

Frameworks for Assessing the Military Implications of Emerging and Disruptive Technologies



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CSBA

Center for Strategic and Budgetary Assessments

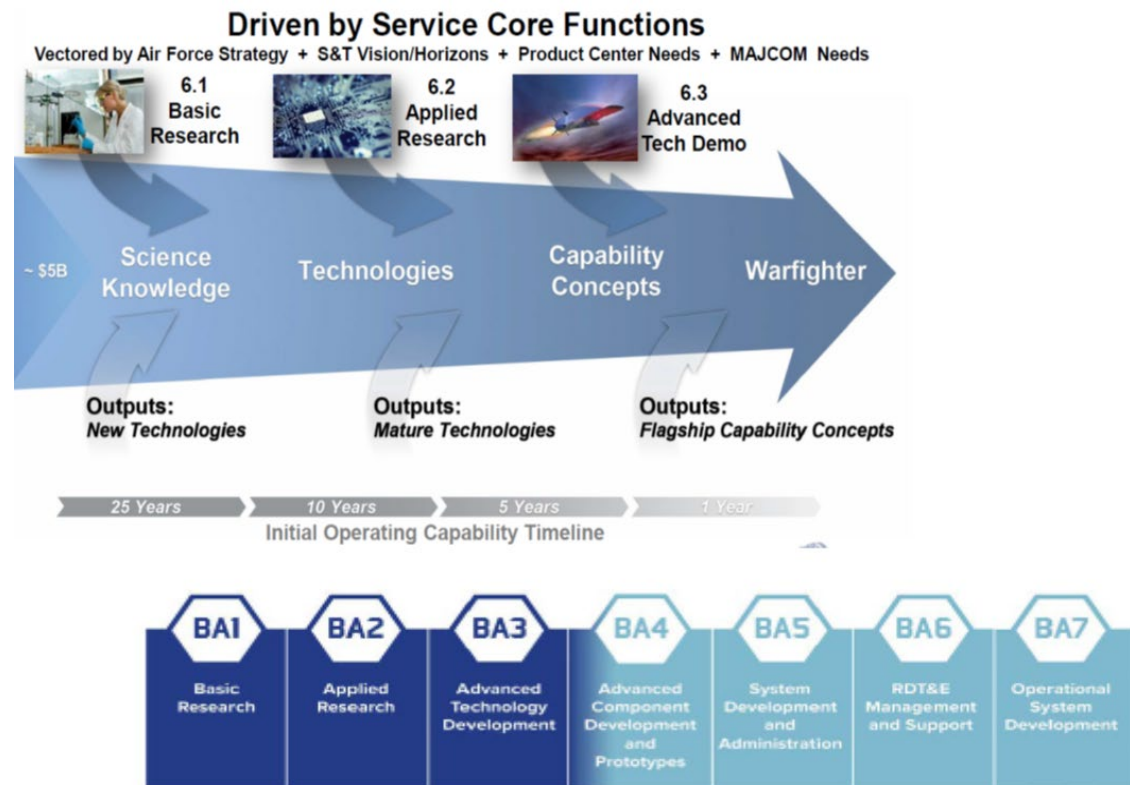
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Overview

- Emerging and Disruptive Technologies
- Offset Strategies
- Operational Concepts
- Analyzing Emerging and Disruptive Technologies
- Future Considerations

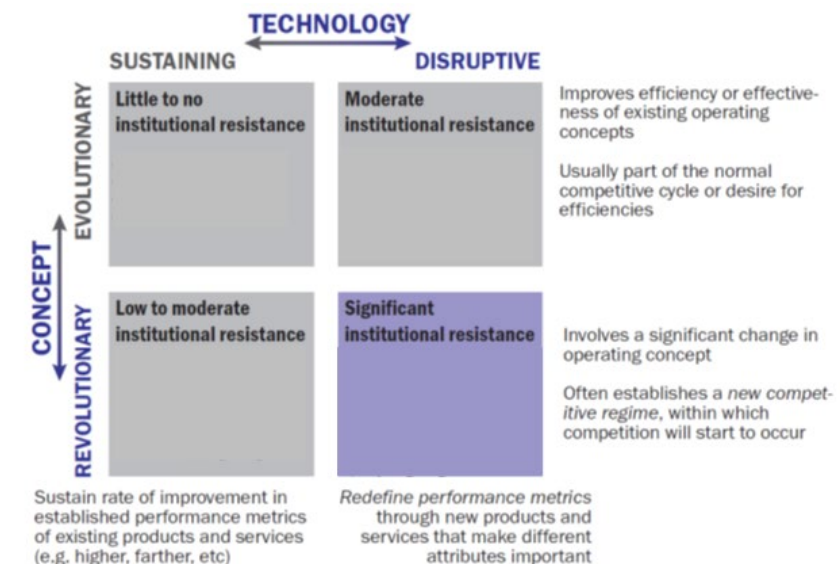
Emerging and Disruptive Technologies

- Emergence and Complex Adaptive Systems
- Dual-use (military and civilian) technologies
- Science and Technology Intelligence- “Technology Watch” and “Horizon Scanning”
- Technology “Push” and Technology “Pull”
- Challenge Problems as Catalysts



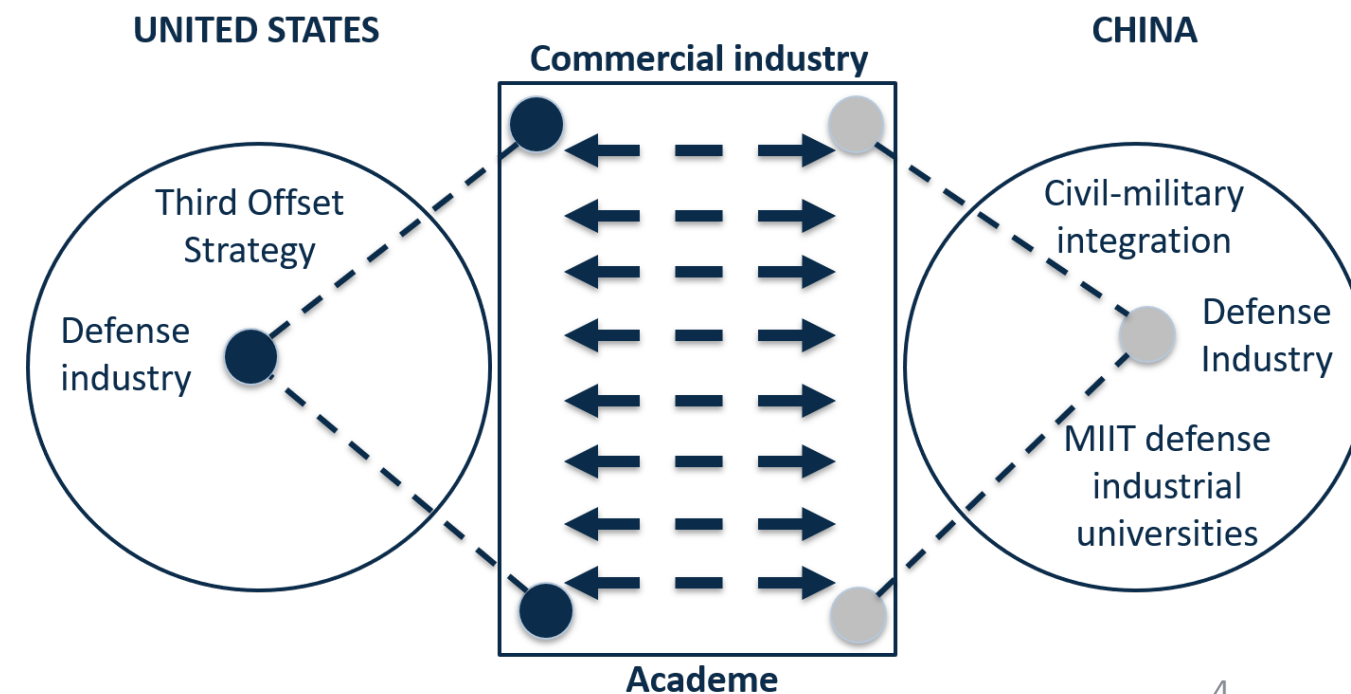
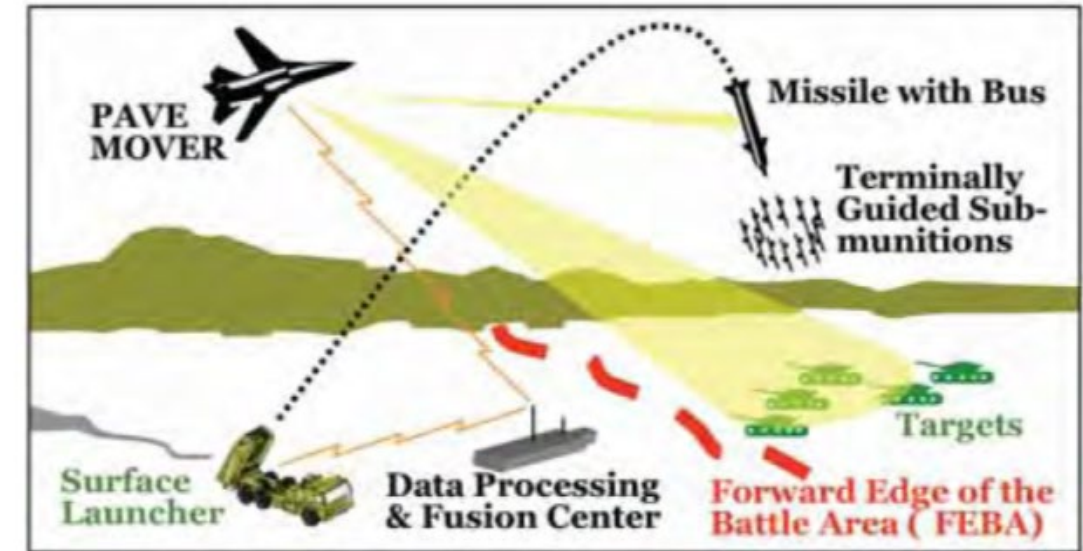
INNOVATIONS (S-CURVES) IN MODERN MILITARY HISTORY

ERA	INDUSTRIAL CAPACITY	NUCLEAR WEAPONS	INVISIBILITY & PRECISION
exemplary metrics	<ul style="list-style-type: none"> • quantity produced 	<ul style="list-style-type: none"> • yield • number of launch options • prosecutable targets 	<ul style="list-style-type: none"> • signature / detectability • collateral effect size • navigation precision
key technologies	<ul style="list-style-type: none"> • mass production 	<ul style="list-style-type: none"> • fission • delivery mechanisms 	<ul style="list-style-type: none"> • radio frequency stealth • electronic warfare • computer control
DoD institutional innovation	<ul style="list-style-type: none"> • effective relations with private industry 	<ul style="list-style-type: none"> • strategic decision making 	<ul style="list-style-type: none"> • performance-driven product development
counters	<ul style="list-style-type: none"> • centralized state control of industry 	<ul style="list-style-type: none"> • equivalent capability creates stasis 	<ul style="list-style-type: none"> • multi-mode detection • basing denial



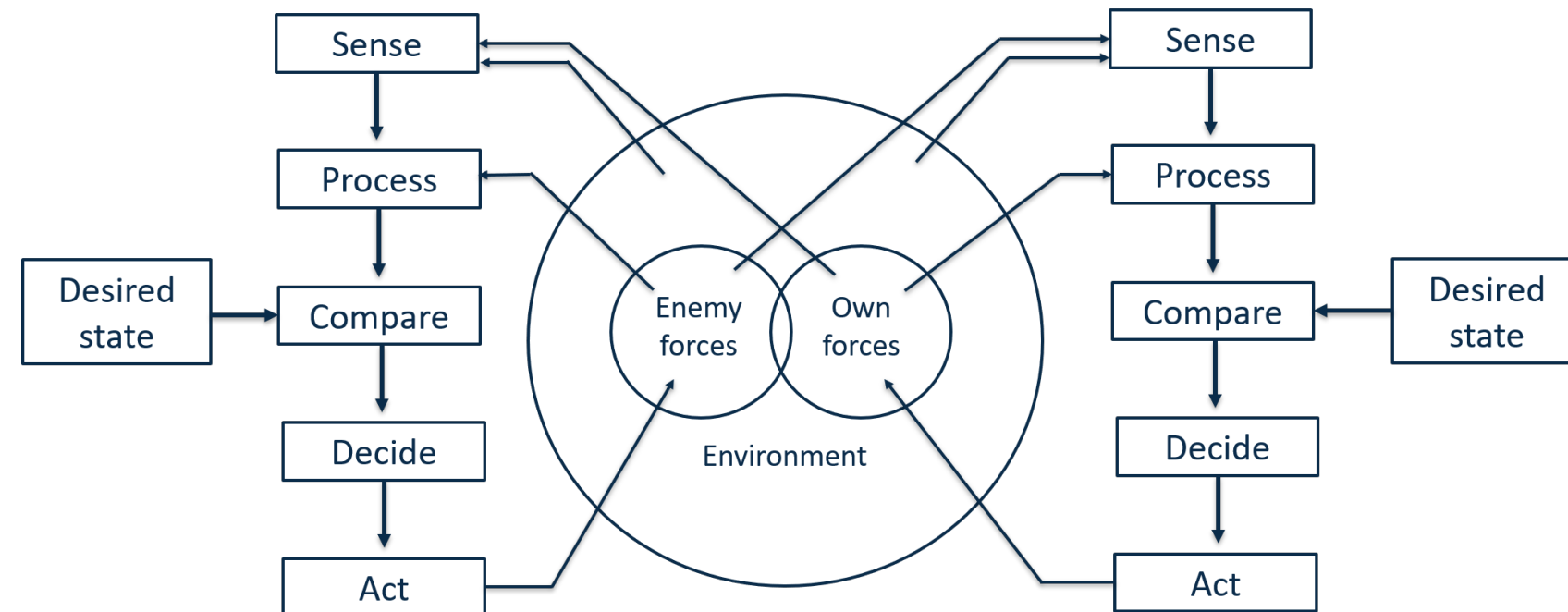
Offset Strategies

- Competitive Strategies
 - Denial
 - Cost imposition
 - Attacking a competitor’s strategy
 - Attacking a competitor’s political system
- Offsets key to address erosion of advantage or imbalance
- The 1st Offset (1950s and 1960s)
 - Address numerically superior forces
 - Nukes, Allies, and economic growth
- The 2nd Offset (1970s and 1980s)
 - Address numerically superior forces below nuclear threshold
 - Conventional Battle Networks and Precision-Guided Munitions
 - “Look Deep, Shoot Deep”
 - Allies, economic growth (GPS, computing, materials)
- The 3rd Offset (2015+)
 - Address proliferation of theater advanced Battle Networks and preserve conventional deterrence
 - Differing views
 - Four “Grids”- (1) Sensor, (2) C4I, (3) Effects, and (4) Logistics & Support
 - Global surveillance and strike approach
 - Speed of information and decisions (A.I. and autonomy)
 - Dual-use technologies and economic growth
 - Allies



Operational Concepts

- The “Modern System”
 - Tactical Level: Tightly interrelated complex of cover, concealment, dispersion, suppression, small-unit independent maneuver, and combined arms
 - Operational Level: Depth, reserves, and differential concentration
 - Technology
 - Increased lethality
 - Neutralized mass movement of forces in the open at increasing distances
- Measure and Counter-measure dynamics
 - Hider vs Finder competition
 - Mass vs Dispersion competition
 - Penetration vs local defense competition
 - Resupply vs disruption competition

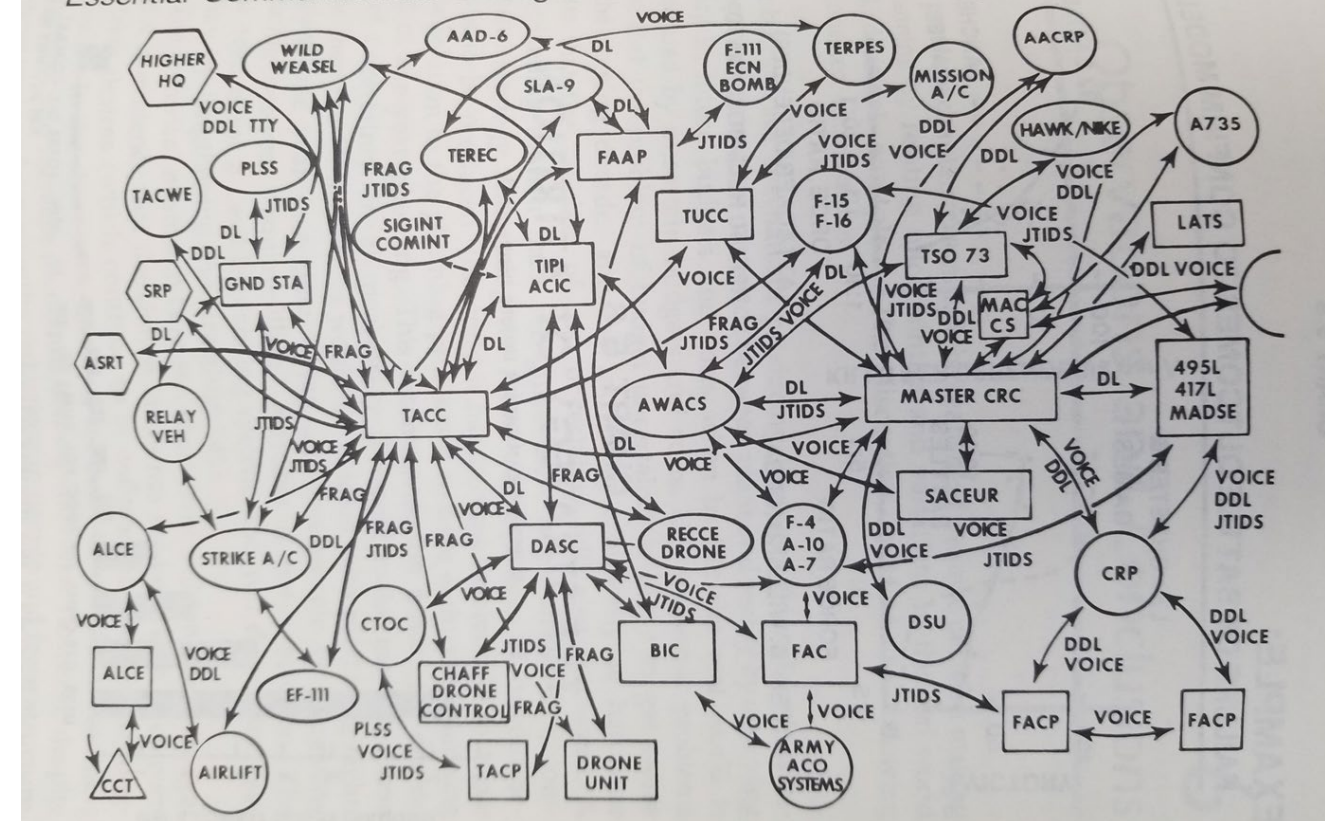


Operational Concepts

- 1980s to 2000s
 - AirLand Battle
 - NATO Follow-on Forces Attack (FoFA)
 - Combined Arms and Maneuver Warfare
 - Net-Centric Warfare
- 2000s to 2010s
 - Prompt Global Strike (PGS)
 - Proliferation of G-RAMM (Guided Rocket, Artillery, Mortars and Missiles)
 - Archipelagic Defense
 - AirSea Battle (CSBA version) and JAM-GC
 - Withstanding Initial Attack
 - Network Blinding Campaign
 - Missile Suppression Campaign
 - Continuing to Seize the Initiative
 - Joint Operational Access Concept (JOAC)
 - Cross-domain synergy
 - Cross-domain denial capabilities



Essential Communications Linkages for a Modern Force Multiplication Scheme

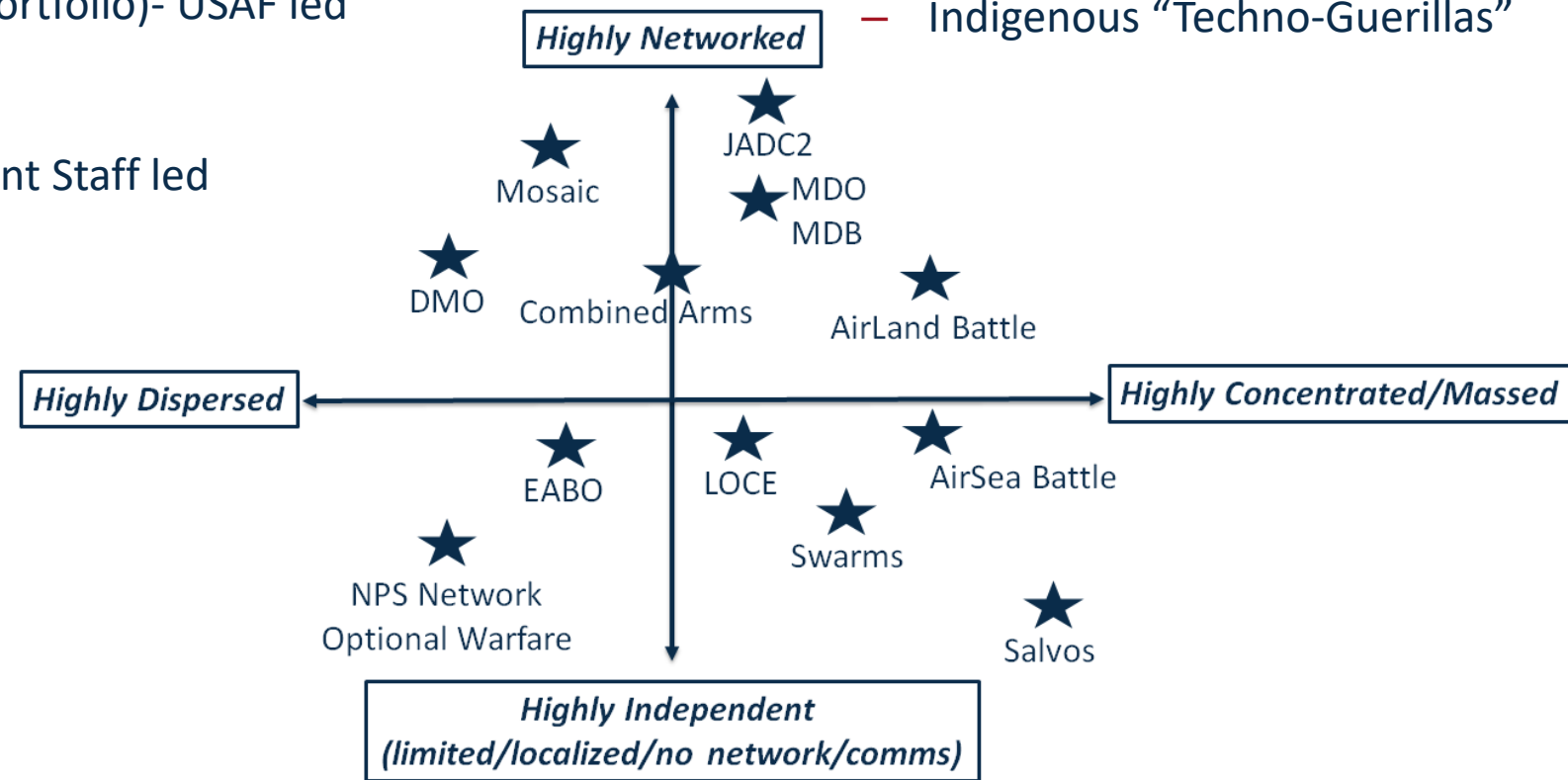
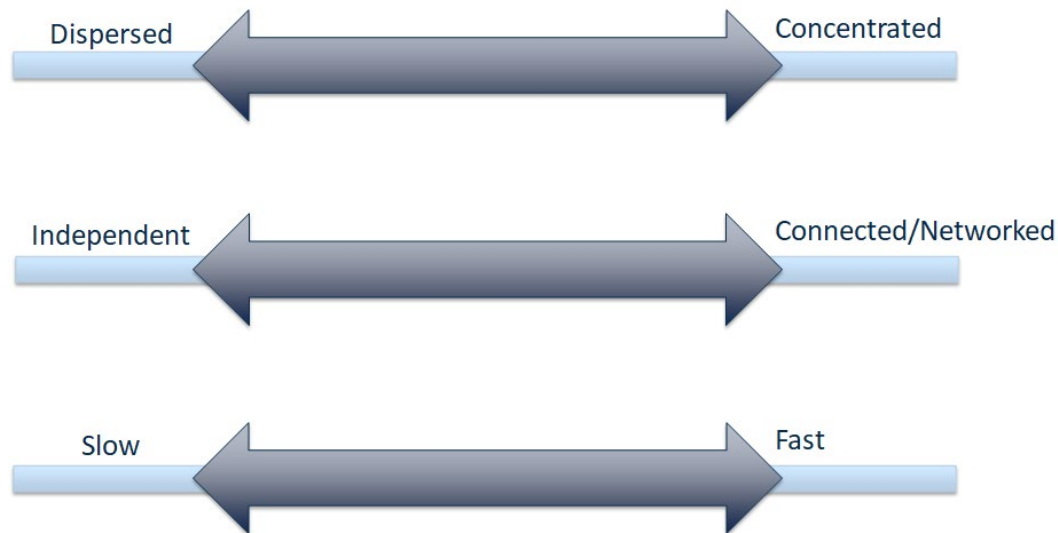


Visions vs Reality

Operational Concepts

- Contemporary
 - U.S. Army and U.S Air Force’s Multi-Domain Battle/Operations (MDB/MDO)
 - U.S. Navy’s Distributed Lethality, then Distributed Maritime Operations (DMO)
 - USMC’s Littoral Operations in a Contested Environment (LOCE)
 - Expeditionary Advance Basing Operations (EABO)
 - Joint All-Domain Operations (JADO)- “no more lines on the battlefield.”
 - C4ISR layer (JADC2 concept & ABMS technology portfolio)- USAF led
 - Global and Joint Fires- U.S. Navy led
 - Contested Logistics- U.S. Army led
 - Information Advantage- U.S. Marine Corps and Joint Staff led

- Alternative Concepts
 - Deterrence by Detection
 - Inside-Out
 - Mosaic Warfare
 - Network Optional Warfare
 - Indigenous “Techno-Guerillas”



Forces are desired to be: Numerous, Dispersed, Persistent, and Non-Descript

Analyzing Emerging and Disruptive Technologies



self-contained
-kill chain wrapped around local decision making

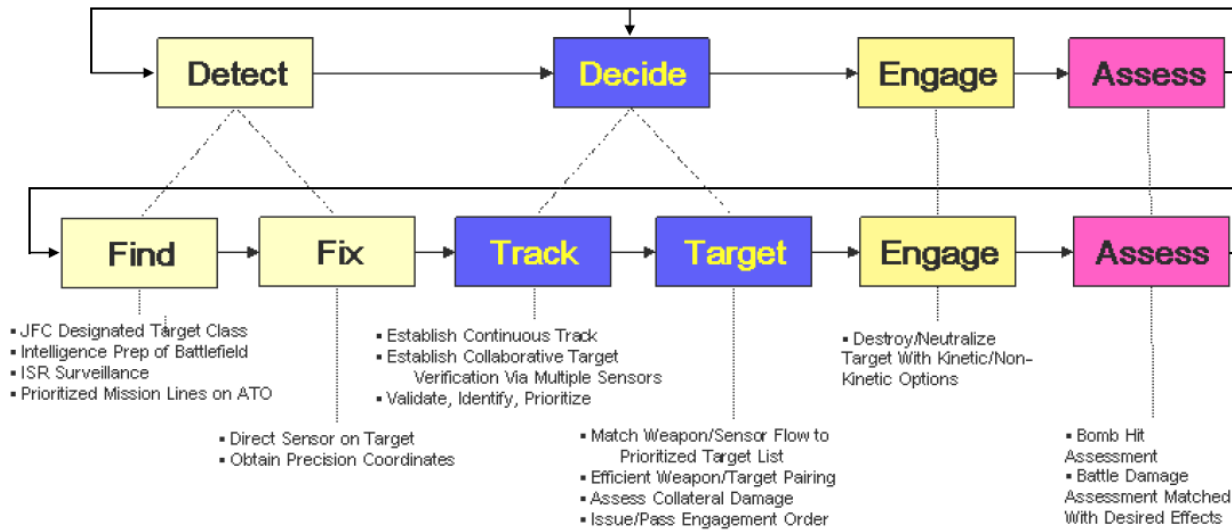
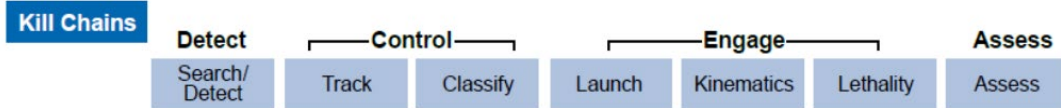
key advantage:
-no external dependencies
-limits communication vulnerability

system-of-systems
-predefined information exchanges enable a third party kill chain

key advantage:
-greater effect (e.g. range) possible by removal of co-location requirement

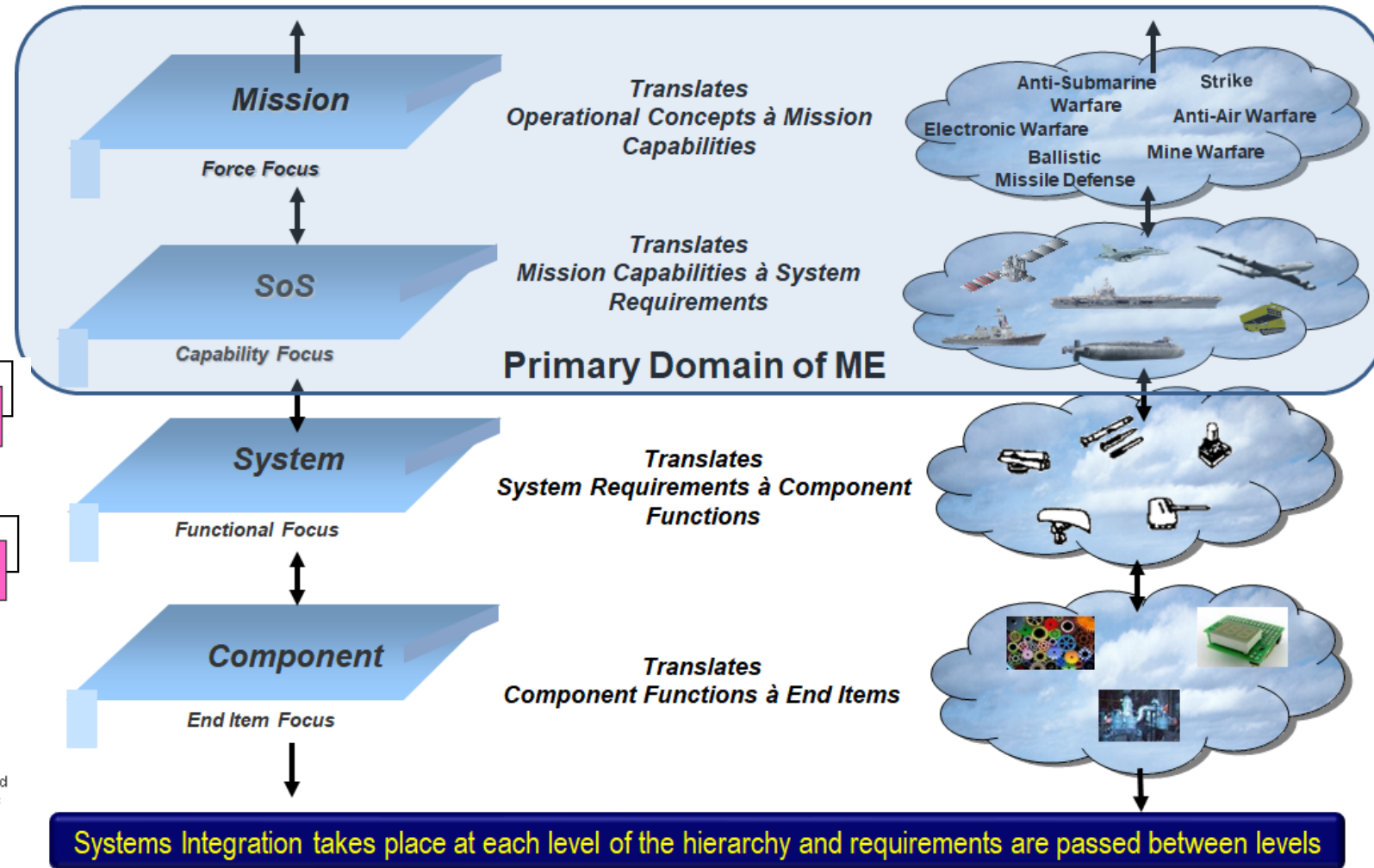
kill web
-more flexible information paths connect more systems

key advantage:
-allows pre-mission adaptation
-more lethal, imposes complexity on adversary



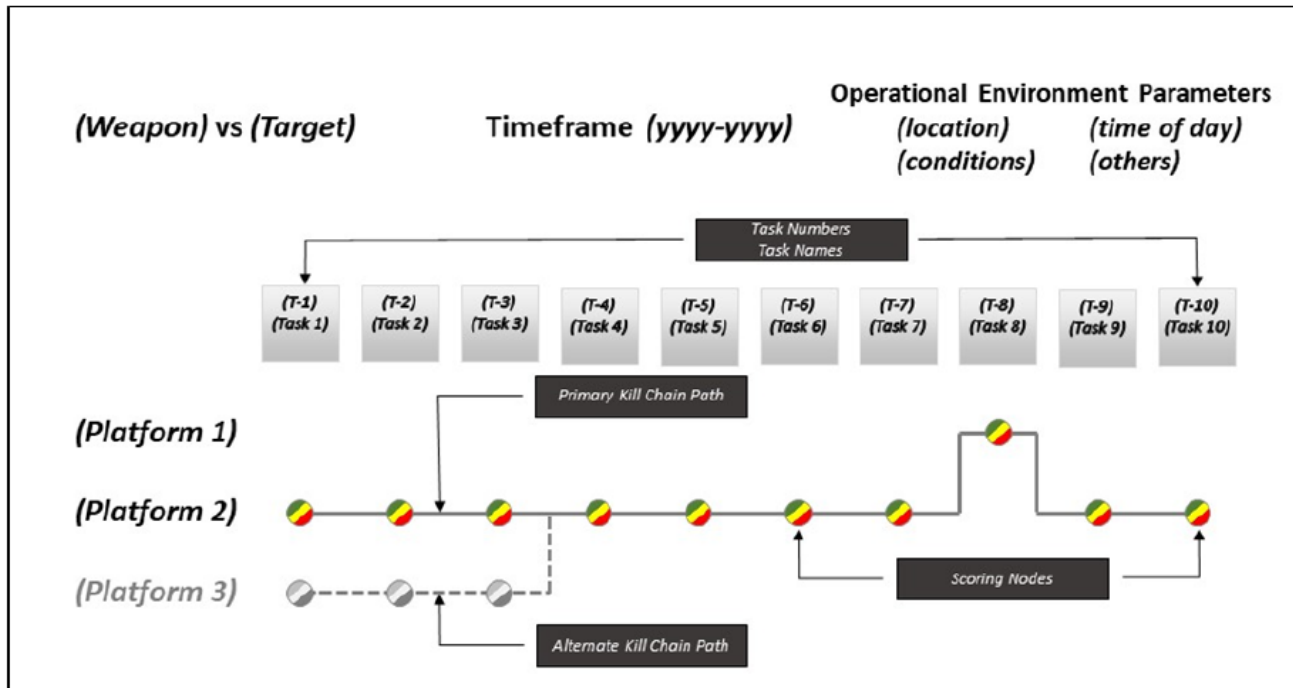
Critical pillars of employing firepower - (coordinated fire support, weapon-target pairing, collateral damage analysis, kinetic/non-kinetic target integration, automated engagement orders, and multi-dimensional deconfliction)

Mission Engineering (ME) Approach

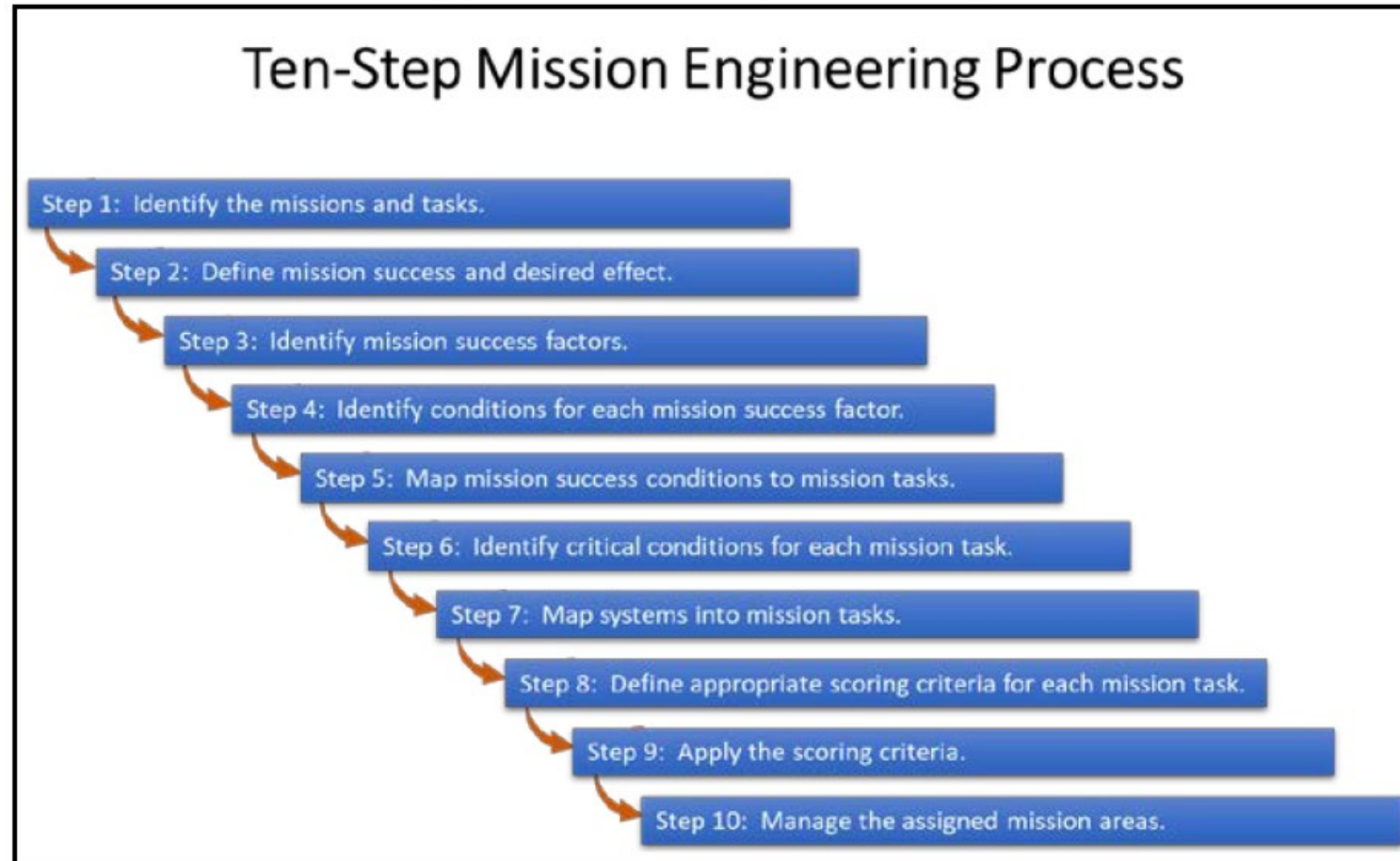


Analyzing Emerging and Disruptive Technologies

A Generic Effects/Kill Chain



Ten-Step Mission Engineering Process



Future Considerations

- Enhance Synergy Between
 - Long-term capability planning and development (NATO Armaments Groups)
 - Technology maturation (NATO STO)
 - Bridged by the NATO ORA community
- Increase Interactions Between
 - Requirements & Operational Concepts
 - Technology Development, Maturation, & Acquisition
 - Including Technology Intelligence
 - Programming Planning Budgeting and Execution (PPBE)
- Link Technologies to Echelons of Analysis (i.e. Mission Engineering Approach)
- People, Technologies, and Organizations are the critical foundation

Threat-Informed, Concept-Driven, Capabilities Development



Thank you

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