Defense Transformation and Network Centric Warfare

Presentation to
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Objective

- **Help You Understand:**
  - *Global Trends*
  - *New Strategic Context*
  - *Warfighting Innovation*
  - *Strategy for Defense Transformation*
  - *Network Centric Warfare (NCW)*
    - *Tenets of NCW*
    - *Evidence for Warfighting Advantage*
  - *Emerging NCW Implementation Strategy*

Global Trends

Globalization II $\longrightarrow$ **Globalization III**
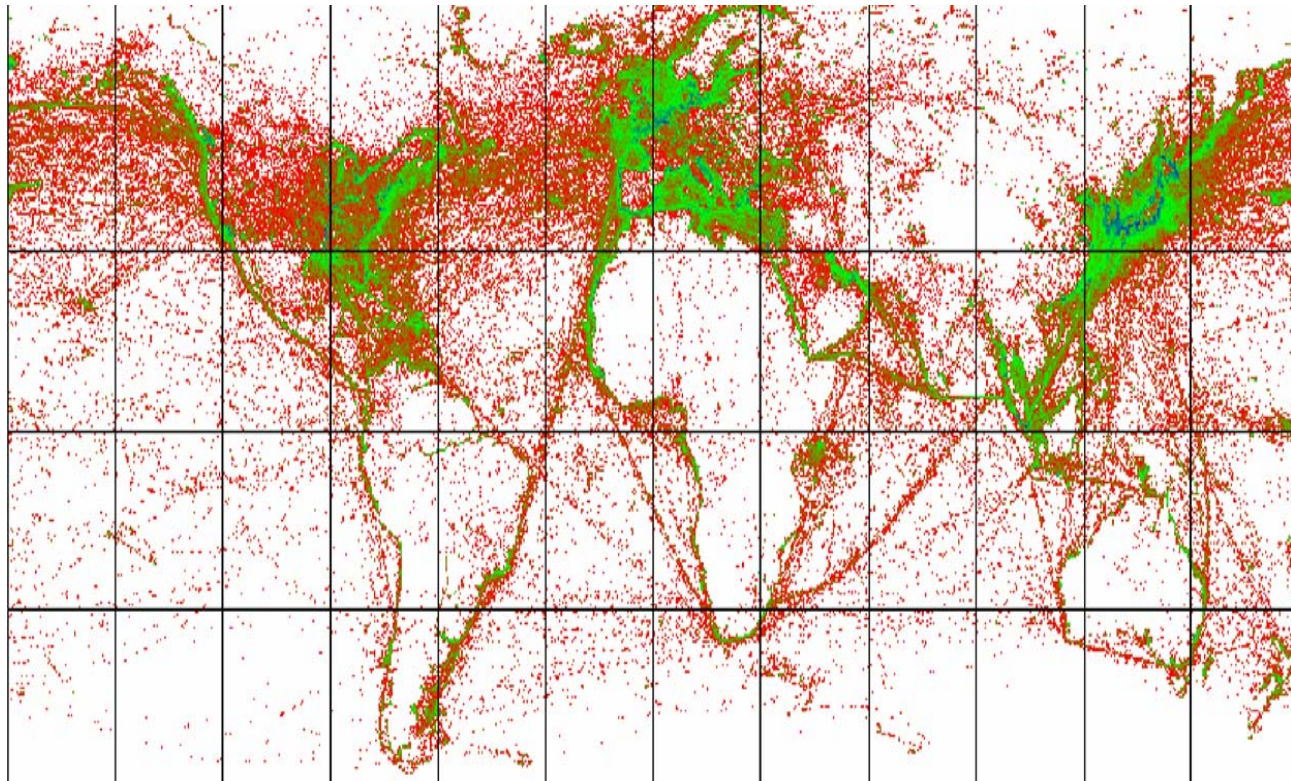
Industrial Age $\longrightarrow$ **Information Age**

Global Trends

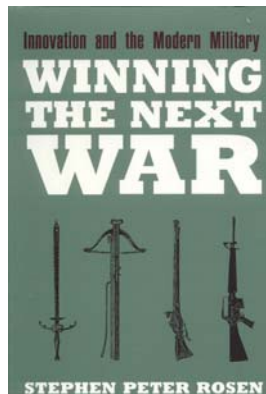## Globalization II → Globalization III

Globalization II
- Static, bipolar "market"
- Bulk of population in 3rd World
- Limits on security "exports"
- *Beliefs in Conflict: Political Ideology*
- Ordering principle = Great Power War; yet none since 1945

Globalization III
- Also bifurcated, but very fluid
- 4 Billion in Core, 2 Billion in Gap
- "Unlimited" global demand for security exports
- *Beliefs in Conflict: Religion/culture*
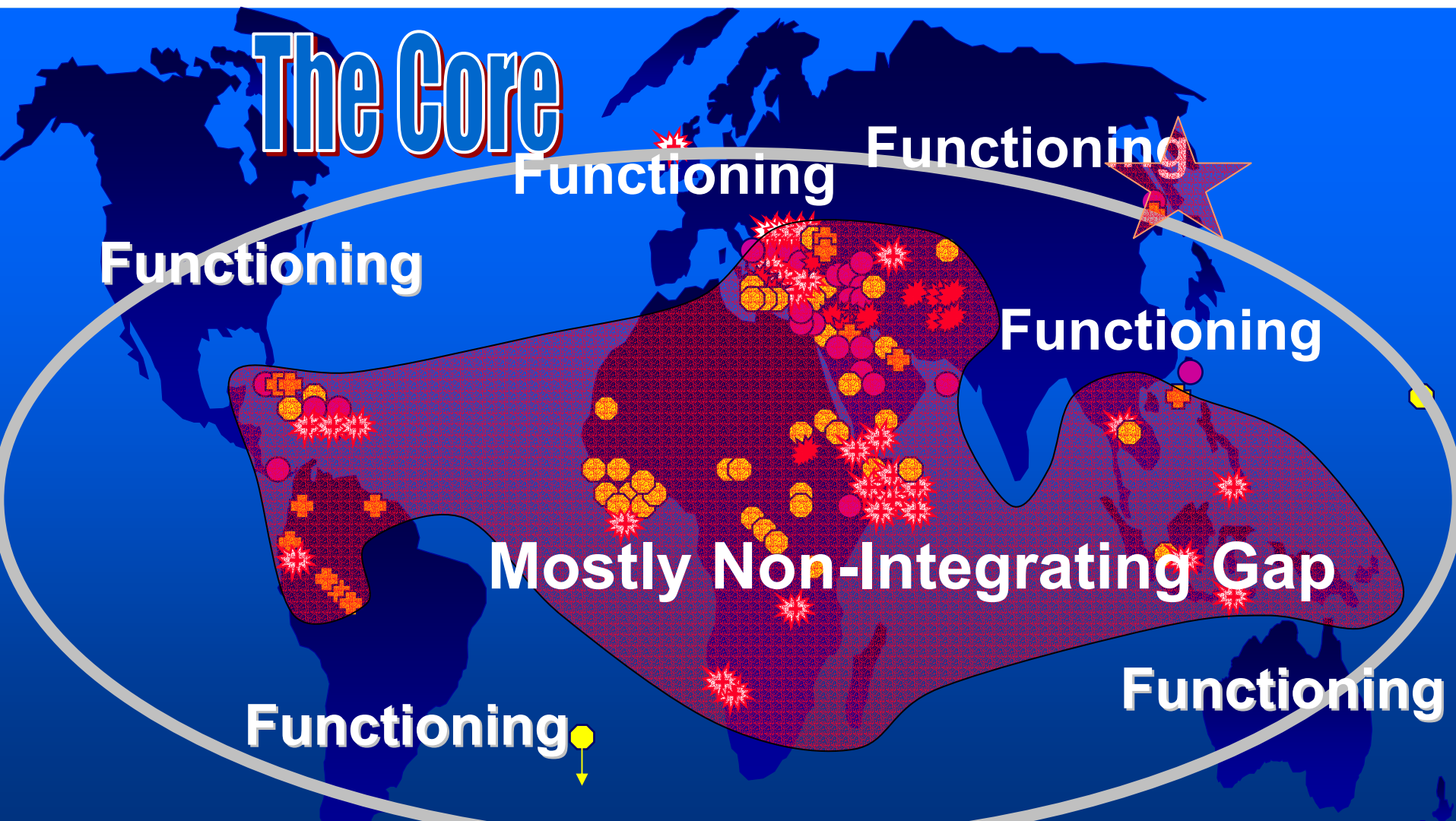- Warfare now simultaneous across system, state and individual levels

Proliferation of WMD & military technology

- *New Rules*
- *New Institutions*
- *New Security Environment*
- *Disconnectedness* → *Danger*

Innovation and the Modern Military
WINNING THE NEXT WAR
STEPHEN PETER ROSEN

Globalization III

The Core

Functioning

Functioning

Functioning

Functioning

Functioning

Mostly Non-Integrating Gap

Functioning

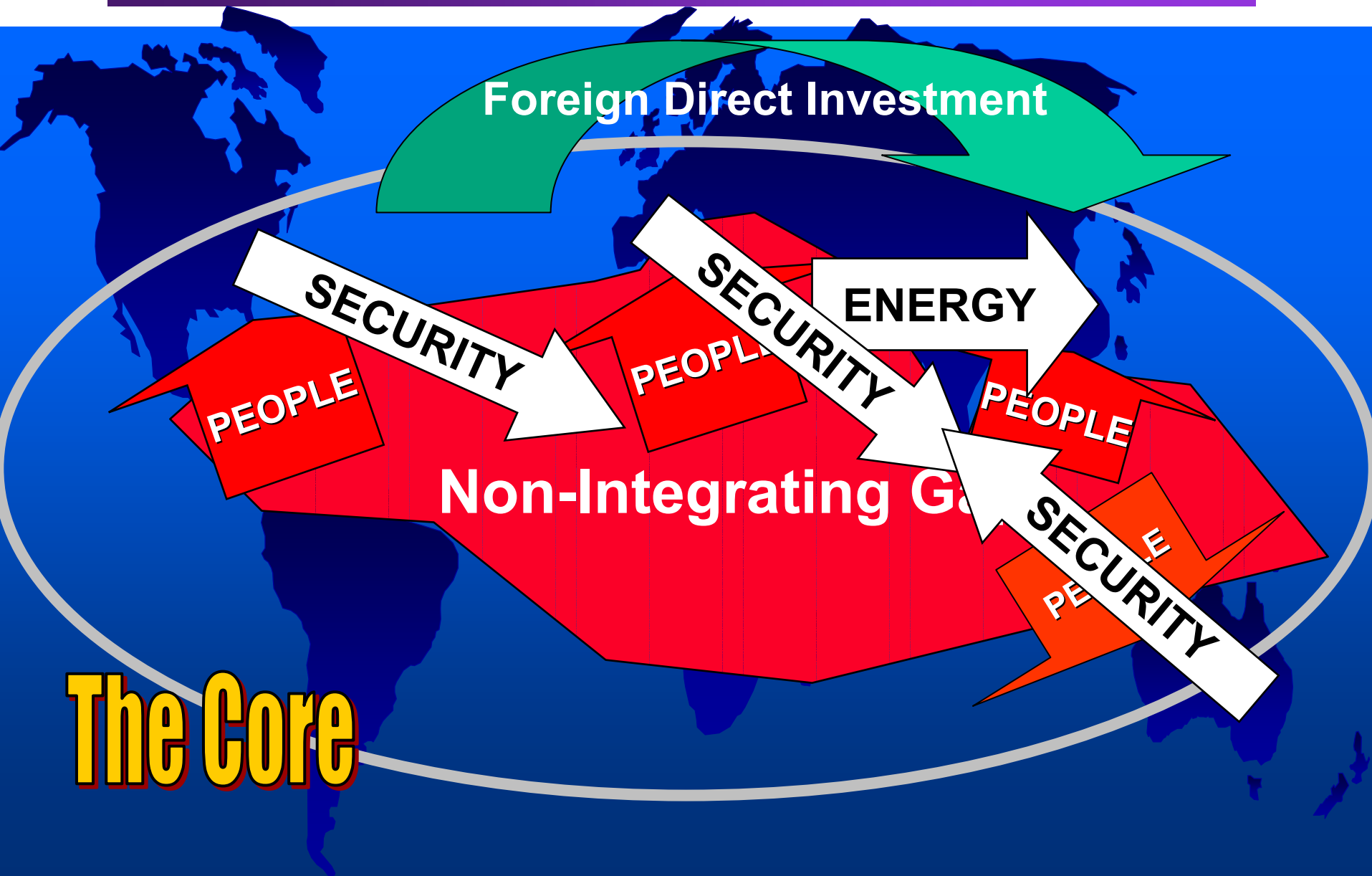Functioning

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

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

Globalization III: Major Flows

Foreign Direct Investment

SECURITY

ENERGY

SECURITY

PEOPLE

PEOPLE

PEOPLE

PEOPLE

SECURITY

Non-Integrating Gap

The Core

Global Trends

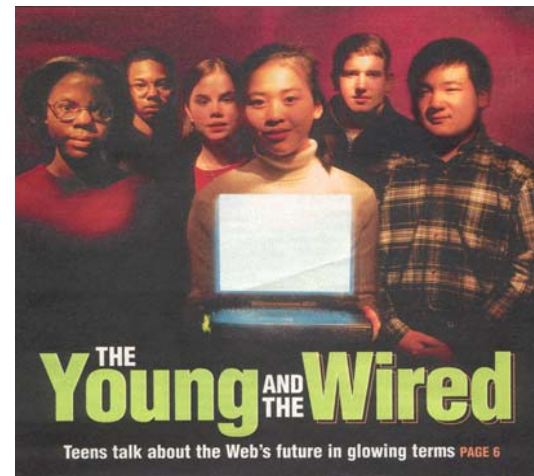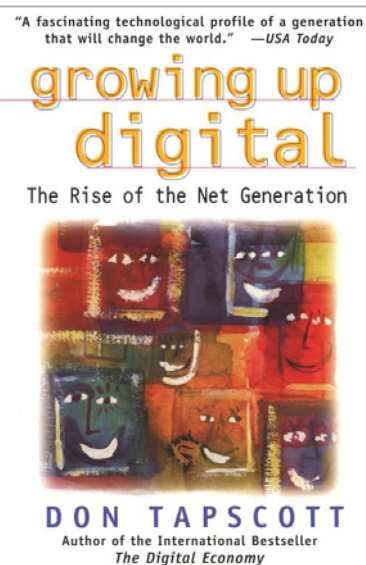## Industrial Age → Information Age

Industrial Age

- Success = Scale + Scope
- Top Down - Centralized
- Vertical Integration
- Information Hoarding
- Local Awareness
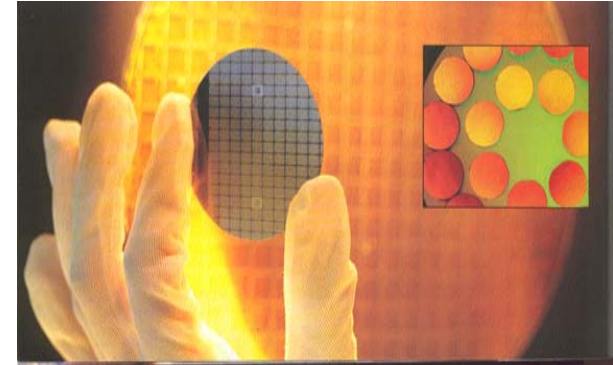- Arms Length Relationships
- Make and Sell
- Inwardly Focused

Information Age

- Success = Adaptability + Agility
- Empowering the "Edges"
- Virtual Integration
- Information Sharing
- Increased Transparency
- Collaboration & Synchronization
- Sense and Respond
- Externally Oriented
- Accelerated Innovation & Experimentation

- *New Rules*
- *New Behaviors*
- *New Competencies*
- *New Relationships*

"A fascinating technological profile of a generation that will change the world." —USA Today

growing up digital

The Rise of the Net Generation

DON TAPSCOTT
Author of the International Bestseller
The Digital Economy

THE Young AND THE Wired

Teens talk about the Web's future in glowing terms PAGE 6

accenture >

Chinese to Become #1 Web Language by 2007

{Now it gets interesting.}

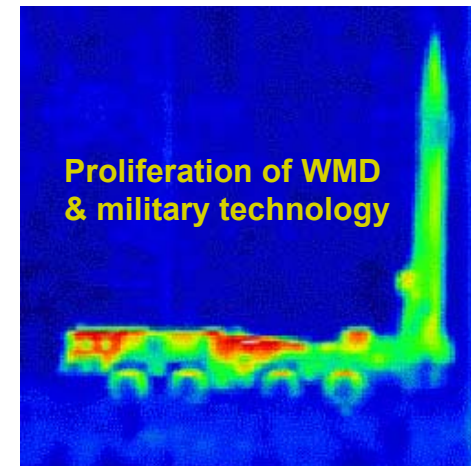# *Global Trends Create a New Competitive Landscape*

Information Age

- **New Technological Context**
  - Access to highly capable, low-cost IT
  - Falling barriers to competitive entry -- sea, space, cyberspace

Globalization III
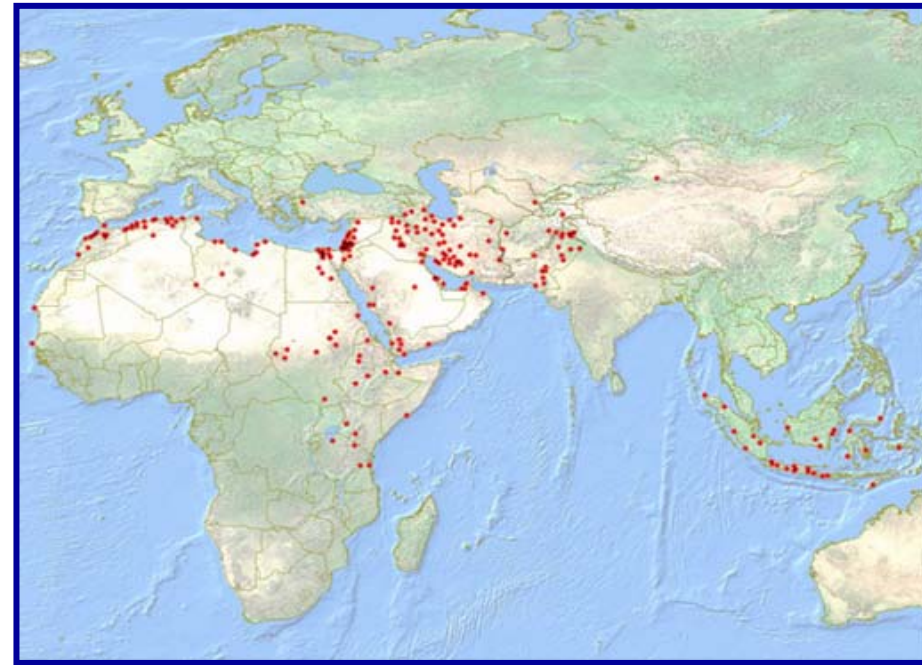
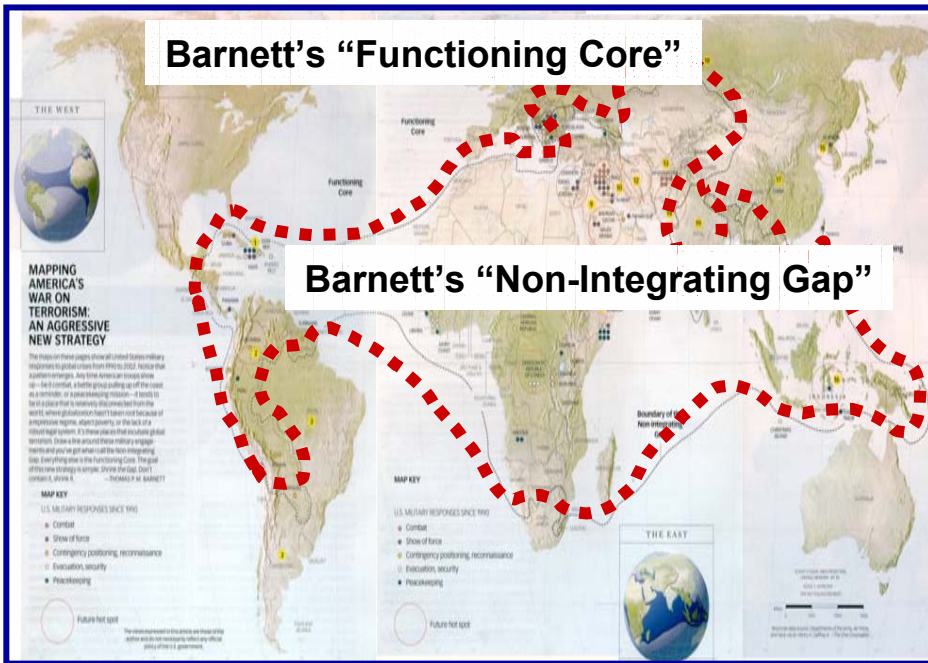- **Broadened Threat Context**
  - Era of uncertainty with rapidly evolving threats
  - State/non-state, nodal/non-nodal
  - Asymmetric / conventional
  - Unrestricted – deterring the un-deterable

Proliferation of WMD & military technology

Global Trends…Threats

Disconnectedness ➡ Danger

Islamic Technical Centers

Barnett's "Functioning Core"

Barnett's "Non-Integrating Gap"

Global Trends Create a
# New Competitive Landscape

Information Age

- **New Strategic Context:**
  - *Information Age principles & phenomena changing character of competition*
  - *Era of globalization – a changed international landscape*
  - *New relationship between operations abroad and homeland security*

Globalization III

*To the degree we do not transform,
we are strategically a fixed-target and therefore at risk*

Transformation: Meeting the Challenges of the New Competitive Landscape

Information Age

Globalization II

Globalization III

Industrial Age
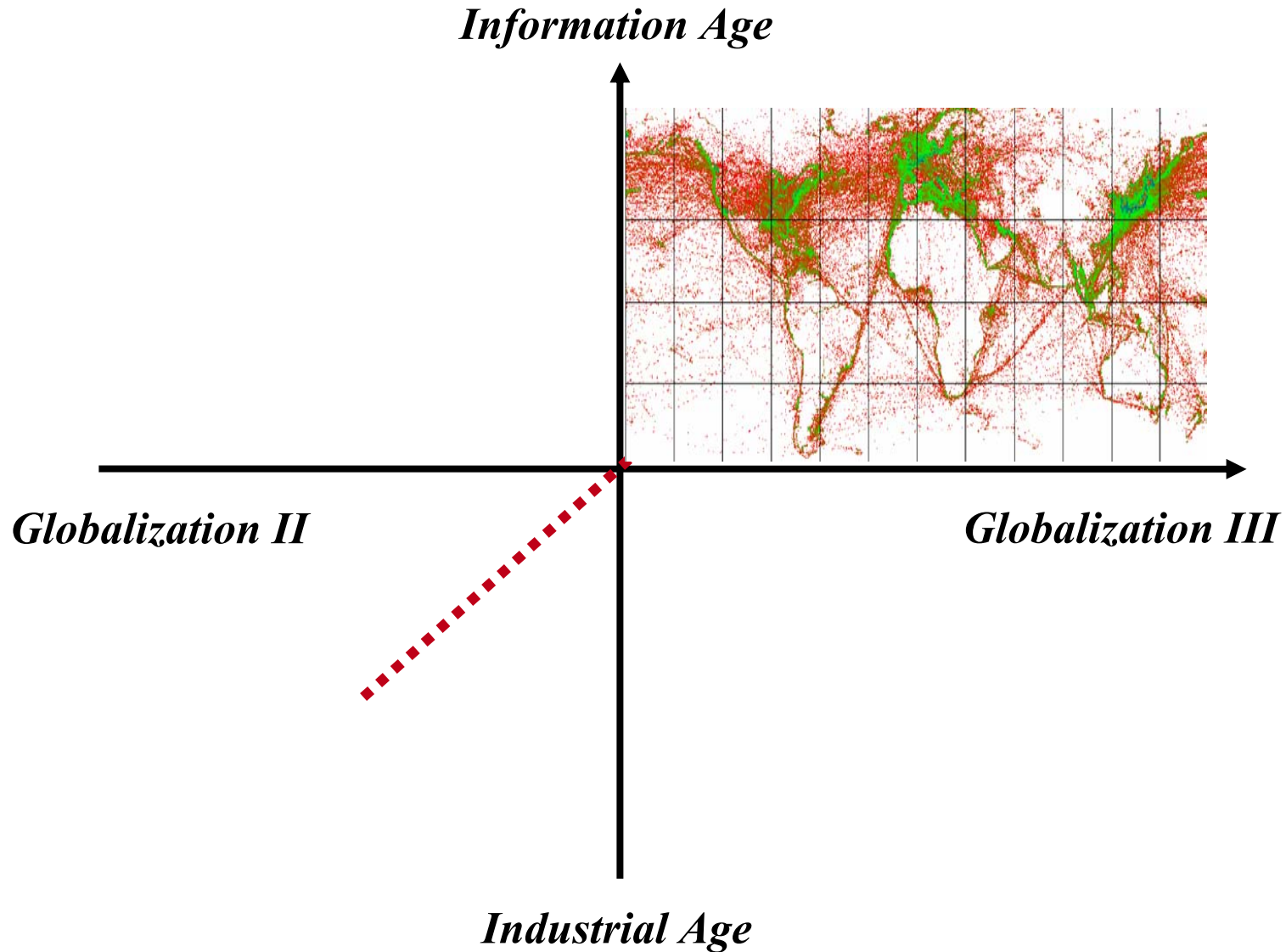
Transformation

- ☑ **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**
- ☑ **Broadened capabilities base**

- *New technology context*
- *Broadened threat context*
- *New strategic context*

## *A Broad and Sustained Competitive Advantage*

Creating Competitive Advantage

…Historical Insights

- Characteristics of ***New Sources of Competitive Advantage***
  - Order of magnitude change in a ***key*** dimension of warfare
  - Emergence of "New Elite" – ***Displacement*** of "Existing Elite"
- Land Warfare: Sustained Rate of Fire
  - Rifle (1.8×10^1 rounds per minute)
  - Machine Gun (6×10^2 rounds per minute)
- Land Warfare: Sustained Speed Maneuver
  - Cavalry + Infantry
  - Mechanized Armor + Infantry + Air Power
- Warfare at Sea: Range of Engagement
  - Battleship: 1.8×10^1
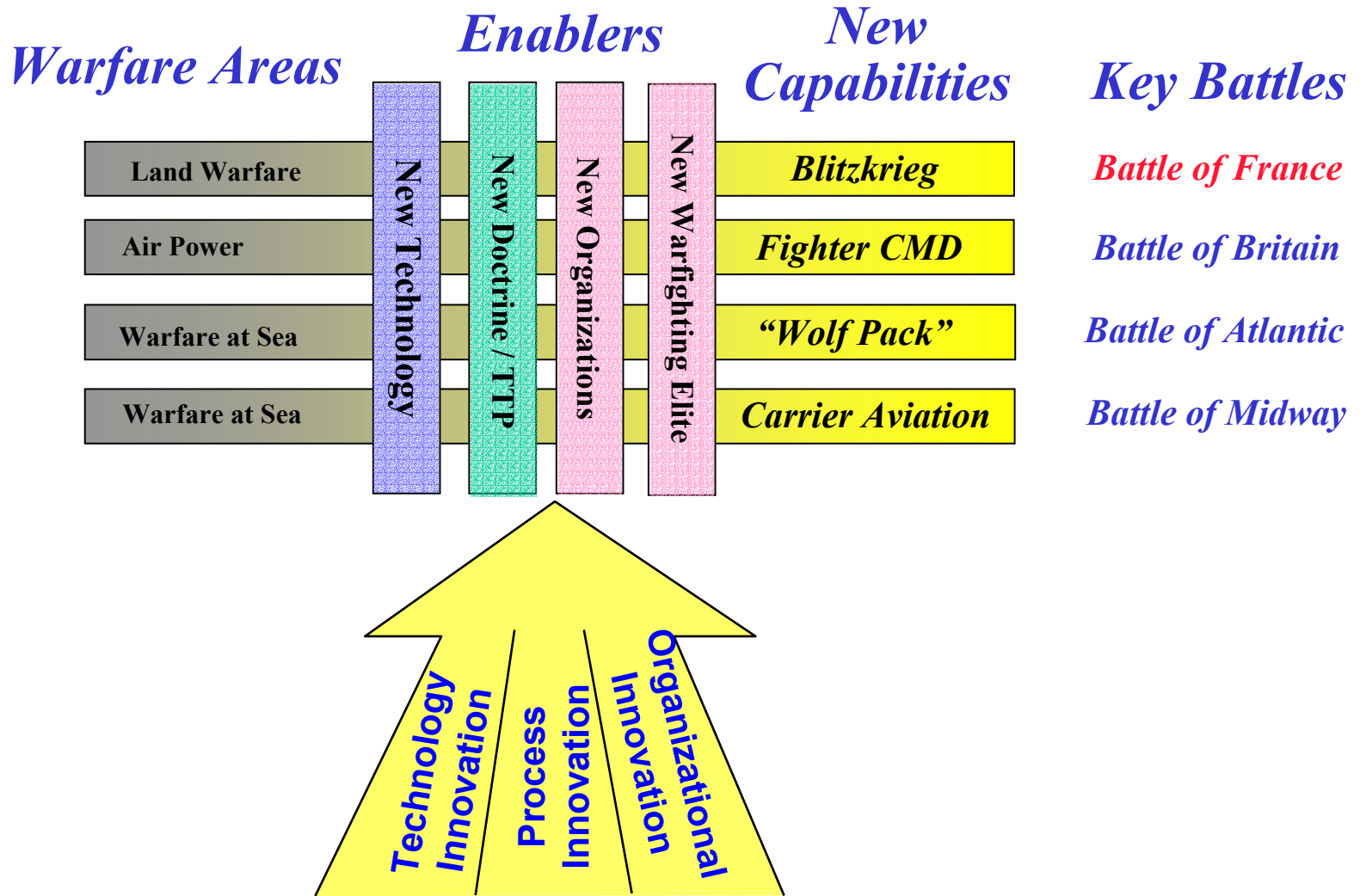 - Carrier Aviation: 1.8×10^2

Order of Magnitude Change **is a leading indicator for a potential new source of** ***Competitive Advantage***

Creating Competitive Advantage:
Exploiting Order of Magnitude Change

Carrier Aviation

Battleship
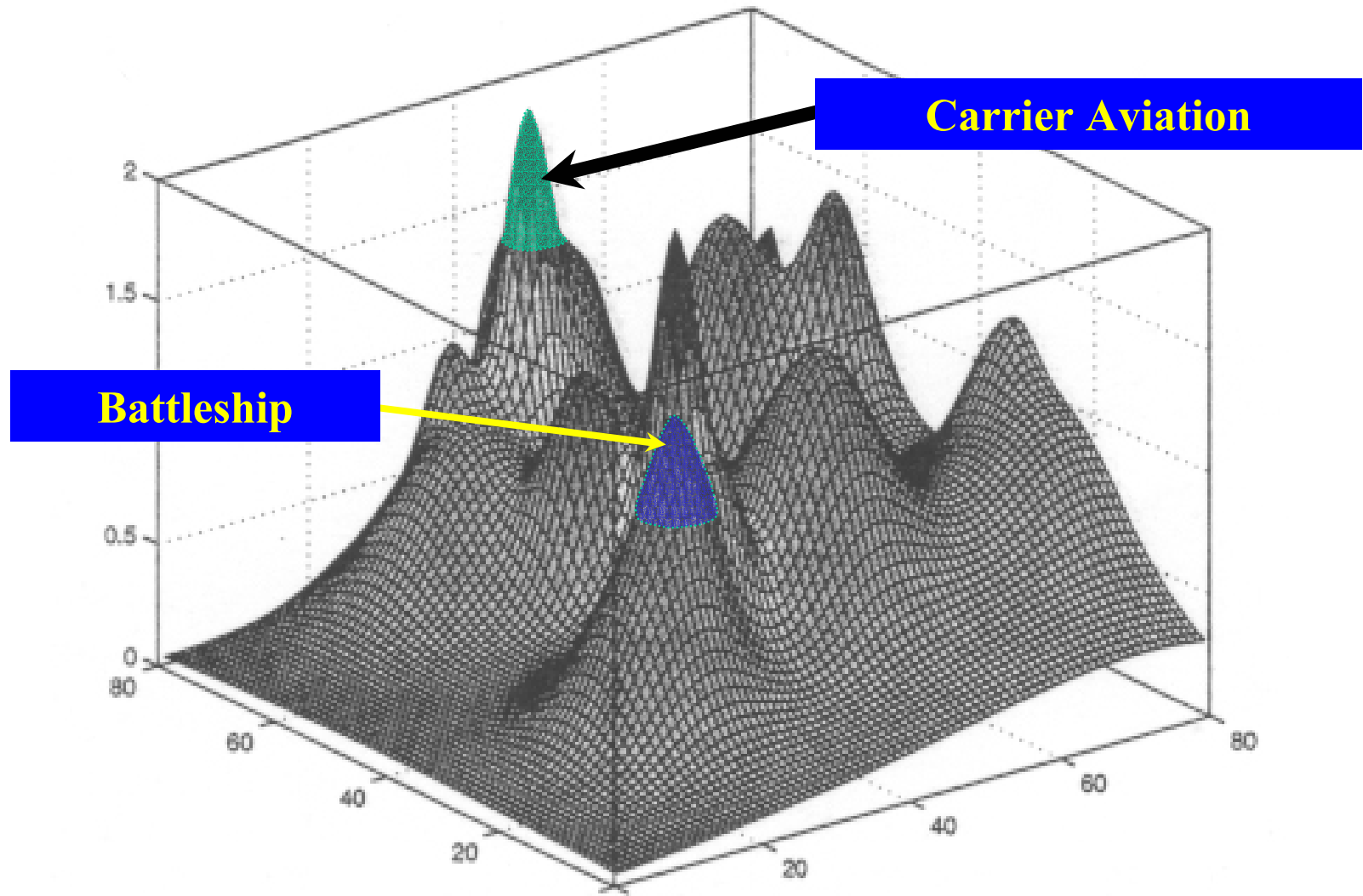
Order of Magnitude Change ⟶ ***New Fitness Peak***

Creating Competitive Advantage: Overcoming Impediments to Innovation

Organizational Behavior
Individual Behavior
Organizational Values
Organizational Incentives
Organizational Structure

Cognitive Domain

Organizational Innovation

Organizational Processes

Information Domain

Process Innovation

"New Concepts"

Platform "Technologies"
Information "Technologies"

Physical Domain

Technology Innovation
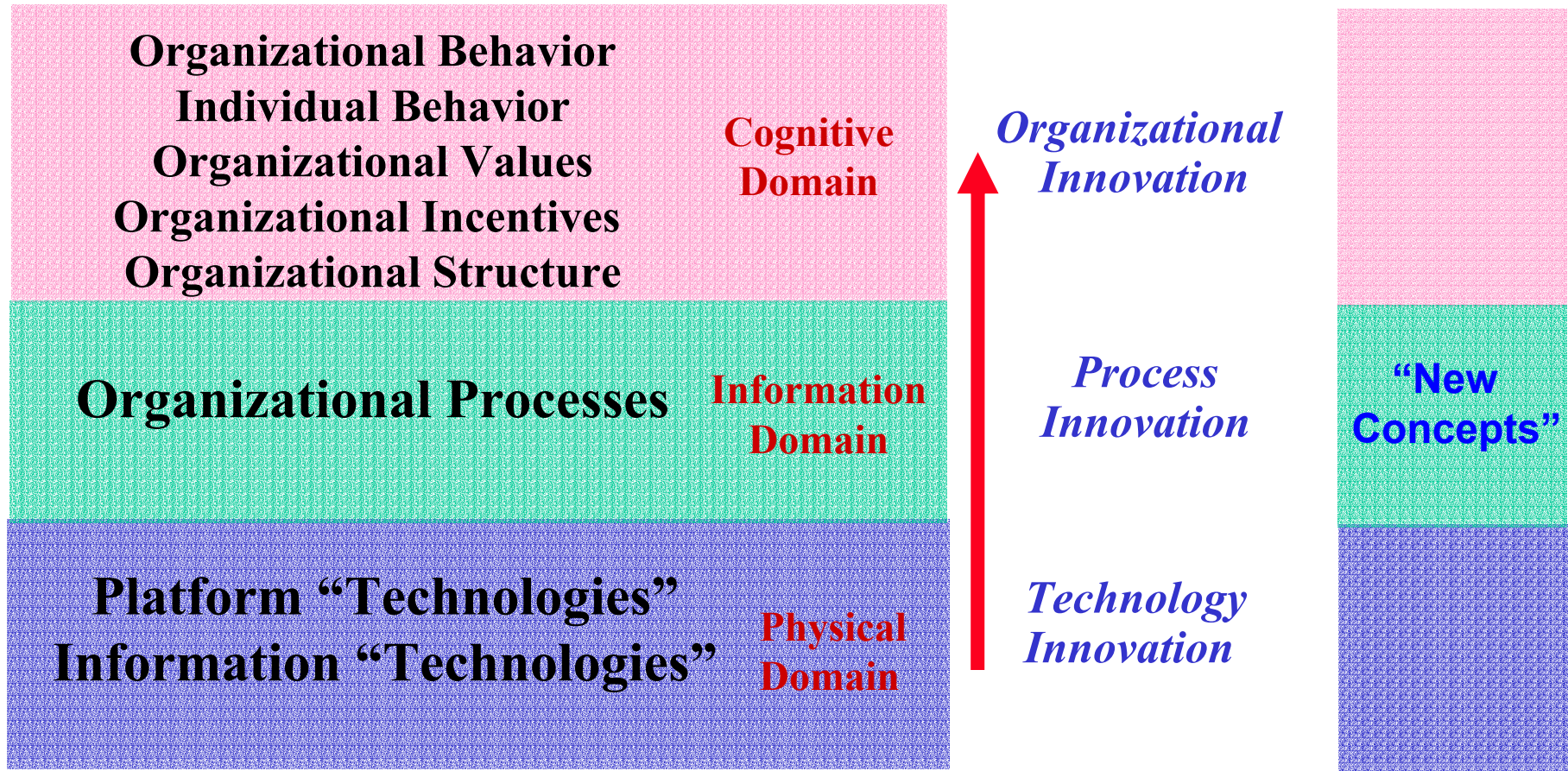
Increasing Level of Difficulty for Change

Impediments to Innovation:
Push Back by the "Existing Elite"
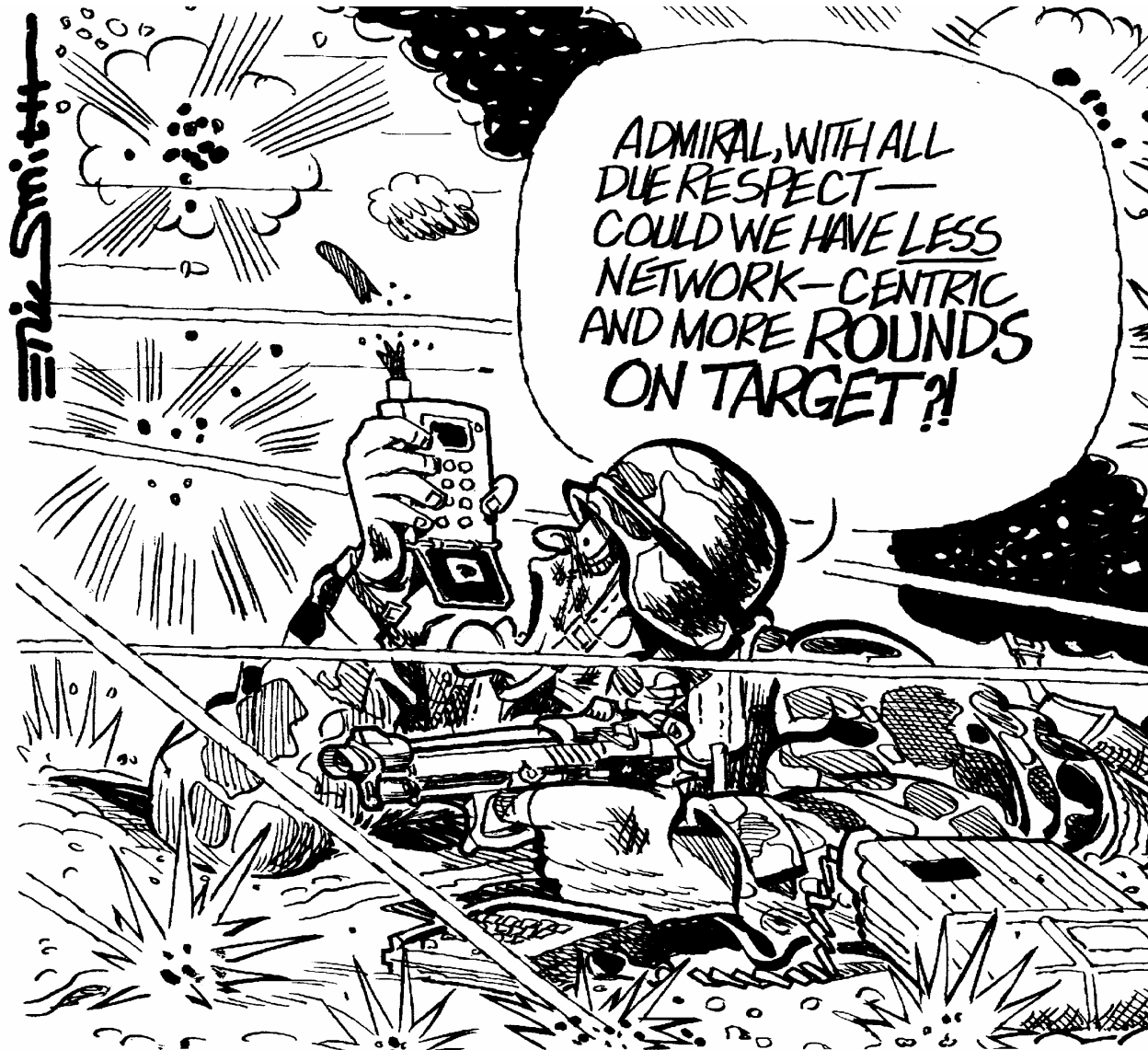
Impediments to Innovation:
Push Back by the "Existing Elite"

Exploring the New Competitive Landscape

Searching Here Now

New Competitive Advantage Could Lie Here

DoD is Here

Or Here
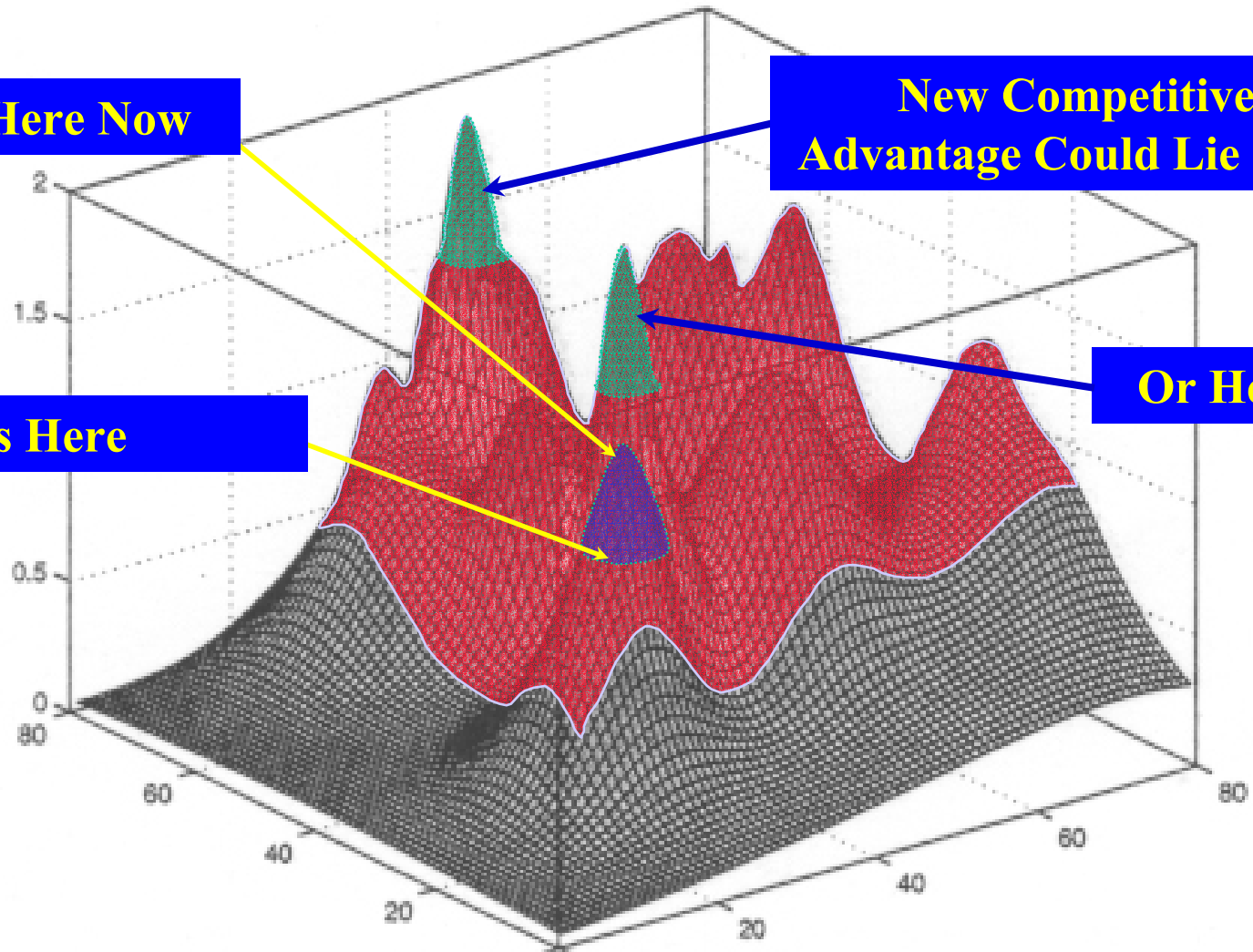
How Do We Explore the "Evolving Competitive Landscape"

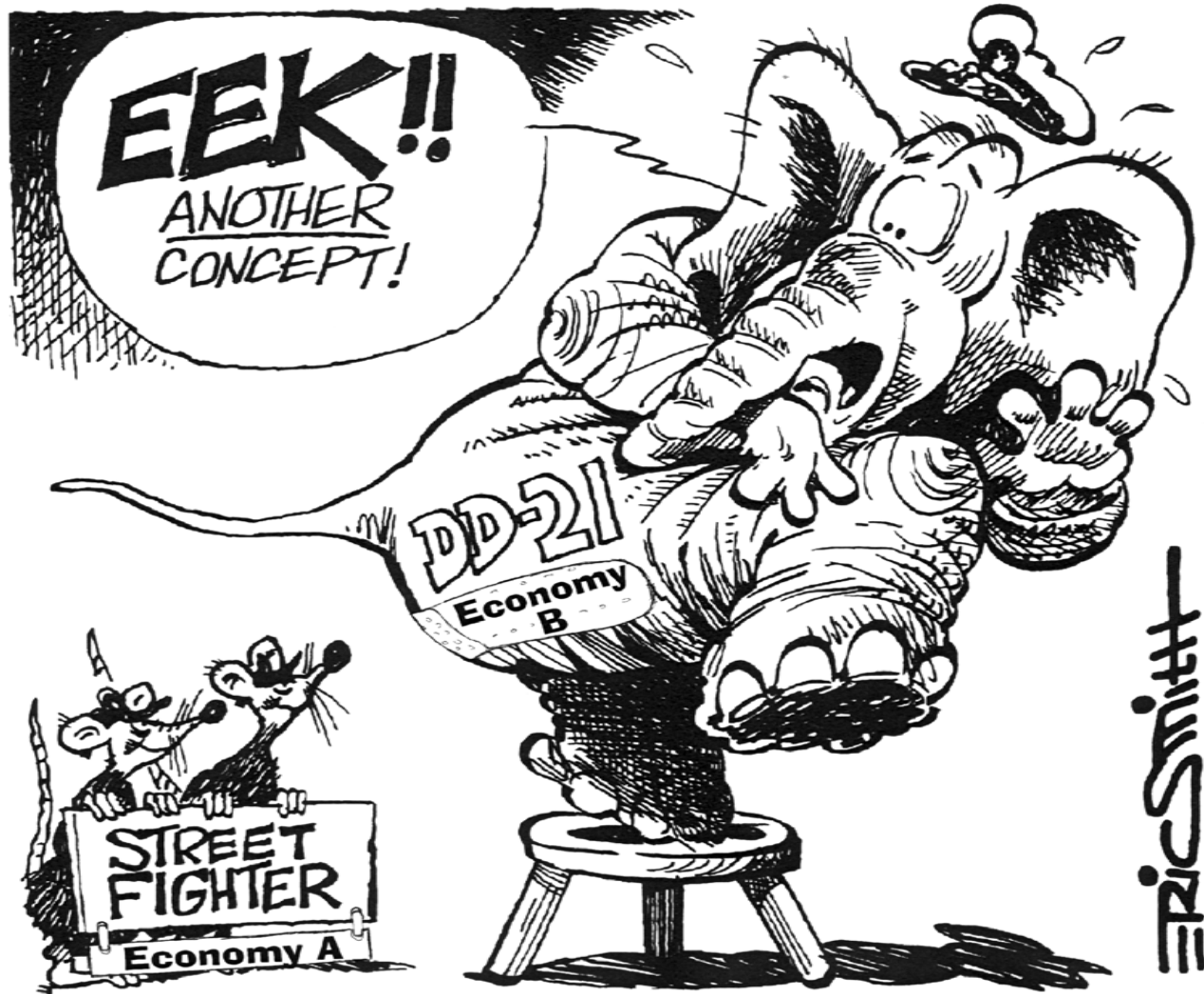# *Transforming Defense*
…Corporate Strategy

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."

Exploring the New Competitive Landscape:
Tangible Progress

Transformation Strategy

- Transform from Industrial Age to the Information Age
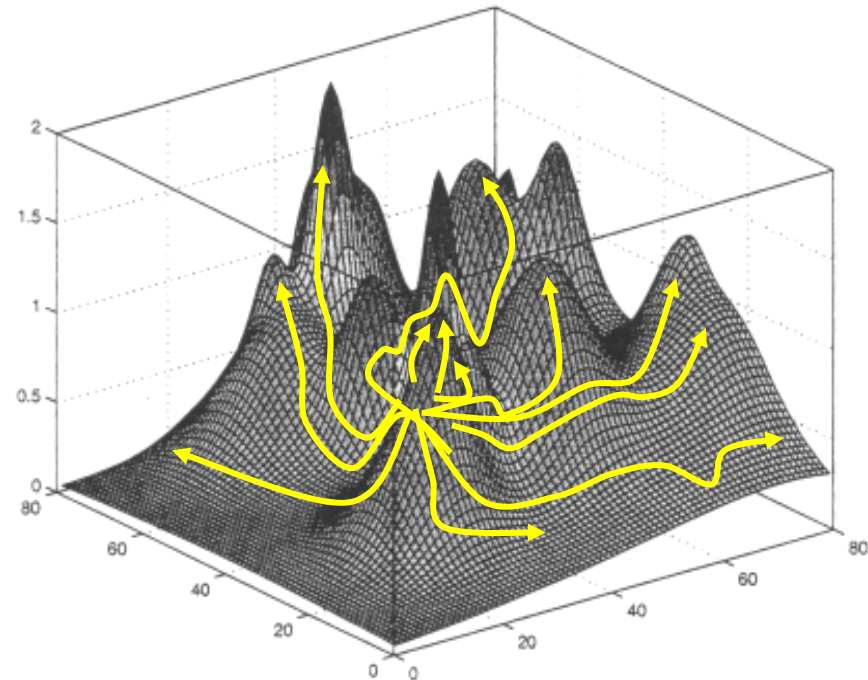
  Implement Network Centric Operations

- Ensure sustained competitive advantage

  Collaborate with Allies

  Dissuade competitive entry

  Underwrite deterrence

  Implement countervailing strategies

- Broaden the capabilities base
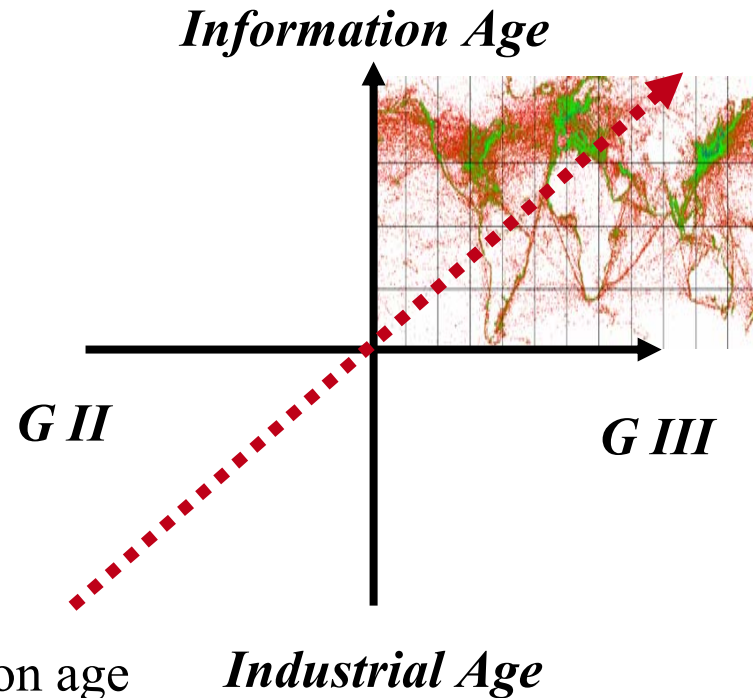
  Operational, Technical, Industrial

  Create new competitive areas

  Revalue competitive attributes for the information age

  Decrease capabilities cycle time

- Leverage our advantages and opportunities

  Manage the revaluation/rebalancing of capabilities and processes

Information Age

G II

G III

Industrial Age

Transforming Defense
… The New American Way of War

The New Rules

- Fight first for *information superiority*
- *Speed* of command
- Access to information: *shared awareness*
- *Dispersed forces*: noncontiguous operations
- *Demassification*
- Elimination of *process lines*
  (e.g. - fusion of ops, intel & logistics or organize, deploy, employ & sustain)
- Elimination of *structural lines*
  (e.g. - Joint ops at the small unit level)
- *Self-synchronization*
- *Alter* initial conditions at *higher rates of change*
- *Compression* of levels of war

Network-Centric Warfare
High Rates of Change
Closely Coupled Events
Lock In / Out
Speed of Command
Self Synchronization

What's Valued
Networking

Sensing

Envelope Management

Speed / Endurance

Numbers

Risk Tolerance

Staying Power

Transforming Defense: Exploiting New Sources of Power

"What we are seeing, in moving from the Industrial Age to the Information Age, is what amounts to a new theory of war: power comes from a different place, it is used in different ways, it achieves different effects than it did before. During the Industrial Age, power came from mass. Now power tends to come from information, access, and speed. We have come to call that new theory of war network-centric warfare. It is not only about networks, but also about how wars are fought- how power is developed."

VADM Arthur K. Cebrowski, USN (Ret)

Director, Force Transformation

IEEE Spectrum – July 2002

Information Age Transformation

…what we saw in Operation Iraqi Freedom

- **NCW Implementation**
- **The power of shared awareness**
  - *Intelligence, Surveillance, Recon*
  - *High speed networking*
  - *New capabilities / Tactics, Techniques, Procedures*
- **Networking + ISR =**
  - *Speed*
- **Information running ahead of the physics**

- **A new Airpower – Land power intersection**
  - *All weather weapons*
  - *Close Air Support*
  - *Interdiction*
  - *Speed*
  - *Weight of Fire vs Precision*
  - *The non-contiguous battlespace*
- **Movement toward tactical level jointness / interoperability**
  - *Especially Special Operations Forces*

Speed creates the appearance of an incompetent opponent

ISR + Speed of Decision + Lethality => Bad options for the enemy

A New "Sweet Spot"

Information Age Transformation:
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

NETWORK CENTRIC WARFARE

Developing and Leveraging
Information Superiority

=== 2nd Edition (Revised) ===

David S. Alberts
John J. Garstka
Frederick P. Stein

CCRP
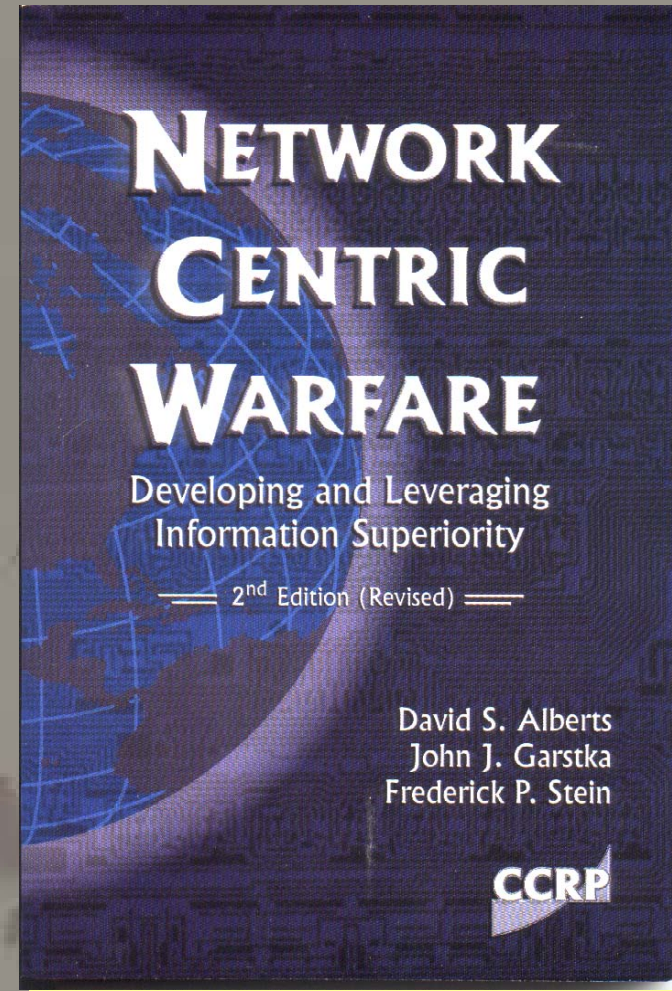
Exploits __Order of Magnitude__ Improvement in Information Sharing

Networked Forces Outfight Non-Networked Forces

Warfighting Advantage: More Evidence

- **Full Dimensional Protection - Counter Air**
  - **USAF found F-15Cs, working with data links (shared awareness), increased kill ratio by over 100% -- 2.6:1 for both Day & Night Ops (JTIDS Operational Special Project - Mid 1990's)**
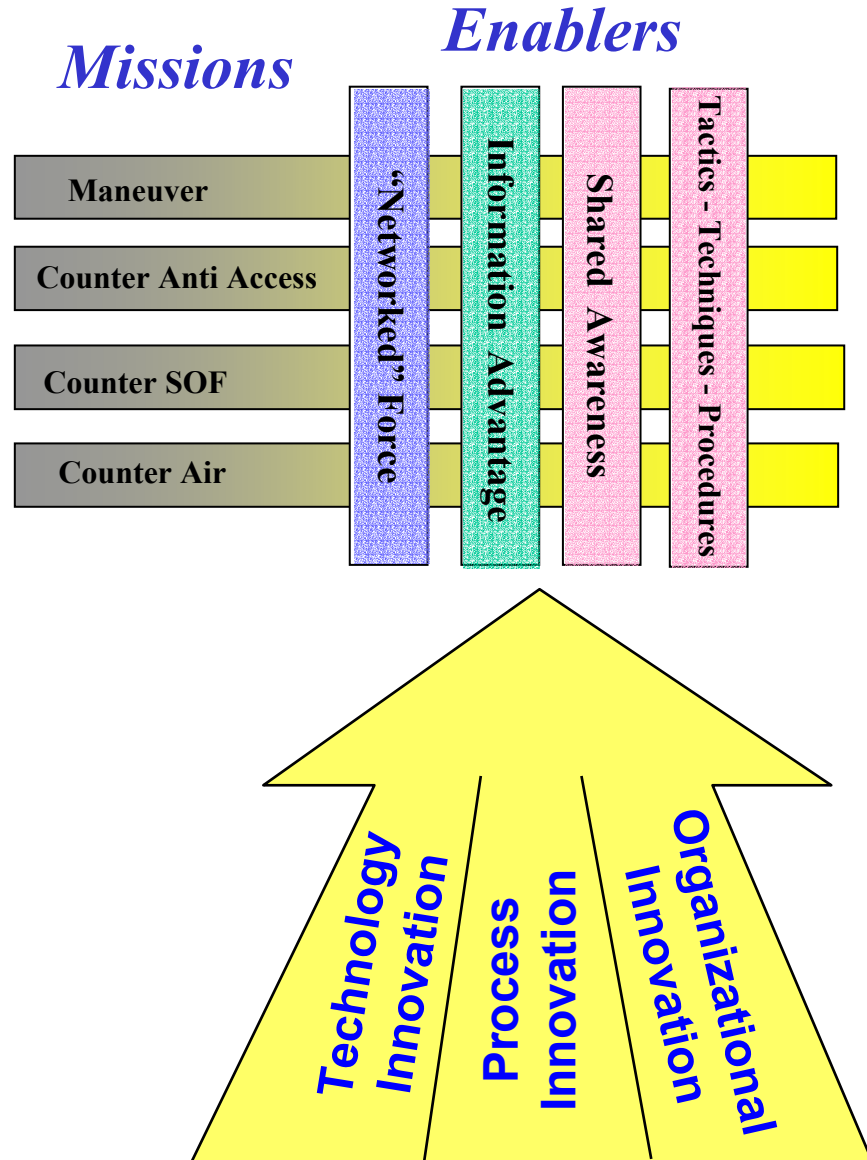
- **Dominant Maneuver**
  - **Digitized forces demonstrate capability to fight over a much larger area with fewer forces than non-digitized forces (USA Division Capstone Exercise - Phase I, Apr 2001)**

- **Precision Engagement - Counter Anti Access**
  - **Networked combined force requires 62% less time to restore mine free shipping in Strait of Hormuz (FBE Foxtrot, Dec 1999)**

- **Precision Engagement - Counter SOF (CSOF)**
  - **Decision cycle reduced by half - shooter effectiveness increased**
  - **10 fold reduction in SOF penetrators by water (FBE Delta, Oct 1998)**

Understanding the
Evidence for Warfighting Advantage

Missions

Enablers

Missions	"Networked" Force	Information Advantage	Shared Awareness	Tactics - Techniques - Procedures
Maneuver				
Counter Anti Access				
Counter SOF				
Counter Air				

Technology Innovation

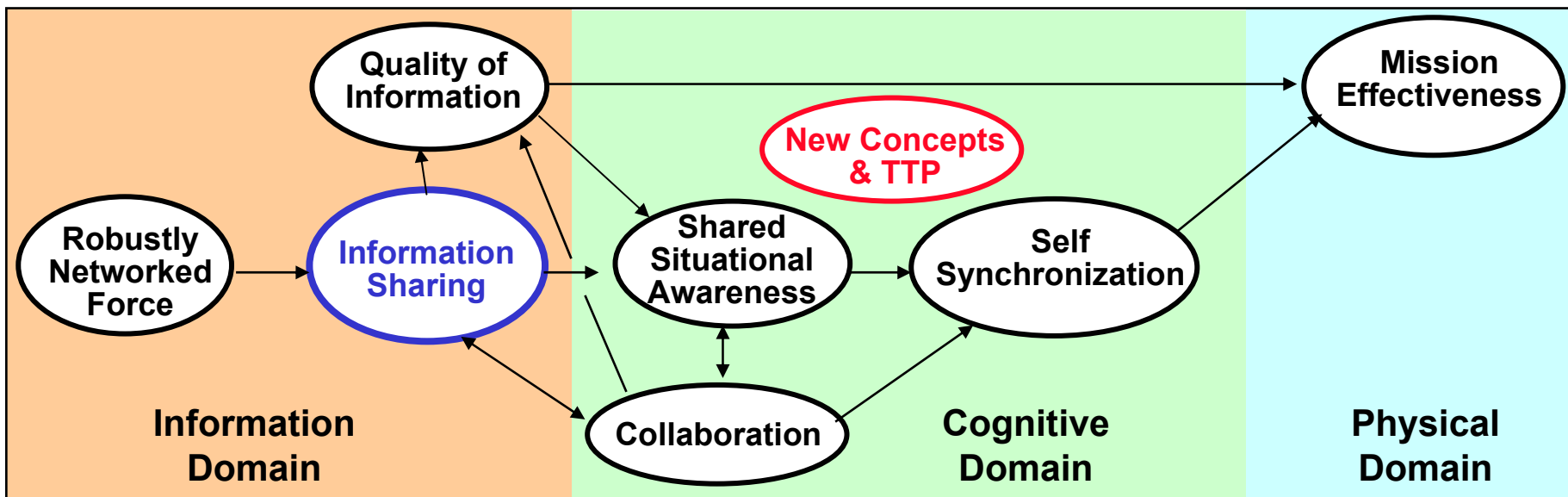Process Innovation

Organizational Innovation

Exploiting Order of Magnitude Change

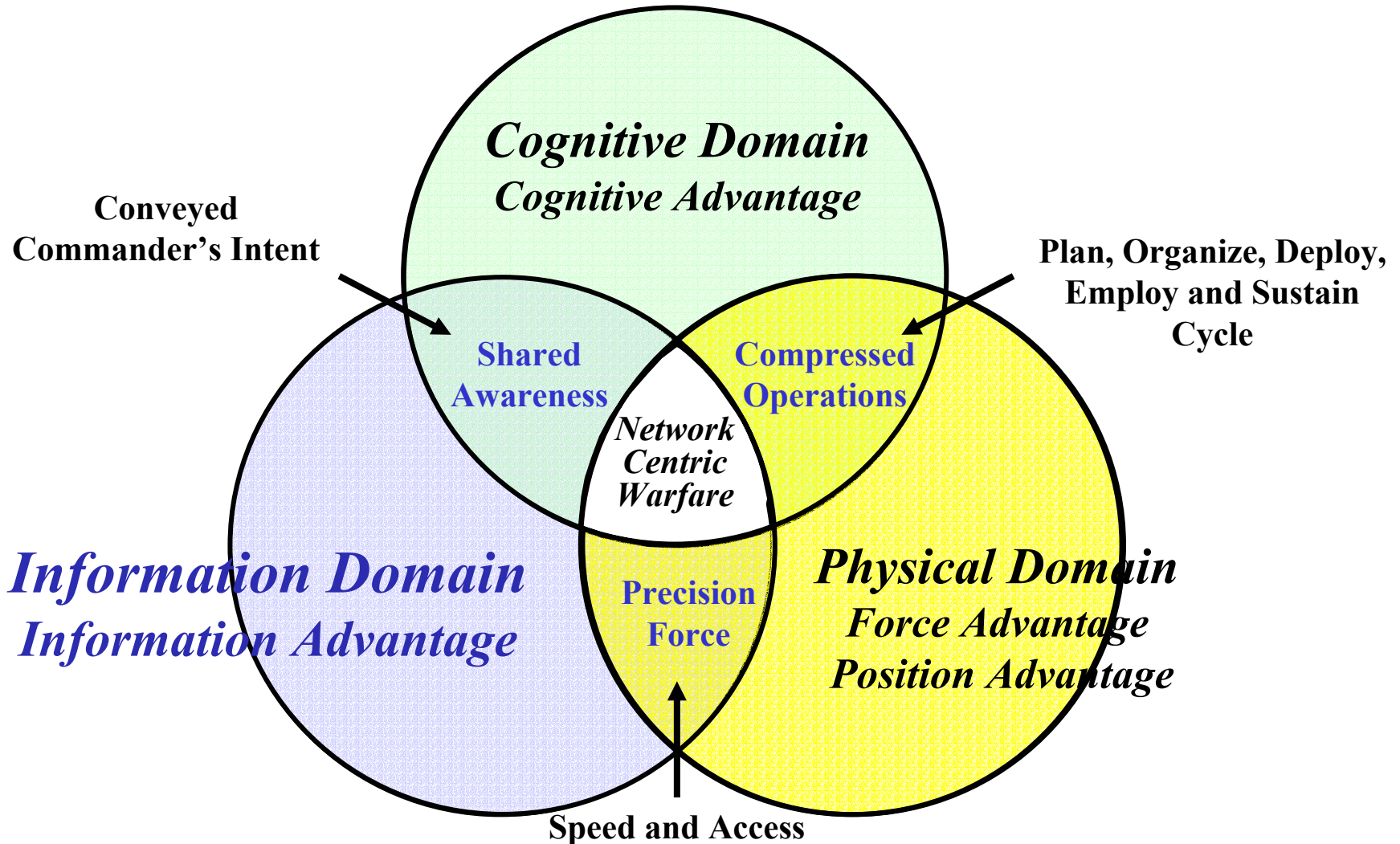Tenets of NCW: A Hypothesis Regarding Sources of Power

- A robustly networked force improves information sharing
- Information sharing and collaboration enhances the quality of information and shared situational awareness
- Shared situational awareness enables collaboration and self synchronization, and enhances sustainability and speed of command
- These in turn dramatically increase mission effectiveness

Top Level Measures for Exploring NCW Hypothesis

Quality of Information

Mission Effectiveness

New Concepts & TTP

Robustly Networked Force

Information Sharing

Shared Situational Awareness

Self Synchronization

Collaboration

Information Domain

Cognitive Domain

Physical Domain

Information-Age Warfare
...Domains of conflict

Cognitive Domain
Cognitive Advantage

Conveyed Commander's Intent

Plan, Organize, Deploy, Employ and Sustain Cycle

Shared Awareness

Compressed Operations

Network Centric Warfare

Information Domain
Information Advantage

Precision Force

Physical Domain
Force Advantage
Position Advantage

Speed and Access

Information Advantage / Superiority

Accuracy

Timeliness

Information Superiority

Relevance
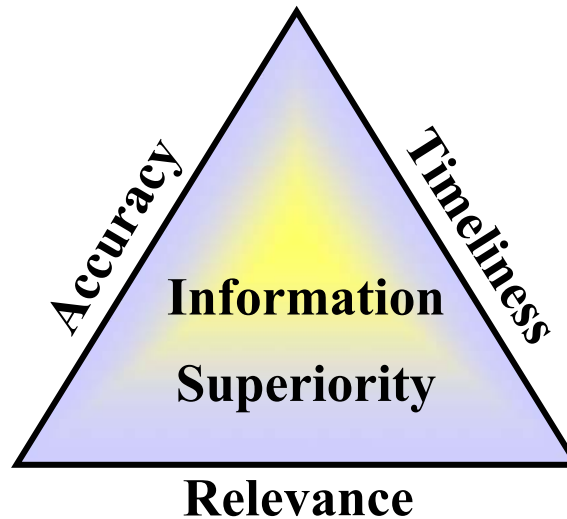
...relative to an adversary...

OURS

NEEDS

ABILITY TO SATISFY

THEIRS

NEEDS

ABILITY TO SATISFY

Creating Information Advantage: Meeting Warfighter's Information Needs

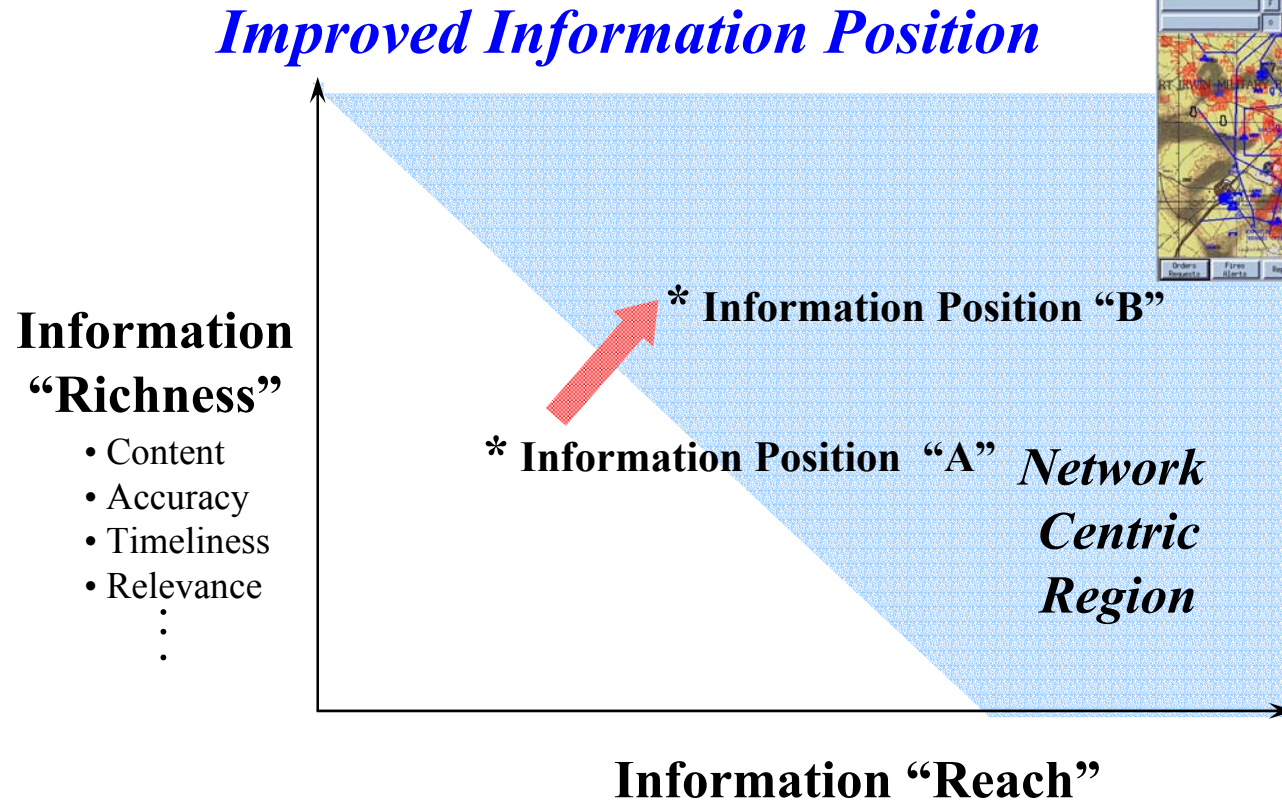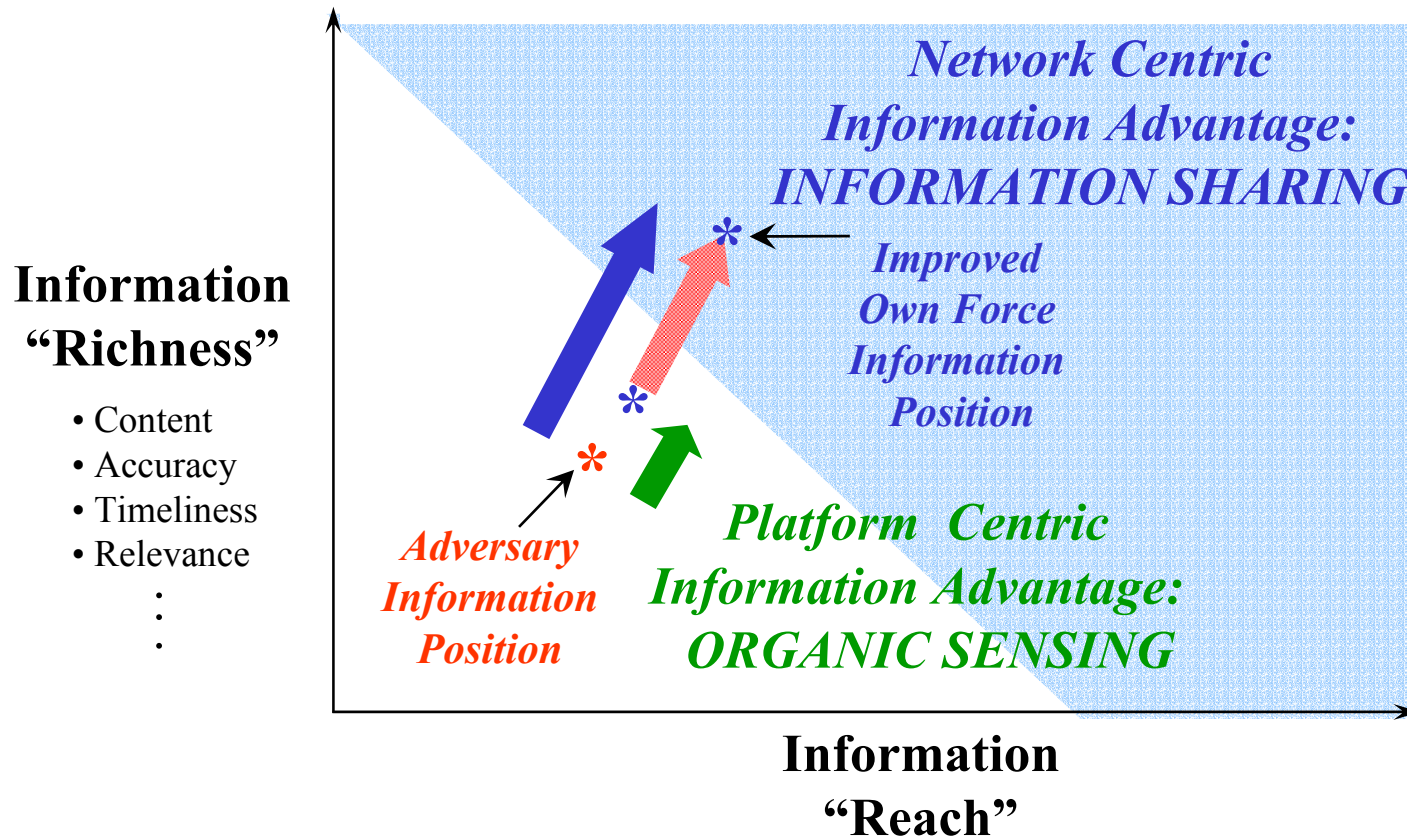| Info On:	Individual/ Node	Unit/ Flight	Force/ Operational
Blue Force	Where am I? Where are my buddies? What is CDR's Intent?	Where is the Flight? What is its Disposition? What is CDR's Intent?	Where is the Force? What is its Disposition? Does CDR's intent need to change?
Neutrals / Non Combatants	Where are the Airliners?	Where are the Airliners?	Is there commercial Air traffic in the area?
Red Force	Where is the Adversary?	Where is the Adversary?	How is the Adversary Reacting? Is this what was expected?

Creating Information Advantage:
Meeting Warfighter's Information Needs

Improved Information Position

Information "Richness"

- Content
- Accuracy
- Timeliness
- Relevance
  · · ·

* **Information Position "B"**

* **Information Position "A"** *Network Centric Region*

Information "Reach"

Networking the Force:

- *Provides Warfighters with Access to a New Region of the Information Domain*
- *Order of Magnitude Change enables New Type of Information Advantage*

Creating Information Advantage:
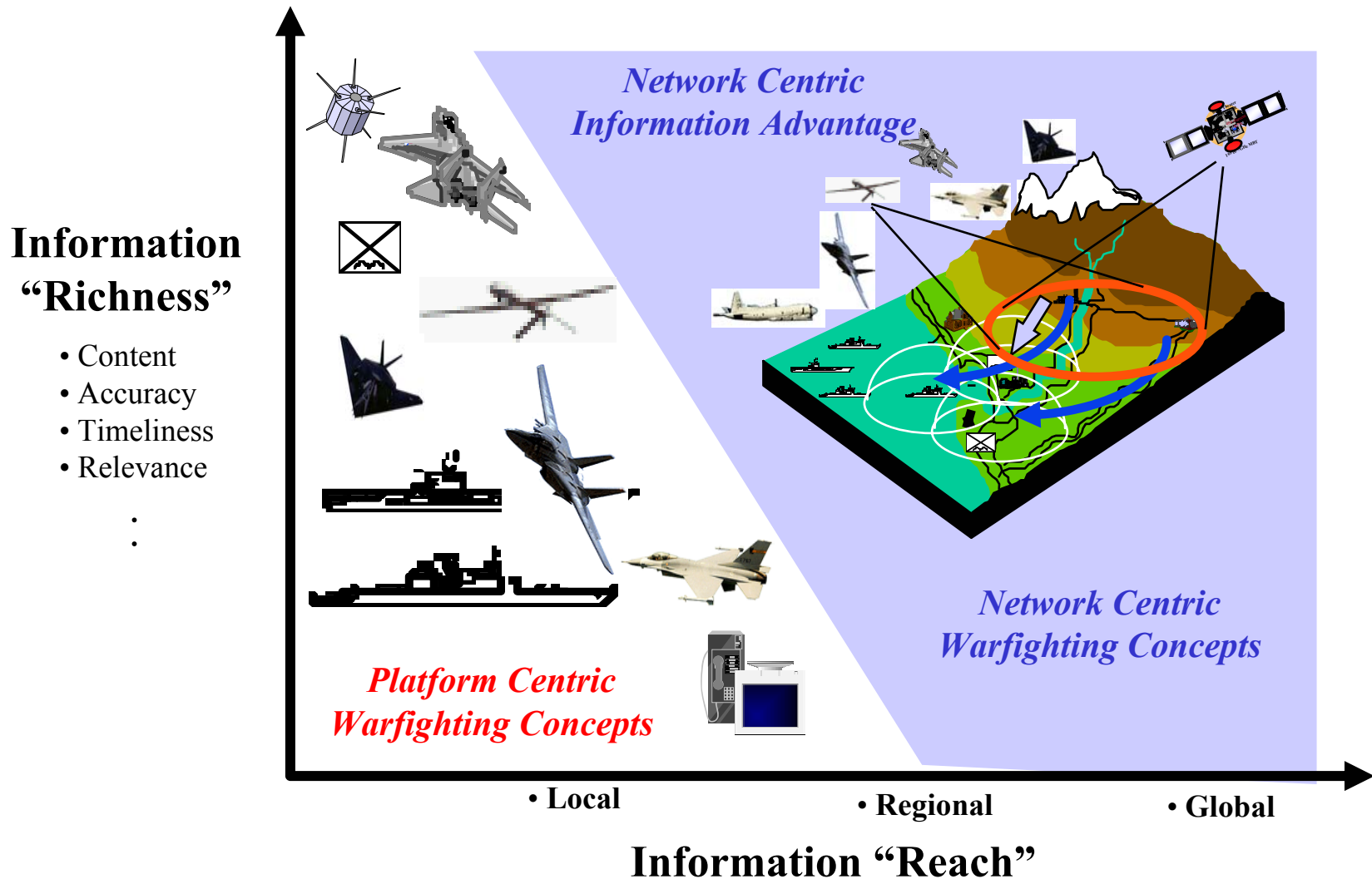## Exploiting Information Sharing as a Source of Power

Information "Richness"

- Content
- Accuracy
- Timeliness
- Relevance
  :
  .

Network Centric Information Advantage: INFORMATION SHARING

Improved Own Force Information Position

Adversary Information Position

Platform Centric Information Advantage: ORGANIC SENSING

Information "Reach"

Information Sharing is a key enabler of increased Combat Power

Operation Iraqi Freedom:
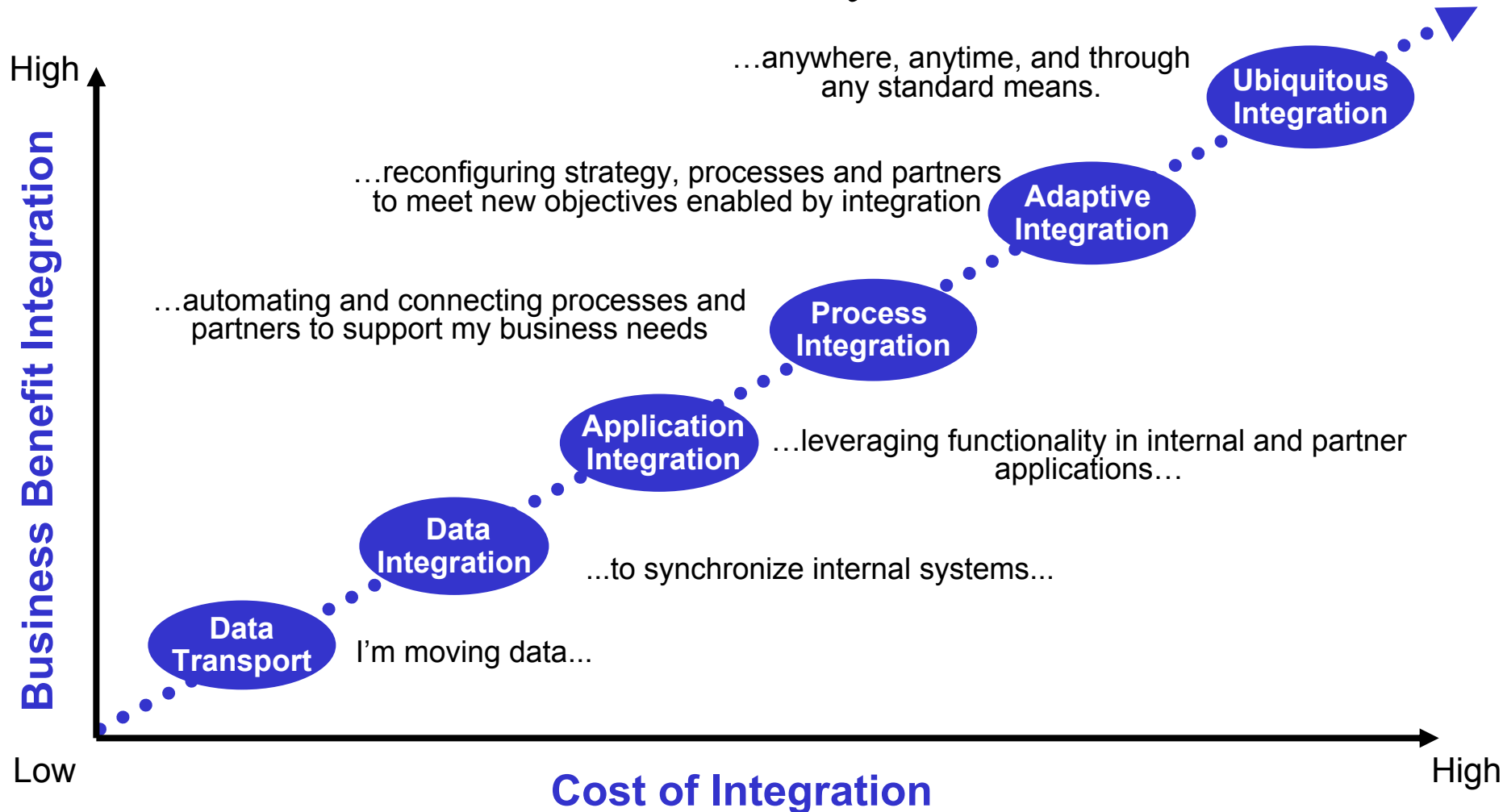## *Increased Information Sharing – Personal Role Radio*

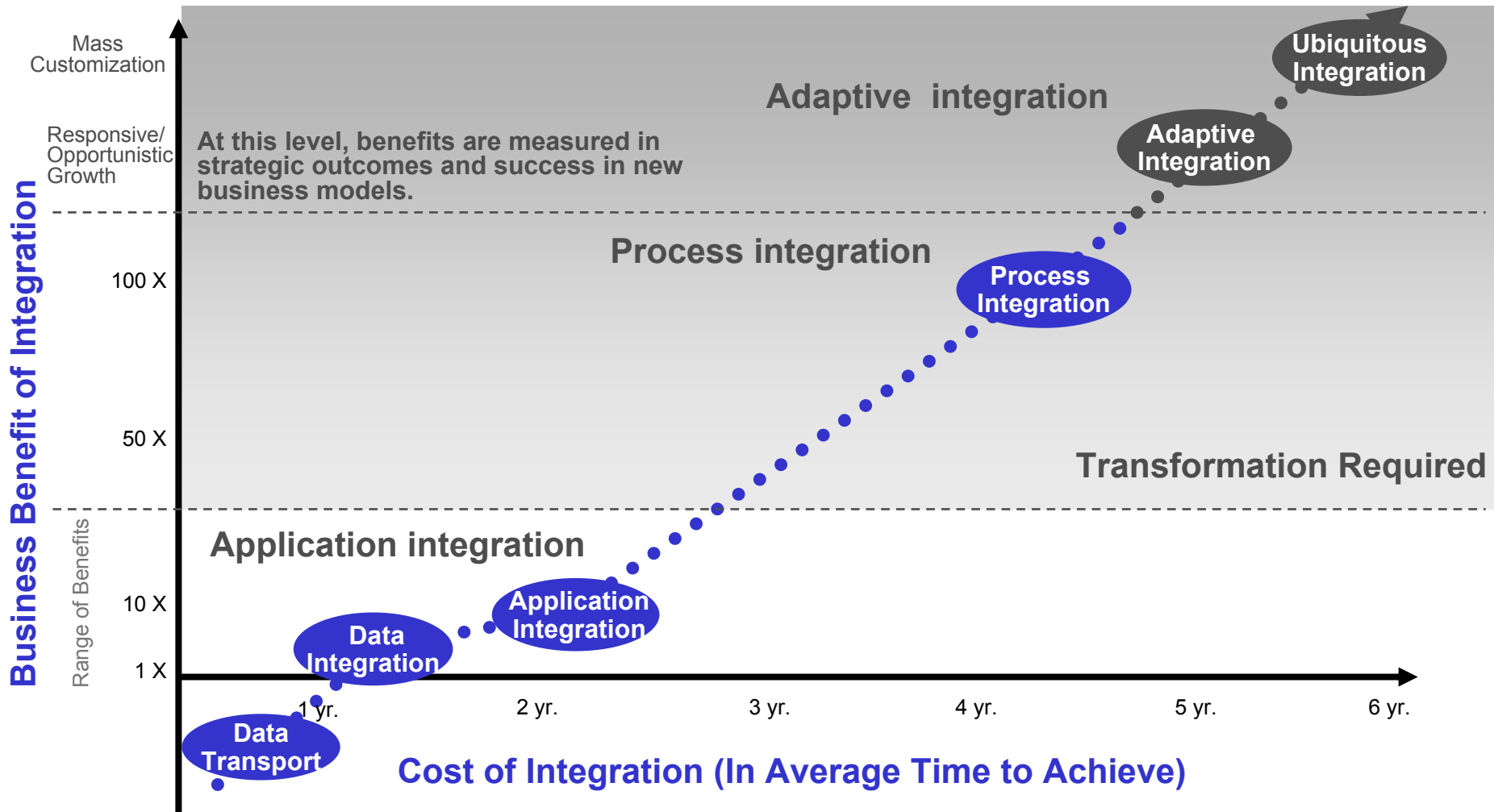# Exploiting Information Advantage: Developing Network Centric Warfighting Concepts

Information "Richness"

- Content
- Accuracy
- Timeliness
- Relevance

Network Centric Information Advantage

Platform Centric Warfighting Concepts

Network Centric Warfighting Concepts

• **Local**   • **Regional**   • **Global**

Information "Reach"

Creating Information Advantage: Insights from the Commercial Sector

Initial Theory

…anywhere, anytime, and through any standard means.

Ubiquitous Integration

…reconfiguring strategy, processes and partners to meet new objectives enabled by integration

Adaptive Integration

…automating and connecting processes and partners to support my business needs

Process Integration

Application Integration

…leveraging functionality in internal and partner applications…

Data Integration

...to synchronize internal systems...

Data Transport

I'm moving data…

High / Low — **Business Benefit Integration**

Low / High — **Cost of Integration**

Source: Accenture

Theory Meets Business Reality: Discontinuity in Integration Continuum

Business Benefit of Integration

- Mass Customization
- Responsive/ Opportunistic Growth
- 100 X
- 50 X
- Range of Benefits
- 10 X
- 1 X

Ubiquitous Integration

Adaptive integration

Adaptive Integration

At this level, benefits are measured in strategic outcomes and success in new business models.

Process integration

Process Integration

Transformation Required

Application integration

Application Integration

Data Integration

Data Transport

1 yr.　2 yr.　3 yr.　4 yr.　5 yr.　6 yr.

Cost of Integration (In Average Time to Achieve)

* Findings represent study and analysis of the results achieved by 17 large organizations. Given the size of the firms studied, the multiple for identifying benefits (X) equated to roughly $1 million.
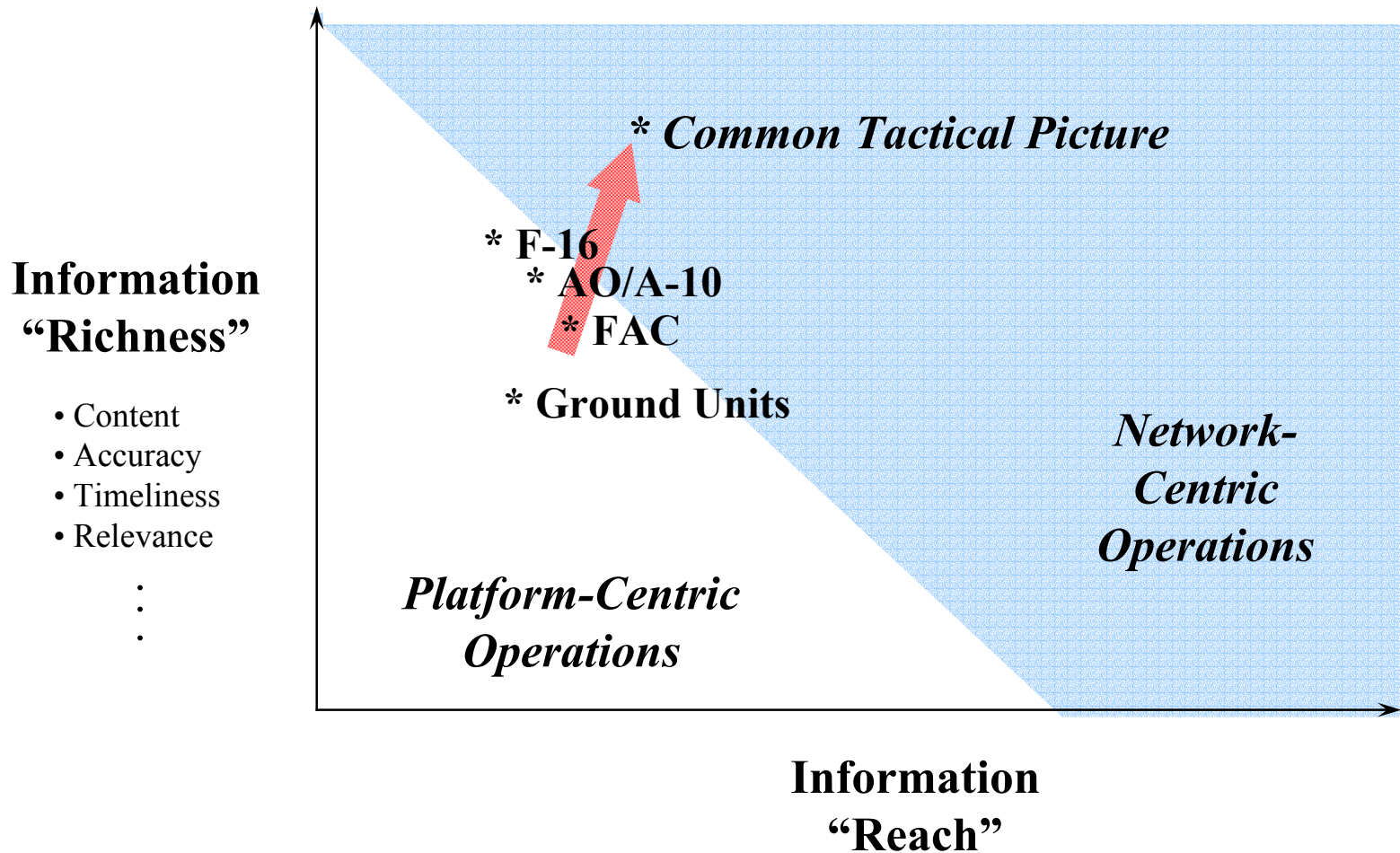
Source: OFT/Accenture/CRITO Case Study

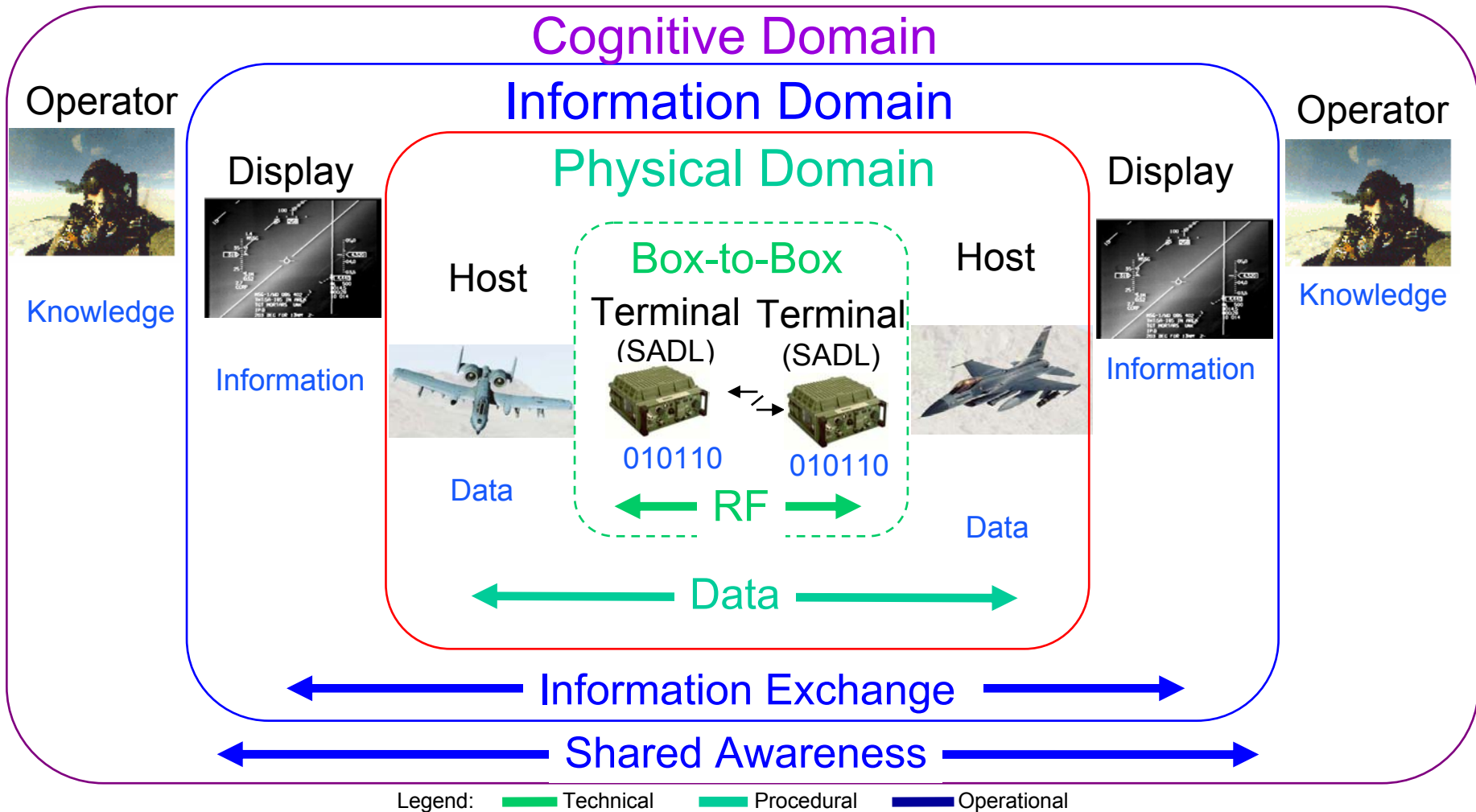# Applying Theory to Make Sense of The Warfighter's Reality

Warfighting Benefit of Information Sharing

Organizational Innovation

Process Innovation

Technology Innovation

We are successfully employing new processes and organizational concepts

New Process Employment

We are *innovating* and *experimenting* with new processes and organizations

Process Innovation

Process Integration

We have integrated existing processes and can collaborate with each other

Transformation Required

Application Integration

Our applications are integrated and we can share information seamlessly: Common Operational Picture

Data Integration

We have integrated our data

Digital Information Sharing

We are networked and can share digital information: E-Mail – Web Chat – 9 Line Messages

Voice Connectivity

We can communicate and share information via voice

Degree of Information Sharing

Applying Theory to Make Sense of The Warfighter's Reality

Warfighting Benefit of Information Sharing (vertical axis)

Degree of Information Sharing (horizontal axis)

Organizational Innovation

Process Innovation

Technology Innovation

Navy Special Warfare

Counter SOF Network Centric Sensing

Air-to-Air

Transformation Required

New Process Employment

Process Innovation

Process Integration

Application Integration

Air-to-Ground

Data Integration

Digital Information Sharing

Voice Connectivity

Operation Enduring Freedom

Air-to-Ground Mission: Digital Close Air Support

Information "Richness"

- Content
- Accuracy
- Timeliness
- Relevance

⋮

* Common Tactical Picture

* F-16
* AO/A-10
* FAC

* Ground Units

Network-Centric Operations

Platform-Centric Operations

Information "Reach"

Close Air Support Mission: Domain Overlay

Digital Close Air Support:
Fighting First for Information Advantage

- **Tactical Situation:**
  - **Blue Force in defensive posture**
  - **OPFOR moving to contact under cover of darkness**
  - **Armored column detected by JSTARS and UAV at approximately 10 mile range from Blue Force and positively identified as hostile OPFOR**
  - **Blue Force tracking information confirms that no Blue Force ground forces are in close proximity to OPFOR**
  - **Fire mission assigned to Close Air Support (CAS)**

UAV

Source: US Army Division Capstone Exercise - Phase I (March-April 2001)

D/TOC

Digital Close Air Support: Network Enabled Engagement

- *Order of magnitude* improvement in real-time information sharing across "air-ground" seam
- Dramatically increased *situational awareness* for CAS Pilots
- *Collaborative precision engagement* of hostile OPFOR
  - Lightening II Pods used for targeting
  - Sensor Points of Interest shared over data link
  - Selective engagement of tanks with Laser Guided Munitions

2 Ship F-16 w/Lightening II + SADL + GBU-12

2 Ship F-16 w/Lightening II + SADL+ AGM-65D

A/OA-10 w/ SADL + AGM-65D

UAV

D/TOC
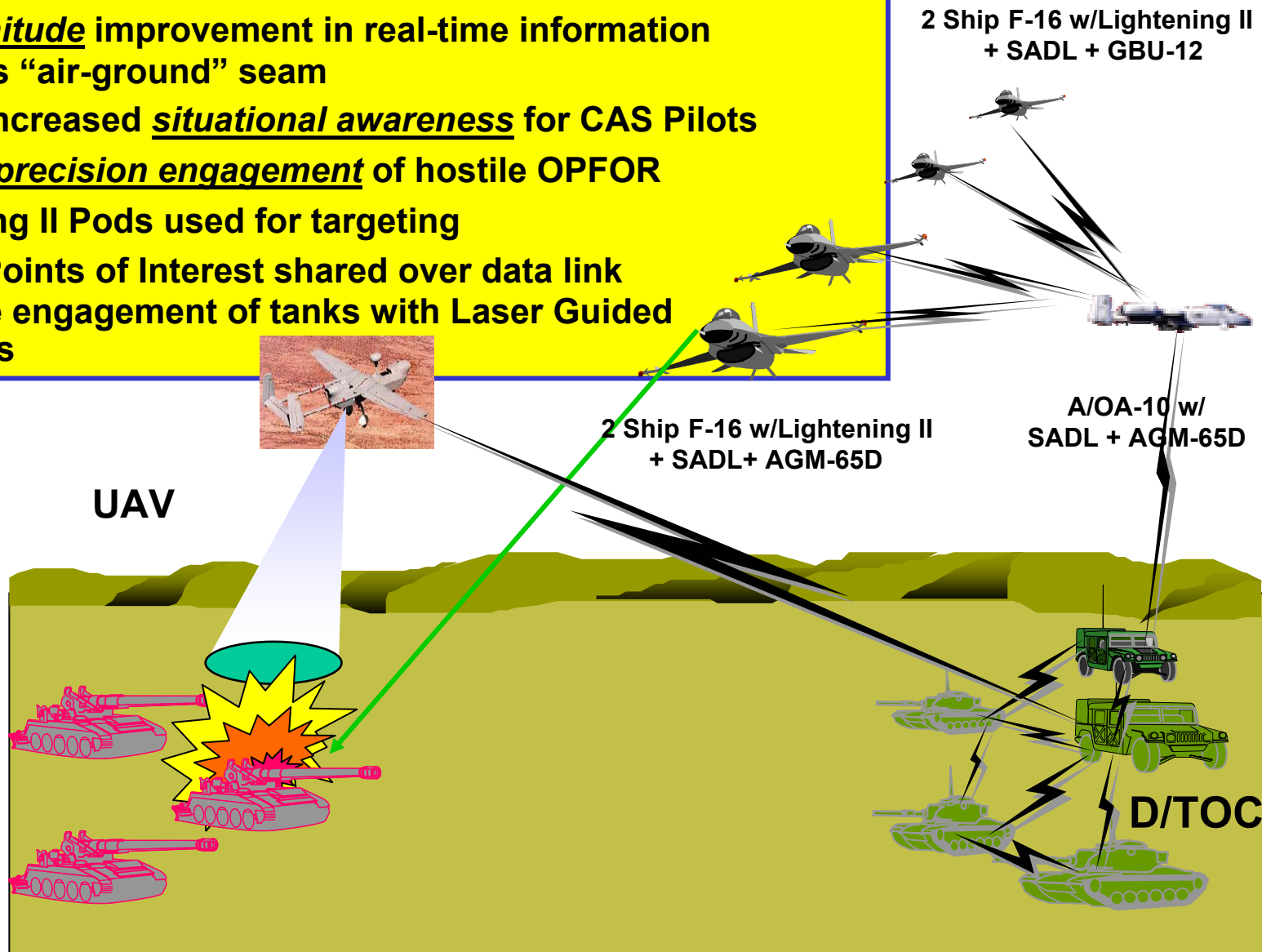
Source: US Army Division Capstone Exercise - Phase I (March-April 2001)

Digital Close Air Support: Decisive Defeat of OPFOR

- **Warfighting Impact:**
  - **First wave battle damage assessment: "Two OFOR Battalions rendered combat ineffective"**
  - **Close Air Support *decisively engages* OPFOR**
  - **Exercise stopped and "restarted" to enable Blue Ground Force to engage OPFOR**

2 Ship F-16 w/Lightening II + SADL + GBU-12

2 Ship F-16 w/Lightening II + SADL+ AGM-65D

A/OA-10 w/ SADL + AGM-65D

UAV

Source: US Army Division Capstone Exercise - Phase I (March-April 2001)

"...I 'm a believer in Digital CAS Technology "– Army Ground Liaison Officer

" ...night missions are normally an exercise in futility but this was amazing" - Air Warrior

D/TOC
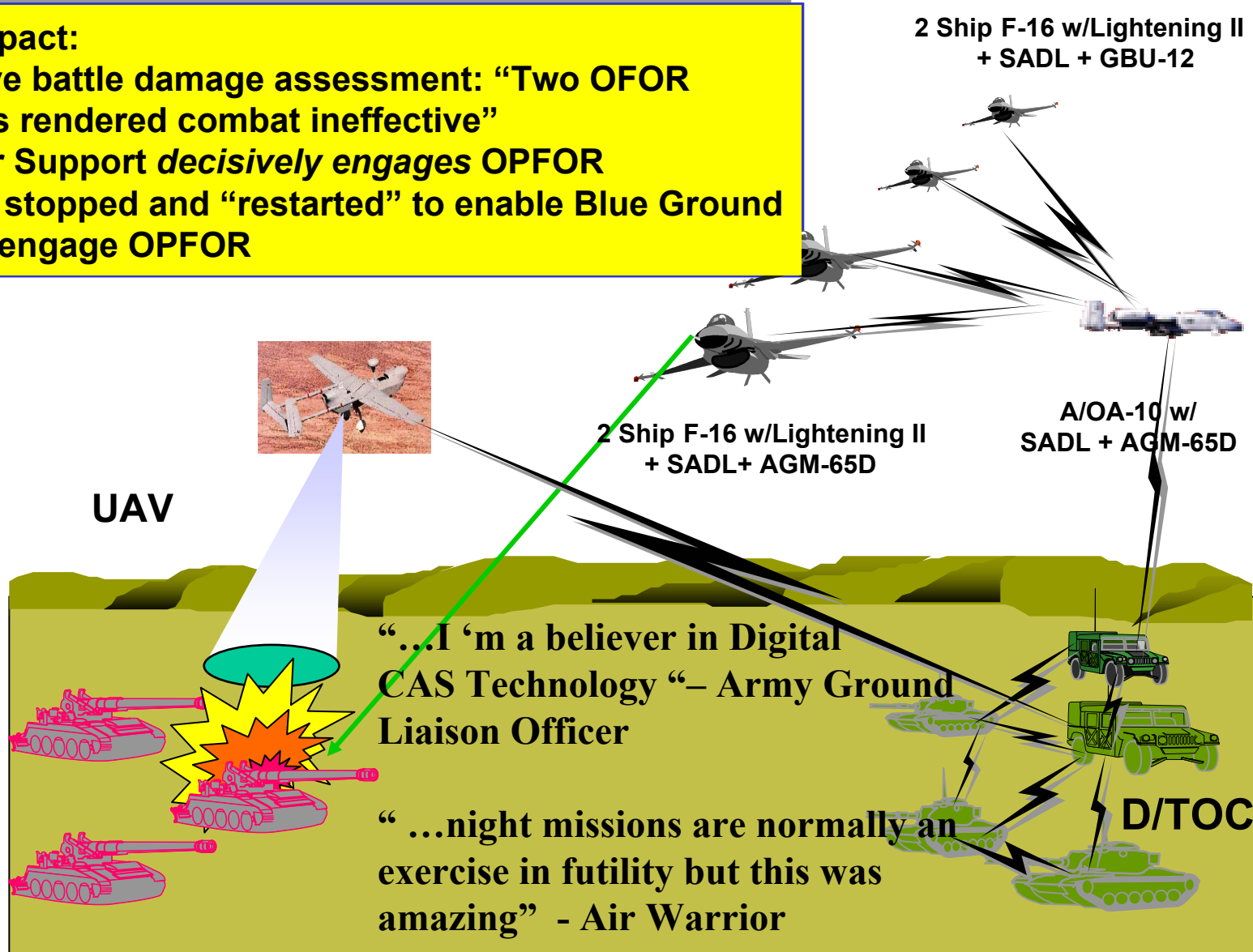
Exploiting Order of Magnitude Change

Quality of Information
- Precision Navigation
- Lightening II Pod

Output Measure:
Decisive Defeat
Of OPFOR
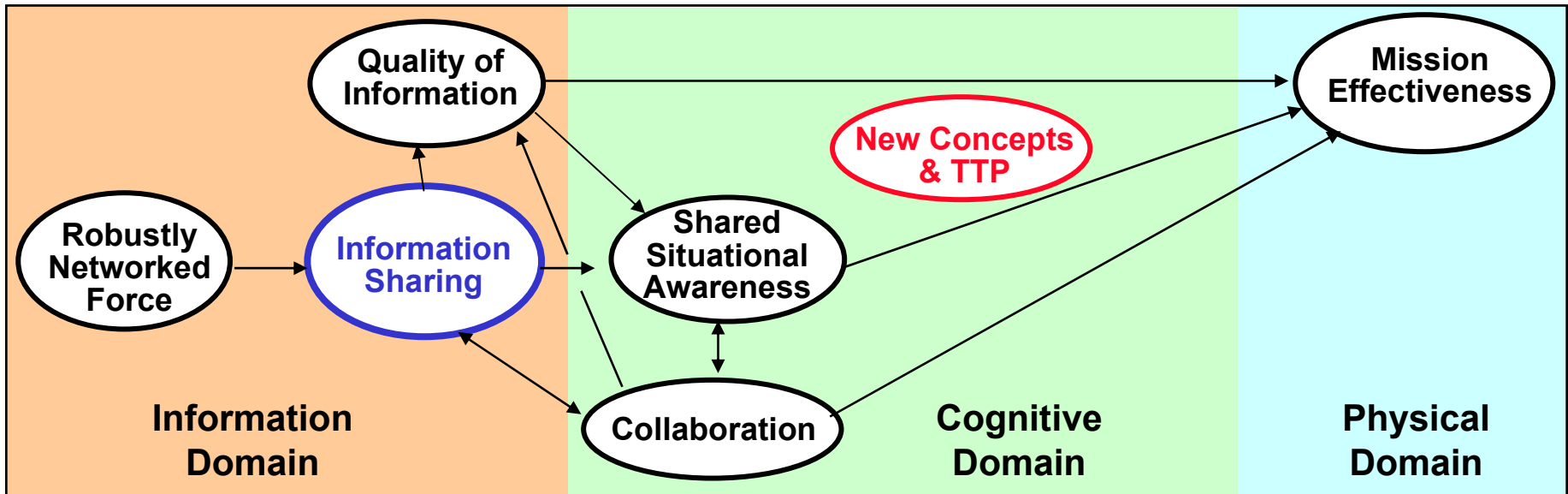
Networked Force
- Air
- Ground

Information Sharing
- Blue Force Information: "Trace" of Blue Forces
- Red Force Information: "Sensor Points of Interest"

Applying Theory to Make Sense of The Warfighter's Reality

Warfighting Benefit of Information Sharing (y-axis)

Degree of Information Sharing (x-axis)

Organizational Innovation

Process Innovation

Technology Innovation

Navy Special Warfare

New Process Employment

Process Innovation

Counter SOF Network Centric Sensing

Air-to-Air

Process Integration

Transformation Required

Application Integration

Air-to-Ground

Data Integration

Digital Information Sharing

Voice Connectivity

Operation Enduring Freedom

Air Superiority Mission:
Shared Tactical Picture + Integrated Processes

Information "Richness"

- Content
- Accuracy
- Timeliness
- Relevance

* Link-16: Shared Tactical Picture

* E-3 AWACS

* F-15C

Network-Centric Operations

Platform-Centric Operations
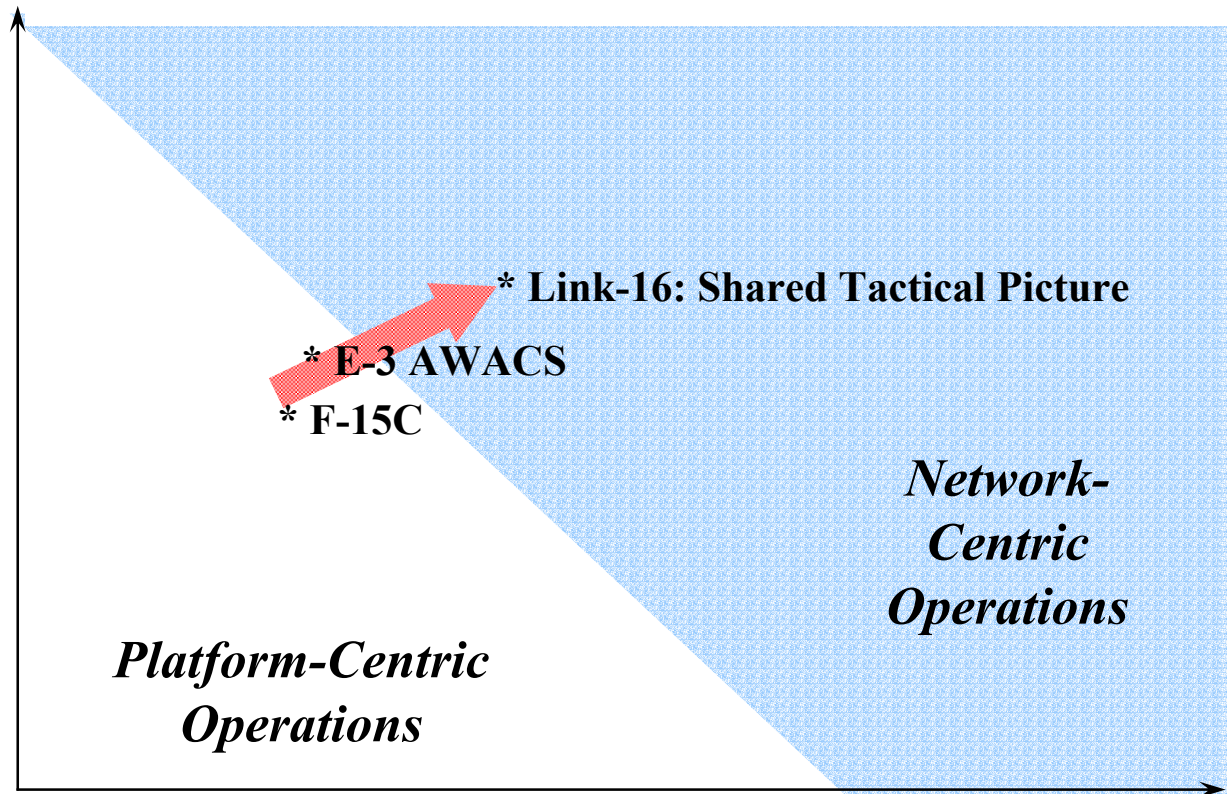
Information "Reach"

Air-to-Air Combat: Domain Overlay

Cognitive Domain

Information Domain

Physical Domain

Operator

Knowledge

Display

Information

Host

Data

Box-to-Box

Terminal (JTIDS)

Terminal (MIDS)

010110

010110

RF

Data

Host

Display

Information

Data

Operator

Knowledge

Information Exchange

Shared Awareness
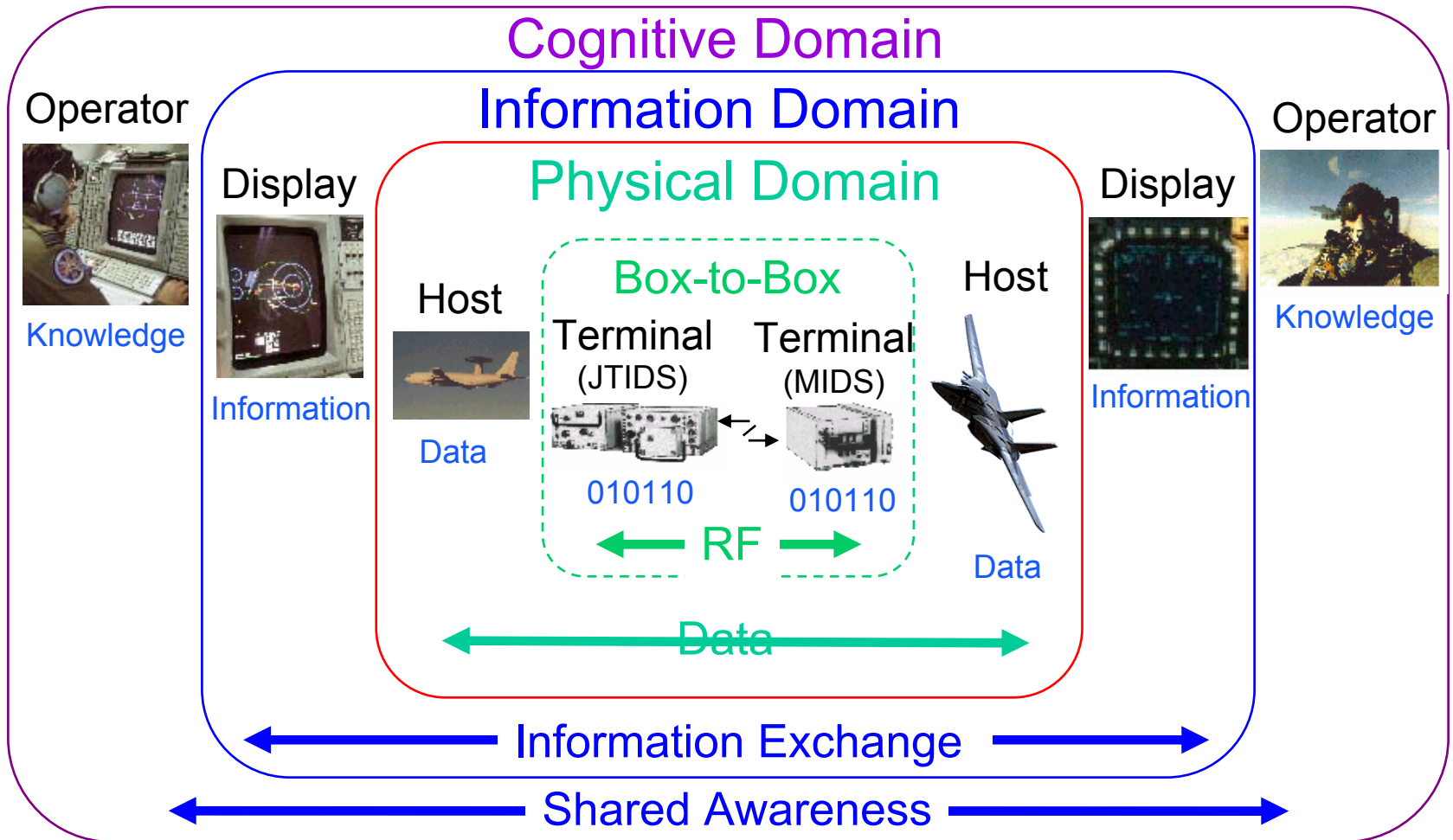
Legend: ▬ Technical ▬ Procedural ▬ Operational

Air-to-Air Combat: The Outcome

F15-C Air Ops: Active Missile Counter Tactics

Without JTIDS/With JTIDS

- **Information Advantage**   Voice Only vs. Shared Tactical Picture
- **OODA Loop**   Baseline Compressed with Self-Synchronization
- **Kill Ratio**   3.10:1   vs. 8.11:1   (*2.61 x increase*) - Day

                                              3.62:1   vs.   9.40:1 (*2.59 x increase*) - Night

- **Hundreds of Iterations**   10,000 plus Sorties – 15,000 plus Flying Hours
- **Spectrum of Engagements**   2 vs. 2   to 8 vs. 16

The **Bottom Line**:   Demonstrated capability for networked aircrews fighting with *shared situational awareness* to increase combat power by over *100 %*

Source: JTIDS Operational Special Project - Report to Congress, Dec 97

Air-to-Air Combat:
4 vs 4 Engagement

Blue11

Blue12

Red 1, 2

AWACS

Red 3, 4
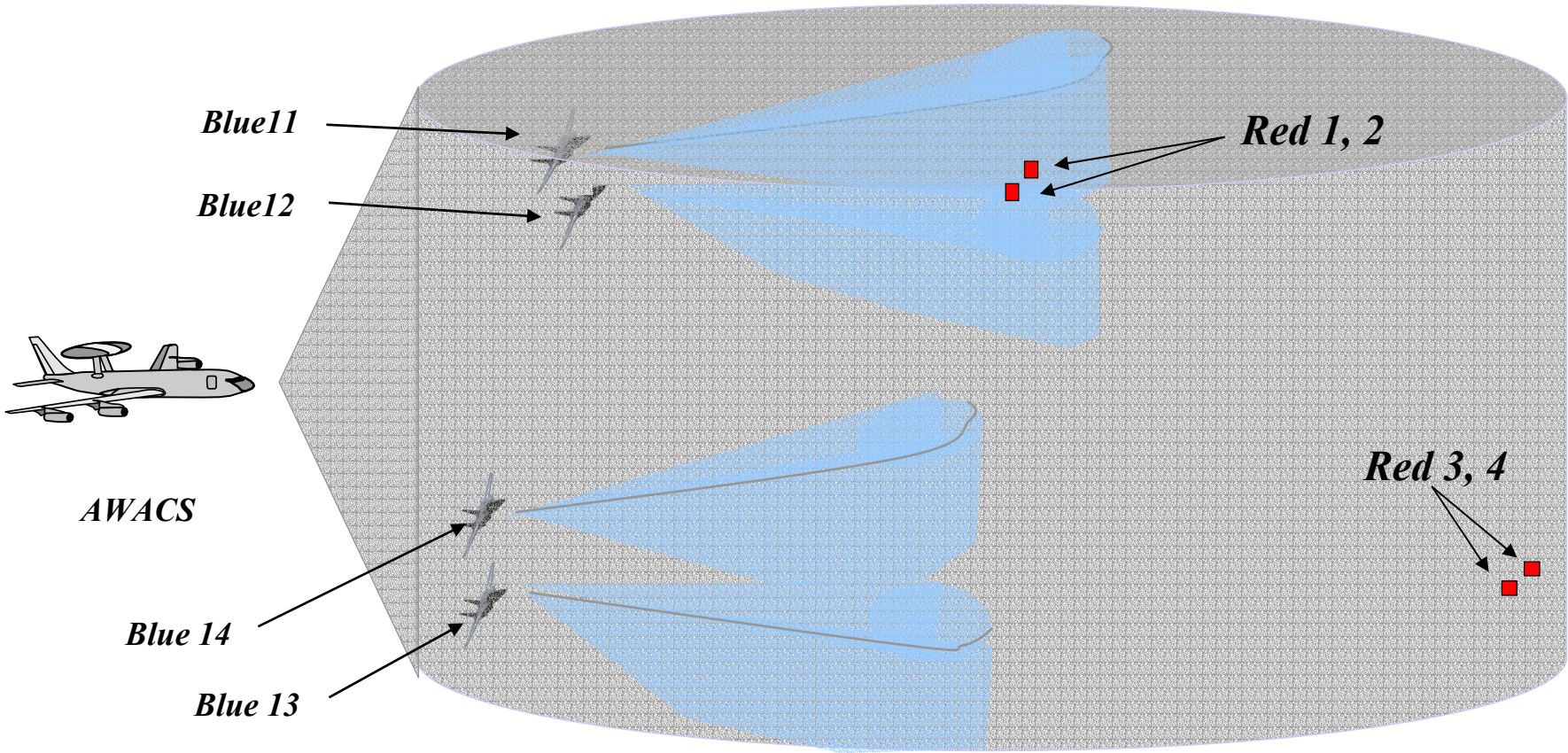
Blue 14

Blue 13

Source: RAND/EBR Case Study

Air-to-Air Combat: Voice Only

Information Domain
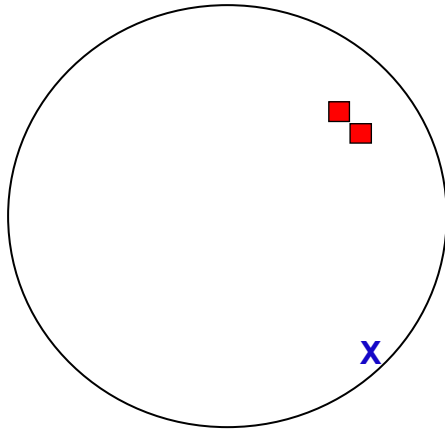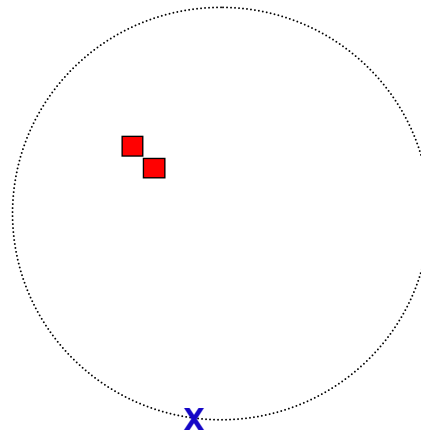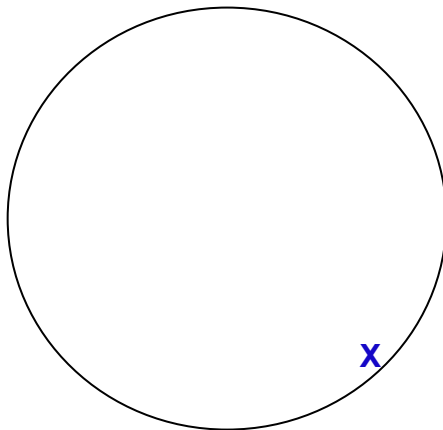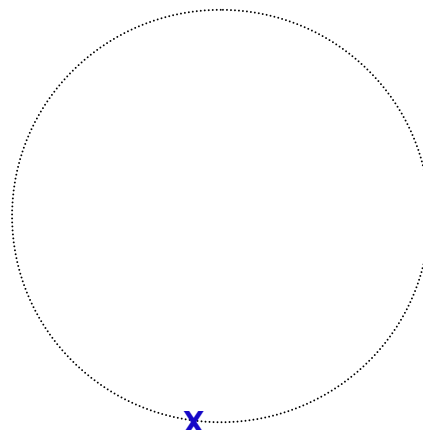
Blue 11 (Lead) View

Blue 12 (Wing) View

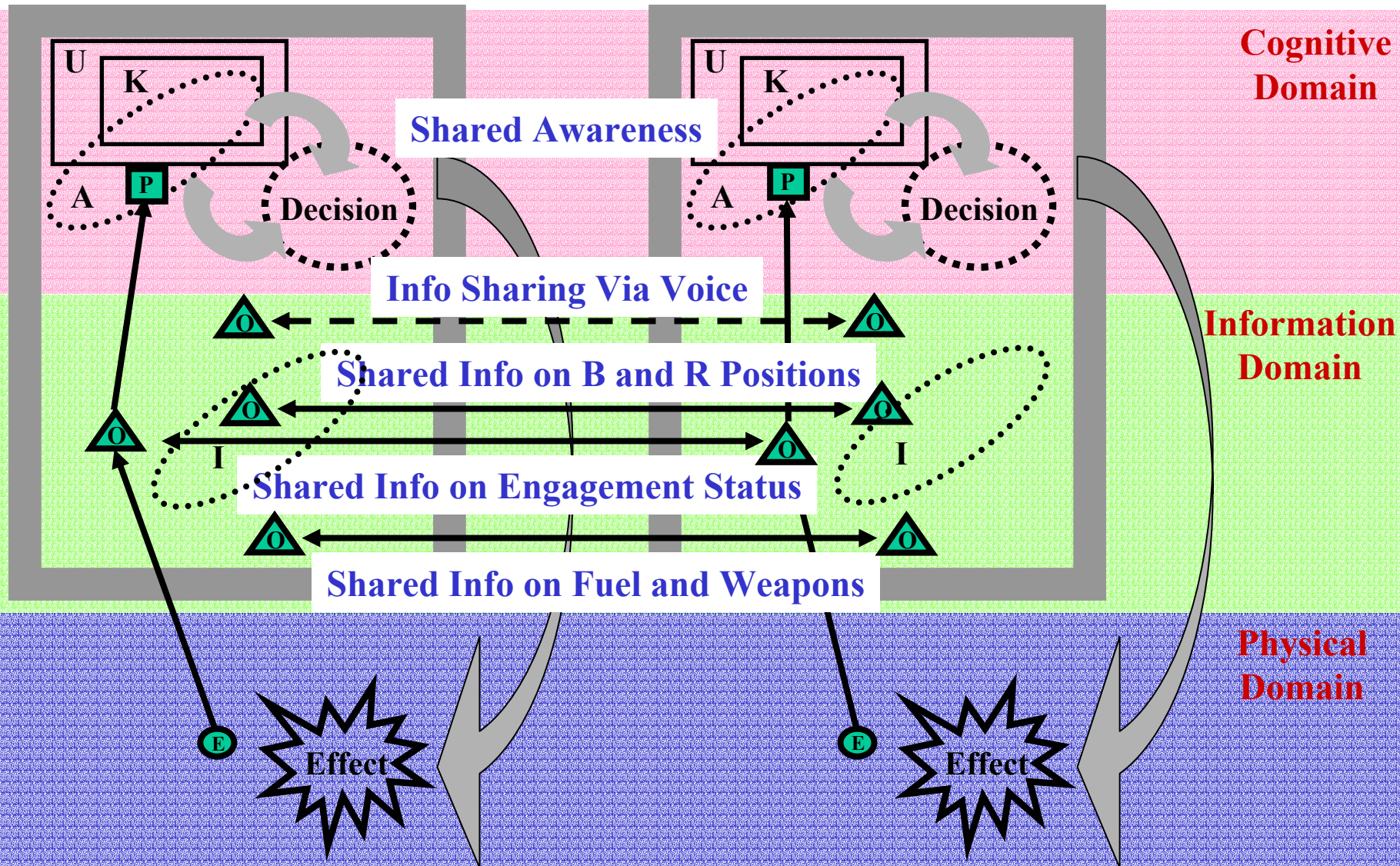*Warfighters Do not Share Common Information*

*Asymmetric Information Positions*

Blue 13 (Lead) View

Blue 14 (Wing) View

Air-to-Air Combat:
Coupled OODA Loops - Voice Only
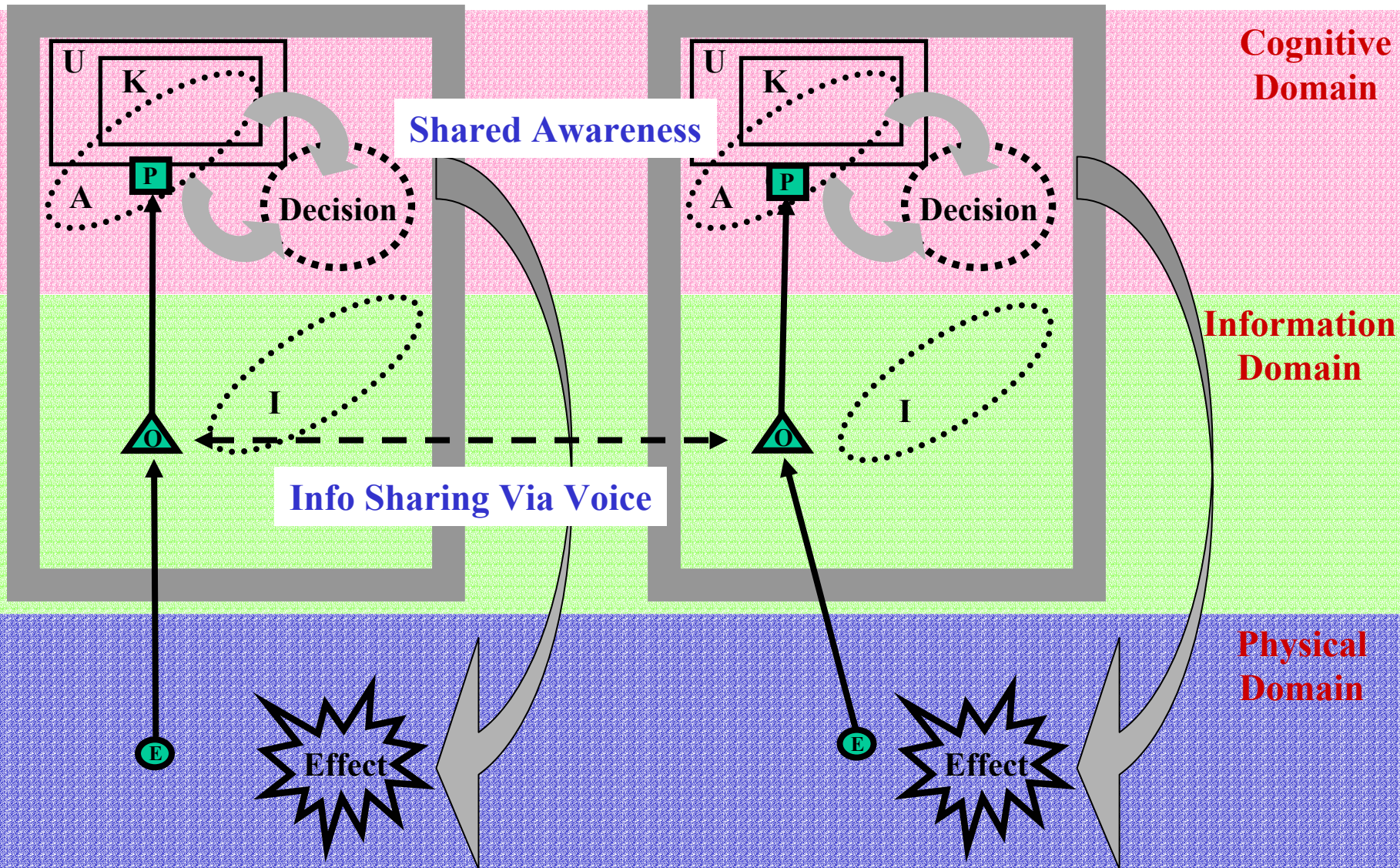
Air-to-Air Combat:
Voice Plus Data Links

Information Domain

Blue 11 (Lead) View
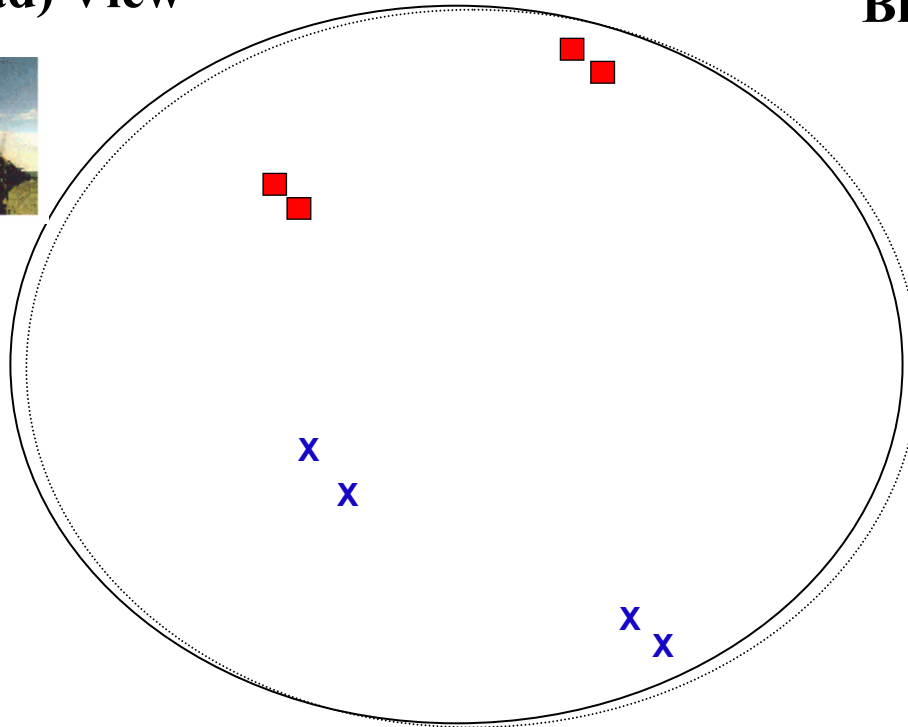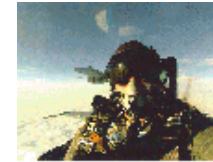
Blue 12 (Wing) View

Warfighters Share Common Information

Symmetric Information Positions

Blue 13 (Lead) View

Blue 14 (Wing) View

Air-to-Air Combat:
Coupled OODA Loops - Voice Plus Data Links

Cognitive Domain

Information Domain

Physical Domain

Shared Awareness

Info Sharing Via Voice

Shared Info on B and R Positions

Shared Info on Engagement Status

Shared Info on Fuel and Weapons

U K A P Decision

Effect

Air-to-Air Combat --- Quality of Individual Information:
Voice Only vs. Voice + Data Link

Voice Only

Link 16 + Voice

Threat Tracks   *Blue Tracks*

AWACS

Threat Tracks   *Blue Tracks*

Blue 11 & 12

Blue 13 & 14
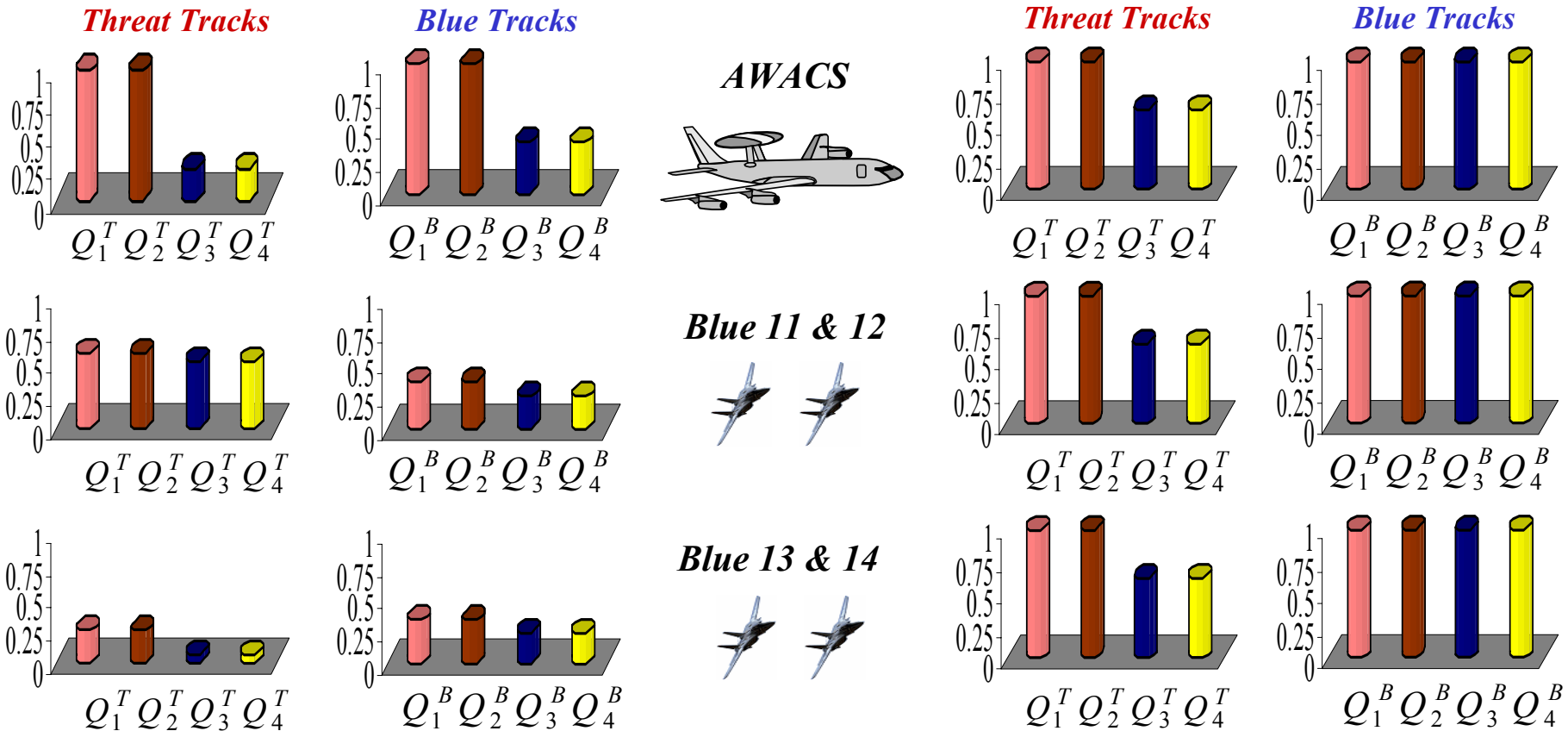
Q_1 **Completeness: Detection** Q_3 **Correctness: Location**

Q_2 **Correctness: ID** Q_4 **Correctness: Velocity**

Air-to-Air Combat: Cognitive Advantage

Superior Ability to Observe – Orient - Decide - Act

B11 (Flight lead)

| Voice Only | Information | Awareness | Understanding | Decisions |

| Link-16 +Voice | Info | Awareness | Understanding | Decisions |

B12 (Wingman)

| Voice Only | Information | Awareness |

| Link-16 +Voice | Info | Awareness | Understanding | Decisions |
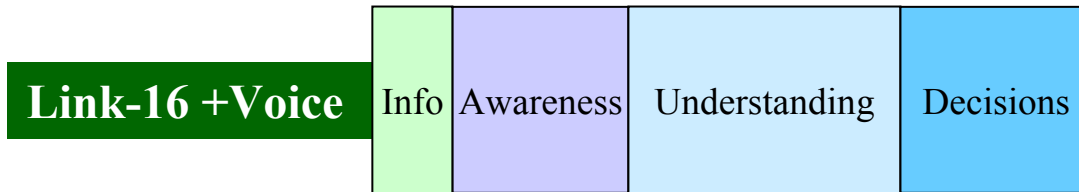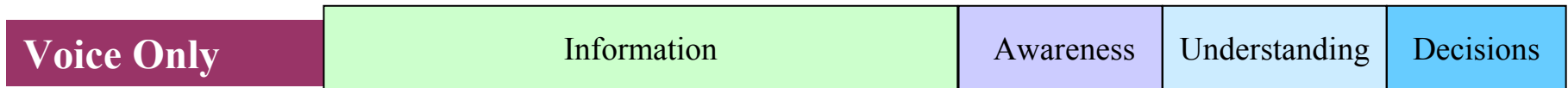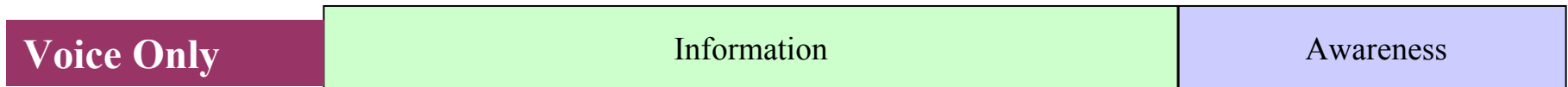
Time →

Source: RAND/EBR Case Study

Air-to-Air Combat:
New Tactics, Techniques, and Procedures

- *Increased situational understanding enables new "high-awareness" tactics that lead to major increases in combat effectiveness*

1. Increased numbers of engagements in the same time period

Time
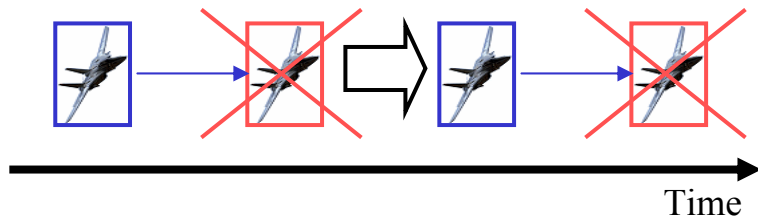
2. Employment of the wingman as combatant rather than defensive patroller

Flight lead

Wingman
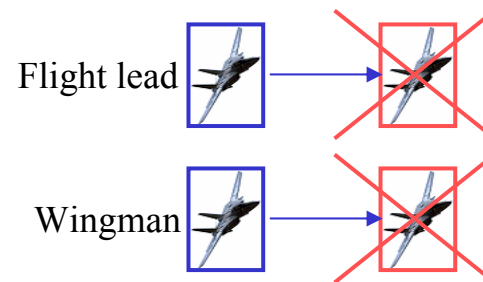
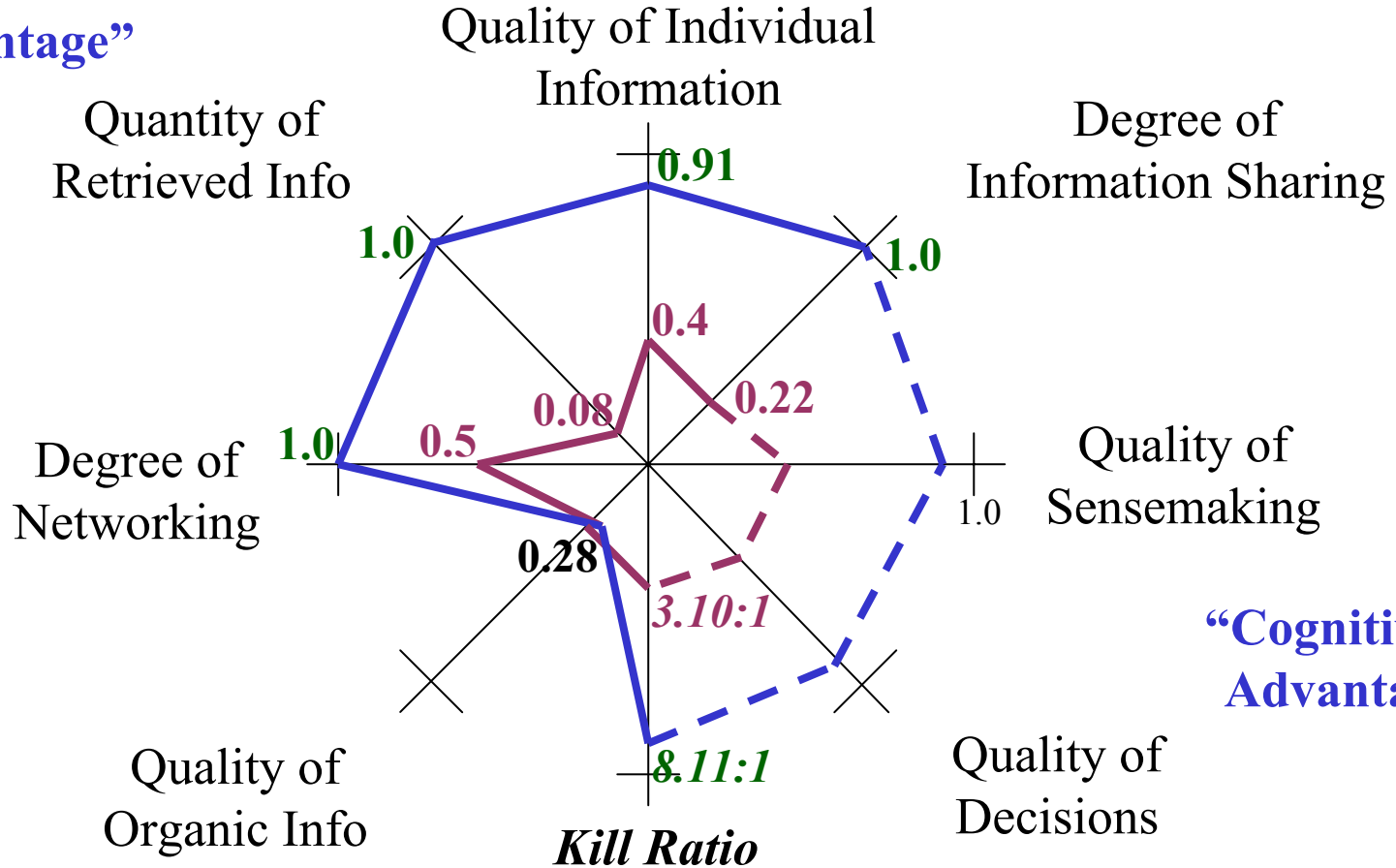3. Advance vectoring to engage red A/Cs from position of maximum advantage
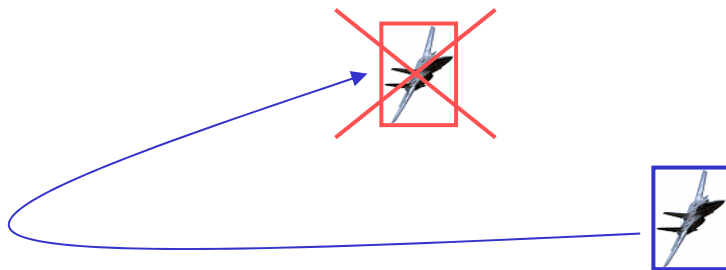
4. Employment of cooperative formations to trap and destroy red A/Cs

Source: RAND/EBR Case Study
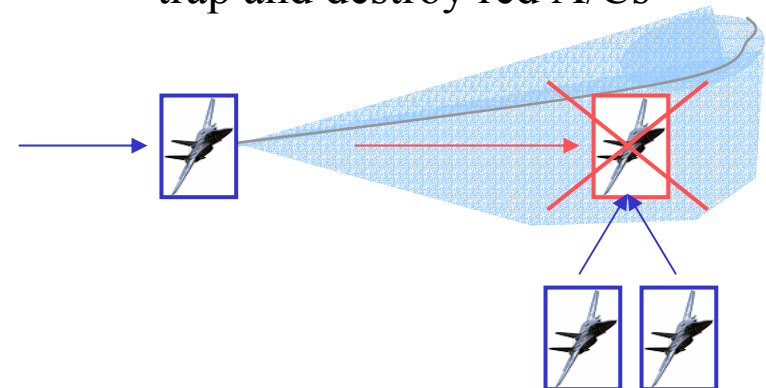
Air-to-Air Combat:
Value of Information + Cognitive Advantage

"Information Advantage"

Quality of Individual Information

0.91

Quantity of Retrieved Info

1.0

Degree of Information Sharing

1.0

0.4

0.08   **0.22**

0.5

Degree of Networking   **1.0**

Quality of Sensemaking

1.0

0.28

3.10:1

"Cognitive Advantage"

Quality of Organic Info

8.11:1

Quality of Decisions

Kill Ratio

Voice

Voice + Link 16

"Warfighting Advantage"

Source: RAND/EBR Case Study

Implementing Network Centric Warfare:
Key Elements of Strategy

- Get the Theory Right
- Apply the Theory Enterprise Wide
- Accelerate Networking of the <u>Joint</u> Force
- Accelerate Deployment of Network-Centric Concepts and Capabilities
- Experiment with Network-Centric Concepts and Capabilities
- Address Challenges of Allied & Coalition NCO
- Develop Doctrine and Tactics, Techniques, and Procedures for NCO
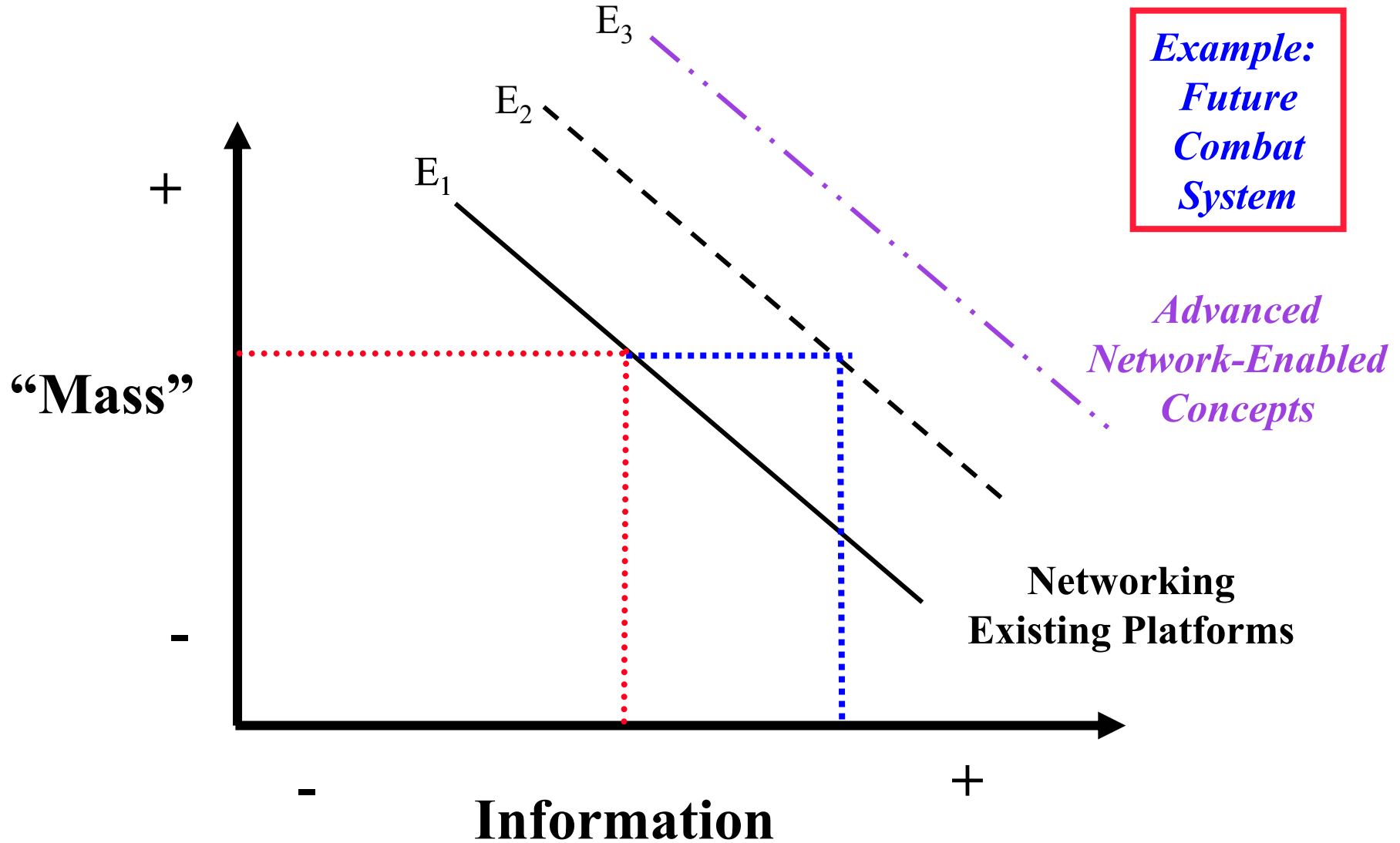 - Service/Combined/Joint/Allied and Coalition

Getting the Theory Right

"Substitution of Information for Mass"

Example:
Dominant
Maneuver

E_2

E_1

"Mass"

Networking
Existing
Platforms

-

-

Information

+

Getting the Theory Right

"Value of Information"

E₂

E₁

"+"

"Mass"

"−"

Examples:

Precision Engagement

Full Dimensional Protection

Networking Existing Platforms

−   Information   +
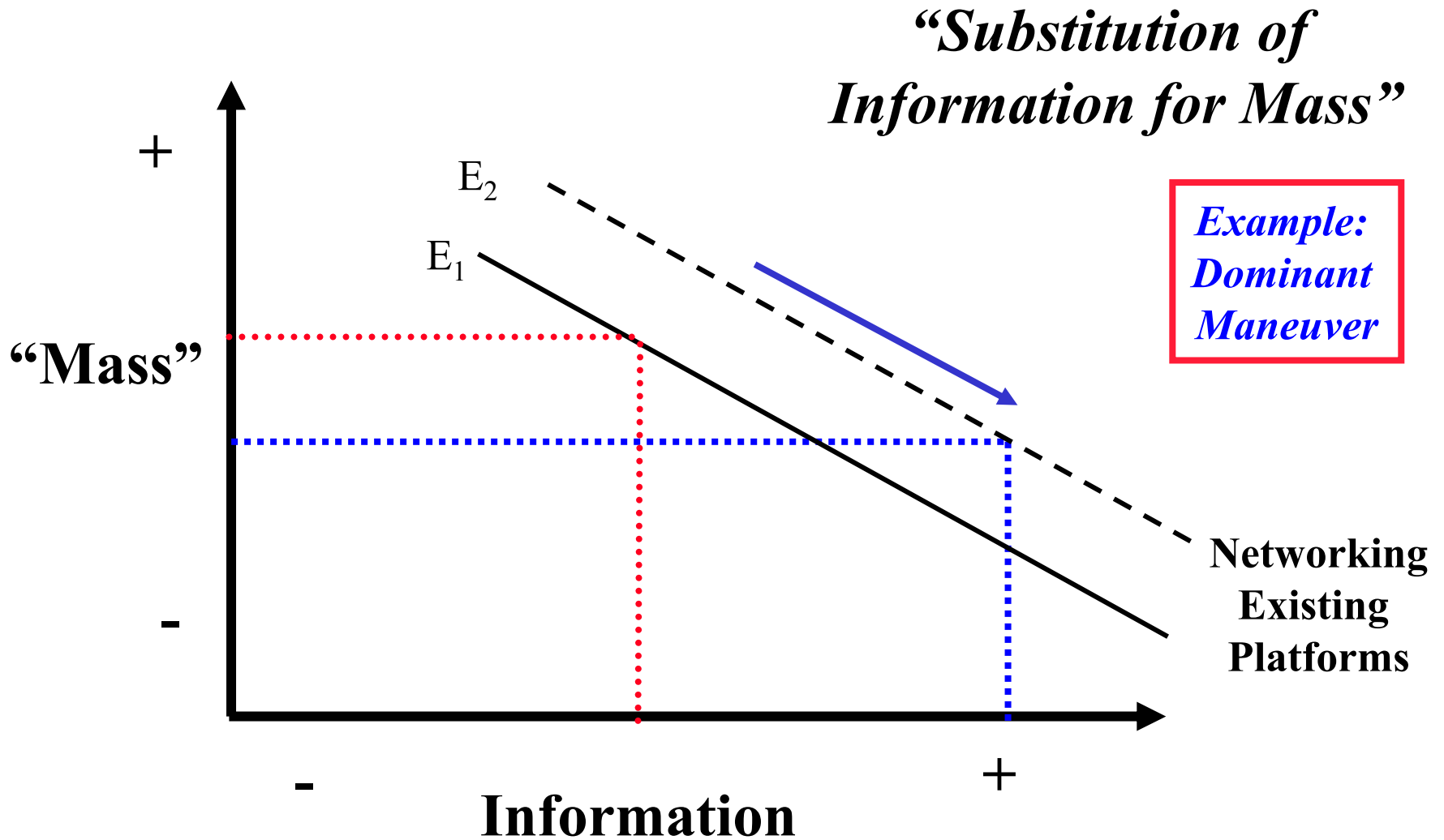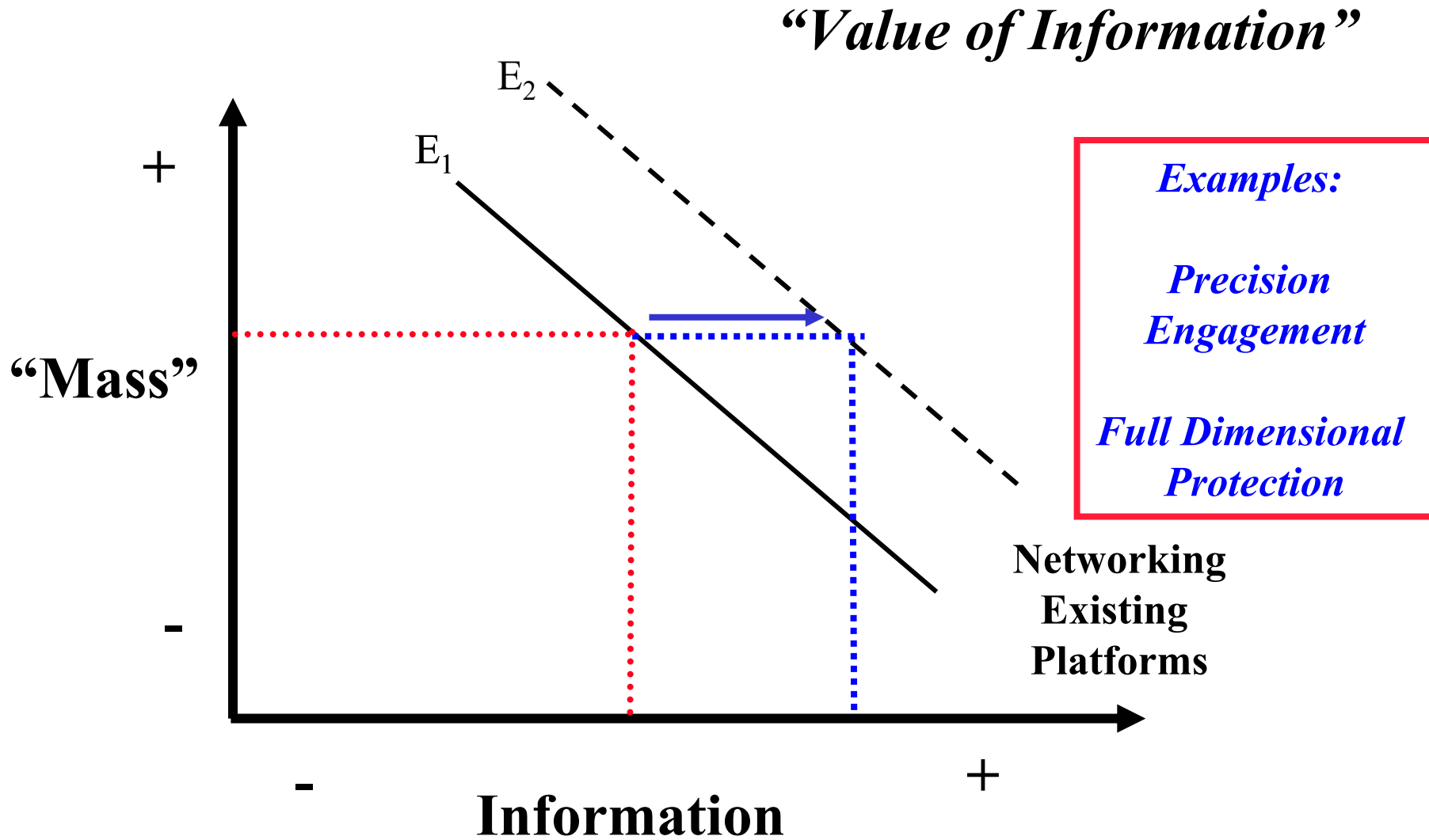
Getting the Theory Right

Example Advanced Network Enabled Concept: Sea-Based Tactical Air

Distributed Sea-based TACAIR

Network-centric
- *Collaborative planning and execution*
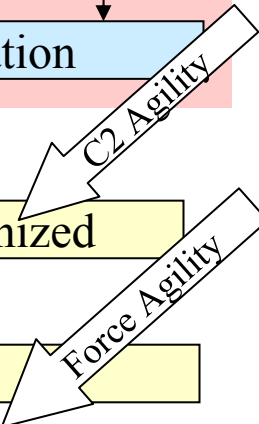- *Netted expeditionary sensors*

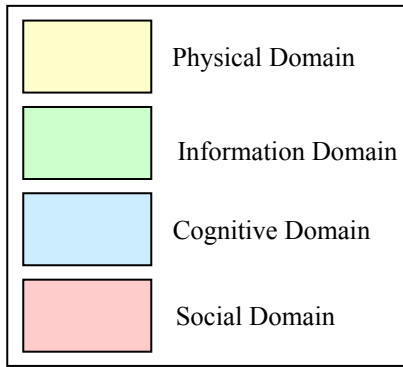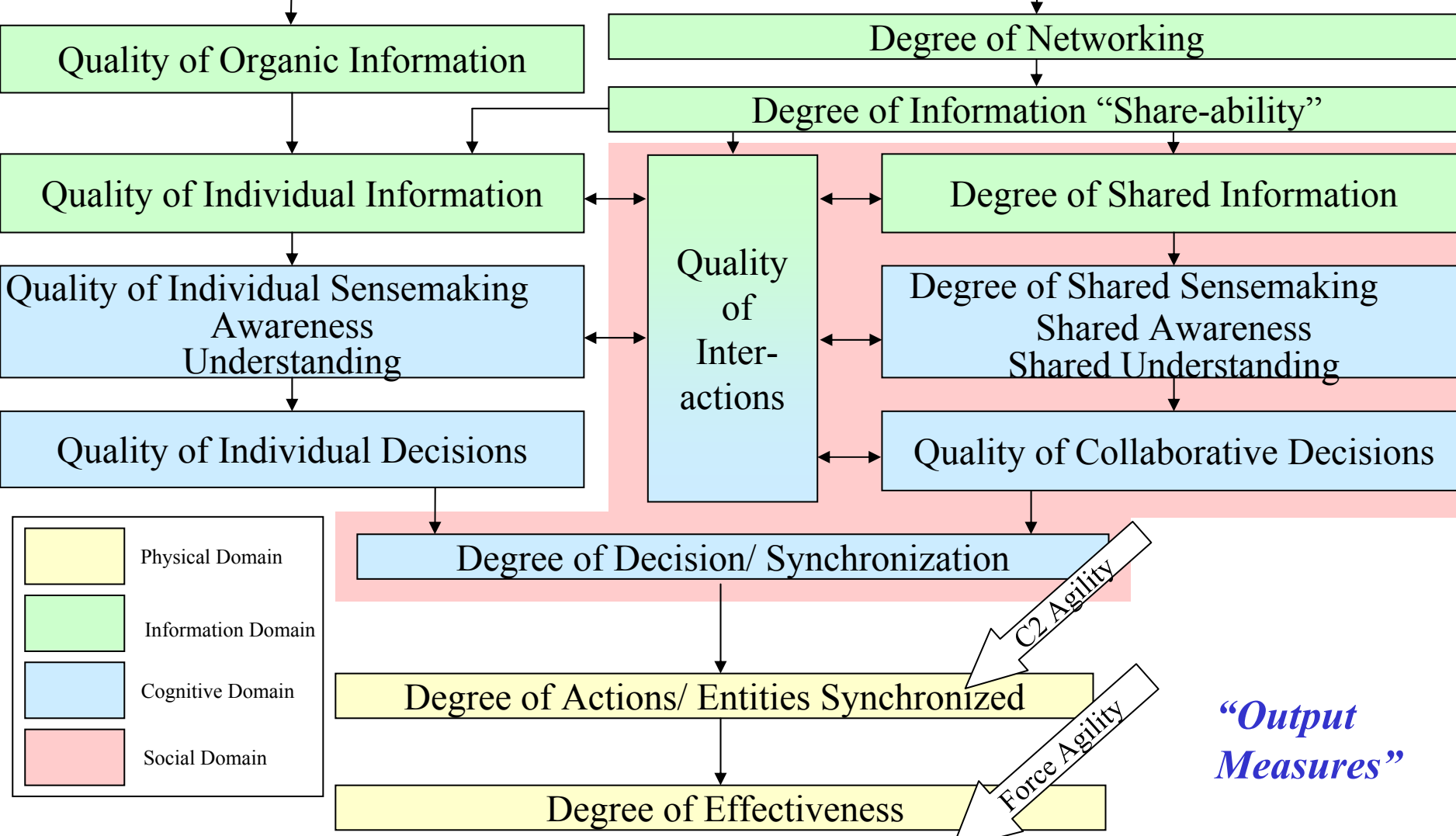*Continuous power vice pulse of power (24 hour ops)*

Assured access
- *Correct tactical instability*
- *Complicate enemy ISR*
- *Improve survivability (susceptibility/vulnerability)*
- *Reduce manpower*
- *Reduce cost*

Sea-basing implementation
- *Split operations/replenishment AIMD ashore or ship-based*
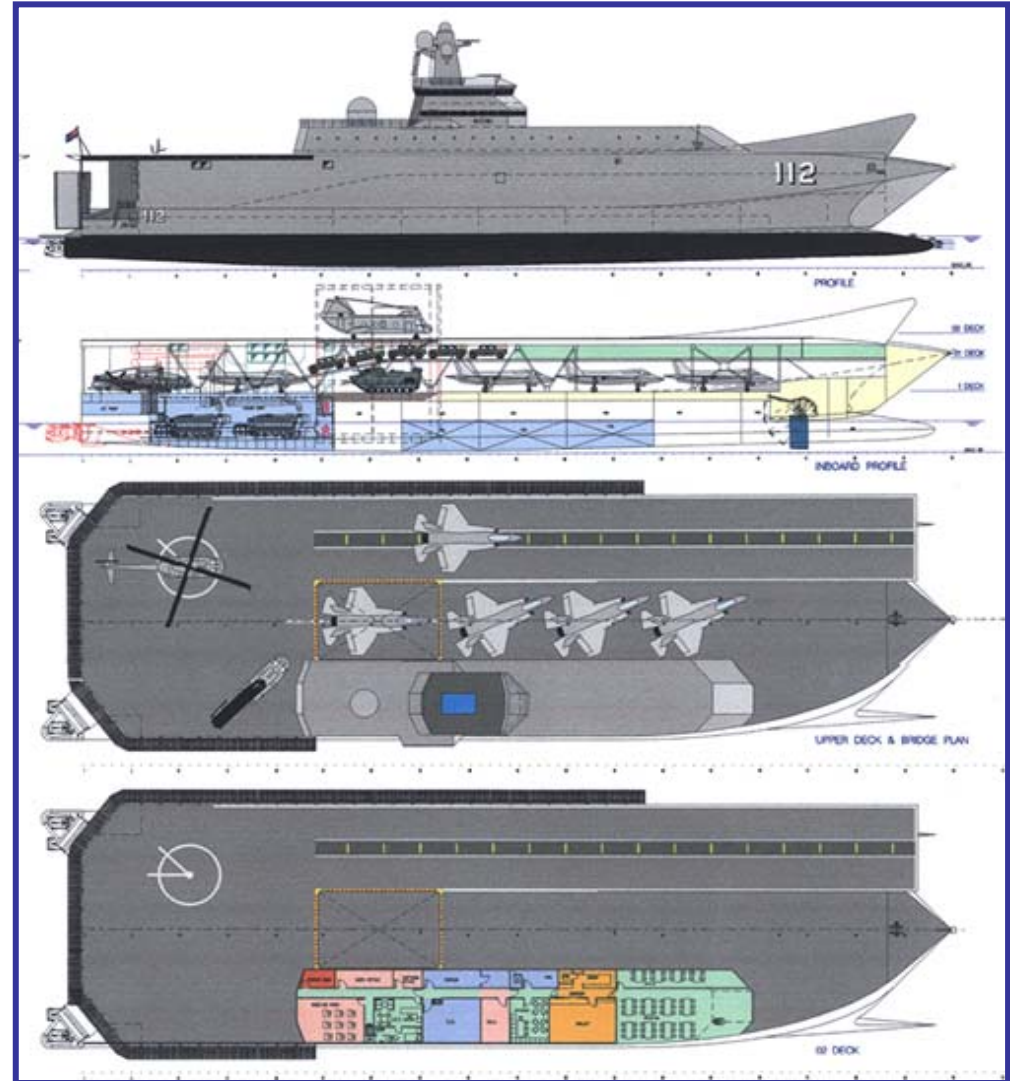
Getting the Theory Right:
# The NCO Conceptual Framework

Force

| *Information Sources* | *Value Added Services* | | *C2* | *Effectors* |

Quality of Organic Information

Degree of Networking

Degree of Information "Share-ability"

Quality of Individual Information ↔ **Degree of Shared Information**

Quality of Inter-actions

**Quality of Individual Sensemaking
Awareness
Understanding** ↔ **Degree of Shared Sensemaking
Shared Awareness
Shared Understanding**

Quality of Individual Decisions ↔ **Quality of Collaborative Decisions**

Degree of Decision/ Synchronization

C2 Agility

| Physical Domain |
| Information Domain |
| Cognitive Domain |
| Social Domain |

Degree of Actions/ Entities Synchronized

Force Agility

"Output Measures"

Degree of Effectiveness

Getting the Theory Right: Command and Control of a Networked Force

What's Different?

- **Common Operational Picture**
  - **Reduced "Fog" of War**
- **Shared Situational Awareness (SA)**
  - **Significantly increased SA for :**
    - Commander
    - Subordinate Commanders
    - Individual Warfighters
  - **Decreased "cognitive loading" in developing SA**
- **Commanders Intent**
  - **Increased shared situational understanding**
  - **Enhanced by capabilities for real-time collaboration**
- **Enhanced speed of decision making**
- **Broader spectrum of Courses of Action**
  - **Increased Audacity**
  - **Reduced Risk**

Getting the Theory Right: Command and Control of a Networked Force
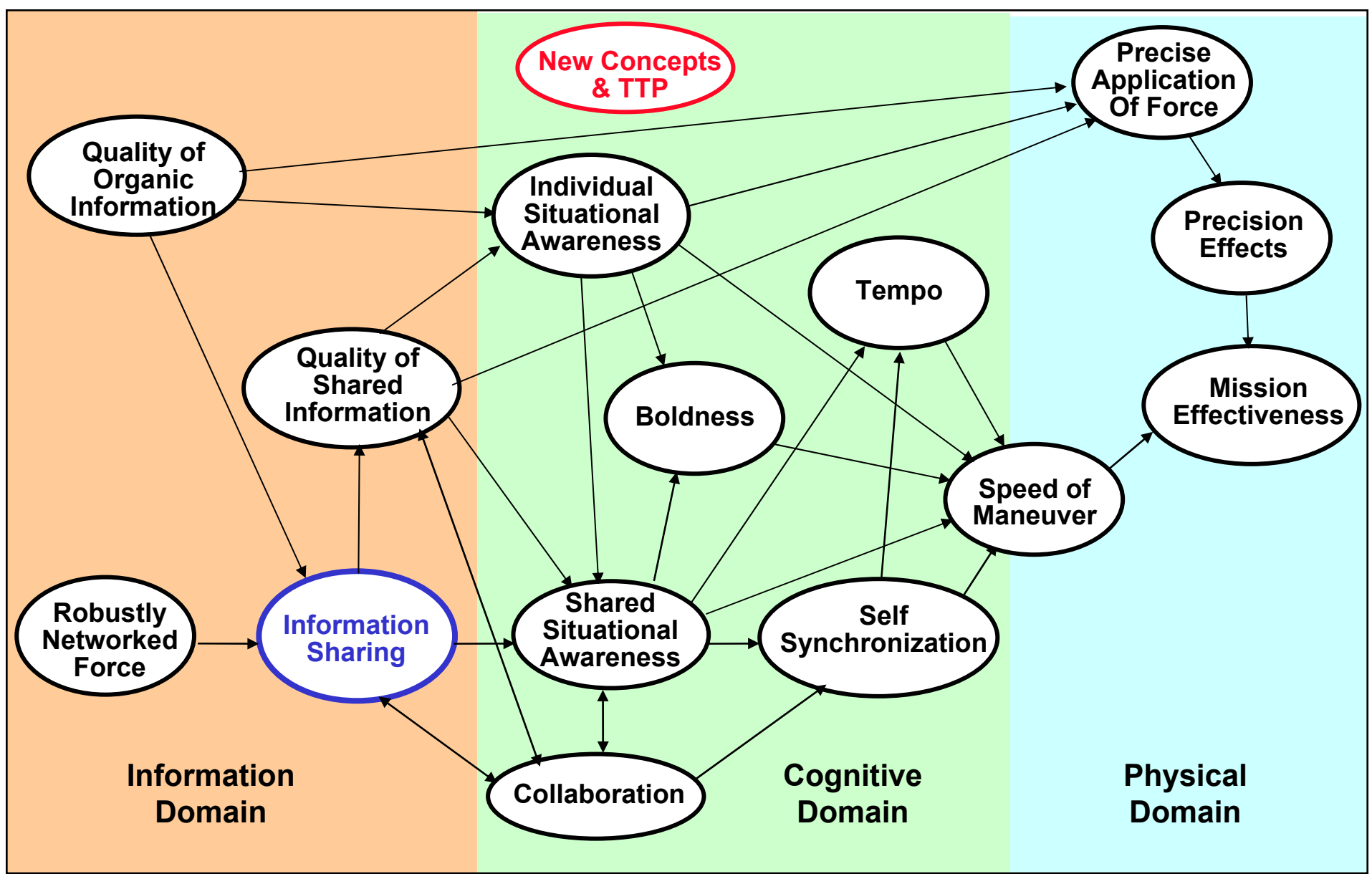
Applying the Theory Enterprise Wide: Supporting Key Force Development Decisions
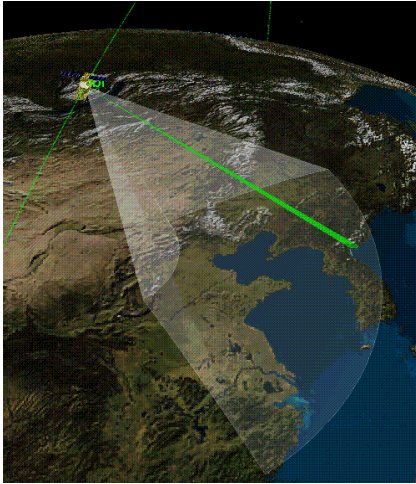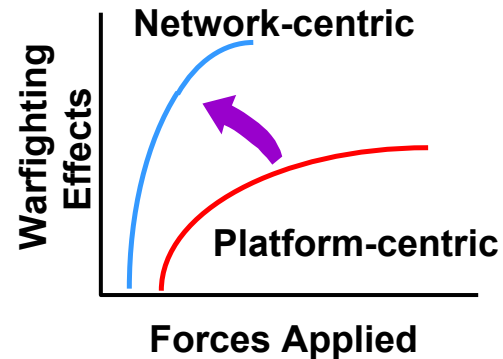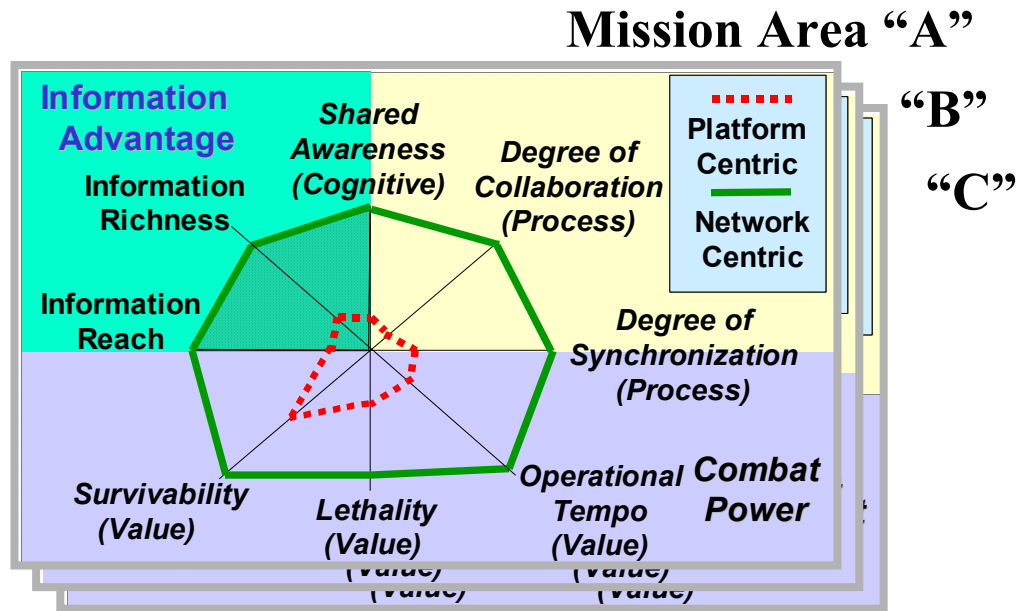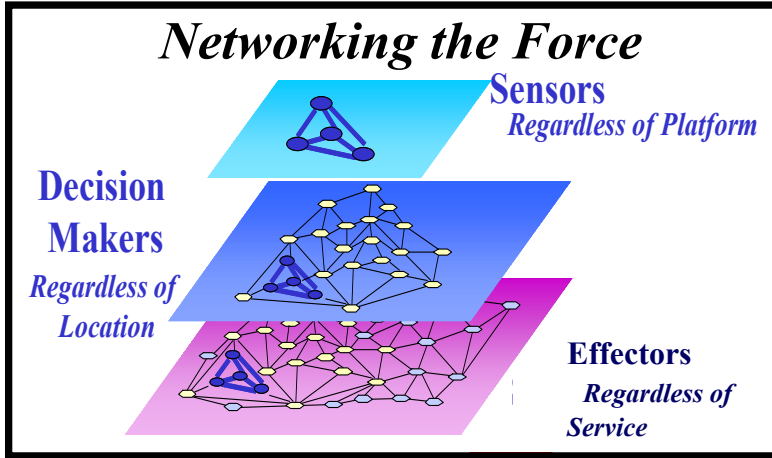

Sensors
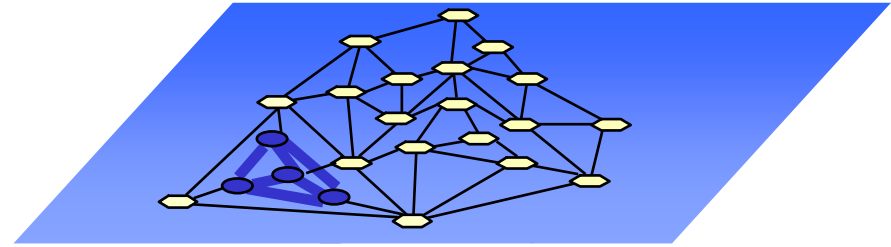
Networks

Command & Control

Effectors (Shooters)

People

Applying the Theory Enterprise Wide: Supporting Key Force Development Decisions

Implementation Challenges

- **Getting the Theory Right**
  - **Advancement of "New Theory of War"**
  - **Development of new "mental models"**
- **Applying the Theory Enterprise Wide**
  - **Making the "Business Case" for key Enabling Investments**
    - **Networking + "Interoperability"**
    - **Sensing**
- **Enabling Information Age Behaviors**
  - **Dealing with challenges of Disruptive Innovation**
  - **Creating the right set of "Incentives"**
- **Overcoming Cultural Impediments to Innovation**
  - **Emergence of "New Elite"**
  - **Potential Displacement of "Existing Elite"**

Take A Ways

- **Network Centric Warfare: An Emerging Military Response to the Information Age**
  - *Evidence exists and is compelling*
  - *Clear linkage between Information Advantage and Warfighting Advantage*
  - *Ideas and concepts have "traction"*
- **Early NCW adopters are reaping significant gains**
  - **Armed Services: Increased Combat Power**
  - **Industry: New Business**
- **A New Mental Model is emerging to navigate the ongoing Transformation from the Industrial Age to the Information Age**

Questions?

To Probe Further

- **DoD Report to Congress on Network Centric Warfare**
  - *Online at www.dodccrp.org*
- **Books**
  - *Blown to Bits* by Evans and Wurster
  - *The Innovators Dilemma* by Clayton Christensen
  - *Network Centric Warfare: Developing and Leveraging Information Superiority* by Alberts, Garstka, and Stein, *Online at www.dodccrp.org*
  - *Understanding Information Age Warfare* by Alberts, Garstka, Hayes and Signori, *Online at www.dodccrp.org*
- **Brochures**
  - *Information Superiority:* www.c3i.osd.mil/infosup/
  - *Global Information Grid:* www.dtic.mil/jcs/J6

To Probe Further (Cont.)

- Articles
  - *Proceedings of the Naval Institute*
    - *"Network Centric Warfare: Its Origin and Future,"* by VADM A.K. Cebrowski and John J. Garstka, Jan 1998
    - Multiple articles on topic of NCW in subsequent issues
  - *Defense News*
    - *"The Future Is Networked: U.S. Must Take Charge of New Military Revolution,"* Senator Joseph Lieberman, 21 Aug 2000
  - *PHALANX*
    - *"Network Centric Warfare: An Overview of Emerging Theory,"* John J. Garstka, Dec 2000
  - *Business 2.0*
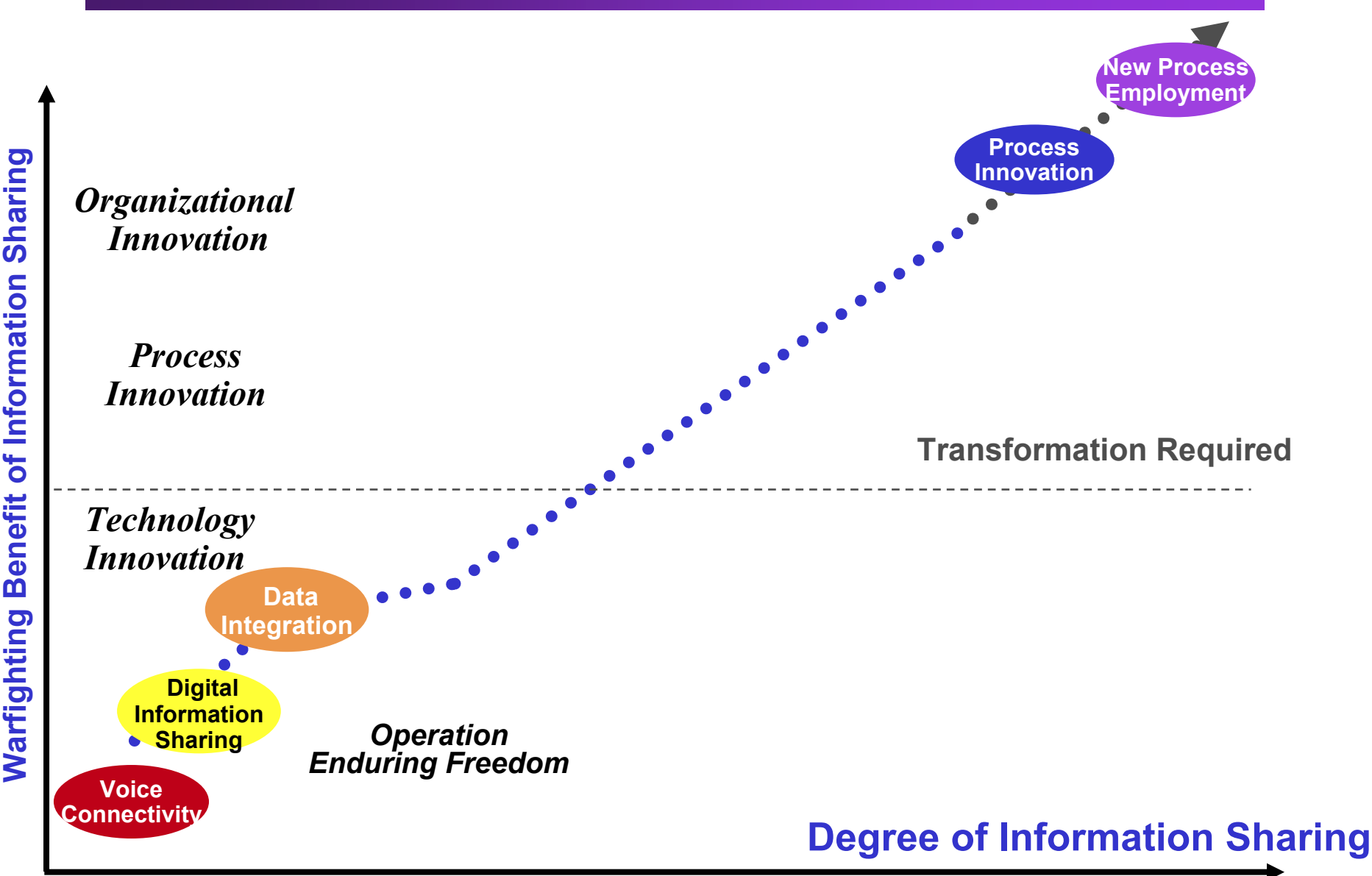   - *"America's Secret Weapon,"* Tom Stewart, Dec 2001
      `http://www.business2.com/articles/mag/0,1640,35142,FF.html`

Operation Enduring Freedom

"*When observing Afghanistan, we are looking for the reinforcement of trend lines.* *Warfare is increasingly being dominated by sensors,* *more so than any other piece of equipment. In Afghanistan, Special Operating Forces are lightly armed, but very well connected to networks. They know where the are in relation to other Special Operating Force and they also know where the enemy is. Our fighting forces are themselves sensors and the are connected to weapons systems and platforms that are capable of delivering enormous fire power.*"

VADM Arthur K. Cebrowski, USN (Ret)

Director, Force Transformation

IEEE Spectrum – July 2002

Exploiting the Power of Information Sharing:
Increasing Tactical Agility
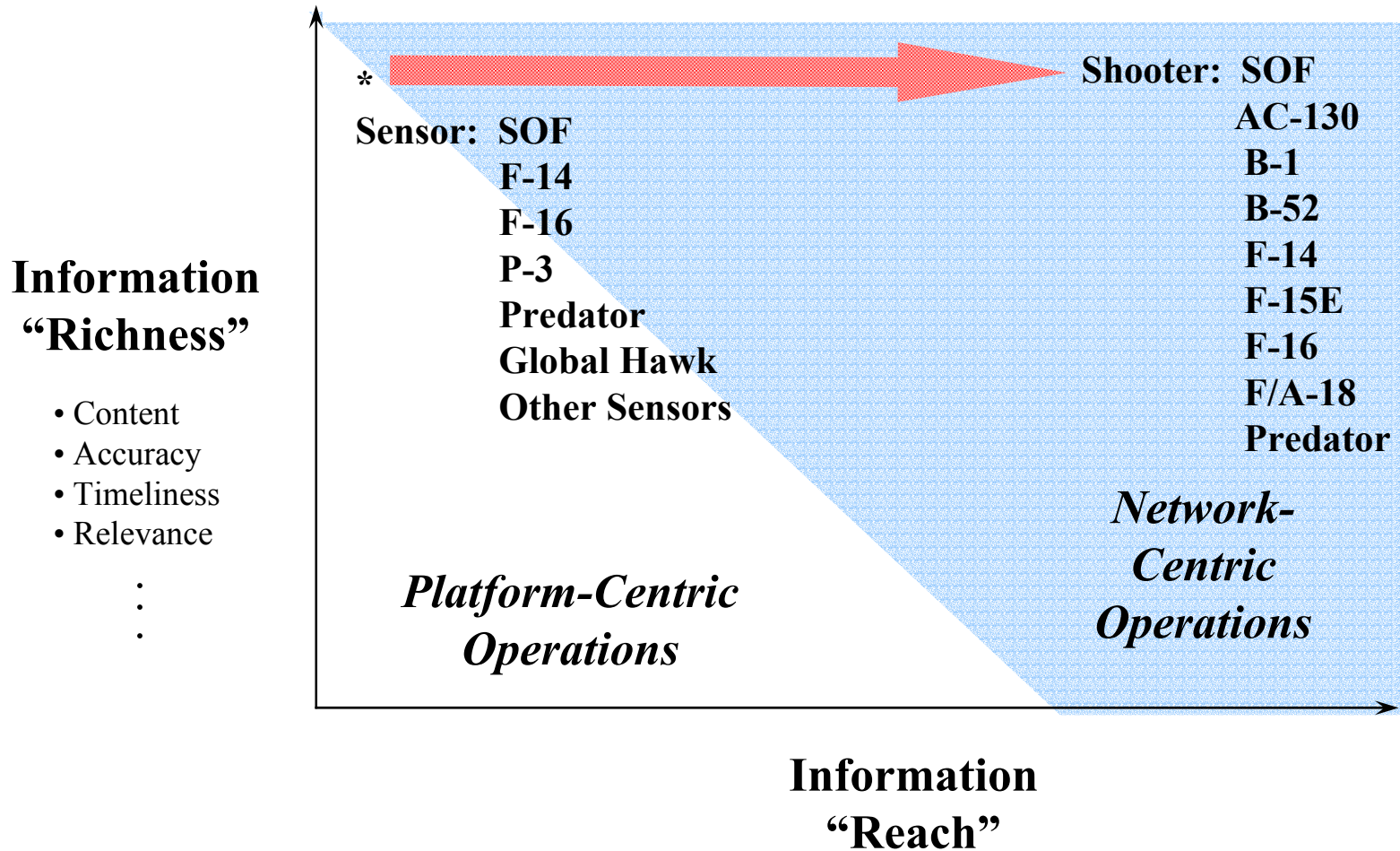
Warfighting Benefit of Information Sharing

Organizational Innovation

Process Innovation

Transformation Required

Technology Innovation

Process Innovation

New Process Employment

Data Integration

Digital Information Sharing

Operation Enduring Freedom

Voice Connectivity

Degree of Information Sharing

Operation Enduring Freedom: Information Sharing - Voice

Unprecedented Tactical Agility

- **SOF forces request Close-Air-Support**

- **F-14 providing Close-Air-Support out of weapons**

- *Real Time Innovation*: **F-14 Radar Intercept Officer employs onboard sensors to mensurate target**

- **F-14 crew passes target data - *via voice* - to AWACS and B-52 enabling successful target kill with precision munitions**

Operation Enduring Freedom:
Information Sharing: Voice + Data

Unprecedented Tactical Agility

Information "Richness"

- Content
- Accuracy
- Timeliness
- Relevance

$\vdots$

Platform-Centric Operations

*

Sensor: SOF
F-14
F-16
P-3
Predator
Global Hawk
Other Sensors

Shooter: SOF
AC-130
B-1
B-52
F-14
F-15E
F-16
F/A-18
Predator

Network-Centric Operations

Information "Reach"

Operation Enduring Freedom: Enabling Agile Mission "Groups"

Unprecedented Tactical Agility

Source: UK Joint Doctrine & Concept Centre
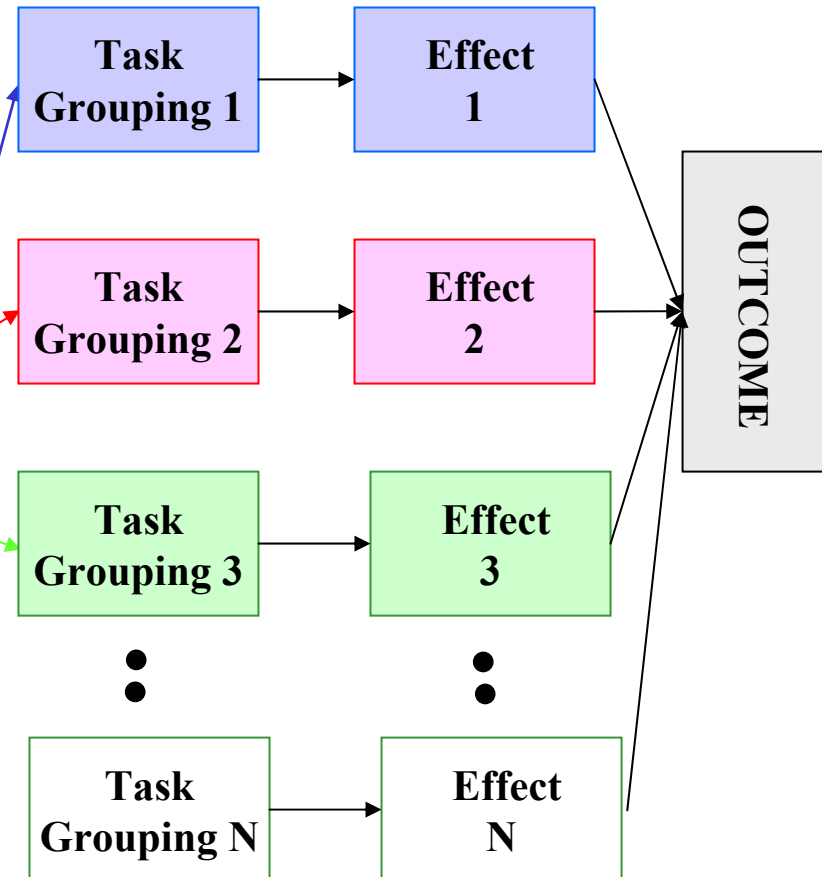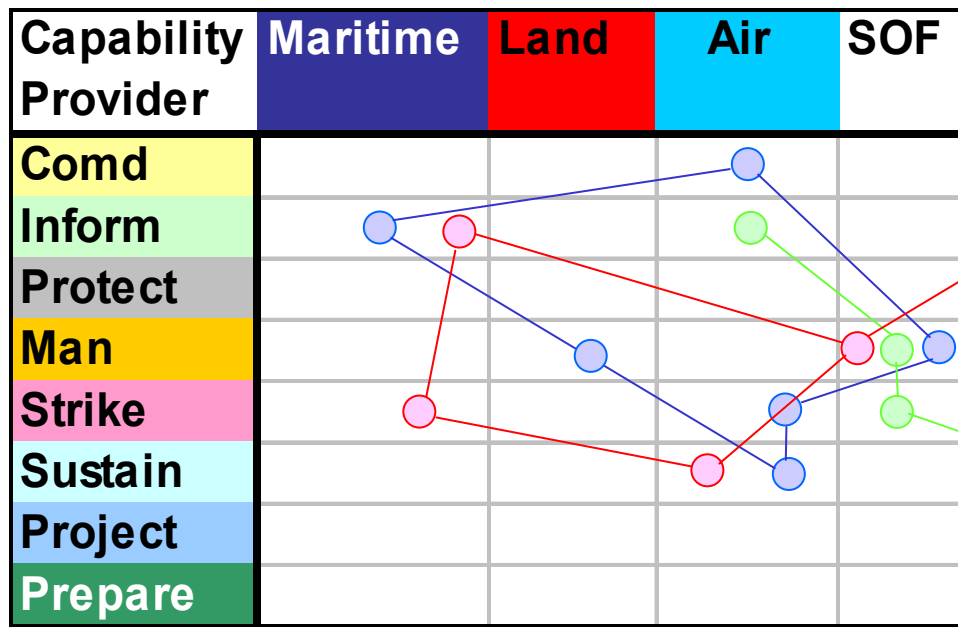
Applying Theory to Make Sense of The Warfighter's Reality
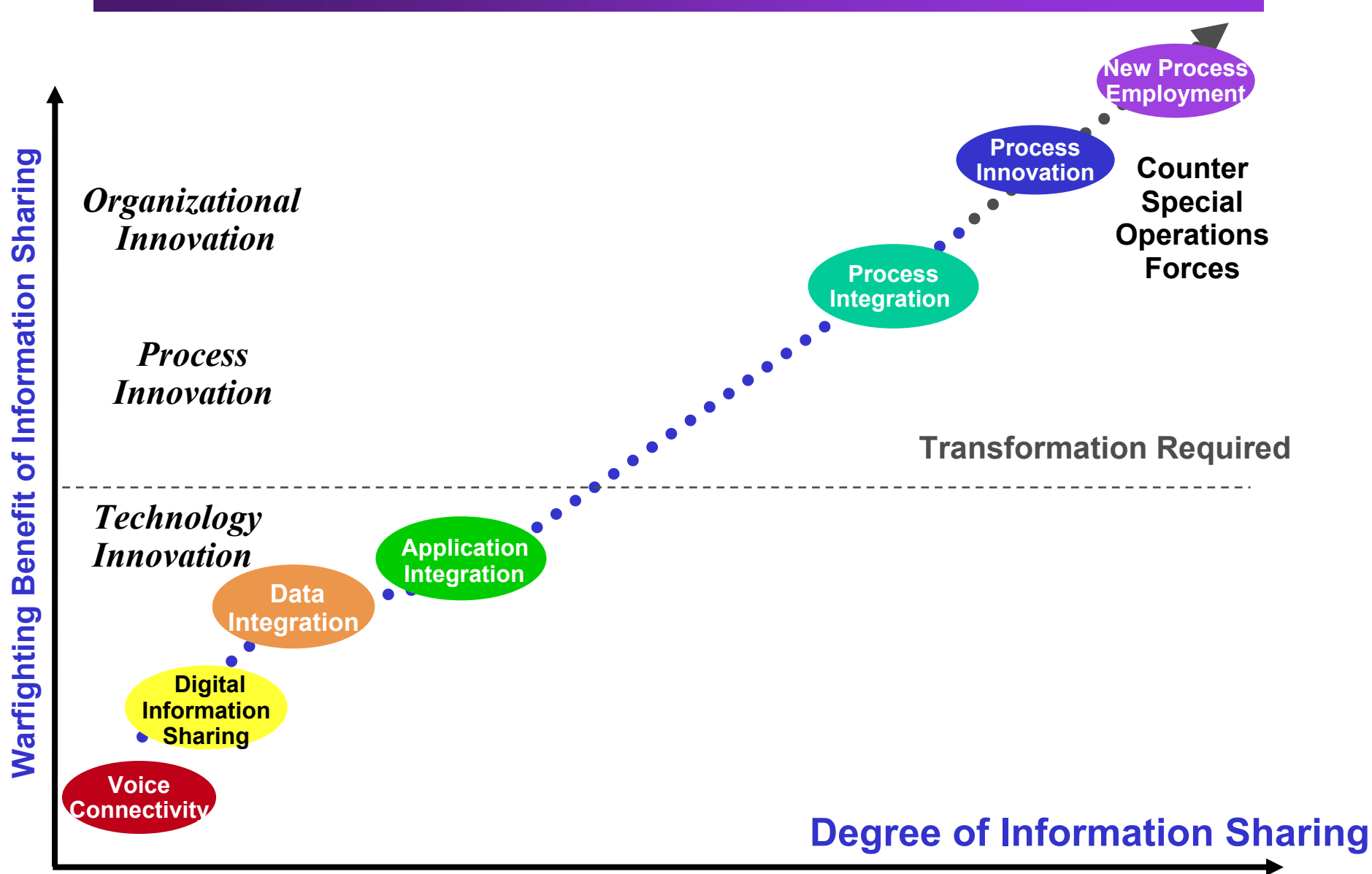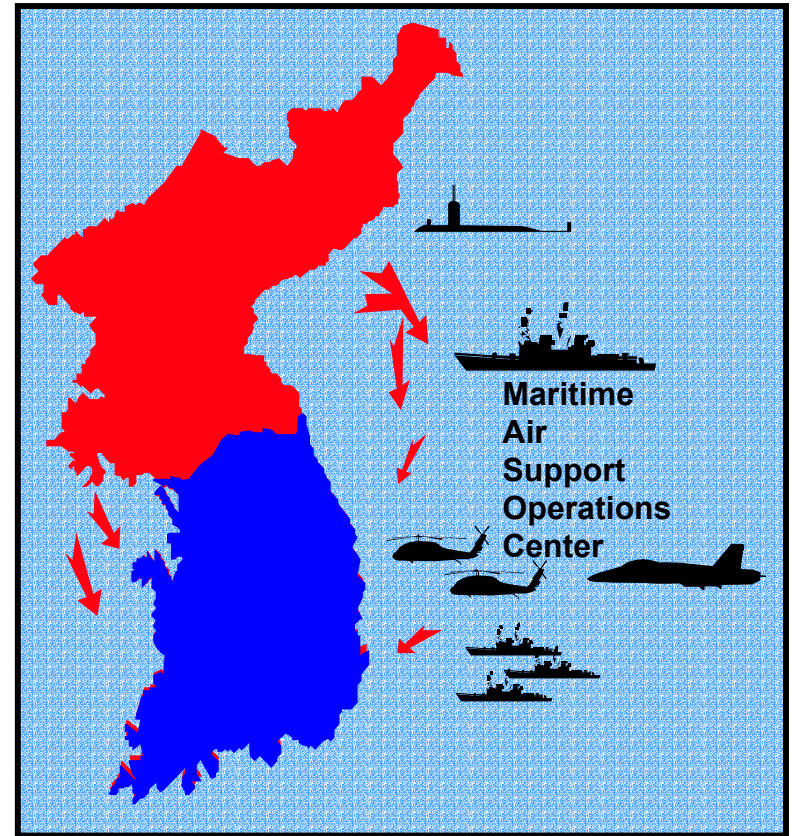
Combined Forces Command Korea

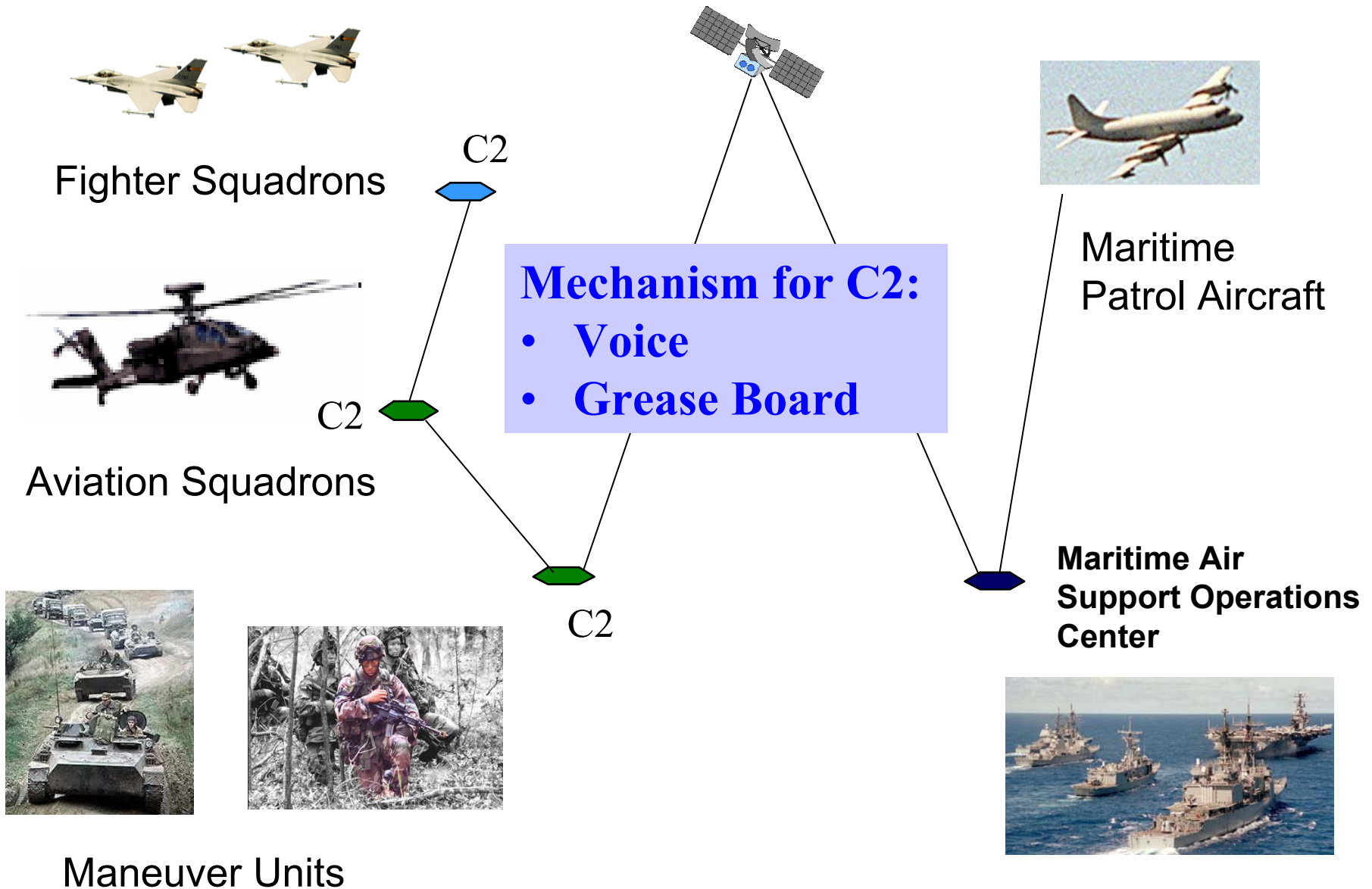*Navy Component Commander's Number One Problem*

Warfighting Challenges

1. Counter Fire

2. Counter Special Operations Forces (CSOF)

3. Theater Air and Missile Defense

Maritime
Air
Support
Operations
Center

Counter Special Operations Forces Mission

Fighter Squadrons

C2

Aviation Squadrons

C2

Mechanism for C2:
- **Voice**
- **Grease Board**

C2

Maneuver Units

Maritime Patrol Aircraft

Maritime Air Support Operations Center

Counter Special Operations Forces Mission

…Information Age

Fighter Squadrons

C2

Maritime Patrol Aircraft

Aviation Squadrons

C2

- **Networked Air-Land-Sea Forces**
  - *Order of magnitude* improvement in real-time information sharing across "service" seam
  - *Dramatically Increased* Shared Situational Awareness
- **Process Innovation**
  - **Weapon-target pairing**
  - **Self-synchronization**
- **Multi-service Solution**
  - **Coordination at "the seams"**

Maritime Air Support Operations Center

C2

Fleet Battle Experiment Delta – Fall '98

Maneuver Units

Counter Special Operations Forces Mission
... *Dramatically Increased Mission Effectiveness*

	Before/After	Self Synchronization	OPTEMPO	Lethality
• Avg Decision Cycle	43 vs. 23 min	■	■	
• Mission Timeline	50% Decrease	■	■	
• Shooter Effectiveness	50% Increase	■		■
• Assets Scrambled	15% Decrease	■	■	
• SOF Leakers	10x Decrease	■		■

The Bottom Line: FBE Delta demonstrated the potential for a networked force provided with *shared awareness* to *self-synchronize* and to accomplish the CSOF mission in *half* the time and to reduce SOF leakers by an *order of magnitude*.

Source: Fleet Battle Experiment (FBE) Delta Quick Look Report
*An Assessment of IT-21 Warfighting Value-Added, 1 Mar 99*

Fleet Battle Experiment Delta: A Component Commander's Perspective
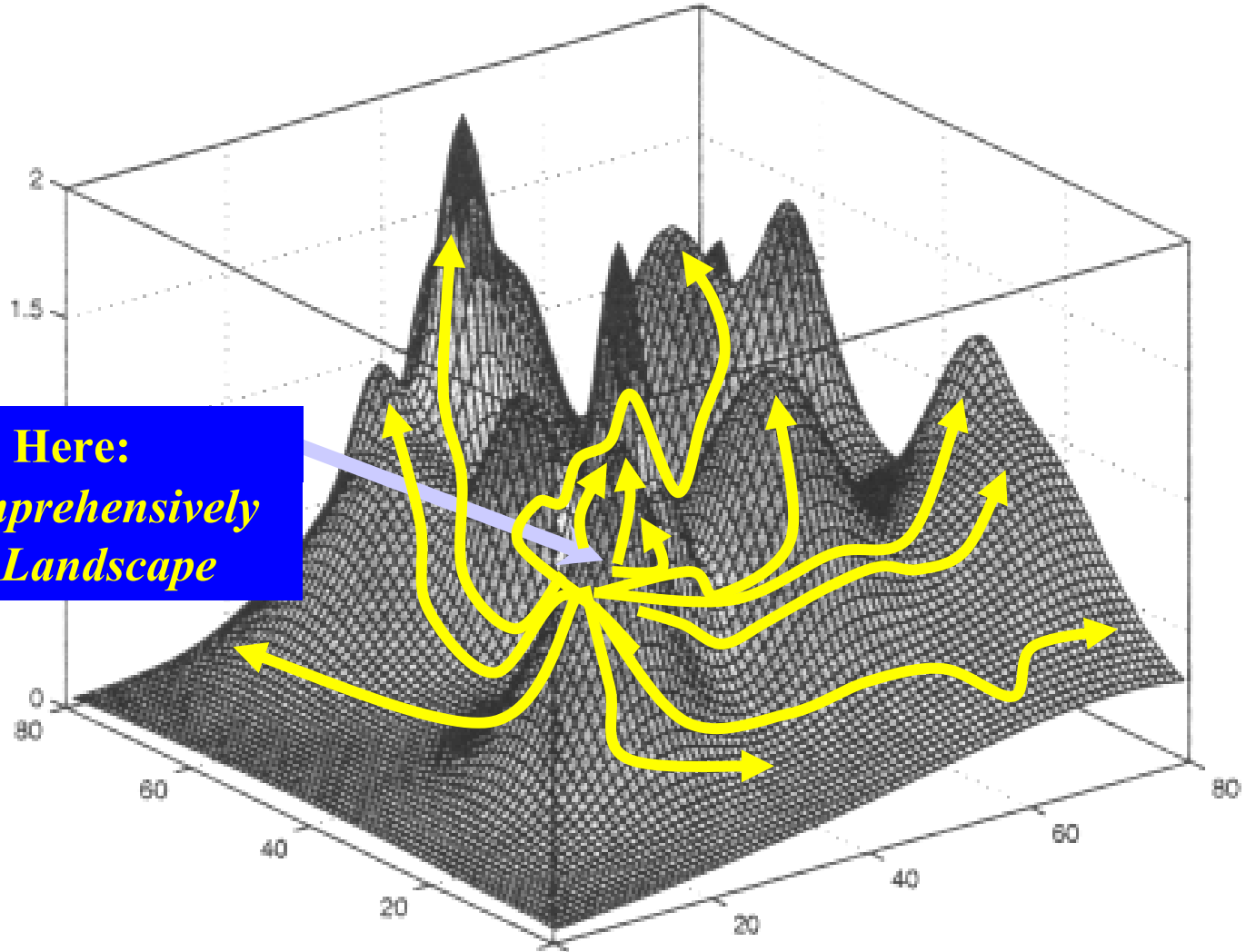
Fleet Battle Experiment Delta

... validated the concept of using Apache helicopters against special operations forces infiltration craft, and left behind a system for linking Navy and Army fire control systems

... demonstrated how the fighting power of the Combined Forces Command Korea could be increased without building new platforms

... unlocked potential combat power that was latent in the joint task force, but had been wasted due to segmentation of the battlespace

ADM Dennis Blair, CINCPAC
Remarks at WEST 2001
San Diego, CA
January 23, 2001

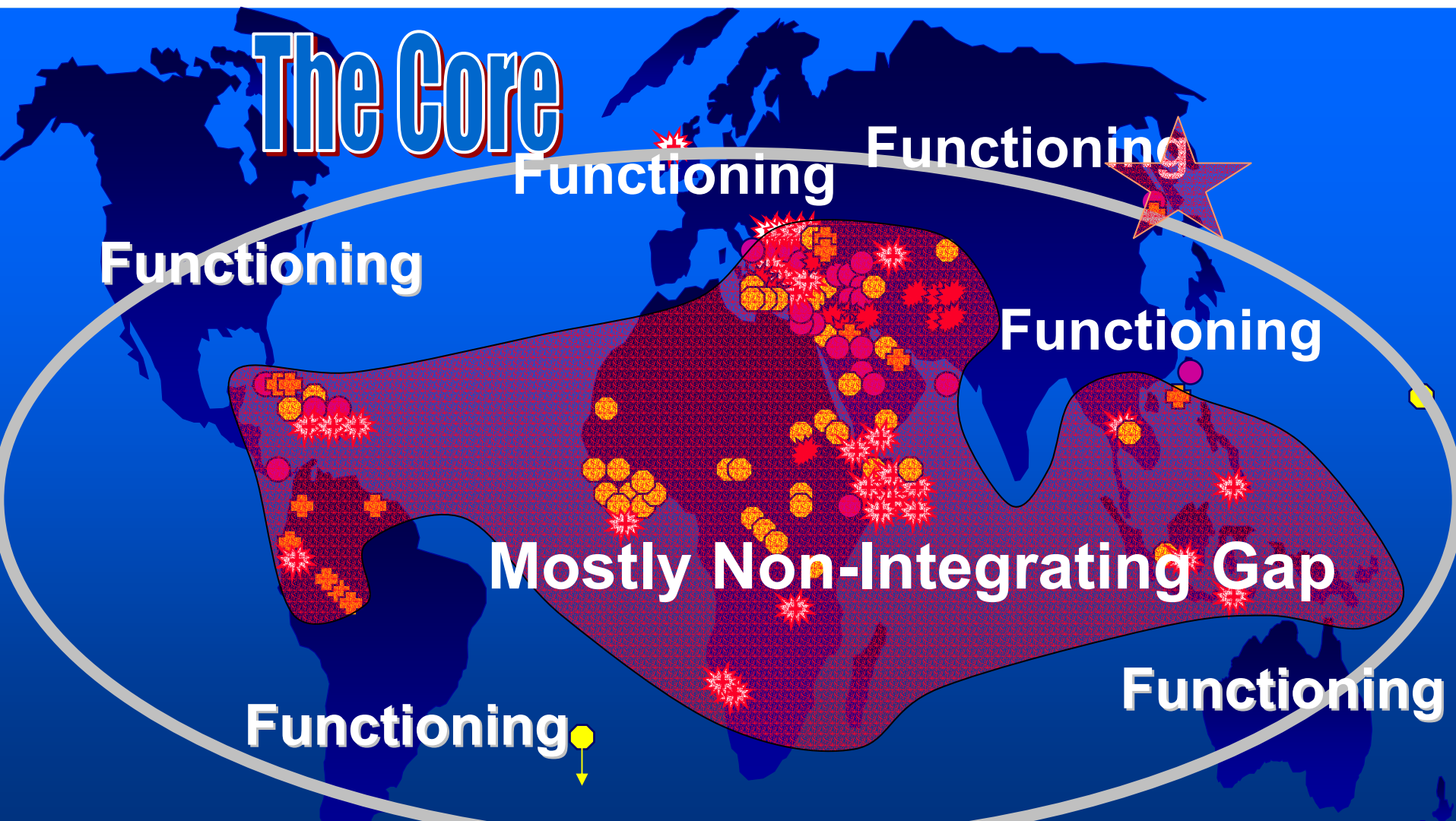# *Exploiting the Power of Information Sharing: Closing the Air-Ground Seam*
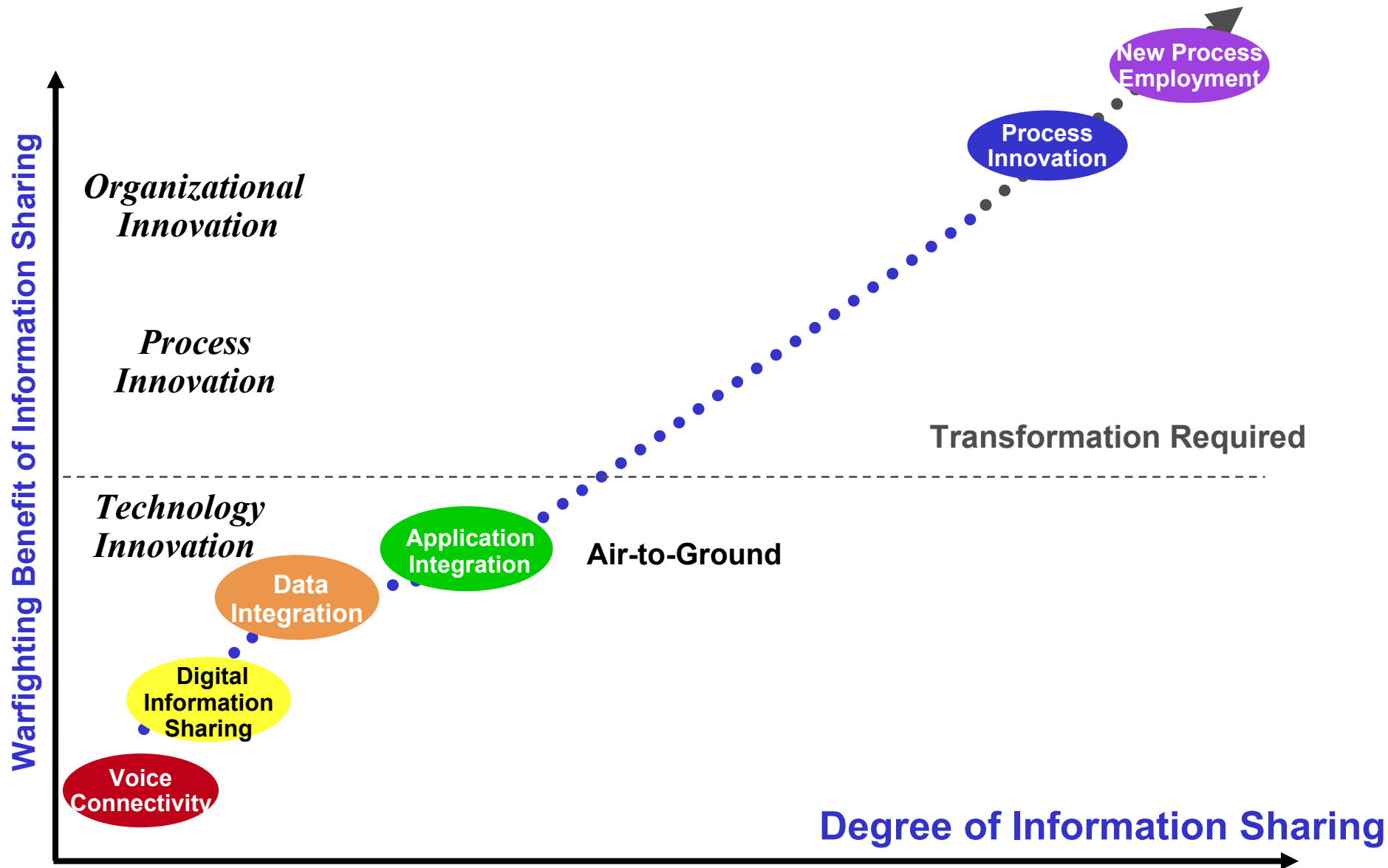
Major Transformation Challenge: Exploring the New Competitive Landscape

DoD is Here:
Needs to Comprehensively Search the Landscape
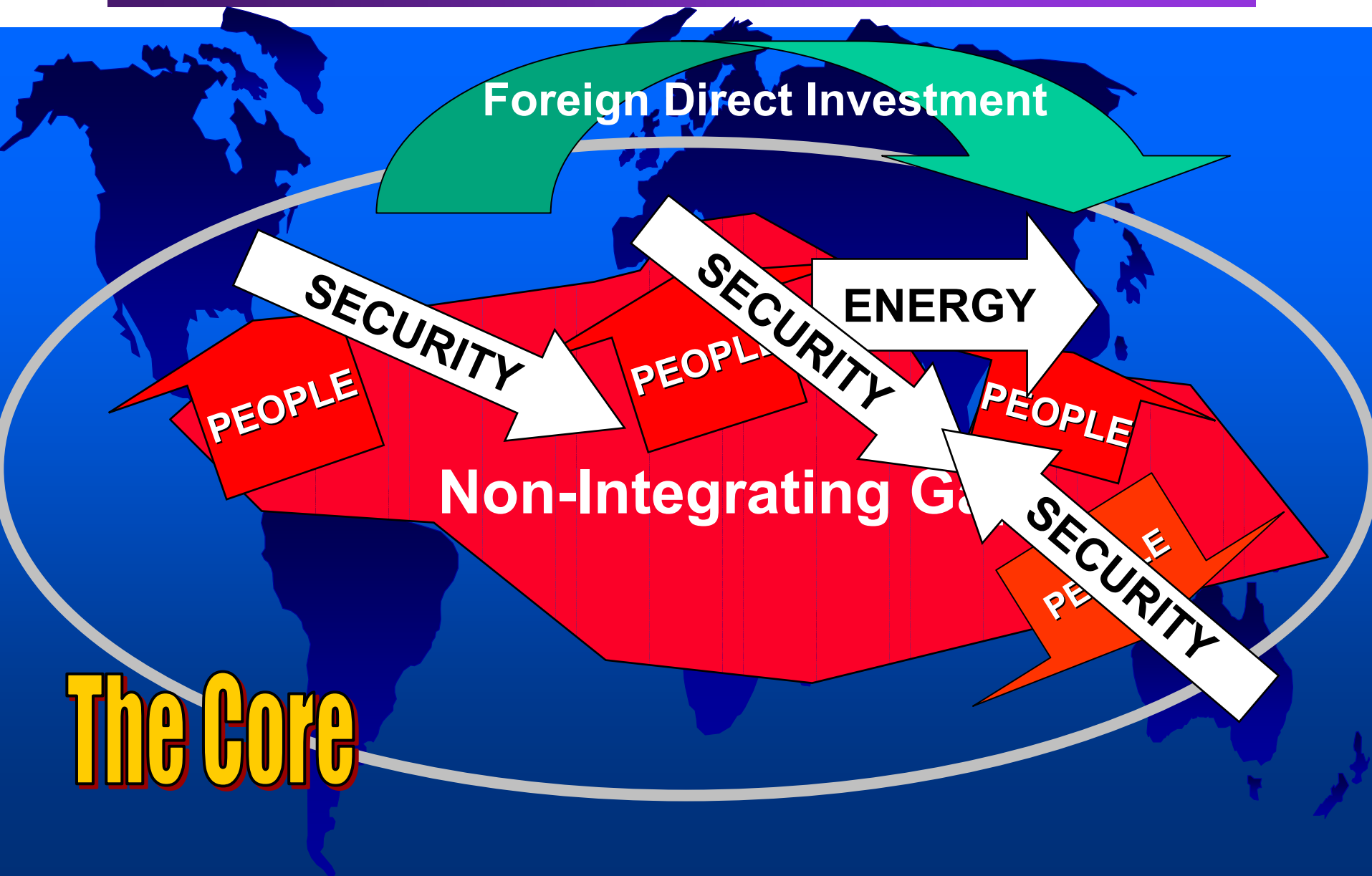
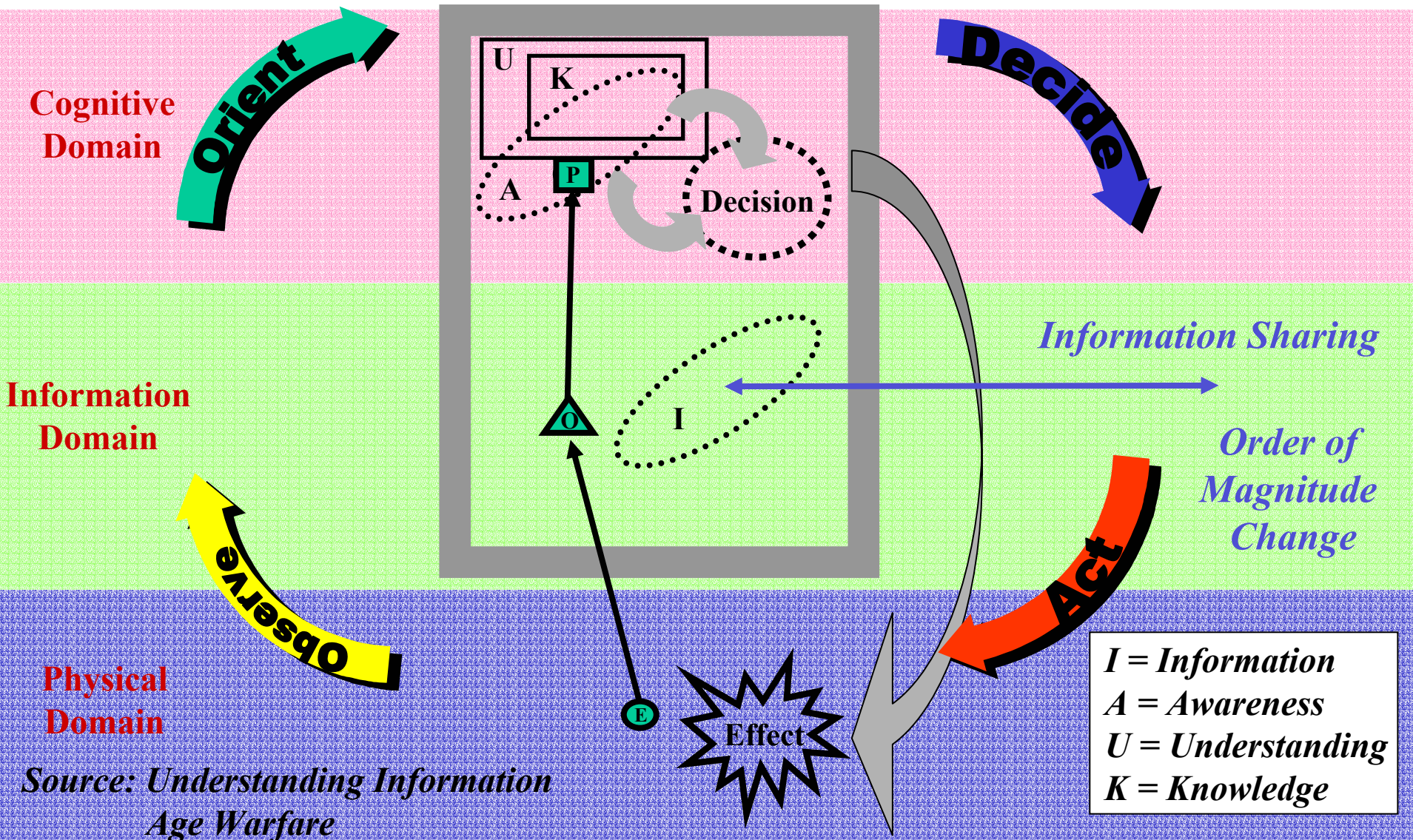# What is the Rule Set for Exploration?

Globalization III: Major Flows

Advancing NCW Theory: A Closer Look

Cognitive Domain

Information Domain

Physical Domain

Orient

Decide

Observe

Act

U

K

A

P

Decision

O

I

E

Effect

Information Sharing

Order of Magnitude Change

I = Information
A = Awareness
U = Understanding
K = Knowledge

Source: Understanding Information Age Warfare

Information Advantage

What matters is *Relative Information Advantage*

Blue Information Needs

Blue's Information Position
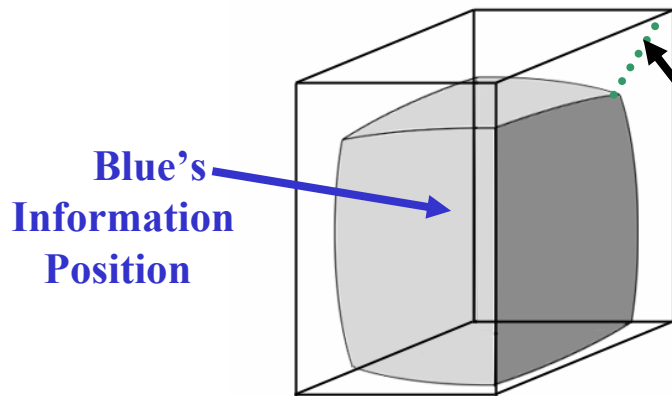
Blue and Red Information Needs are potentially different

One's Information position is relative to one's Needs

Red's Information Position
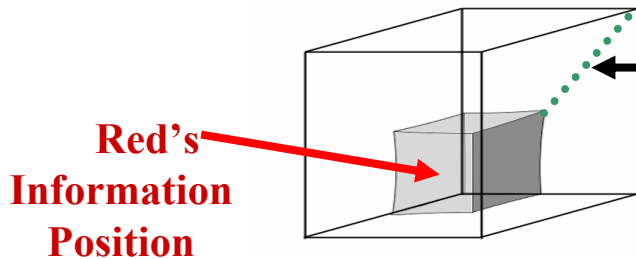
Red Information Needs

The Objective is to improve Blue's Relative Information Position vs Red's Relative Information Position

Source: Understanding Information Age Warfare