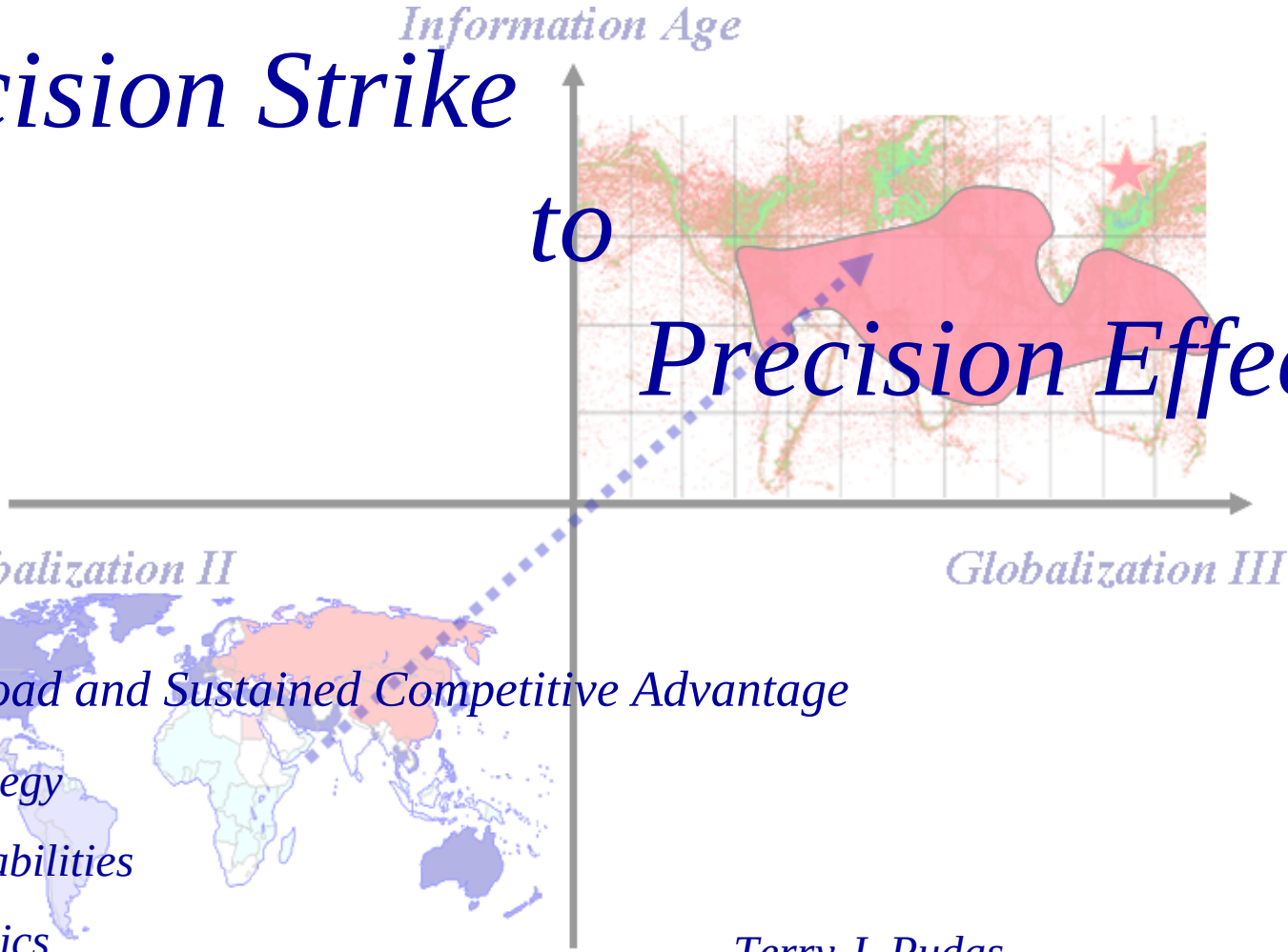
Transforming National Security

Precision Strike

to

Precision Effects



Vision: Broad and Sustained Competitive Advantage

- *Strategy*
- *Capabilities*
- *Metrics*

Terry J. Pudas
Acting Director, Force Transformation
25 January, 2006

Transforming Defense

…The Concept

Elements of Transformation

☑ Continuing process

☑ Creating/anticipating the future

☑ Co-evolution of concepts, processes, organizations, and technology

☑ New competitive areas/competencies;revalued attributes

☑ Fundamental shifts in underlying principles

☑ New sources of power

☑ Culture - attitudes, values, beliefs

- *New Strategic Context*
- *Broadened Threat Context*
- *Technological Threats Facilitated by Falling Barriers to Competition*

"The ultimate competitive advantage lies in an organization's ability to learn and rapidly transform that learning into action."

Jack Welsh

Transforming Defense

…Compelling Need

- New strategic context
  - *New Theory of War based on information age principles and phenomena*
  - *New relationship between operations abroad and homeland security*
  - *New concept/sense of security in the American citizen*
- Broadened threat context
  - *State/Non-State*
  - *Symmetric/Asymmetric*
  - *Traditional/Unrestricted*
- New technological threats facilitated by the falling barriers to competitive entry
  - *Immediate accessibility to highly capable low cost IT*
  - *Opens key operational domains to competition: space, sea, cyberspace*

To the extent we do not transform, we are at risk

Transforming Defense

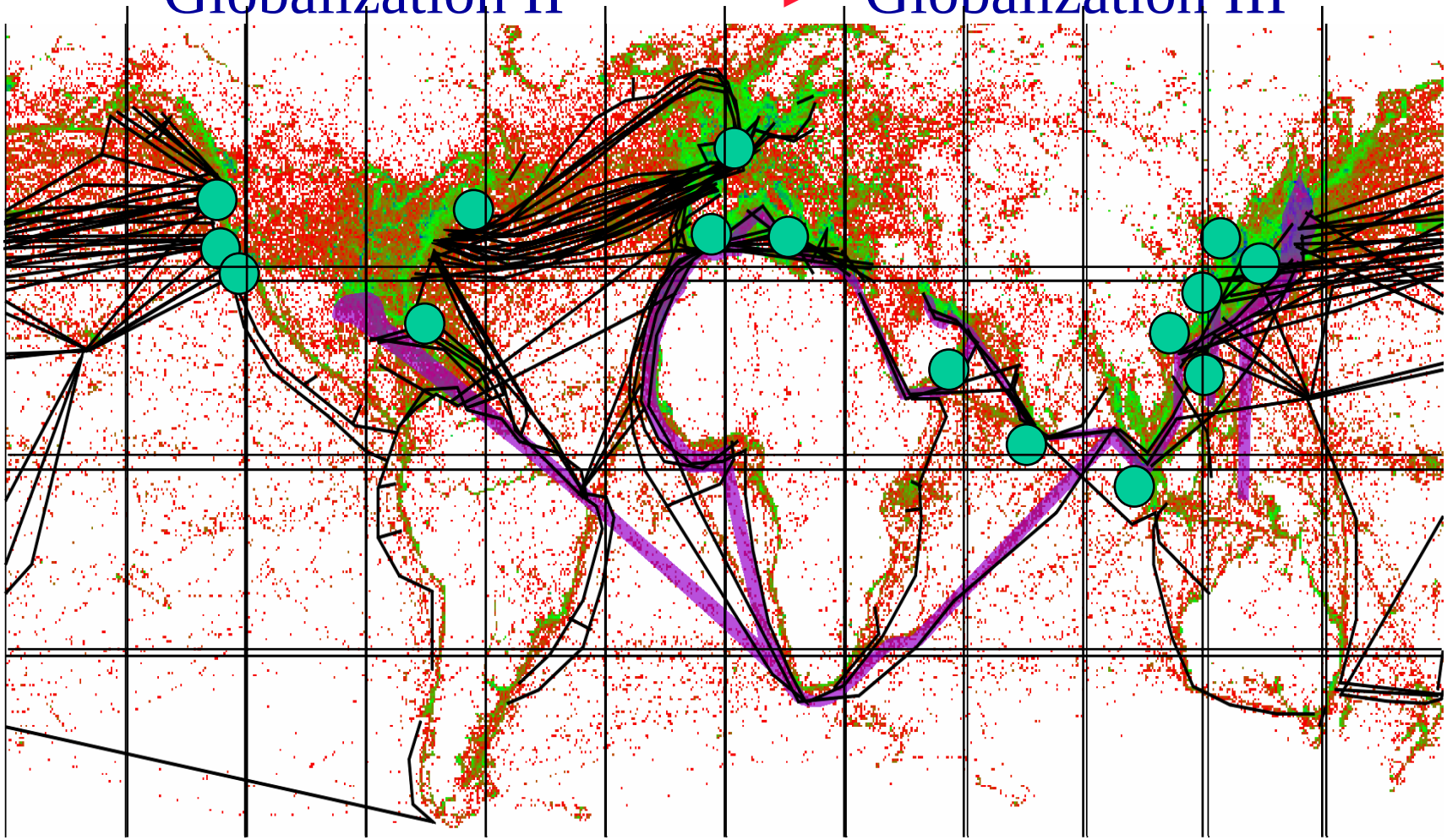
…Elements of Strategy

- Transform from Industrial Age to the Information Age
  - *Implement Network Centric Operations*
- Ensure sustained competitive advantage
  - *Assure Allies*
  - *Dissuade competitive entry*
  - *Underwrite deterrence*
  - *Implement countervailing strategies*
- Broaden the capabilities base
  - *Operational, Technical, Industrial*
  - *Create new competitive areas*
  - *Revalue competitive attributes for the information age*
  - *Decrease capabilities cycle time*
- Leverage advantages and opportunities
  - *Manage the devolution of "sunset" capabilities and processes*

Achieve Speed and Agility vice Optimization

Global Trends

Globalization II → Globalization III



Industrial Age → Information Age

Trends in Security Competition

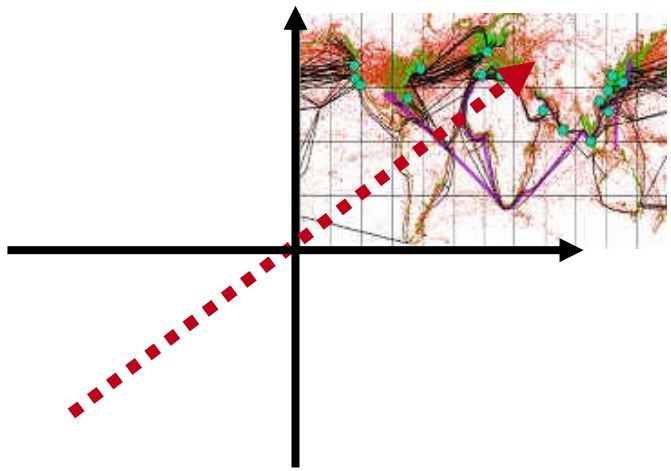
Information Age

- Short Cycle Time
- Mass Customization
- Adaptive Planning
- Interdependence

Globalization II

(1947 – 199X)

- Developed Rules
- Mature Markets
- Narrowing Customer Base
- Security = Defense



Globalization III

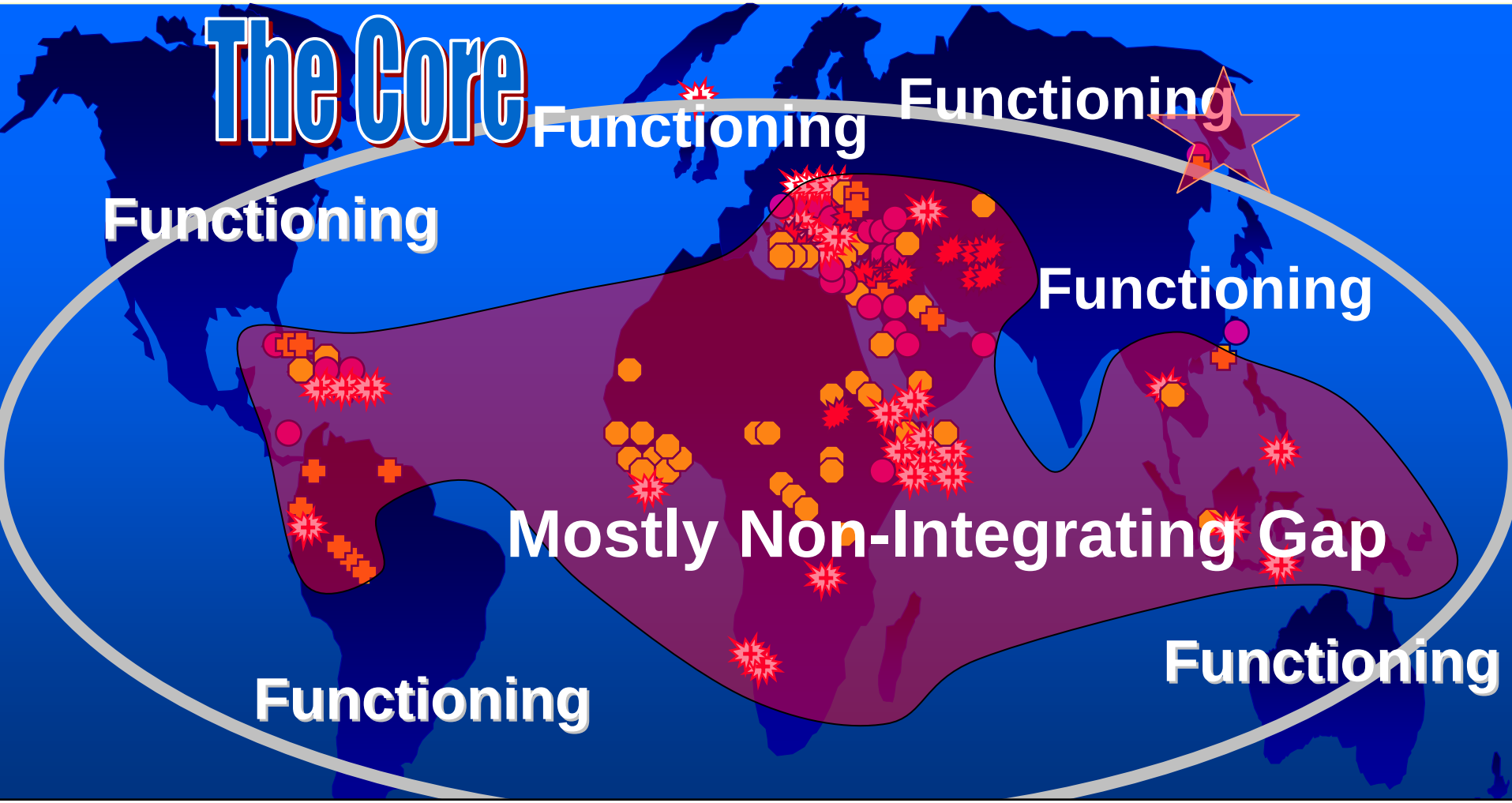
(199X – 20XX)

- Emerging Rules
- Market Opportunities
- New Customer Base Emerging
- Security = All Else + Defense

Industrial Age

- Long Cycle Time
- Mass Production
- Deliberate Planning
- Tortured Interoperability

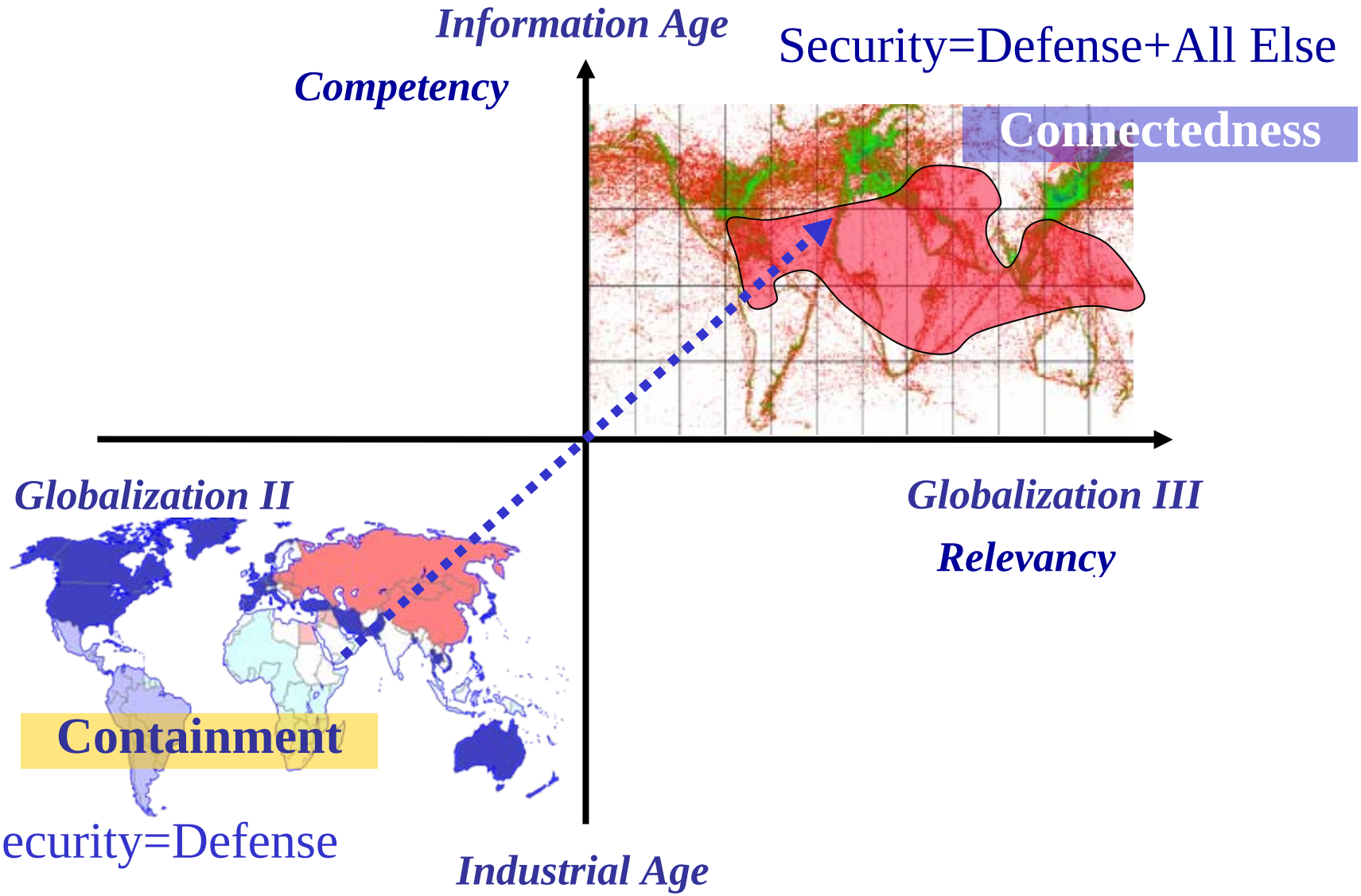
Globalization III



U.S. Military Responses to Situations, 1990-2002

Evac's | Peace/ Relief | Contingency Positioning | Show of Force | Combat

Shifting Strategic Imperatives



Security Environment

… Four Challenges

Irregular

Those seeking to erode American influence and power by employing unconventional or irregular methods

Catastrophic

Those seeking to paralyze American leadership & power by employing WMD or WMD-like effects in unwarned attacks on symbolic, critical or other high-value targets

Traditional

Those seeking to challenge American power by instigating traditional military operations with legacy and advanced military capabilities

Disruptive

Those seeking to usurp American power and influence by acquiring breakthrough capabilities

No hard boundaries distinguishing one category from another

Capabilities Balance

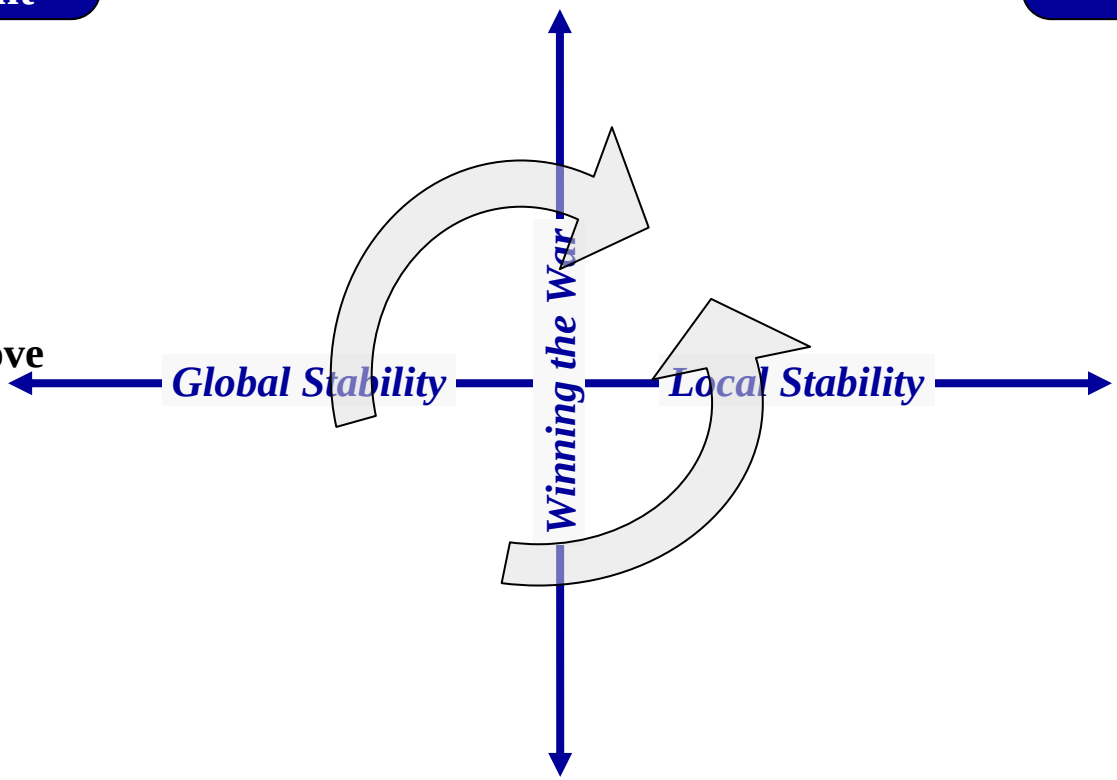
…Competent and Relevant

Domain of Cooperative Engagement

Winning / Maintaining the Peace

All Sources of Power

Domain of Political Victory



Strategic Advantage:

The Commons

High Seas & Air Above

Space

Cyberspace

Intervention:

Decisive Operations

Land

Littorals

Low Altitude

Domain of Strategic Primacy

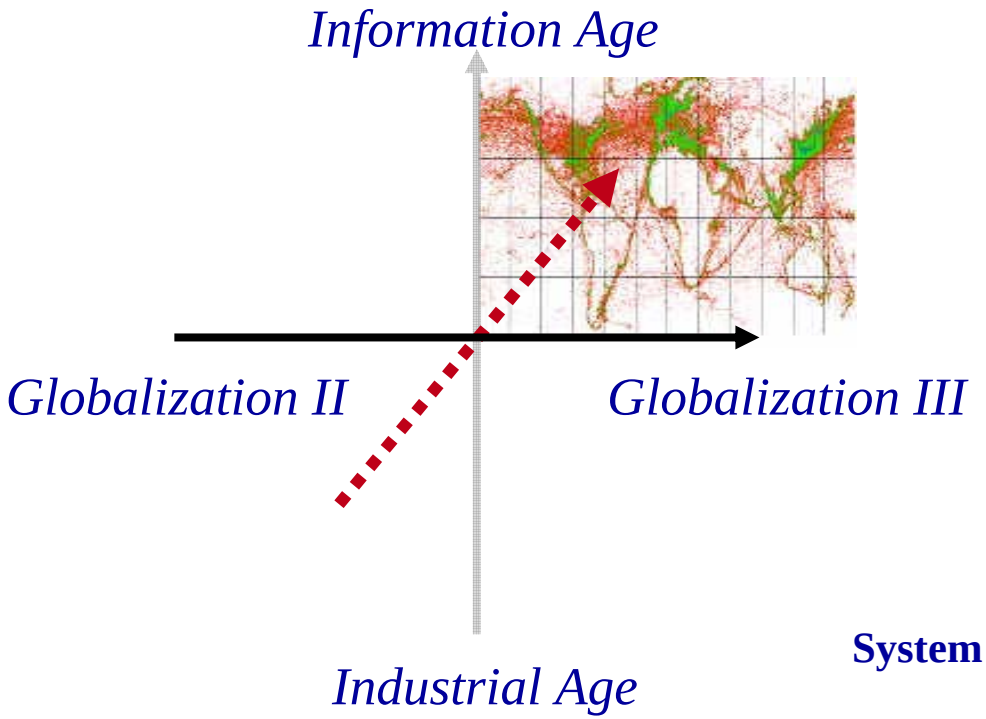
Winning the Battle / Combat

Combat Power

Domain of Military Victory

Global Trends…Threats

…Strategic Response



Strategic Capabilities:

- *More preventative - less punitive*
- *Achieve unambiguous warning earlier*
- *More Special Operations like characteristics*
- *An intel / surveillance-based force*
- *Interoperability/interdependence*
- *Coping with Systems Perturbations*

System	**----- [Great Power War?] -----**			
State	**Political Ideology**	**Hated Dictator**	**Hated Dictator w/Nukes**	**Nuclear Nationalists**
Individual	**Narco-terrorists**	**Regional Terrorists**	**International Terrorists**	**SEI***

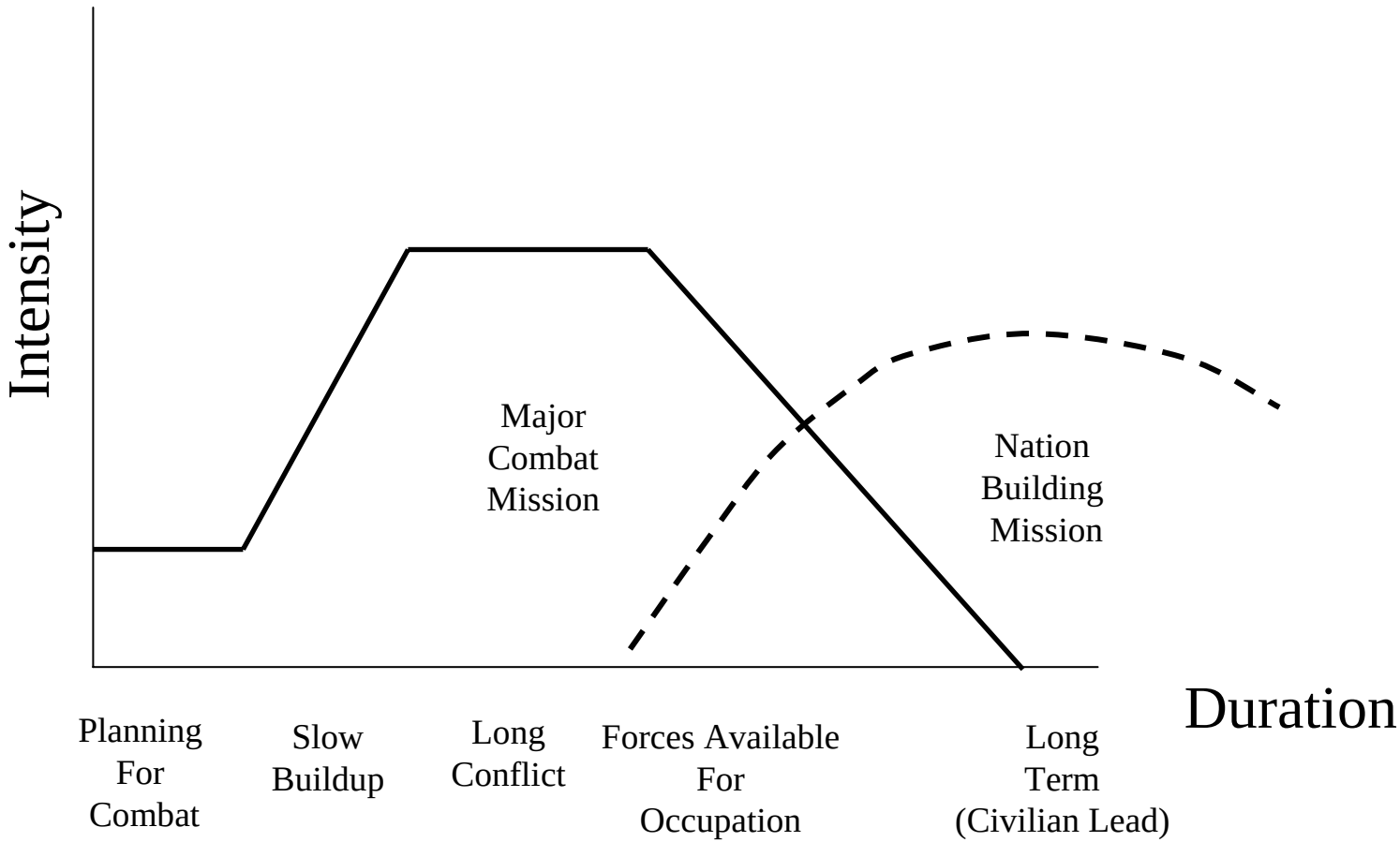
*** Super-Empowered Individual**

Top Level Issues

…Culture: Attitudes, Values, Beliefs

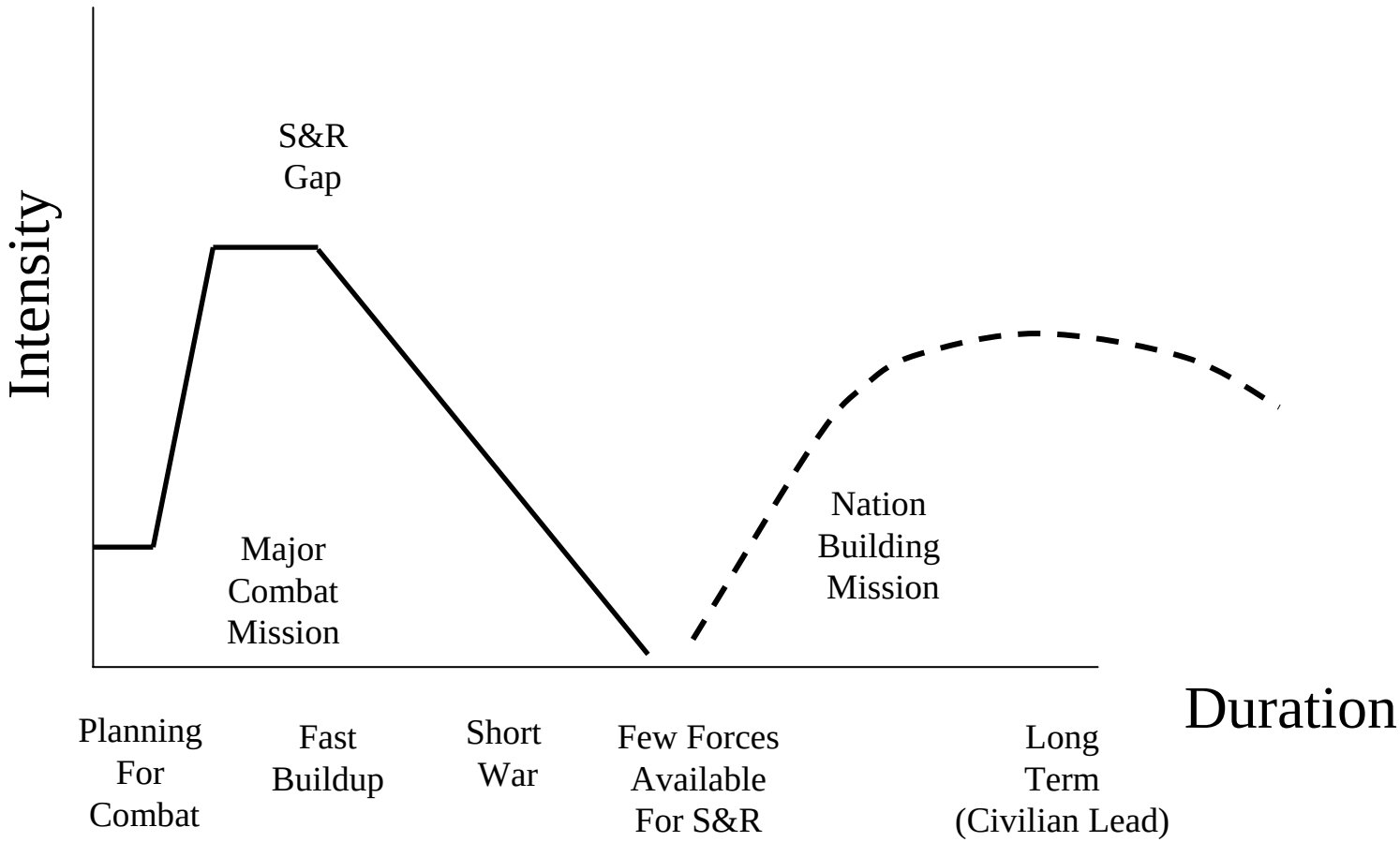
The Stabilization Mission Gap

. . . Traditional Model



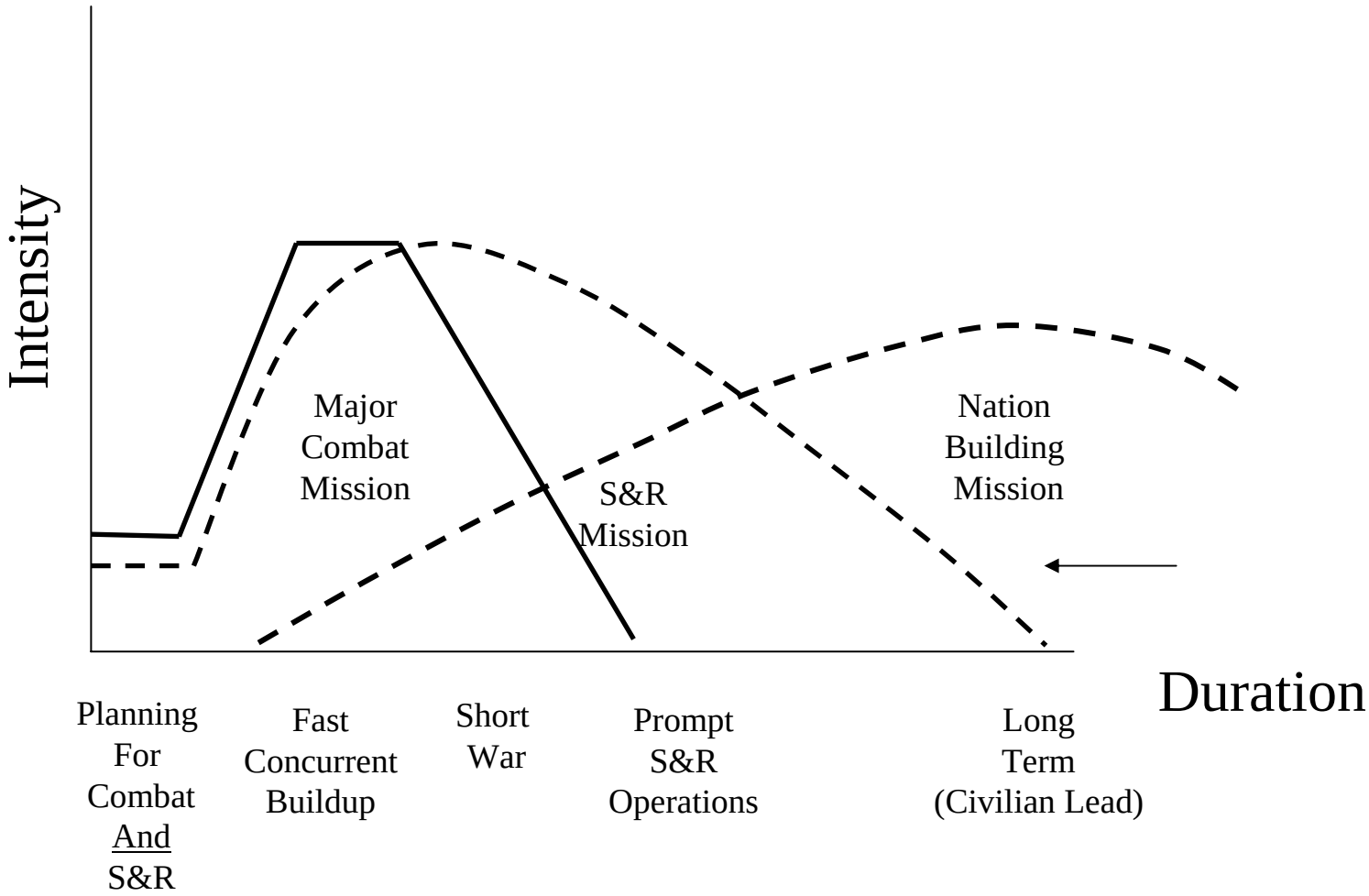
The Stabilization Mission Gap

. . .New Challenges



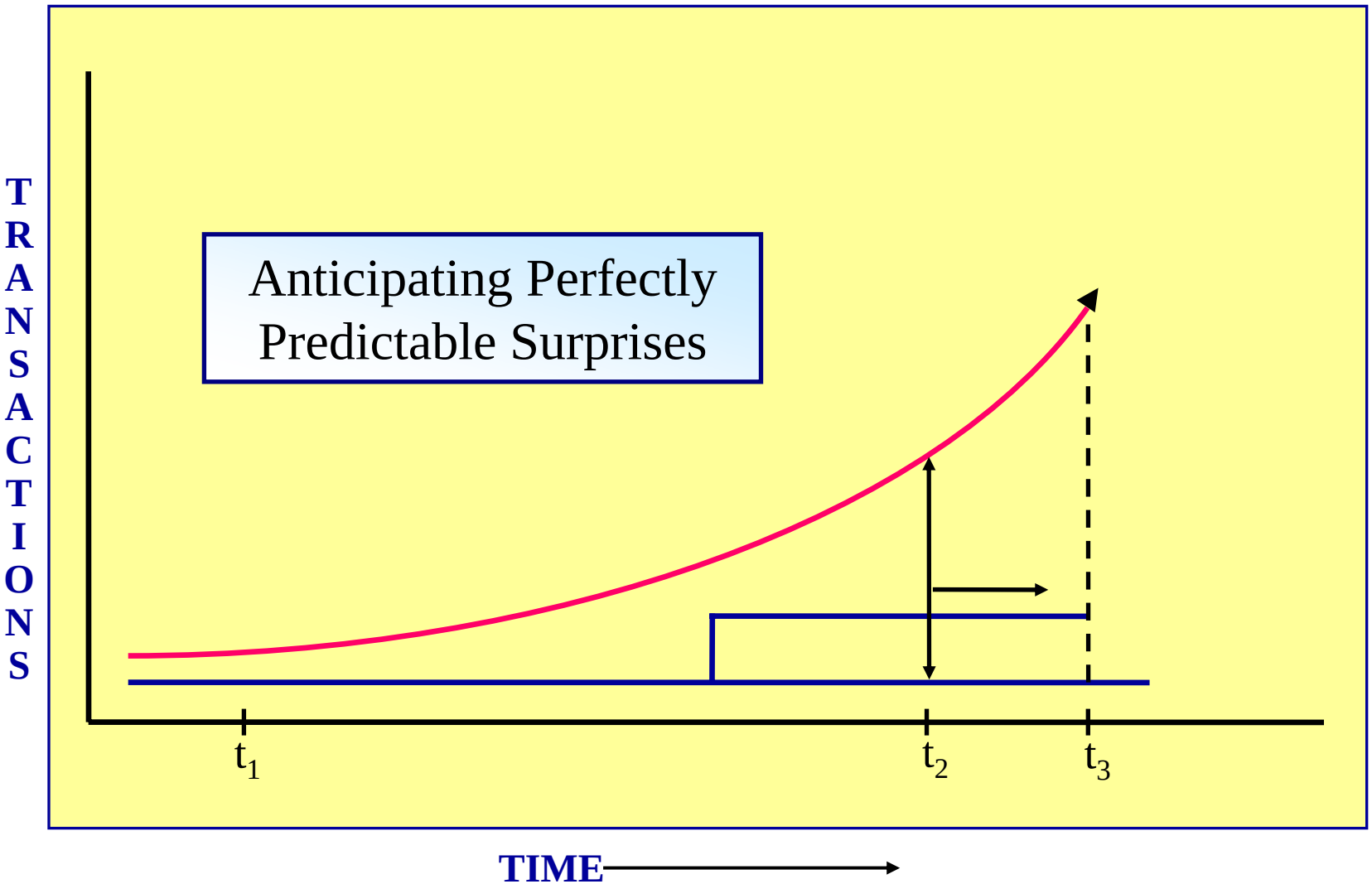
The Stabilization Mission Gap

. . . *Transformed S&R Capability*



Informing Transformation

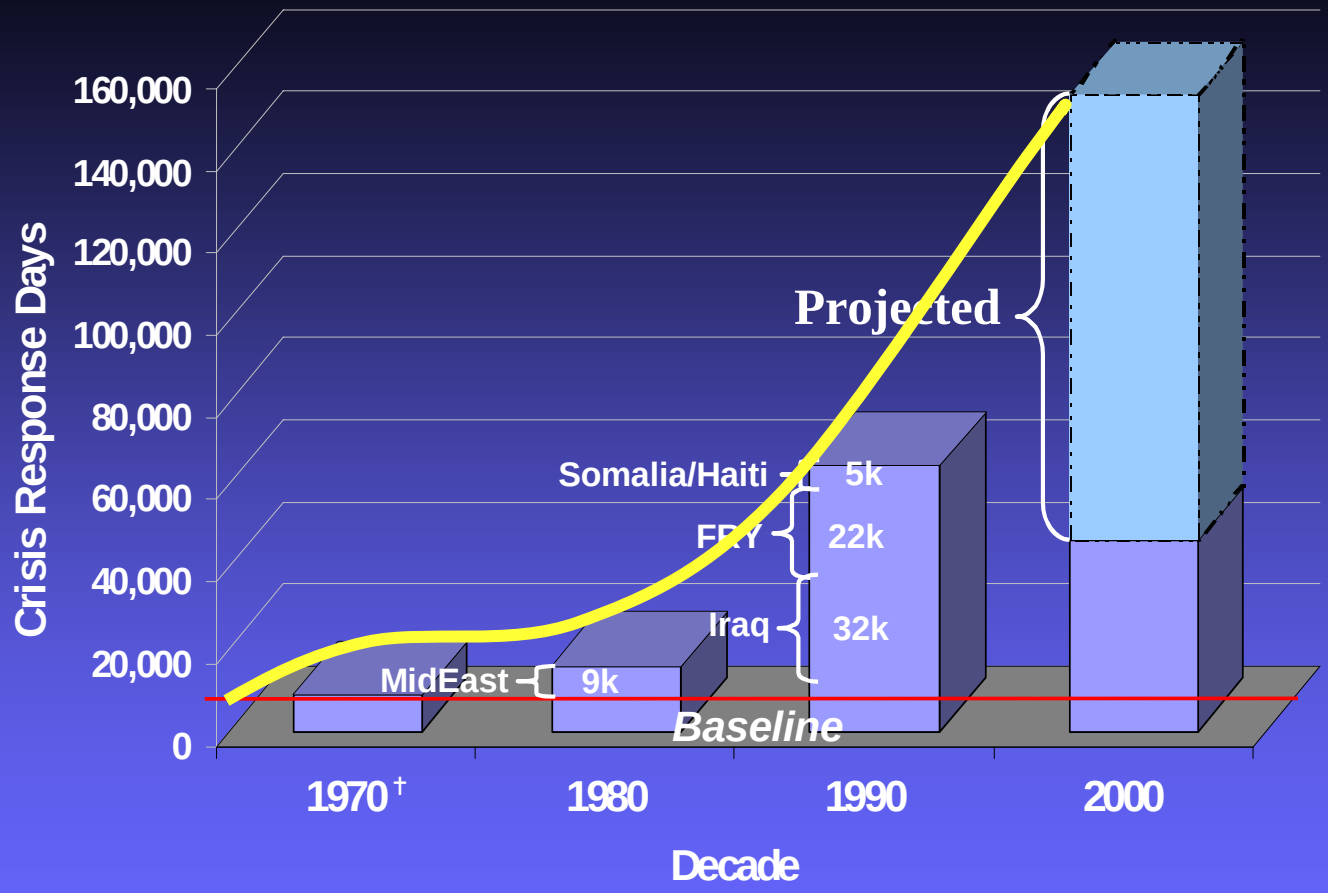
…Transactions vs. Resources



Global Trends and Implications

Policy Choices:

- *Engagement Policy*
- *Substitution of Capital for Labor*
- *Civil Component of National Security*
- *Allied / International Component*

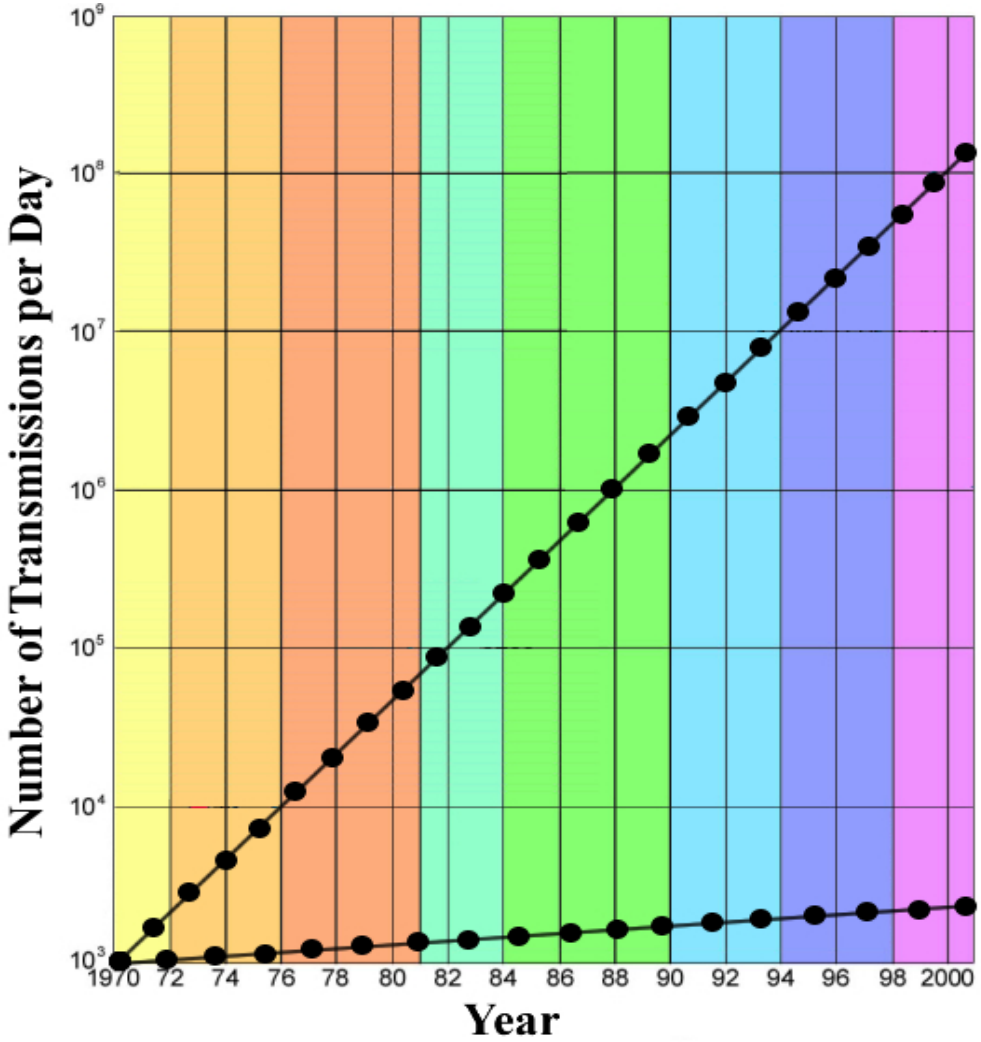


† Excludes Vietnam War

* Total number of response days for all operations by Army, Navy, Air Force and Marines

The Collection – Analysis Gap

…Managing the Inevitable



Policy Choices:

- ***Automate Triage***
- ***Automate Analysis***
- ***We all become analysts***

Military Response to Information Age:
Network Centric Warfare

Translates an Information Advantage
into a decisive Warfighting Advantage

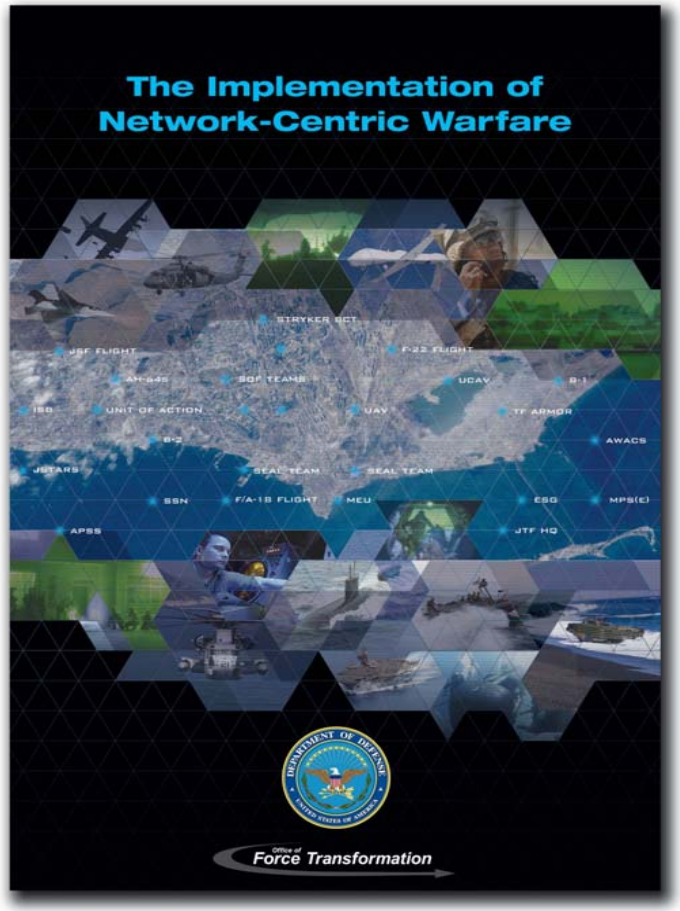
Information Advantage - enabled by the robust networking of well informed geographically dispersed forces

Characterized by:

- Information sharing
- Shared situational awareness
- Knowledge of commander's intent

Warfighting Advantage - exploits *behavioral* change and new doctrine to enable:

- Self-synchronization
- Speed of command
- Increased combat power



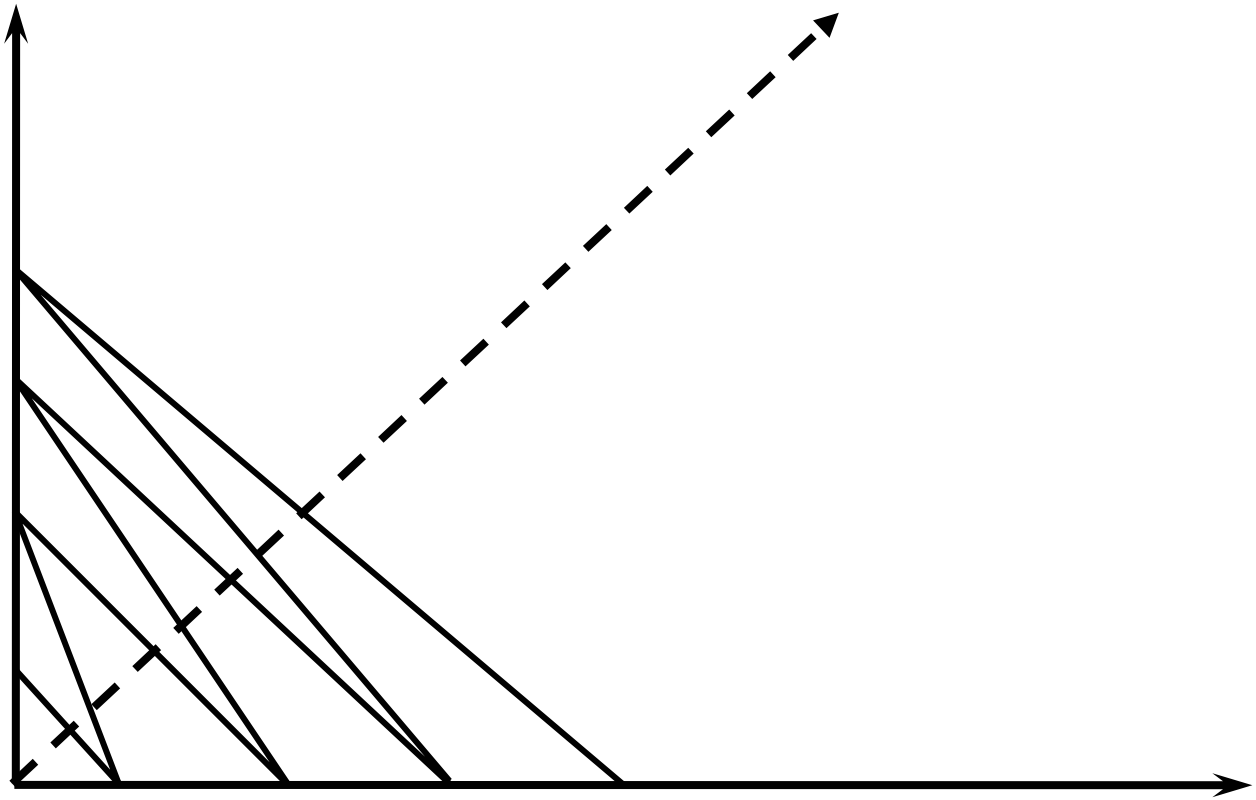
Information Sharing is a New Source of Power

Learning Rate

Competitive Advantage

Information "Richness"

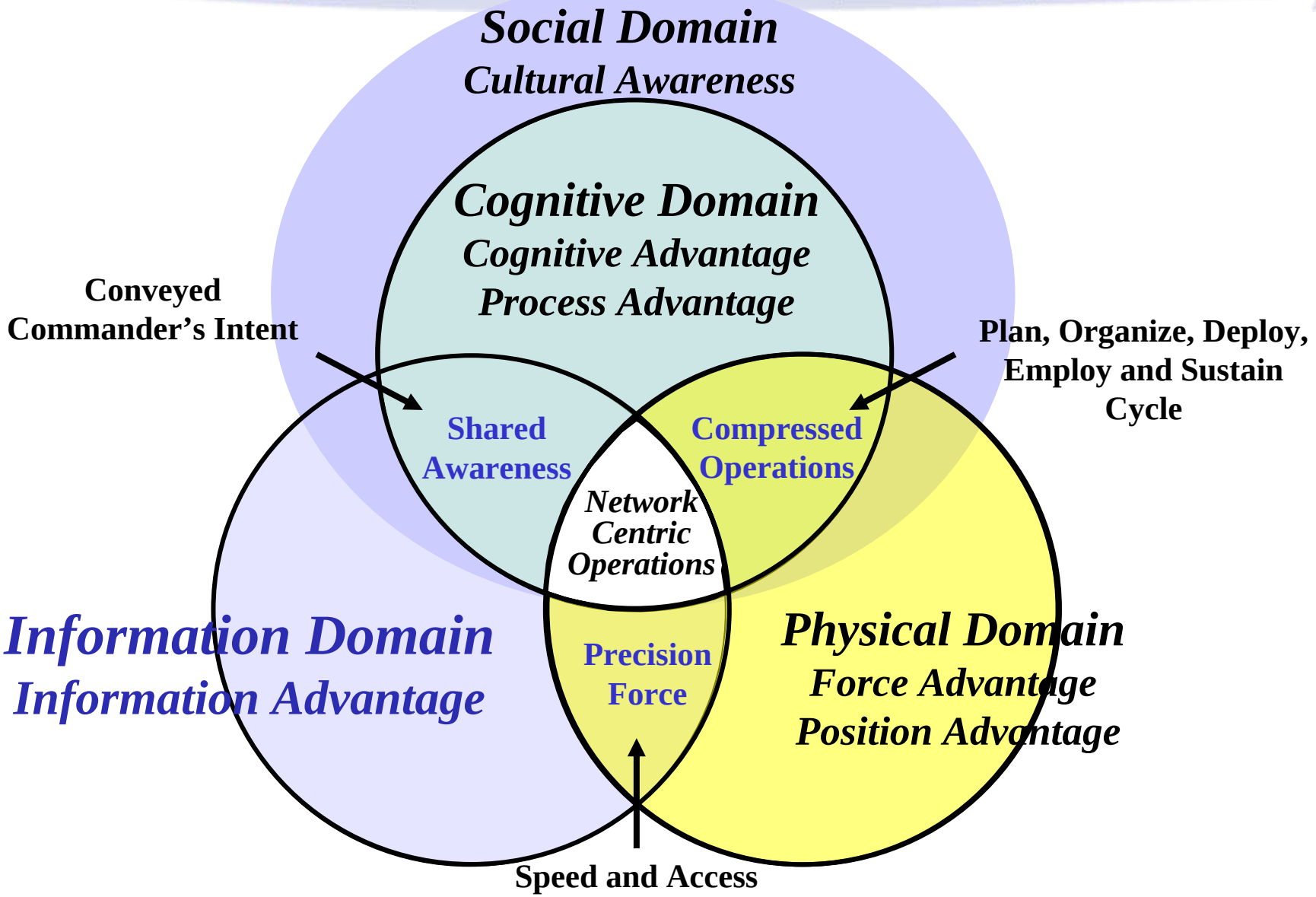
- Content
- Accuracy
- Timeliness
- Relevance



Information "Reach"

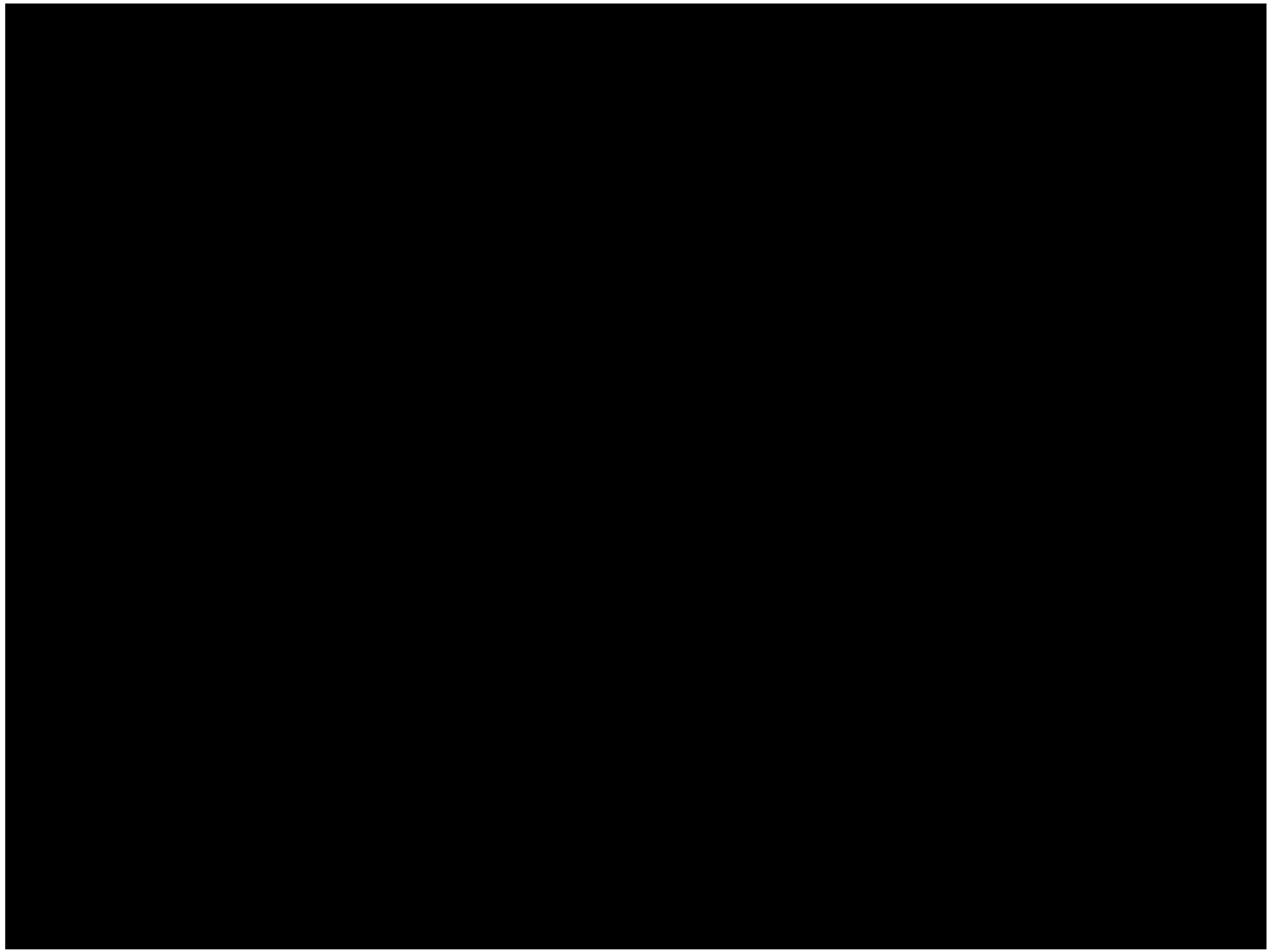
Competing in the Information-Age

…The Power of Network-Centric Operations



Shared Awareness

…The new competitive advantage



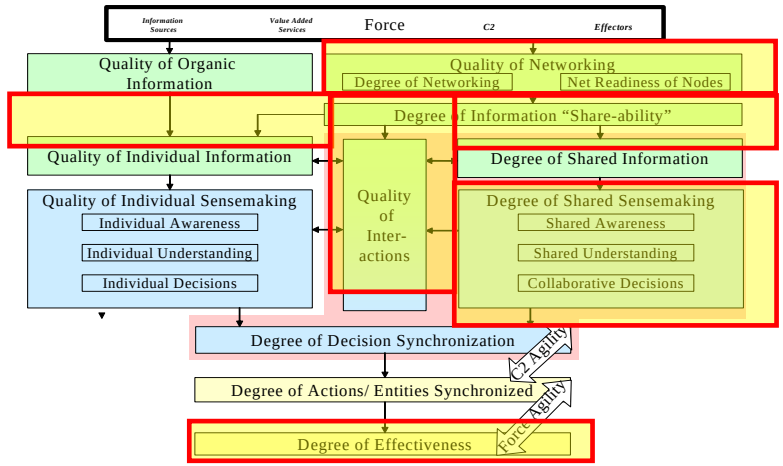
Source: New York Times Television – The Perfect War, 2004

Stryker Brigade Case Study

Scenario

- SBCT attack on Shughart-Gordon
- Certification Exercise (CERTEX) at Joint Readiness Training Center, May 2003

Area of Focus



Hypotheses

- Stryker Bde NCO capabilities provide significant information and decision superiority and increase force effectiveness and are a source of combat power

Findings

- Friendly :Enemy casualty ratio decreased from 10:1 to 1:1
- Increase in Individual/shared information quality from about 10% to ~80%
- Acceleration of speed of command from 24 to 3 hours in key engagement
- Bottom line result: allowed commander ability to control the speed of command

Identify Issues of Regret

… Candidates for Action Now

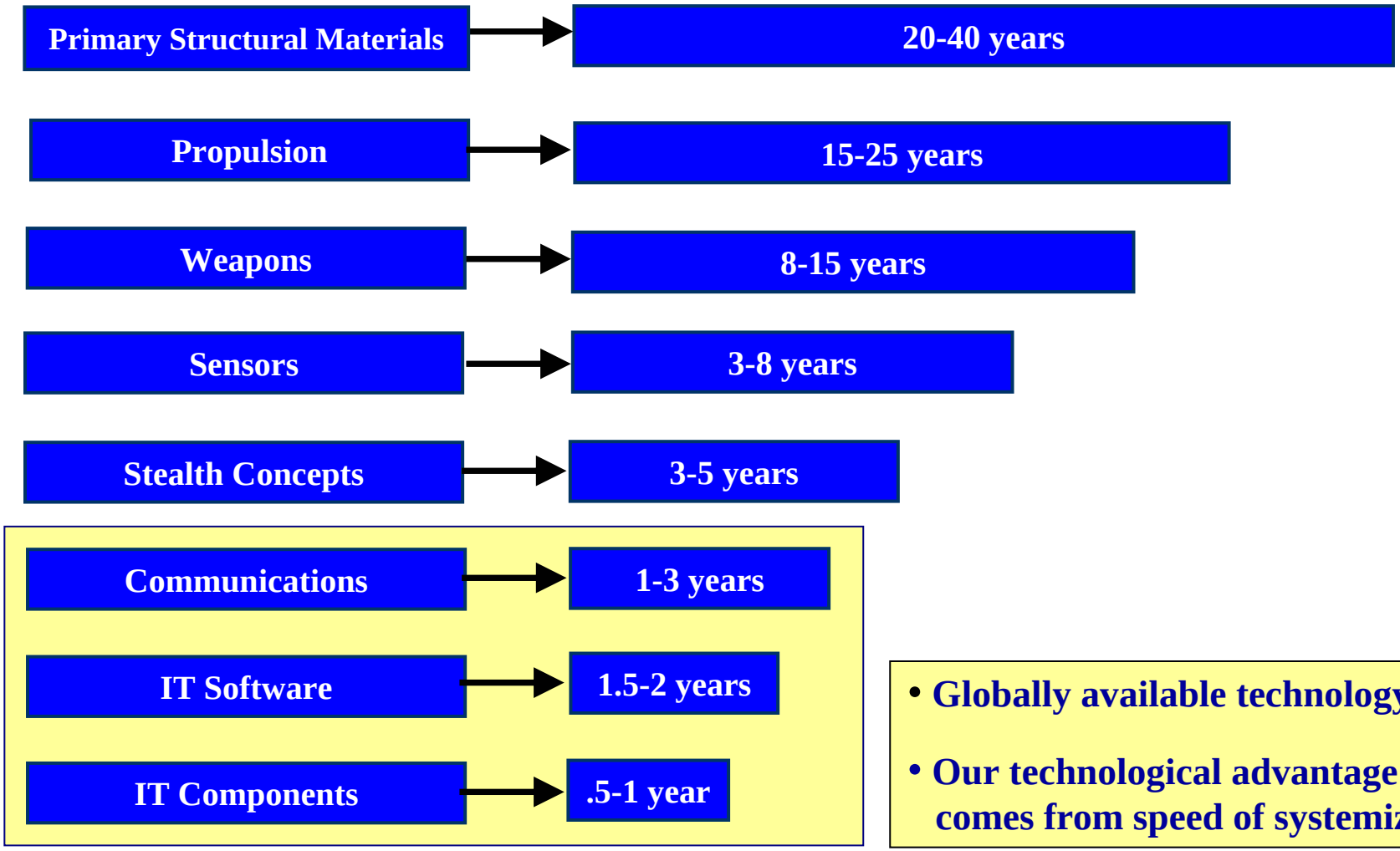
Warfare Elements

- ***Fire* –** non-lethals, directed energy, redirected energy
- ***Maneuver* –** seabasing, vertical battlefield, lift for operational maneuver
- ***Protection* –** urban operations, "biomedical countermeasures" cycle time
- ***C2&C* –** joint interdependency vs. interoperability
- ***ISR* –** demand-centered intelligence, tactically responsive space
- ***Logistics* –** joint demand-centered logistics

Risk Management (*creating on-ramps*)

- ***Joint concept development & experimentation* –** short cycle time / rapid iteration, concept-based / technology-enabled
- ***Joint training* –** live / virtual / constructive / distributed
- ***People* –** culture and organizations

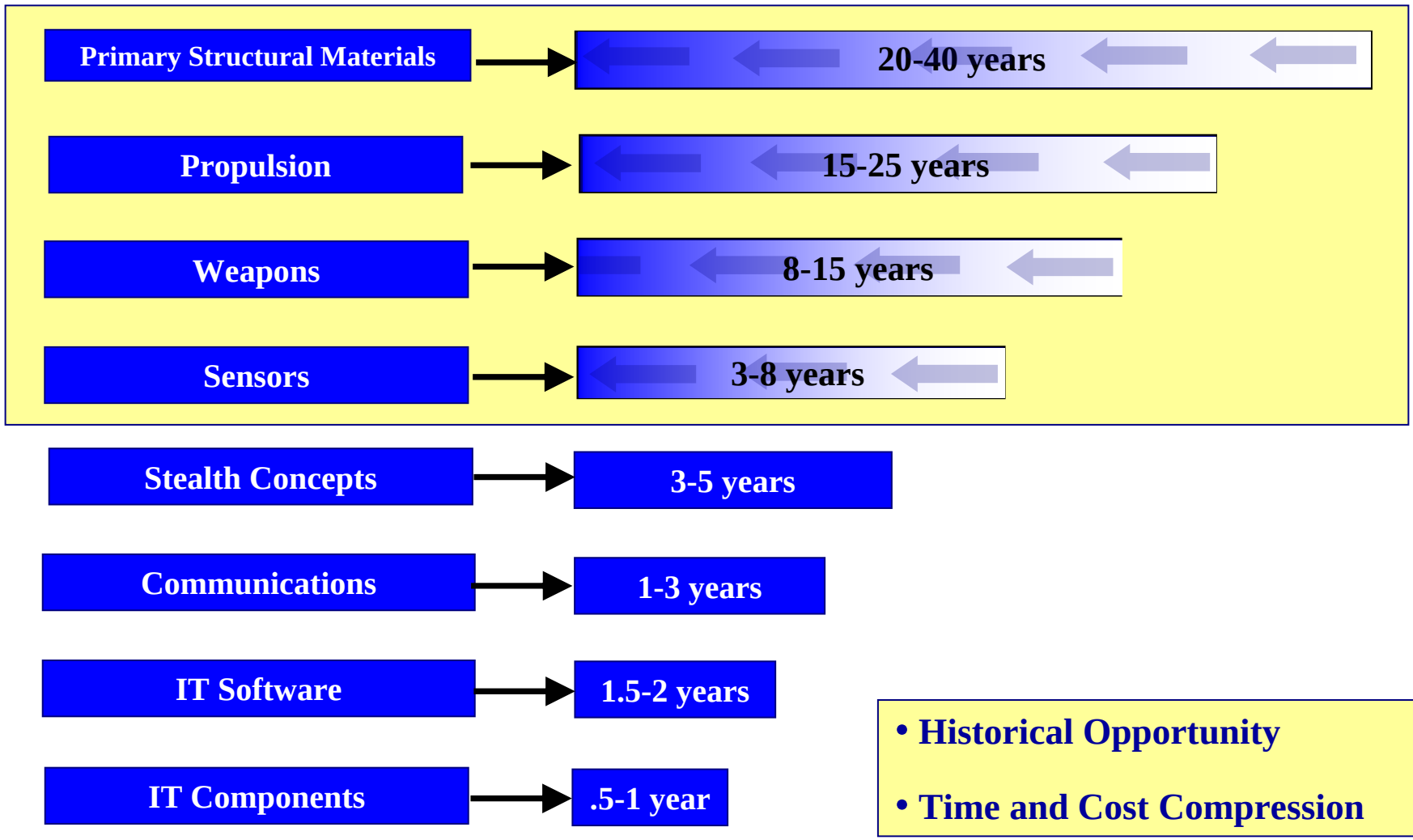
Technology Trends and Cycles



- Globally available technology
- Our technological advantage comes from speed of systemization

Technology Trends and Cycles

…New Opportunities

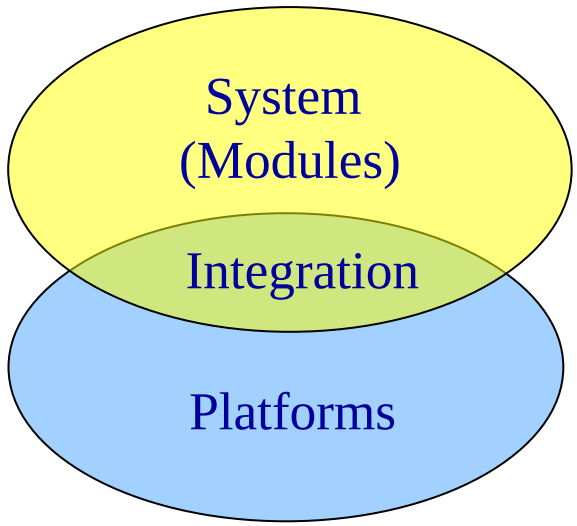


Alternative Architectures

…Characteristics

Focus in designing alternative architectures:

- Low unit cost
- Modularity
- Numbers
- Speed
- Networking
- Sensing
- Innovative designs
- Mass Customization



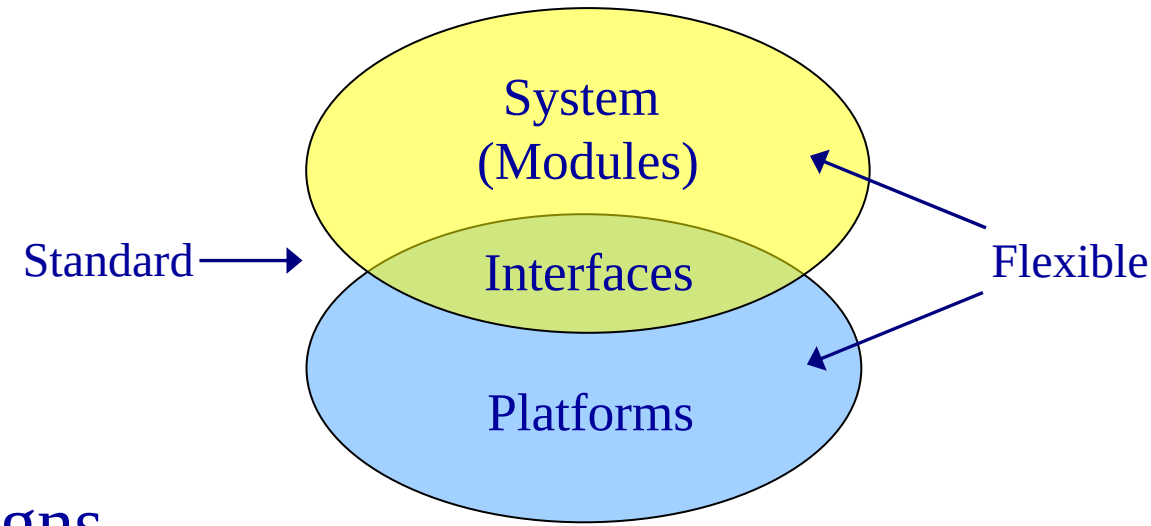
Preserve Strategic Advantage: innovation & the breadth, depth and diversity of the industrial base

Alternative Architectures

…Characteristics

Focus in designing alternative architectures:

- Low unit cost
- Modularity
- Numbers
- Speed
- Networking
- Sensing
- Innovative designs
- Mass Customization



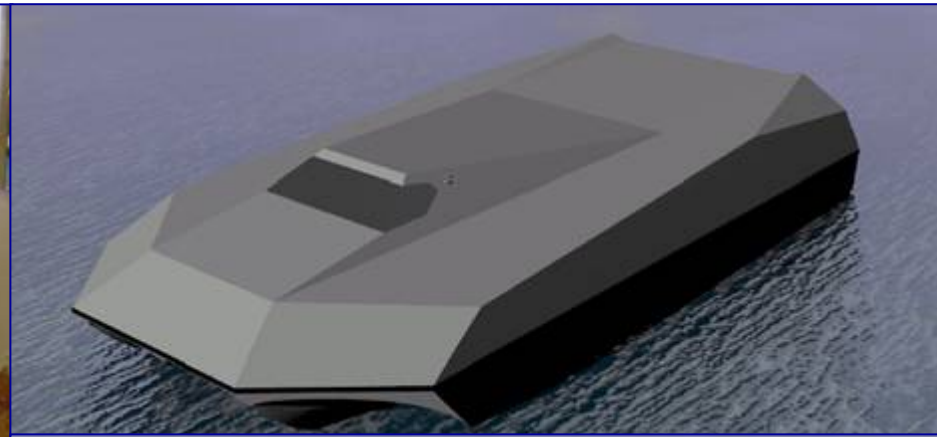
Preserve Strategic Advantage: innovation & the breadth, depth and diversity of the industrial base

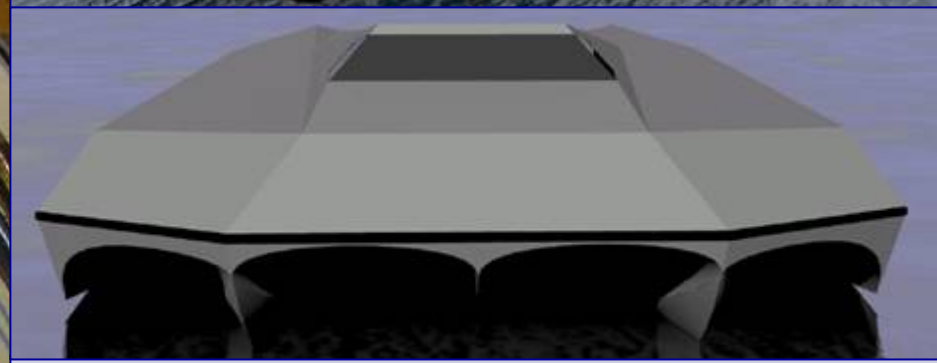
High Speed at Sea

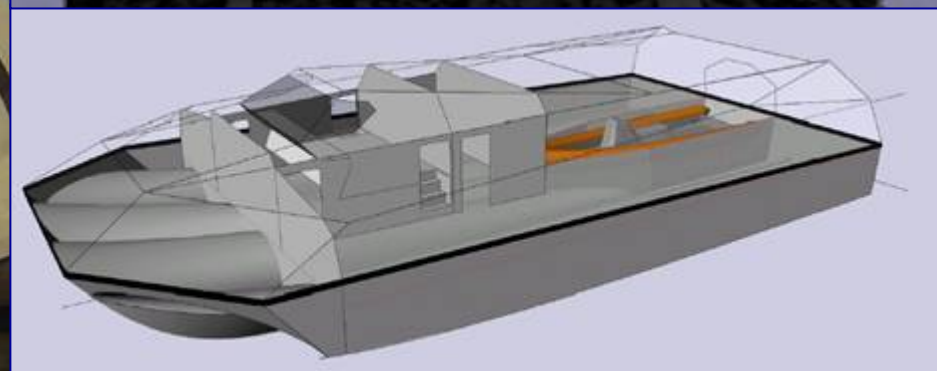
M-80

LOA	80’-0”
Beam	40’-0”
Tunnel Width (4)	5’-0”
Draft (static)	2’-4”
Displacement	67 MT
Payload	15 MT
Fuel Load	10 MT
Classification	ABS
Main Engines	4 x 1650HP C-30 Caterpillars
Surface Piercing Propellers	4
Speed Max @ full load	50-55 knots
Range @ full load & max speed	500 NM
HP Required (total)	6200hp
Clear Height	15’-0”

Payloads 43% of Displacement
- 11-M RIB or equivalent
- UAVs
- 15 personnel







Stiletto

Project "Sheriff"

…Controlling the Engagement Timelines

The Capabilities

- "Speed-of-light Sensing
- Networked
- Lethal/Non-Lethal Options
- Active/Passive Options
- Kinetic/Non-Kinetic Options
- Survivability

The Technology

- Compact Active-Denial Technology
- Phraselator High-Power Direction Hailer
- Vector-Beam High-Power White/IR Spot Light
- Counter Improvised Explosive Device (IED)
- Active Protection
- Counter Sniper
- Rapid-Fire Kinetic Weapon
- Multi-Spectral Sensor Suite
- Armor Protection
- Integrated Electronic Warfare Suite
- Net-Centric Technology

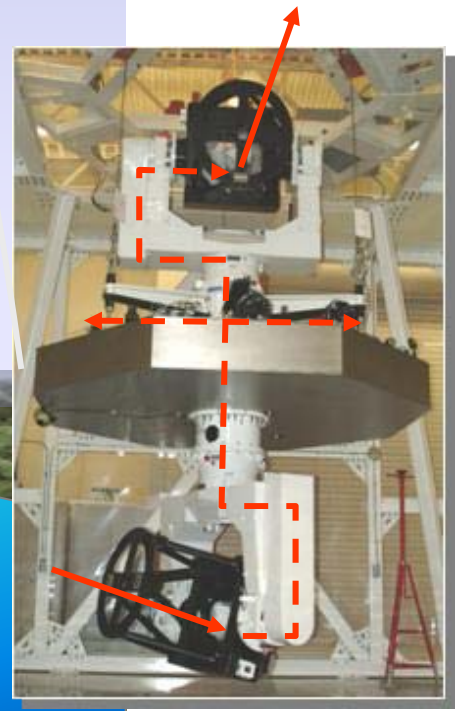
Re-Directed Energy

…Concept Description

Warfighting Advantage:

- **Decrease Engagement Timeline**
- **Reduce Collateral Damage**
- **Revalue LOS Only Lasers**
- **Increase Shots per Laser**
- **Optimize Beampath Flexibility & Engagement Options**

Laser – Relay Mirror – Air Vehicle Technology Pairing

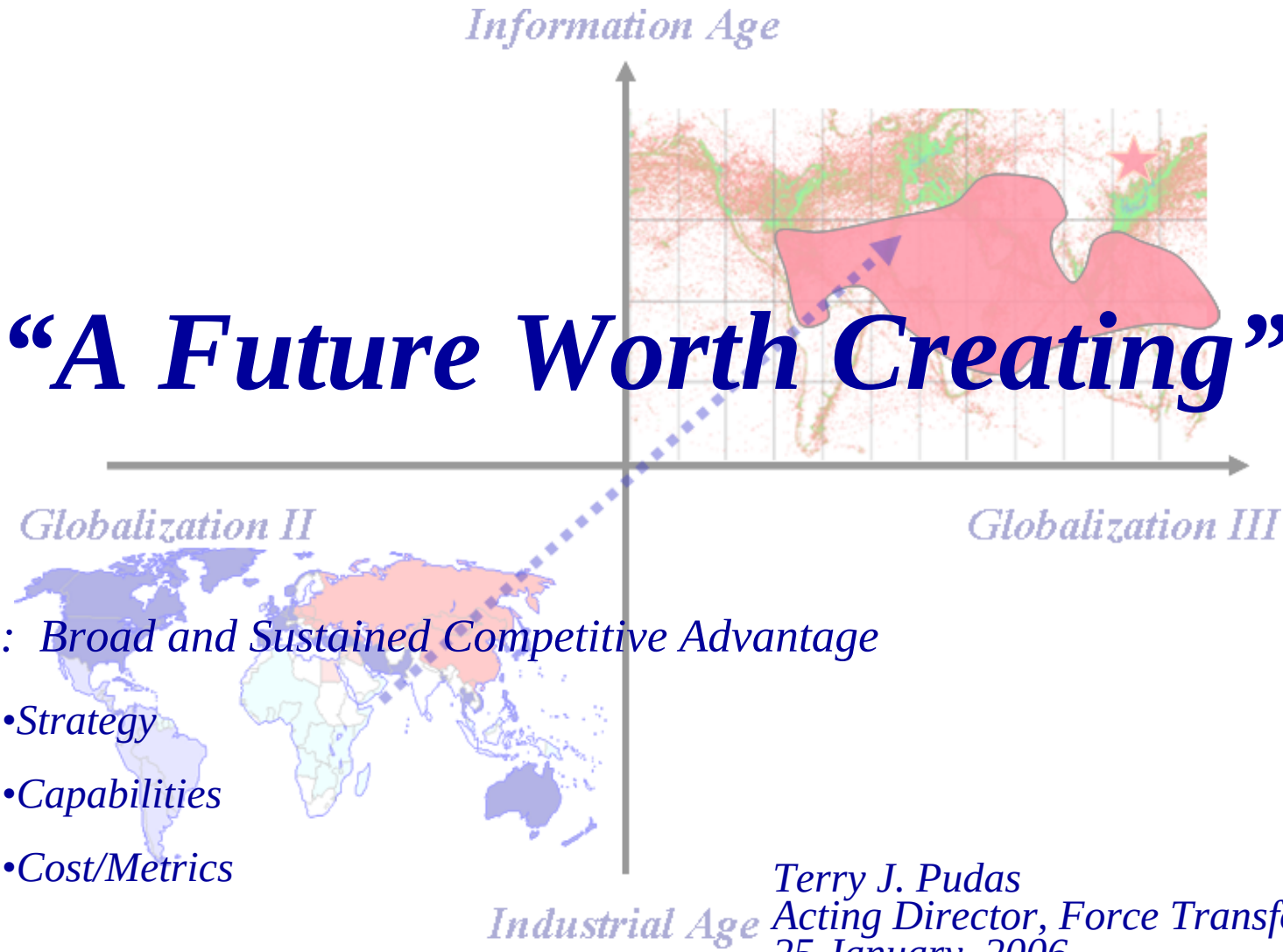


New Logic and Metrics

- Achieve higher learning rates
  - *Co-evolve concepts, capabilities and processes*
  - *Continuous adaptive acquisition and experimentation*
- Employ higher transaction rates
  - *Faster cycle times*
  - *Speed of information and operational mobility*
- Create and preserve options
  - *Technology on-ramps*
  - *Broaden capabilities base*
  - *Mass customization*
- Create overmatching complexity
  - *Scalable*
  - *The small the fast and the many*

BACK-UP

Transforming National Security



"A Future Worth Creating"

Vision: Broad and Sustained Competitive Advantage

- *Strategy*
- *Capabilities*
- *Cost/Metrics*

Terry J. Pudas
Acting Director, Force Transformation
25 January, 2006

Full Spectrum Effects Platform

Full-Spectrum Effects Platform

'Sheriff'…non-lethal enablers of lethal force

Hailing & Warning
LRAD / Phrasealator
BWL
Laser Dazzler
ADT

Sensing
Acoustic
IR
Radar (APS)
Optics
ELINT/ADT

Countermeasures
MMBJ
LRAD
Laser Dazzler
APS
ADT

Lethal Force
Gunslinger

Scalable Combat Effects

- Concurrent protection
- Avoiding irrevocable & unintentional
- Precision categorization
- Discriminate before commit.
- Transformational fire and maneuver

Non-Lethal and Directed Energy

(CNN) – “Law enforcement officers were questioning a Parsippany, New Jersey, man who they say may have pointed a laser beam at an airborne police helicopter Friday night and a Cessna aircraft two nights before, said a spokesman for the Port Authority of New York and New Jersey.” 12/31/04

MAHE, Seychelles (AP) – “The crew of a cruise ship attacked by pirates off the coast of Somalia used a sonic weapon to help ward off the attackers, the Miami-based Seabourn Cruise Line said Monday.” 11/8/05

“More than 400 incidents involving the dangerous practice of shinning laser light into aircraft have been reported since 1990, U.S. Department of Transportation Secretary Norman Mineta said at a January 2005 press conference in Oklahoma City.” 1/5/06

Competitive Advantage

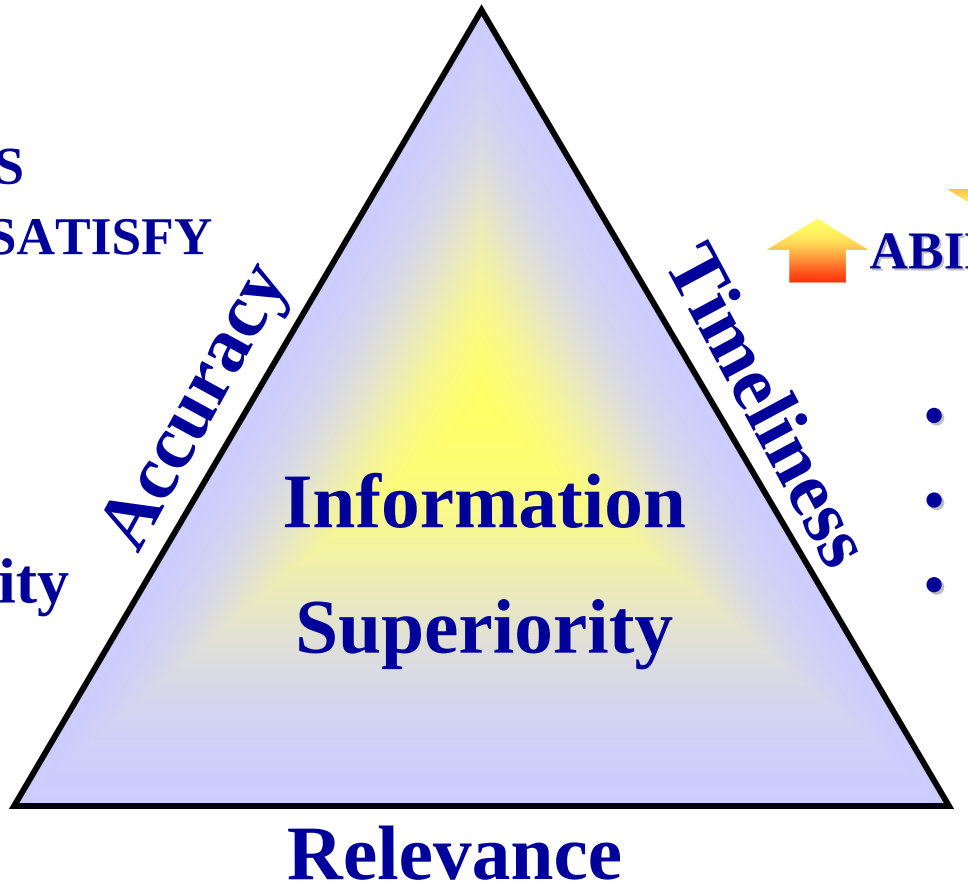
…New Sources of Power

THEIRS

NEEDS

ABILITY TO SATISFY

- **Increase**
- **Deny**
- **Add Complexity**



OURS

NEEDS

ABILITY TO SATISFY

- **Decrease**
- **Satisfy**
- **Simplify**

"We need a force which is designed and capable of fighting first for information superiority."

Transforming National Security

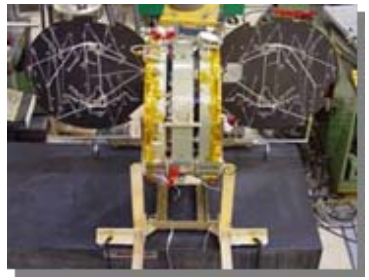
War is more than combat

and…

Combat is more than shooting

Concept/Technology Initiatives

- Operationally Responsive Space-Based System



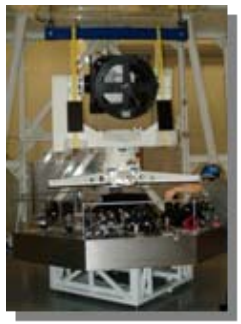
OFT Teamed With

AF Space Command, AFRL, NRL, NRO, Johns Hopkins Applied Physics Lab, NASA, MIT Lincoln Labs

- Full-Spectrum Effects Platform: Project "Sheriff"

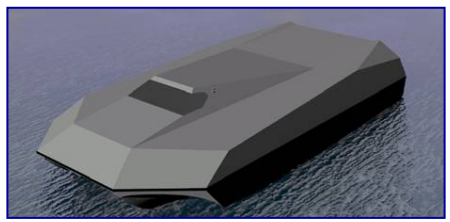
Army AMO/CCS, US Army Futures Center, MCWL, NSWC-DD

- Tactical Re-Directed Energy



Air Force Research Lab/DE/ DDR&E, IDA (JAWP)

- Advanced Technology Craft Prototype Development & Experimentation



NUWC / NAVSEA Combatant Craft Division, Naval Undersea Warfare Command / CCD, SOCOM, Naval Postgraduate School

Full-Spectrum Effects Platform

'Sheriff'…plan in action

Acoustics testing

- F-SEP Spiral 0 Integration Complete
- Testing at Dahlgren, Quantico and Aberdeen Dec -Feb '06.
- Infantry Center Test & Validation March – May '06.

APS Installation

F-SEP Spiral 0 Stryker 2 December 2005

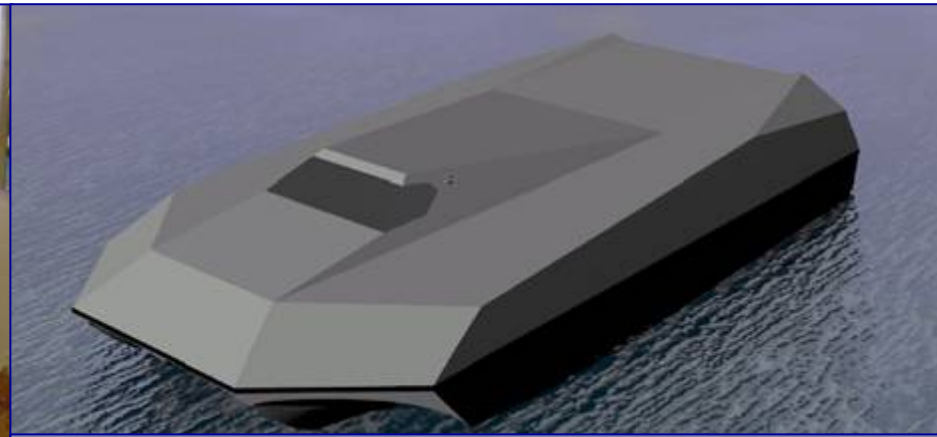
Stiletto

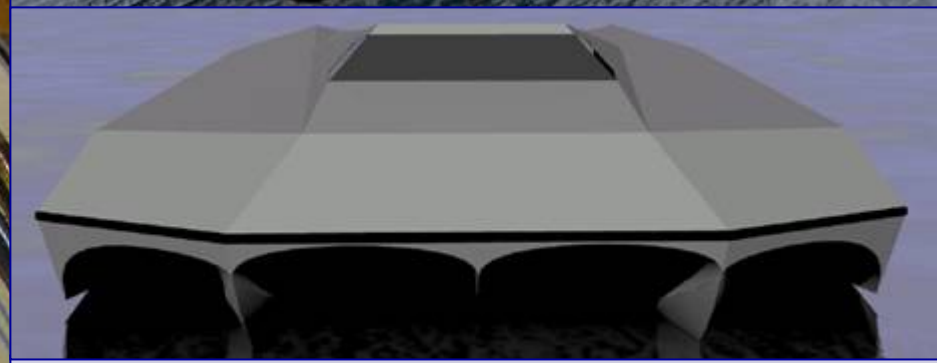
High Speed at Sea

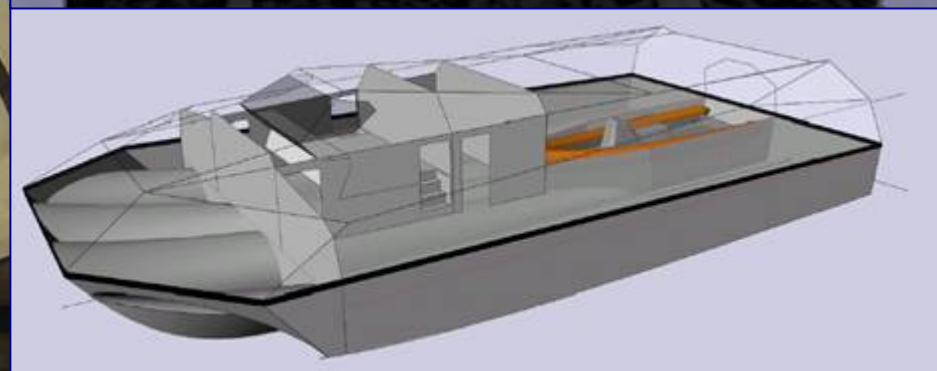
M-80

LOA	80’-0”
Beam	40’-0”
Tunnel Width (4)	5’-0”
Draft (static)	2’-4”
Displacement	67 MT
Payload	15 MT
Fuel Load	10 MT
Classification	ABS
Main Engines	4 x 1650HP C-30 Caterpillars
Surface Piercing Propellers	4
Speed Max @ full load	50-55 knots
Range @ full load & max speed	500 NM
HP Required (total)	6200hp
Clear Height	15’-0”

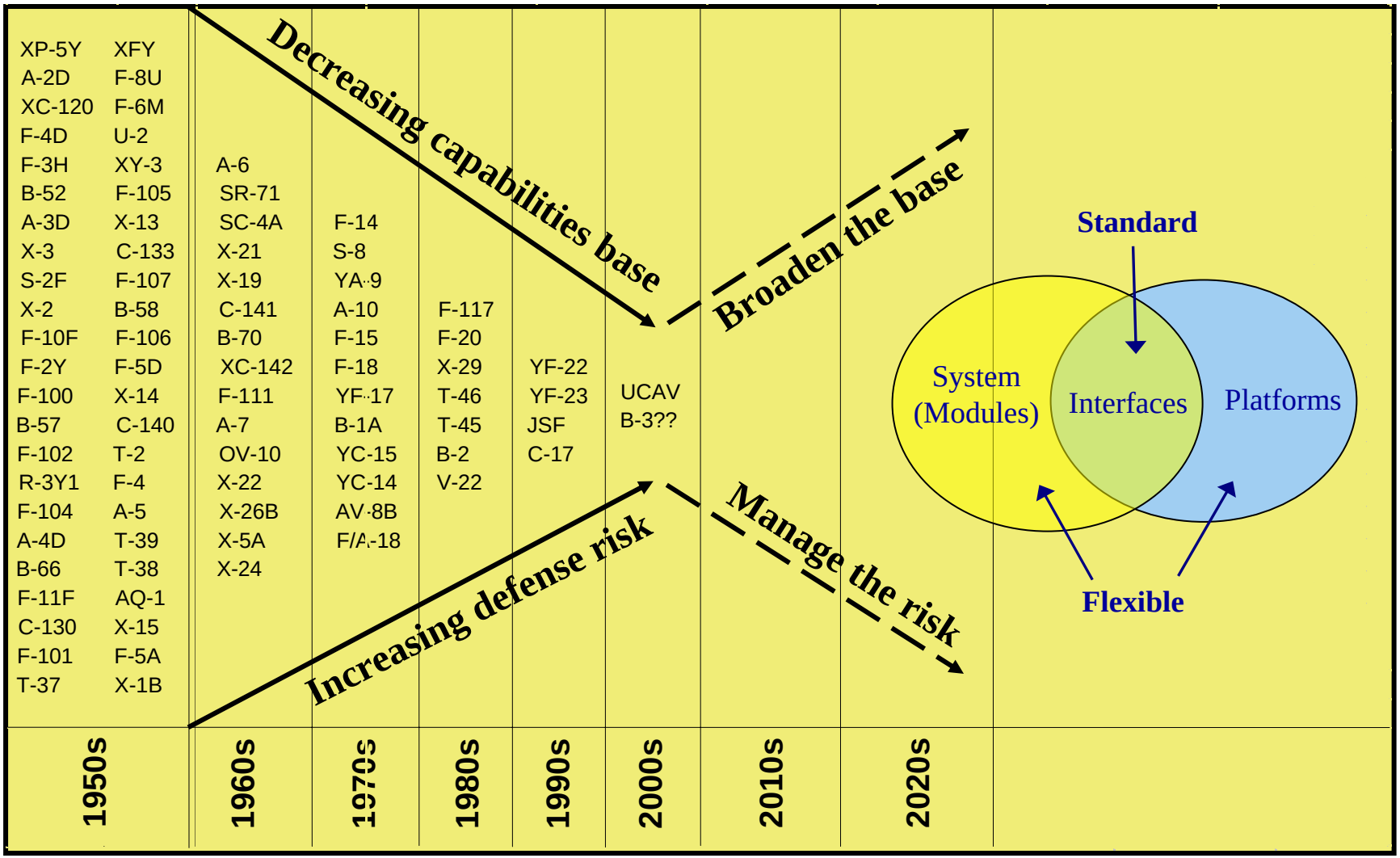
Payloads 43% of Displacement
- 11-M RIB or equivalent
- UAVs
- 15 personnel





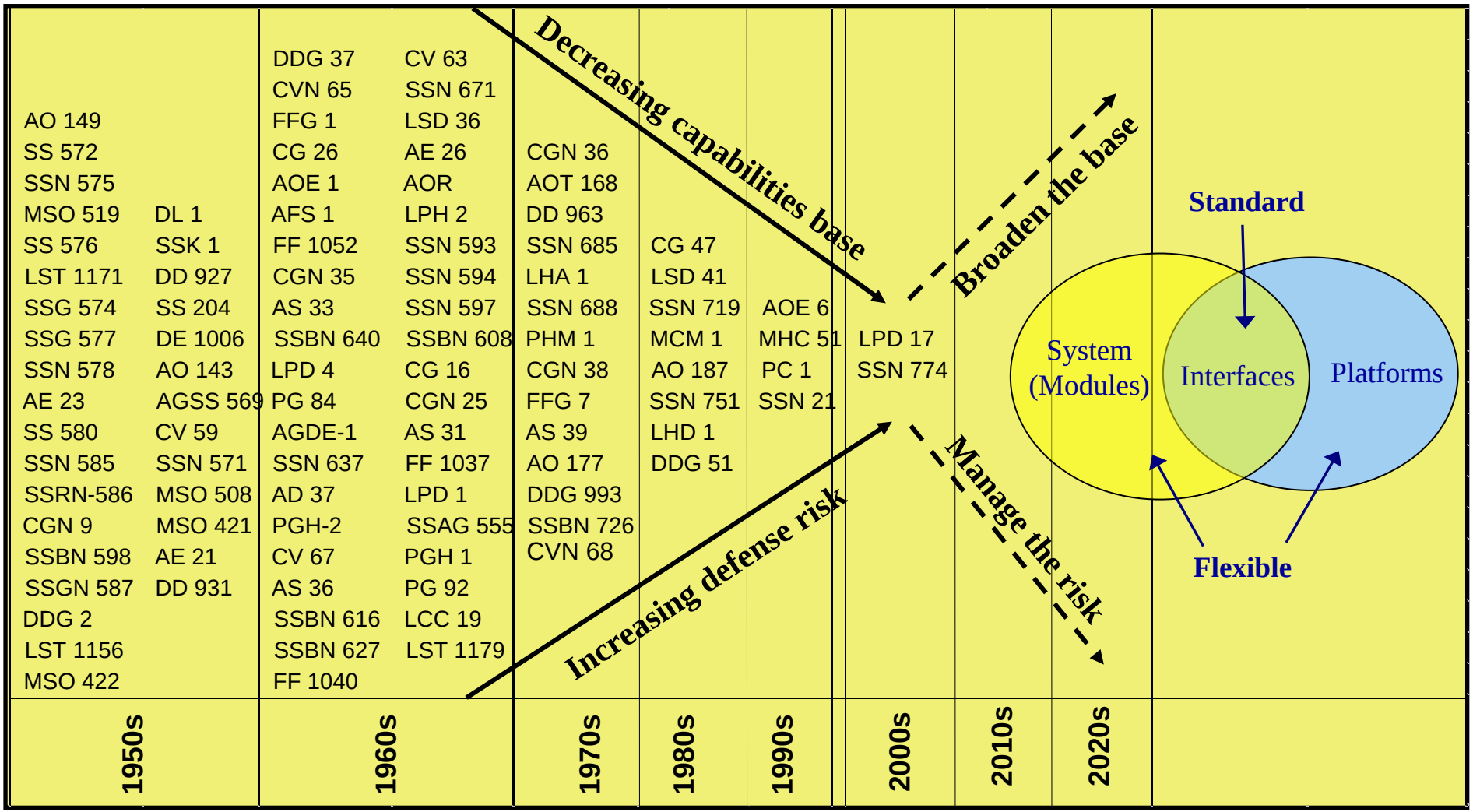


Aircraft Program Trends



Source / Rand Aviation Week & Space Technology

Navy Program Trends



Based on date first ship in class was launched

Transforming Defense

…Characteristics of the Future Joint Force

This is the age of the small, the fast, and the many.

- *Small: Power and size are uncoupled*
- *Fast: A shorter response with a faster rise time more precisely placed in time and space*
- *Many: The power of the collective at lower cost over a larger area*

Rebalance for the information age

- *"Demassification" through increased information fractions*
- *Simplification through adaptive relocation of complexity & the human*
- *Networked components vice integrated systems*

Operations based on assured access, information superiority, control of initial conditions and rates of change

- *A priori access to the domains of conflict*
- *Secure a superior information position and convert it to a competitive advantage*
- *Leverage the path dependency of conflict*

Corporate change based on co-evolution and continuous adaptive acquisition

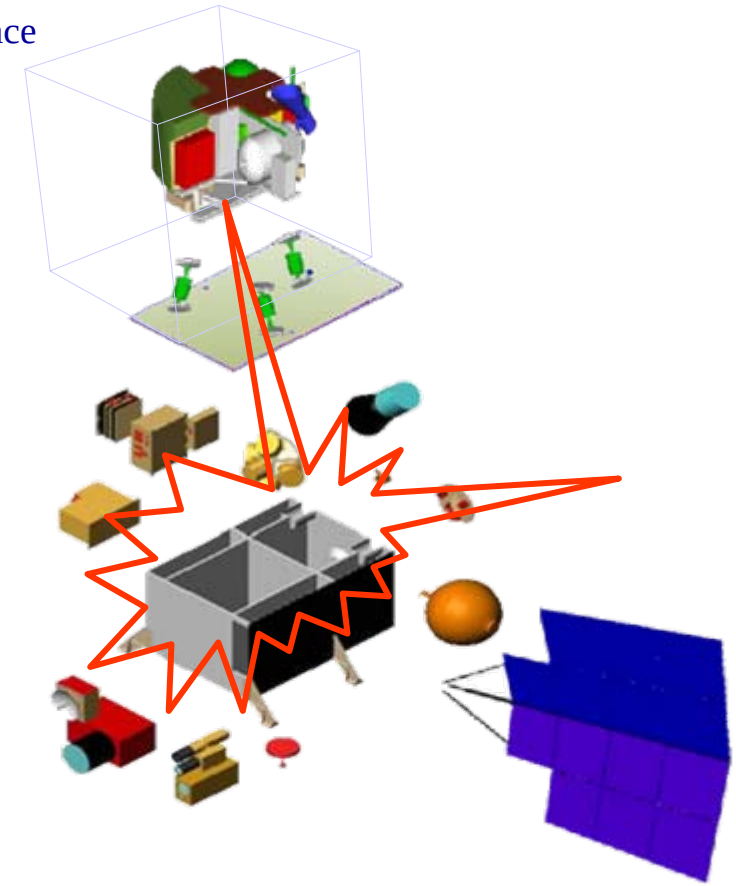
Modular Bus Technologies

Payload
- Compliant with standard interface
- On-board processing
- Decision quality data
- Payload isolation (optional)

Core spacecraft (robust to all inclinations and HEO orbits)
- Standard with some modular subsystems
- Flexible propulsion

LV Adapter
- Standard interface
- Softride

Standard Communications
- High speed theater downlink
- JTRS software radio



Operability features
- Standard command and telemetry
- Autonomy
- Self activation / calibration

Rapid integration features
- Pre-qualified components
- Built-in test
- Robust and storable

Flexible data bus / C&DH architecture
- Plug ‘n play switch fabric
- High and low speed digital

Modular Solar Array
- Scalable power
- Adaptable to all orbits

Tailorable Bus Built on Open Common Standards

New Logic and Metrics

…Competency

- Access

  The ability to use military assets, both information and physical, at the best points of effect in hard-to-reach locations even when denial strategies are employed by the enemy;

- Speed

  Minimization of response time from deliberate operational (or strategic) maneuver to stunning tactical swiftness;

- Distribution

  The extent to which firepower, sensors, and other systems are spread over a diverse and geographically dispersed set of assets/platforms;

- Sensing

  The ability to provide information with accuracy, timeliness and relevance, and especially to locate and track fleeting targets;

- Mobility

  The ease and promptness by which military assets can be shifted from one physical location to another; and

- Networking

  The extent to which military assets are connected together through information technology that assures shared awareness and information access.

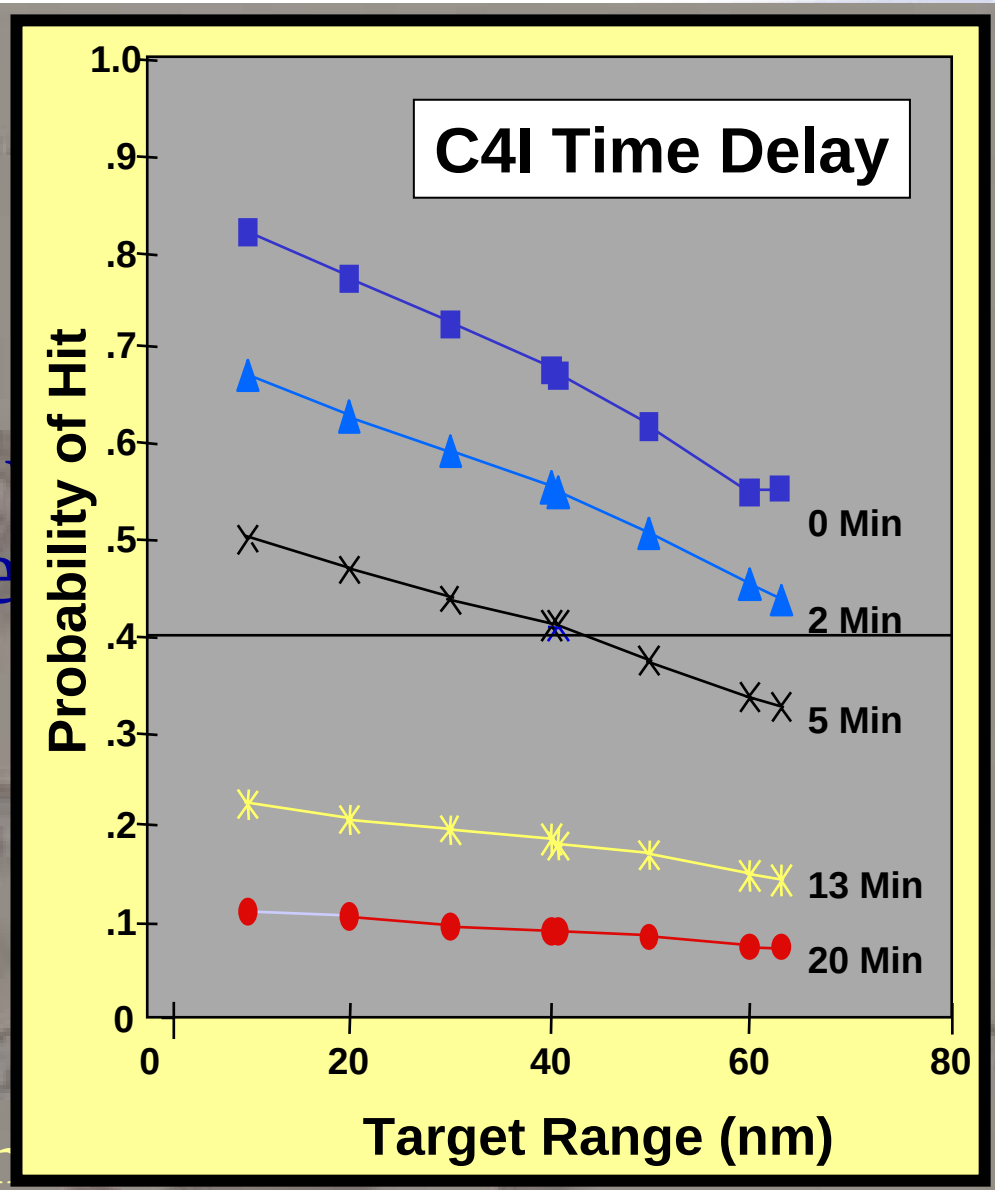
Why Organization Matters

Organization

- Determines *command relationships;* career patterns and professional development
- Establishes *connectivity* between communications nodes;
- Provides *structures* for information exchange requirements

Weapons Employment Time Delay

- Offense vs. Defense
  - Mobility vs. Shooters
  - Stealth vs. Sensors
- Envelope management
  - depth of battle
  - Stealth & Mobility vs. Engagement Range
  - Speed, Time, ~~Timing~~
- Trimming for speed
  - Shorten sensor times Arch



Western Iraq Case Study

…Key Findings to Date

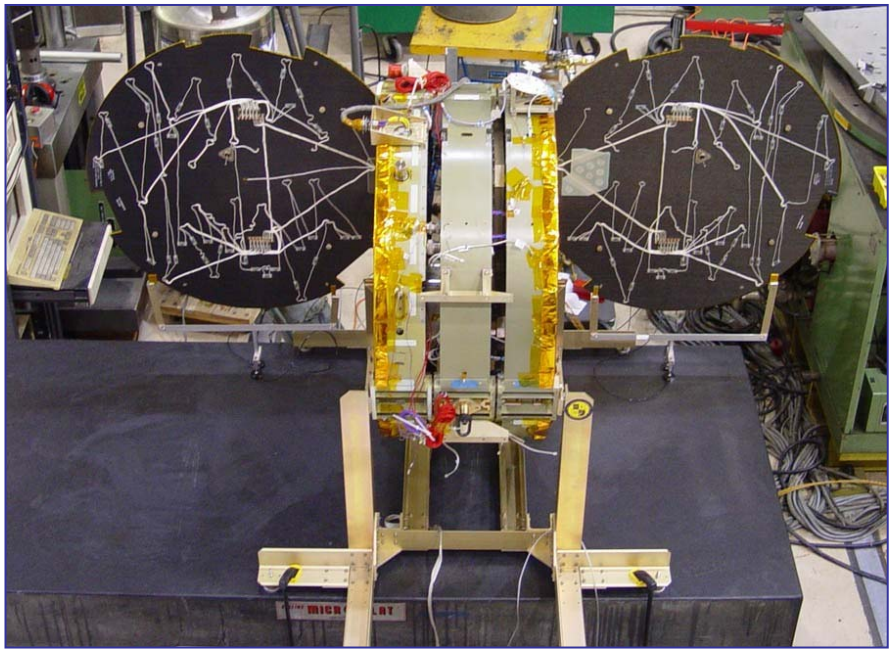
- Western Iraq was the ***most "networked" theater of operations***, operationally and tactically, in the history of warfare.
- ***Largest conventional & coalition SOF operation*** in the history of warfare.
- ***Largest scale use of tactical data-links*** in history of warfare.
- Only area of operation in Iraq where Blue Force Tracking information on SOF + conventional ground forces was provided via data link to fixed wing combat aircraft.
- Zero Fratricide: ***Only area of operations in Iraq where air-to-ground fratricide was eliminated***

Transformation

www.oft.osd.mil

Operationally Responsive Space

…TACSAT 1



A capability on orbit within the planning time constraints of a major contingency

- Responsive
  - < 2 Yr concept to on-orbit capability
- Low Cost
  - Total cost of experiment less than $15M including launch
- Experiment
  - UAV Components in Space
  - Space/Air Horizontal Integration
  - Designer Payloads
  - TCP/IP Based: SIPR Net Accessed
  - New commercial launch vehicle
- Operationally relevant capability
  - Integrated into Combatant Commanders Exercises/Experiments
  - Time / Capability Trade Off

Key Barriers to Transformation

…Challenges

- Cultural barriers
  - *Speed of understanding vs speed of doctrine*
  - *Values, attitudes and beliefs*
- Physical barriers
  - *Speed of mass (lift and mobility)*
  - *Speed of information (connectivity & interoperability)*
- Fiscal barriers
  - *Willingness and ability to devalue and devolve*
  - *Strategic approach to cost*
- Process barriers
  - *Transformation of the management of defense*

Strategic Approach to Cost

Key Elements

- *Decrease operational costs*
- *Achieve better ROI for less*
- *Broaden the capabilities base*
- *Create and preserve future options*
- *Manage divestiture*
- *Transform non-discretionary areas*
- *Impose cost to adversary*
- *Develop counter-cost imposing strategies*

New metrics create opportunities for new cost dynamics

Transforming Defense

… Corporate Strategy

Part I: Continuous small steps

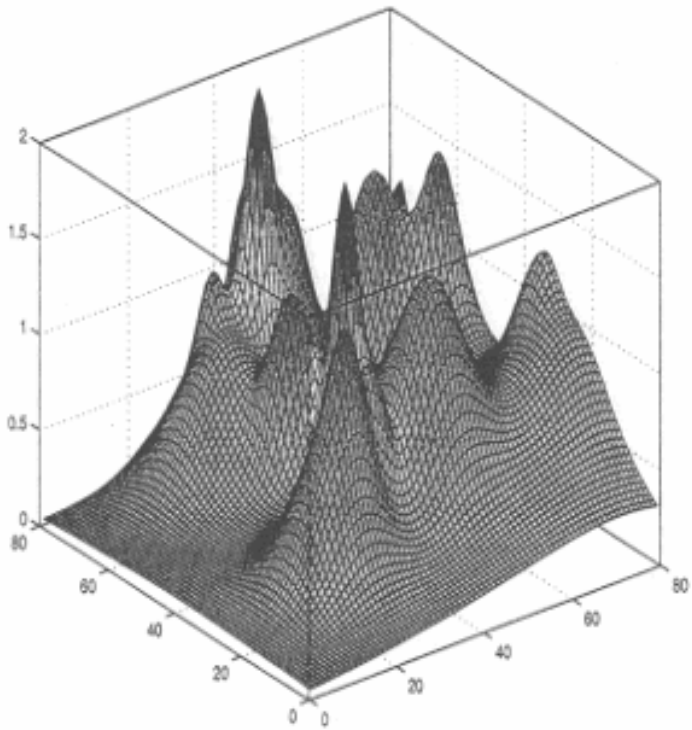
- ***Sustaining***
- ***Evolutionary changes***
- ***Stay on the local maximum***

Part II: Many medium jumps

- ***Explore and expand the local region***
- ***New doctrine / organization / systems***

Part III: A few big bets

- ***Could change DoD***
- ***Change the world***
- ***Create a new game with new rules***



"If you are not making any big bets you are a fixed strategic target <u>and</u> at risk."

Non-Lethal Weapons

…Summary

1. **Transformational? - Yes**
   - **New strategic context (expanded competition-moral principle)**
   - **Broadens the capabilities base**
   - **Expanded threat context**
   - **Allows us to do things we cannot currently do**
2. **Do we have the technical ability to create a NLW capability? - Yes - If we choose to do so**
   - **Demonstrated prototypes currently exist**
   - **Law enforcement already using**
   - **Potential NLW utility from ongoing S&T initiatives**
3. **Do NLWs have military utility - Unequivocally Yes**
   - **Need identified and requested in Kosovo**
   - **Examples of requirement in Iraq**
4. **Are there impediments to creating/employing a NLW capability? - Yes**
   - **Structural-Joint S&T**
     - **Acquisition authority**
     - **Executive agent/Program office**
   - **Legal/policy-Reexamine the root decisions upon which the policies and treaties were created/interpreted**
   - **Cultural-Warrior+Enforcer+"Systems Administrator"**
     - **Create a constabulary capability (stability and reconstruction)**

War is more than combat and combat is more than shooting

Broaden the Base?

"If the only person that builds spacecraft for the government is Air Force Space Command, and I go to that warehouse for every product, there is not a lot of competition. There are a lot of well-intending, energetic people, but there is not a lot of competition."

Gen. James E. Cartwright
Commander, U.S. Strategic Command

Space News, 10 October 2005

New Design Principles

- Capabilities are decoupled from platform
- Power and survivability have been decoupled from size
- Information has been substituted for mass
- Mass customization delivers greater value than mass production
- Networked components outperform integrated systems

Technology

…Opportunities and Payoff

- Composites Materials
- Innovative designs
- Networking
- Information for mass
- Distributed capabilities
- Proximate netted sensors
- Directed and redirected energy
- Robotics

Increased

Speed
Survivability
Sea keeping
Payload fraction
Dispersion
Shared awareness
Lethality
Tactical stability

Decreased

Life cycle cost
Procurement cost
Vulnerability
Manning
Structural mass
Infrastructure

Approaches to Logistics

Mass-Based

- More is better
- Mountains of stuff measured in days of supply
- Uses massive inventory to hedge against uncertainty in demand and supply
- Mass begets mass and slows everything down

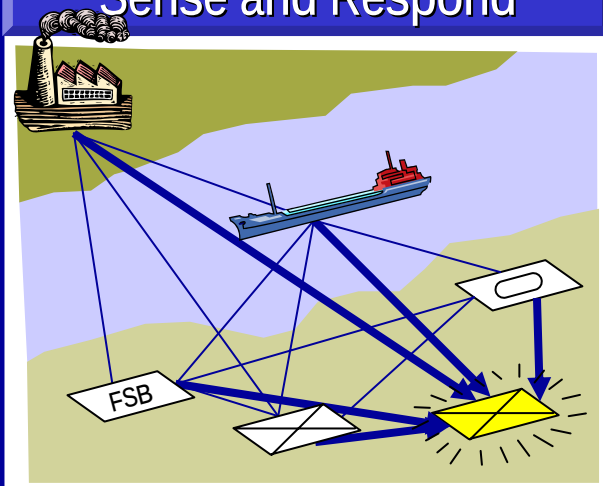
Prime Metric: Days of supply

Just-in-Time

- On-time is better
- Inventory is reduced to a minimum and kept moving
- Uses precise demand prediction and static optimization to purge uncertainty
- Works great … except when it doesn't

Prime Metric: Flow Time

Sense and Respond



- Agile is better
- Inventory is dynamically positioned throughout
- Uses transportation flexibility and robust IT to handle uncertainty
- Initial S&R models look promising

Prime Metric: Speed &Quality of Effects

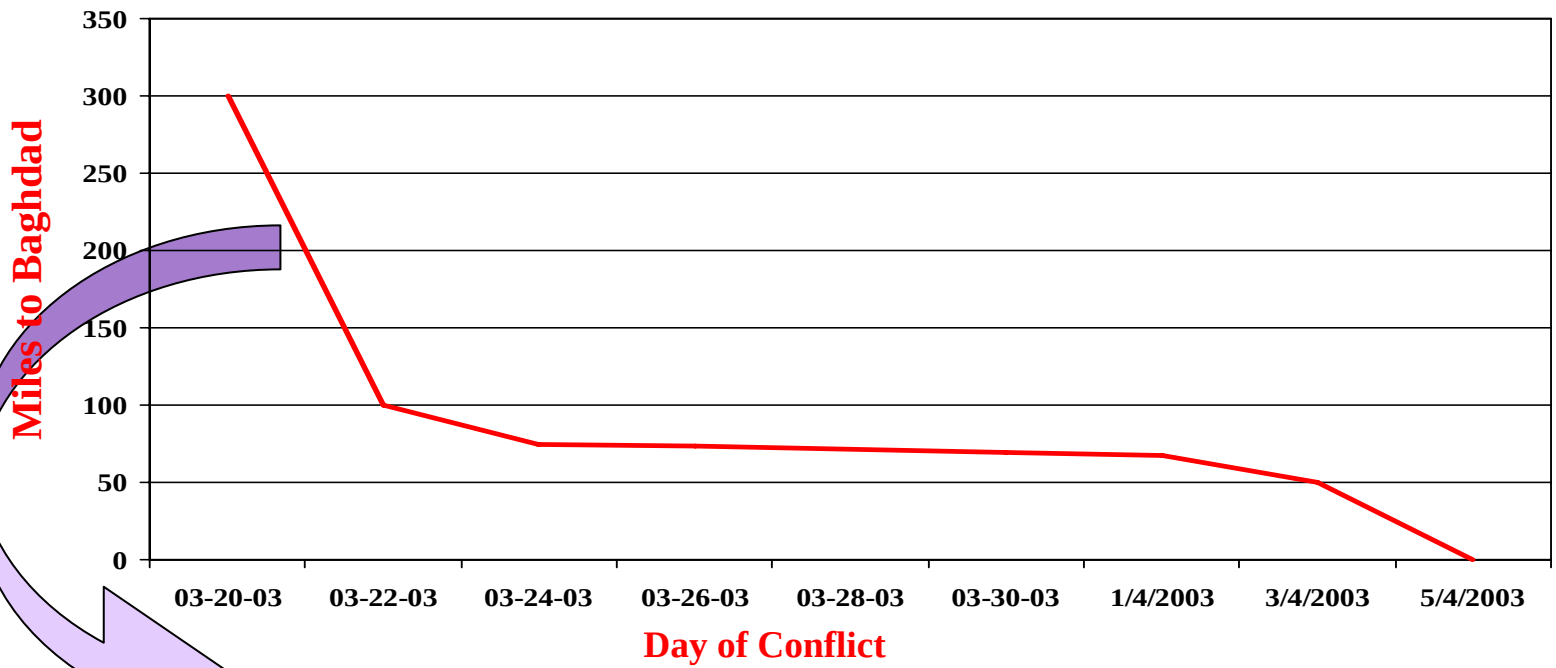
Transforming Defense

… General Observations

The Emerging American Military:

- *More expeditionary (including lighter, more lethal)*
- *More networked (more interoperability at the JTF level)*
- *Designed to leverage the exterior positions (precision from distance as sensors move in)*
- *Leverages increasingly persistent ISR*
- *Tighter sensor-shooter timelines (sensing, C2, fly-out)*
- *Values Information Superiority (information operations)*
- *Expanded unmanned capabilities (UAV, UCAV, UUV, robotics)*

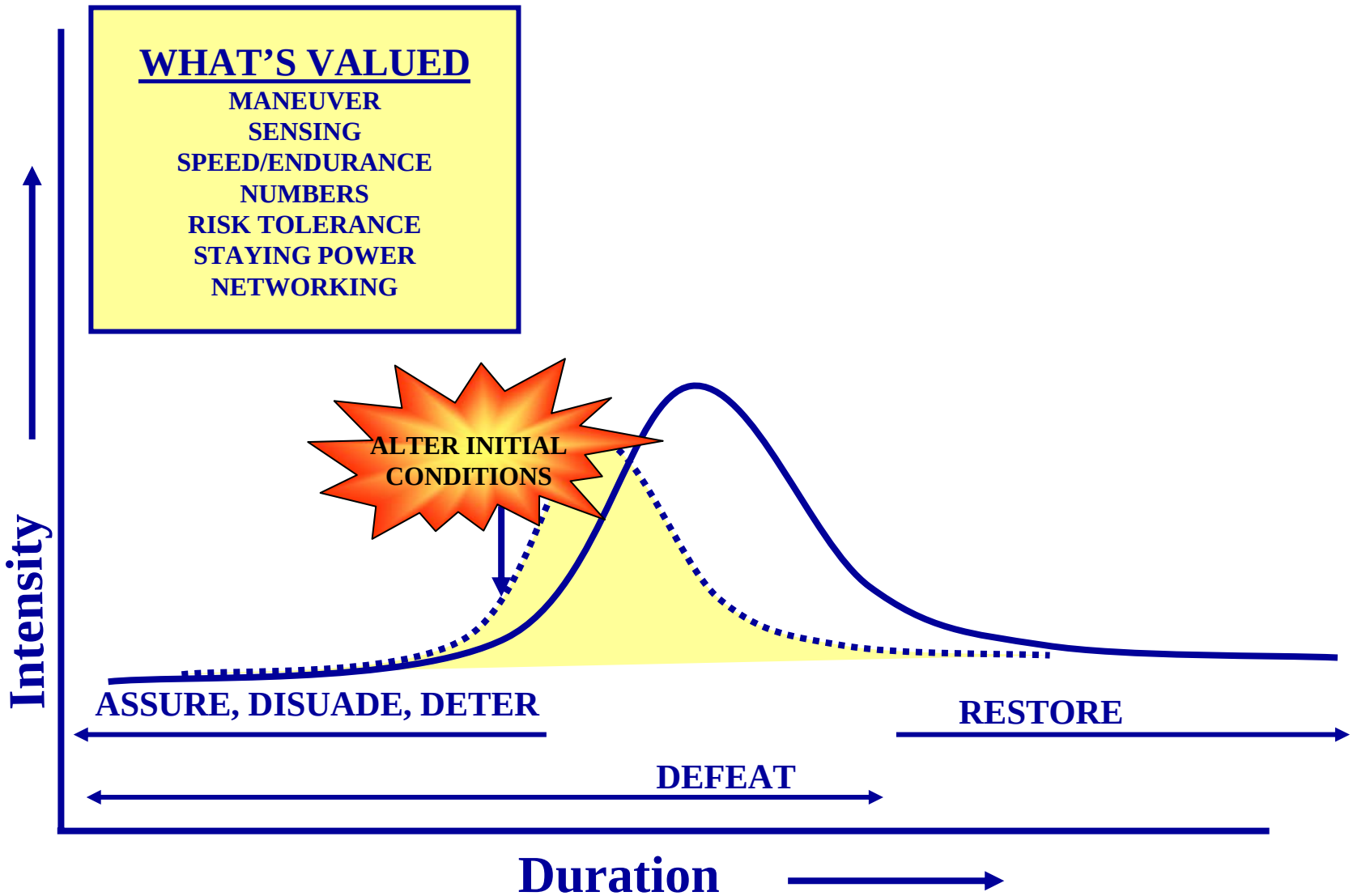
The Advance to Baghdad



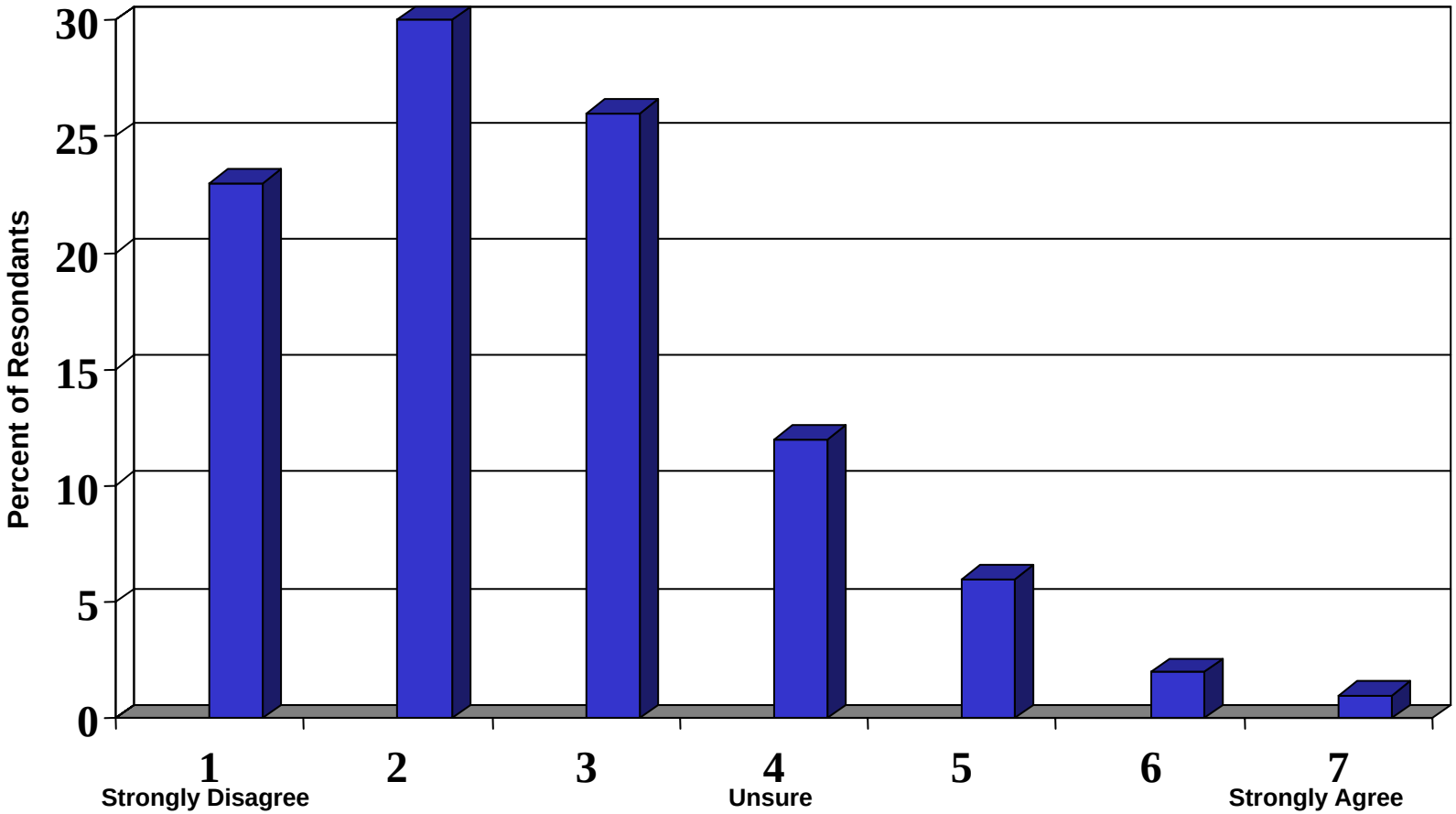
1. **Rate of Advance outruns logistics Communications**
2. **Logisticians shift to "push" system – use models, Sitreps, to "sense" supply needs**
3. **Tactical Units shift to cross supply to fill gaps**

Transforming Defense

…2nd derivative force

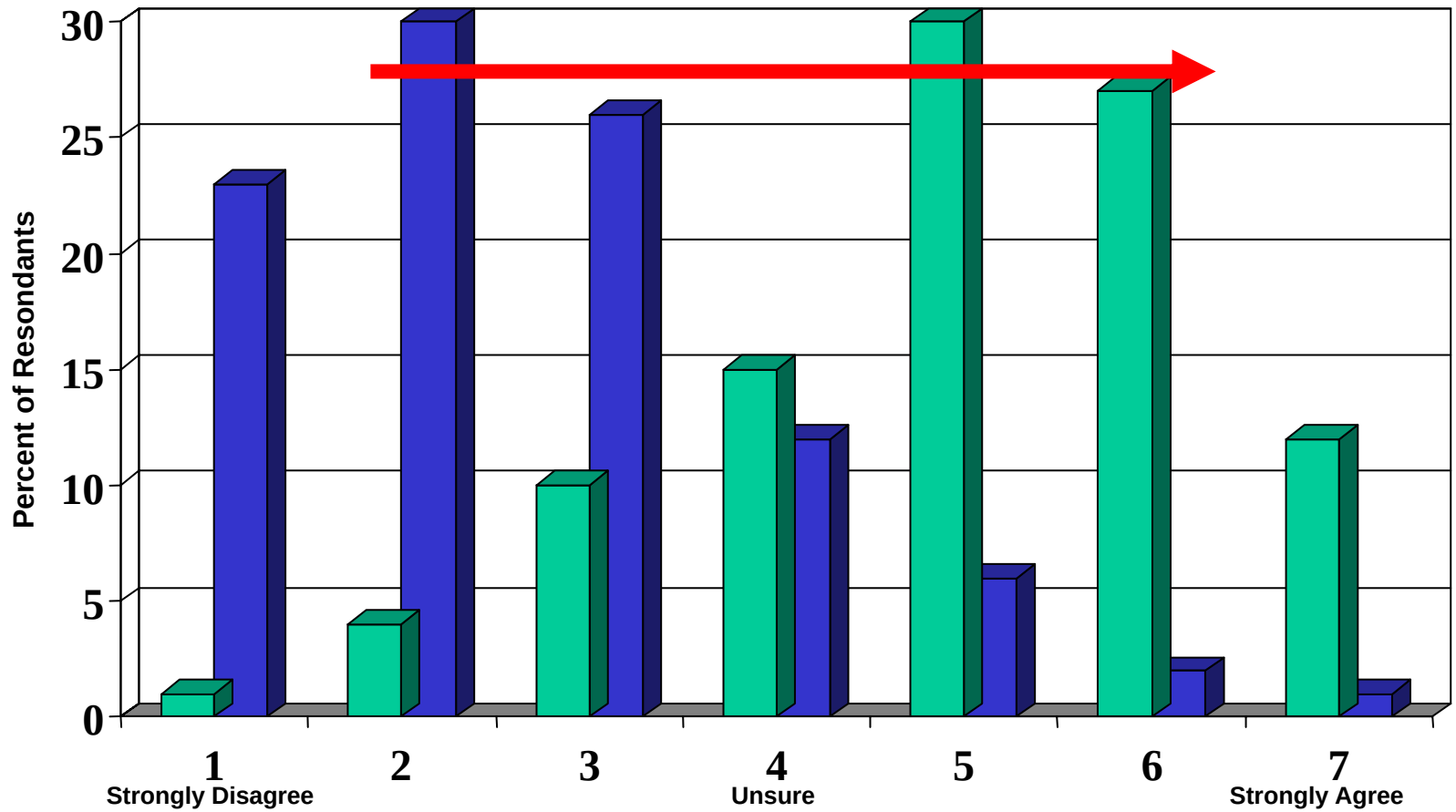


Within the next 10 years, some adversaries will likely have the ability to use long-range precision strike weapons such as ballistic and cruise missiles to deny our use of fixed military infrastructure, such as ports, airfields, and logistical sites.



Source: Thomas G. Mahnken and James FitzSimonds, *"Officer Attitudes Toward Innovation"*, Naval War College, 2002

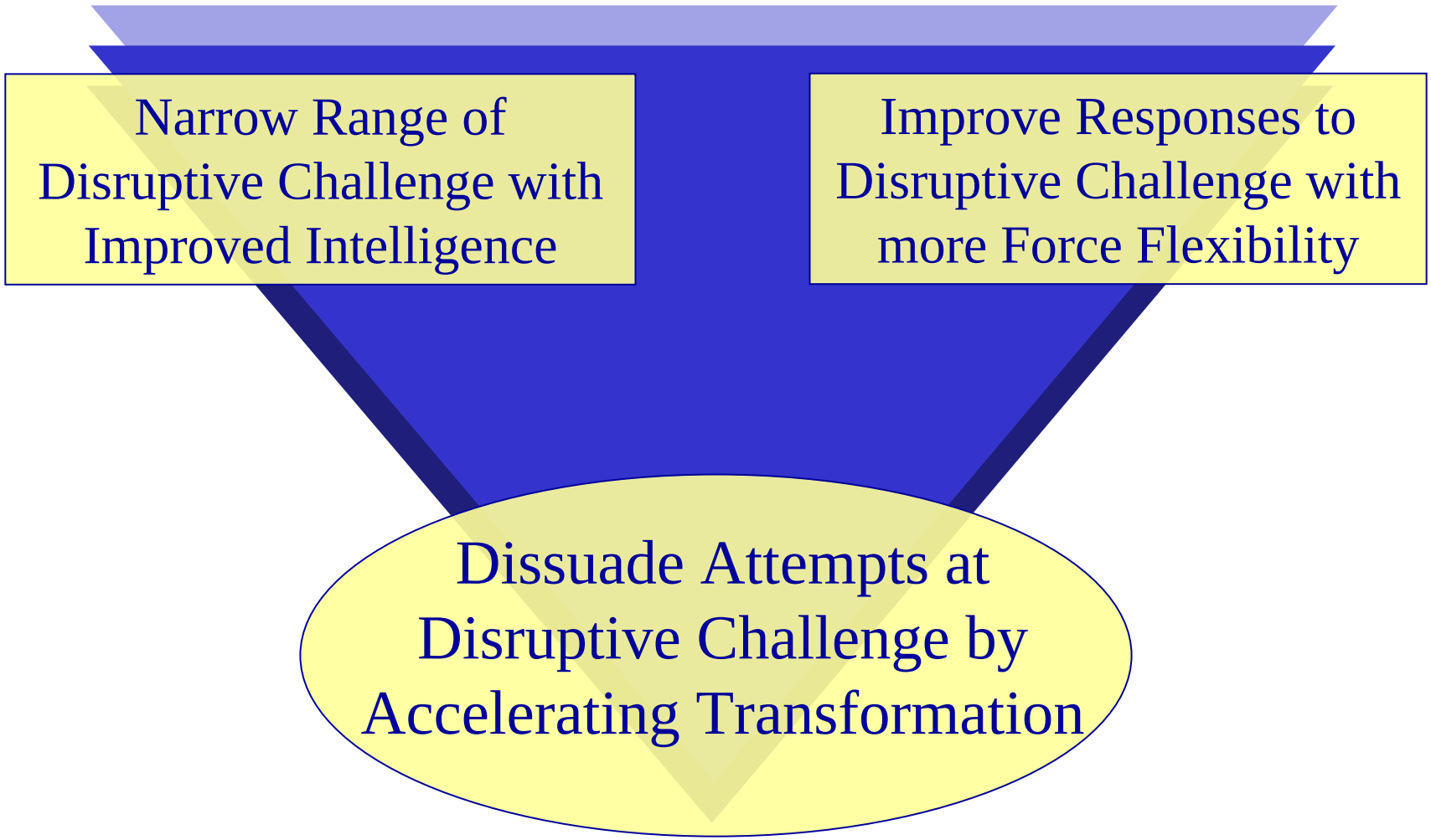
Within the next 10 years, some adversaries will likely have the ability to use long-range precision strike weapons such as ballistic and cruise missiles to deny our use of fixed military infrastructure, such as ports, airfields, and logistical sites.



"The Limits of Transformation: Officer Attitudes toward the RMA," Tom Mahnken and James Fitzsimmons NWC, 2003

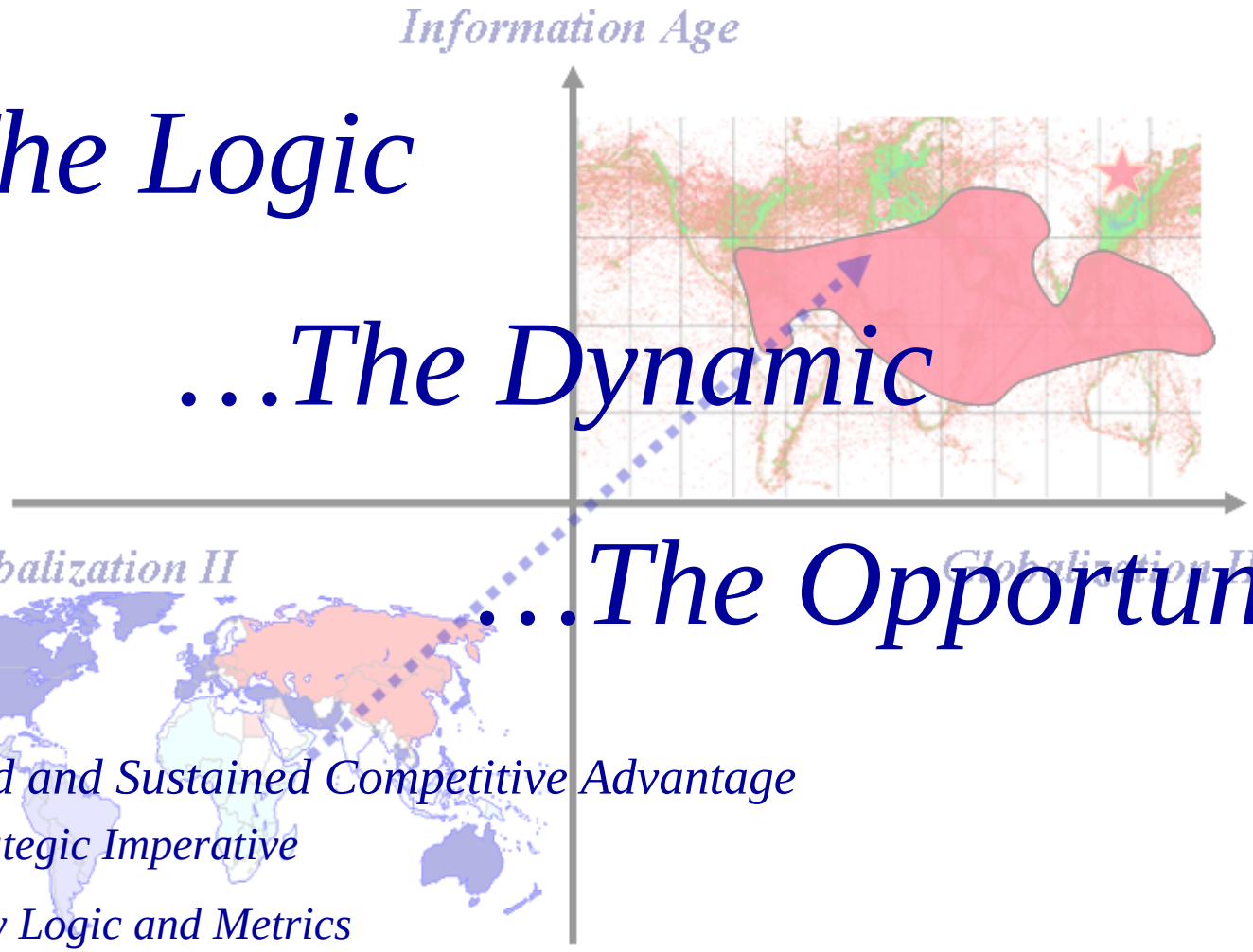
Disruptive Security Challenges

…An Approach




ALAM MAKMUR

Transforming National Security



…The Logic

…The Dynamic

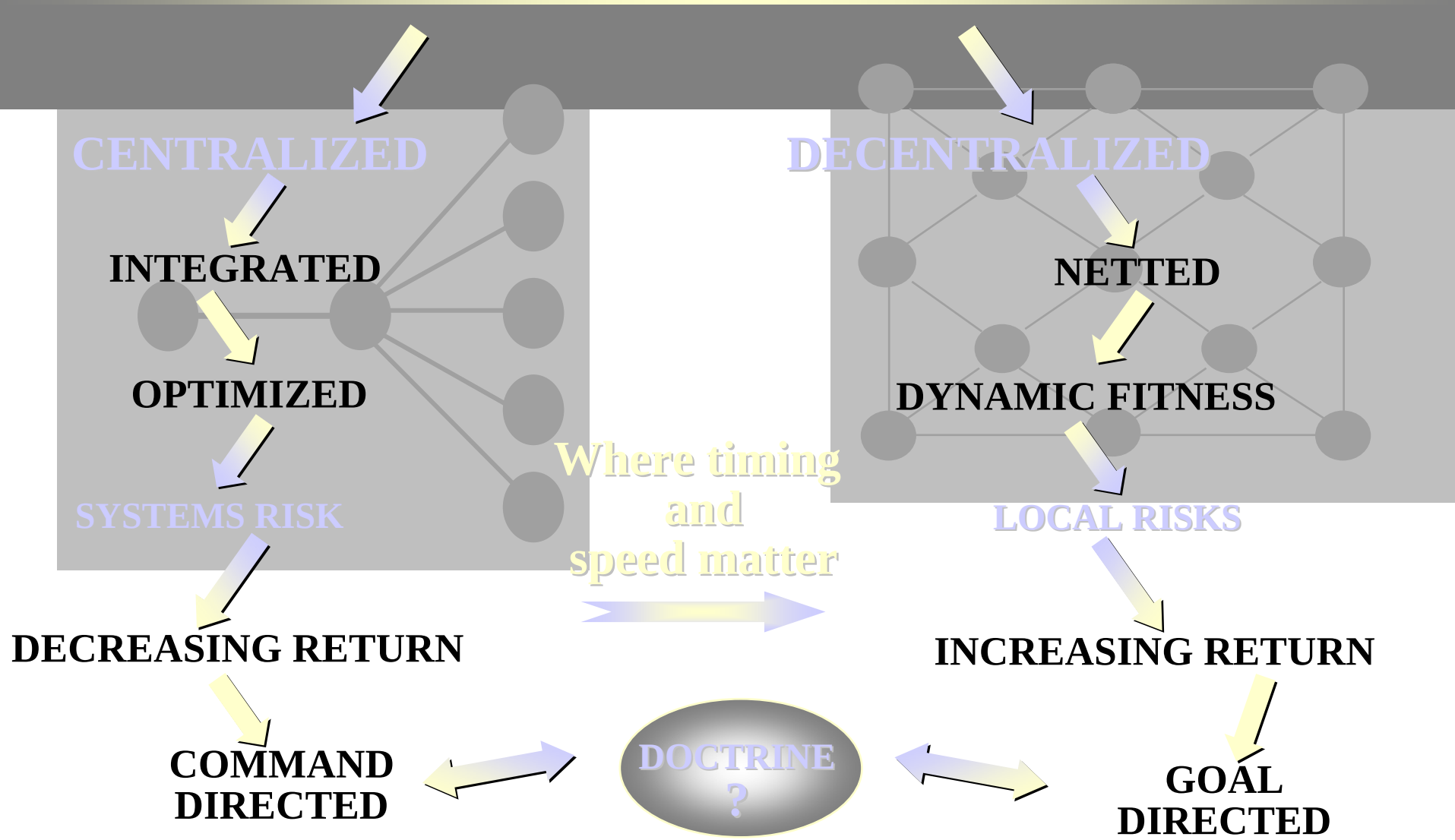
…The Opportunity

Vision: Broad and Sustained Competitive Advantage

- *Strategic Imperative*
- *New Logic and Metrics*
- *Technology Opportunities*

Terry J. Pudas
Acting Director, Force Transformation
18 January, 2006

Architectural Choices



Locating System Complexity

Causes for Increased Speed

Incentives:

- The value of time

"Demassification":

- The devaluing of distance and geography

More direct coupling of input to output:

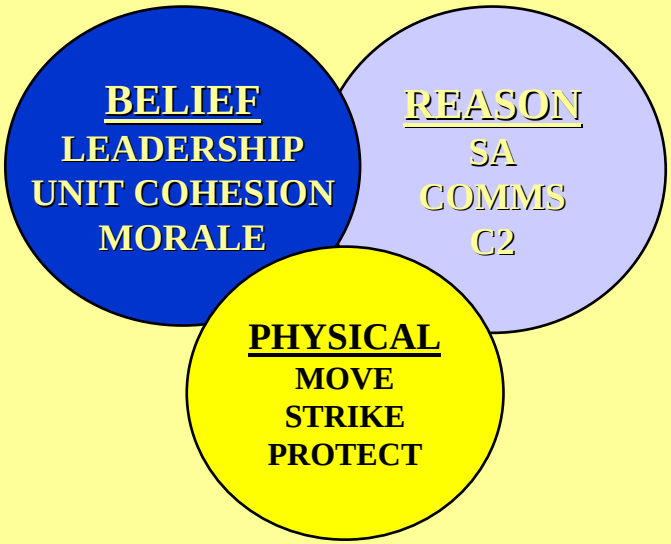
- The flattened hierarchy

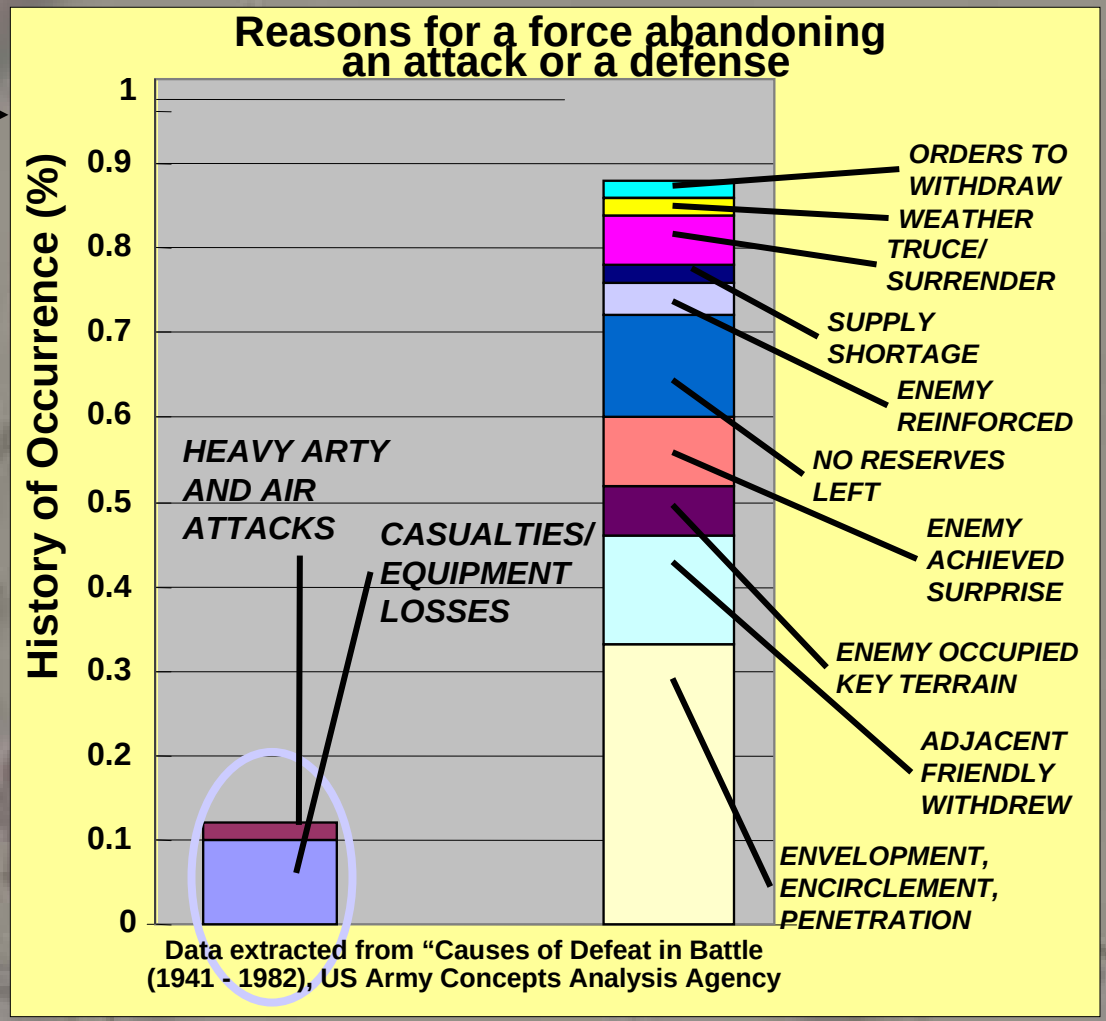
Speed of Effects

NETWORK CENTRIC WARFARE

HIGH RATES OF CHANGE
CLOSELY COUPLED EVENTS
LOCK IN/OUT
SPEED OF COMMAND
SELF SYNCHRONIZATION

DOMAINS OF WAR

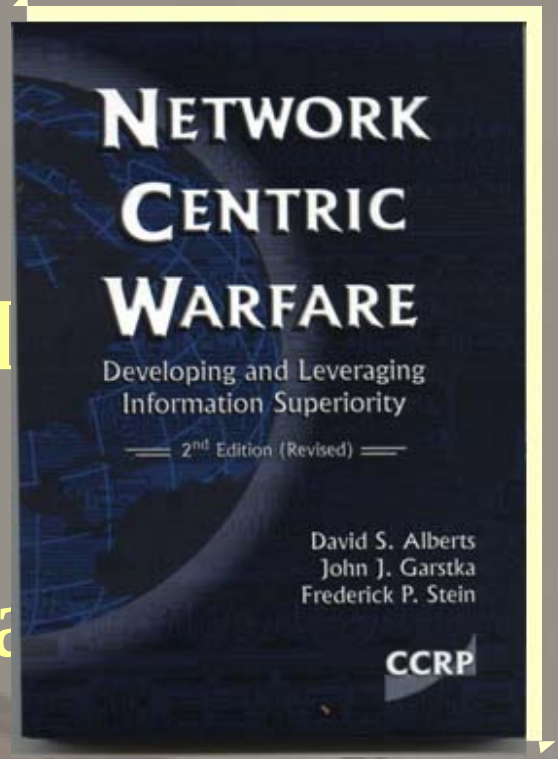




Effects-Based Warfare

Human Behavior Dominates Outcome

- Not modeled well
- No rigorously quantifiable M
- Appreciated by Clausewitz
- Basis of Network-Centric Wa



Readiness = f(cohesion, morale,

Project “Sheriff”

…Controlling the Engagement Timelines

The Capabilities

- “Speed-of-light Sensing
- Networked
- Lethal/Non-Lethal Options
- Active/Passive Options
- Kinetic/Non-Kinetic Options
- Survivability

The Technology

- Compact Active-Denial Technology
- Phraselator High-Power Direction Hailer
- Vector-Beam High-Power White/IR Spot Light
- Counter Improvised Explosive Device (IED)
- Active Protection
- Counter Sniper
- Rapid-Fire Kinetic Weapon
- Multi-Spectral Sensor Suite
- Armor Protection
- Integrated Electronic Warfare Suite
- Net-Centric Technology

Sherriff Video

Full-Spectrum Effects Platform

Active Denial Technology (ADT)

Laser Dazzler

Long Range Acoustic Device (LRAD)

Gunslinger

- Speed
- Information
- Lethal / Non-Lethal
- Active / Passive
- Kinetic / Non-Kinetic

Active Protection System (APS)

Bright White Light (BWL)

Mobile Multiband Jammer (MMBJ)