Fire Support and The Operational Environment Through 2030

Mr. Dwayne D. Hynes
Deputy Chief of Staff, G-2
May 2017

Key Judgements

Future Operational Environment 2035:

- Non-State actors possess increasingly advanced weapons
- Nation-states have adapted their tactics
- Advances in more lethal weaponry will likely make war more bloody not less
- If you can be seen, you can be hit—assume you'll be located by SIGINT
- Assume operations without GPS, intermittent communications, & radical transparency
- Do not assume air superiority
- What's coming out now is what you'll see in 2035

Near-Term Fire Support Implications:

- Need for longer ranges and munition diversity
- Debut of laser-based weapons
- Need to get back to basics
- Need for secure communications on the move

Long-Term Fire Support Implications:

- Prepare for hypervelocity weapons and rail guns
- Prepare for multi-mission capable platforms

Key Technology Enablers:

- **Energy & Power**
- **Artificial Intelligence & Big Data Analytics**
- **Quantum Sensors**

BLUF

Wide Spectrum of Threats, Challenges, & Contingencies

- Revanchist Russia
- China: Technology Leader, Managing the Relationship
- Sources of Threats and the Focus of Contingencies:
  - Iran, North Korea, Afghanistan-Pakistan, Middle East, Africa
- Terrorism: Persistent Global Problem
- Chronic Intra-State Wars:
  - Africa, Asia, Europe's Periphery, Latin America
- Humanitarian Assistance and Disaster Relief Operations
- Proliferation of Missiles and Rockets, Cyber Technologies, and WMD

Must Be Prepared to Operate in a Full Range of Complex Environments

- Early Engagement, Shaping, Regional Presence, Prevention

Potential Crises to 2030

Early Engagement, Shaping, Regional Presence, Prevention are Critical to Global Stability, Security

Our Operational Environment
Complex, Lethal, Volatile

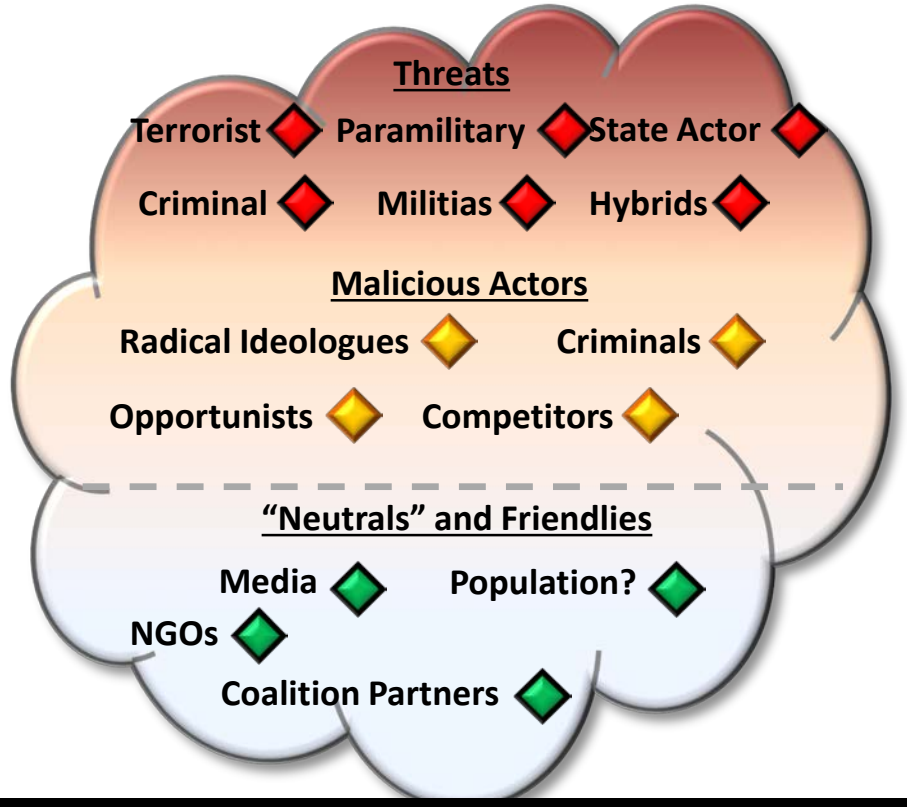
Essential Elements of the Complex Environment

- Multitude of Independent Actors
  - Threat, Malicious, and Neutral/Friendly Actors
- Technology Enables Effective Action – Violent and Nonviolent – and Rapid Adaptation
- Lack of Effective Governance or Rule of Law

Ends
- Wealth
- Resources
- Political authority
- Influence
- Sovereignty
- Identity
- Legitimacy

Ways
- Competition
- Cooperation
- Conflict

Means
- Attack the "will"
- Complexity – Chaotic Conditions – Anti-access
- Asymmetry



Characteristics

Lethal
- Well Armed
- Technology Proliferates to Many
- Non-linear Relationship between Economic and Military Power

Persistent
- Victory Ill Defined
- Blurred Transitions, e.g. Conflict to Post Conflict.
- Unexpected Friction

Asymmetric
- Sidestep US Preferred "Way of War"
- Deny ISR & Strike Options
- Exploit Cyber
- Unforeseen Effects from Actions

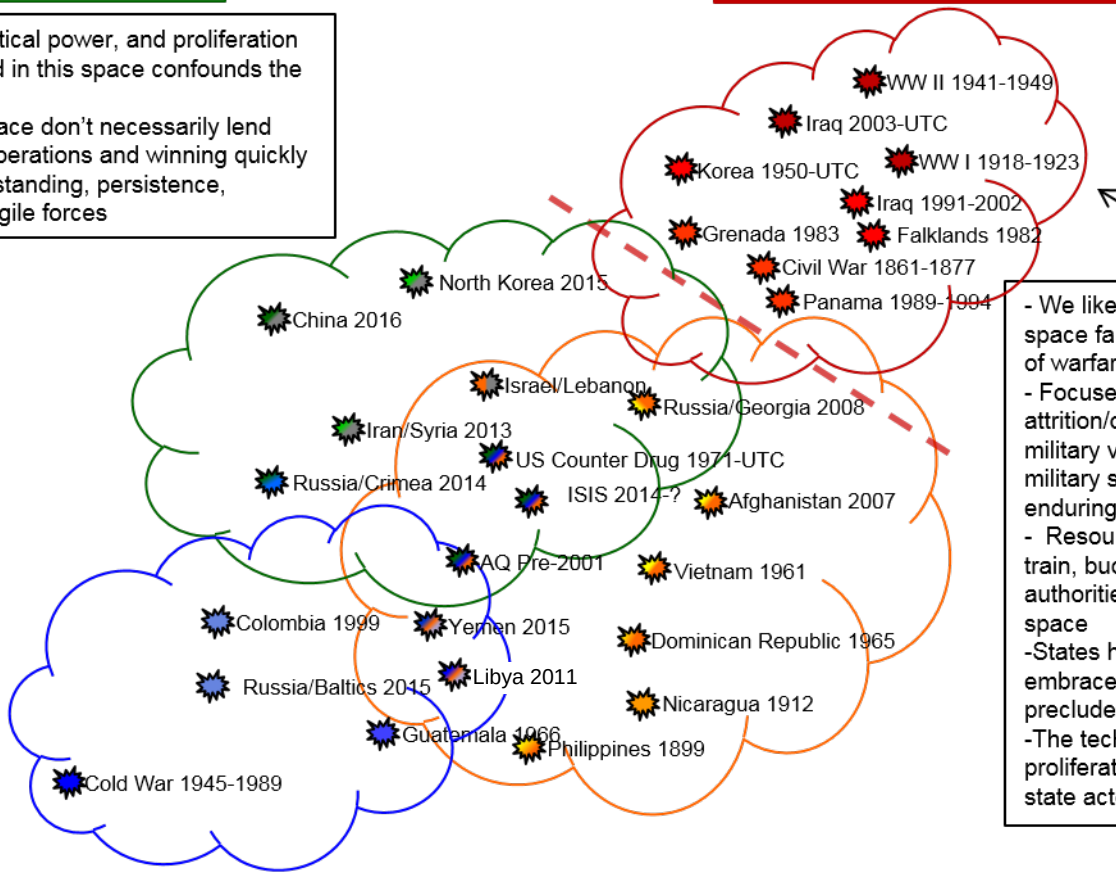
Proliferation and reverse engineering increases accessibility

Competitive International Relations

Unconventional Warfare

-The ambiguity, diffusion of political power, and proliferation of lethal technologies presented in this space confounds the U.S.'s preferred way of war.
- Problems in Int'l Rel in this space don't necessarily lend themselves to rapid, decisive operations and winning quickly
- Success requires deep understanding, persistence, perseverance & adaptive and agile forces

Traditional / Conventional Warfare



- We like to think we understand this space fairly well. We consider this style of warfare our strength/advantage
- Focused on state on state conflict using attrition/overwhelming force to achieve military victory and we've translated military success into real change with enduring and acceptable outcomes
- Resources and processes (man, equip, train, budget, institutions, laws, and authorities) are set up/optimized for this space
-States have made investments and embraced capabilities and doctrines to preclude the US' advantage.
-The technologies and capabilities have proliferated to smaller nations and non-state actors.

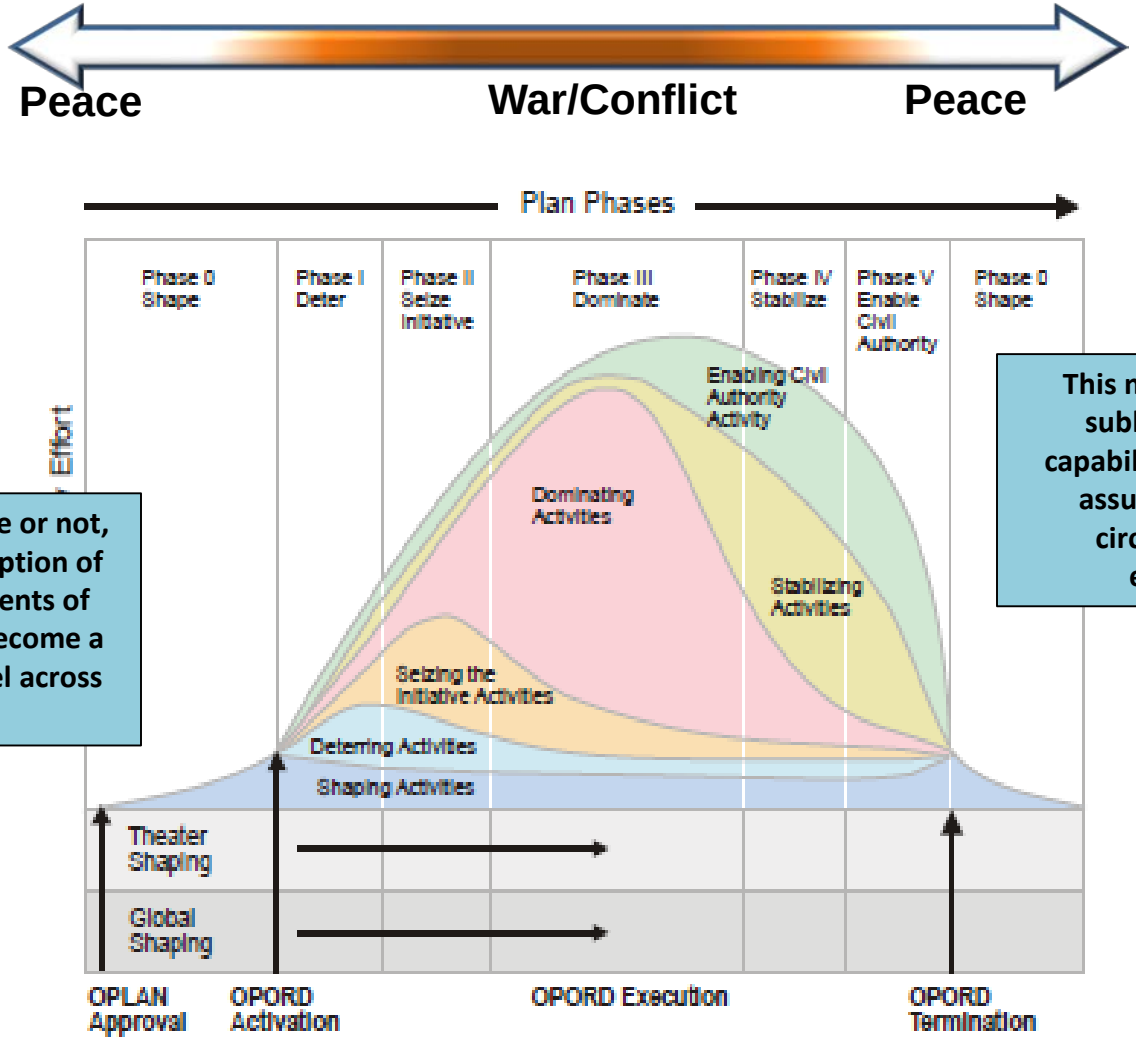
Political Warfare

Irregular Warfare

Do we have adequate theories, concepts, tools, practices, and elements of design to campaign effectively across the entire spectrum of conflict and competition?

"History doesn't repeat itself, but it does rhyme" Mark Twain

Notional Plan Phasing Construct



Whether we meant it to be or not, this Illustration, the description of the phases, and the elements of operational design have become a substitute campaign model across DoD.

This model has also become a subliminal "map" of DoD's capabilities and created artificial assumptions of under what circumstances we should employ those tools.

Strategic Trends in Warfare

Distinction between peace and war will continue to blur

- Operating in the "grey space"
- Increasing importance of "nonmilitary" resources
- Actions short of war

Non-state groups capable of greater disruption

- Spread of precision–guided weapons
- Cyber activists and crowd sourcing

Increasing stand-off and remote attacks

- Use of unmanned systems
- Increase of information attacks
- Initial attacks focused on critical facilities and disrupting political/military command and control

Continued concerns about nuclear and chem-bio

- Escalate to deescalate
- Do-it-yourself

Observe-Orient-Decide-Act (OODA) Loop:

- 4th Gen – energy and maneuverability
- 5th Gen – information power and information maneuverability

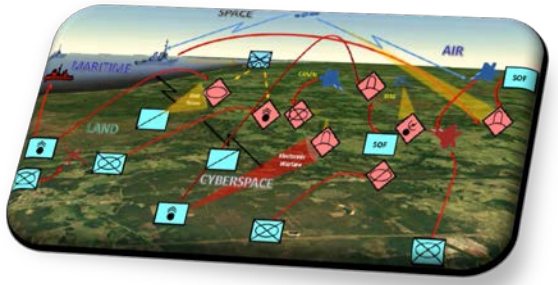
Adversaries pursuing the means to increase situational understanding while denying coalition situational understanding

Changing Character of War

- **Tactical battlefield expanding from km's to 10's km or in some cases 100+ kms**
- **From use of professional military to increased use of non-military forces and covert means**
- **From frontal, direct clash of large formations to highly maneuverable operations employing stand-off precision and robotic weapons and information attacks**
- **From destruction of combat personnel and weaponry to destruction of critically important military and civilian facilities**
- **From deterrence through maintenance of military power to deterrence by escalation**
- **From winning by defeating the enemy on the battlefield to winning by disrupting the support systems on which the military depends**

Preparing for Future of Land Warfare

- *Primacy of the Defense? Deny vs compel*
- *The rapid diffusion of information technology connects and empowers civilian populations (radical transparency)*
- *Information will not strip away the fog of war / AI in decision making*
- *Lethality and casualties (building resilience in humans/machines)*
- *How integrated do we need to be with Allies and Partners?*
- *Expanding tactical battlefield; implications for modularity*
- *Decoys and deception; controlling signatures*
- *The degraded environment; the contest to communicate*
- *Enhanced Human Performance*
- *Leader Development: Disciplined disobedience*
- *Protection – Mobility Tradeoff (mounted and dismounted)*
- *The role of SOF*
- *The proliferation of WMD; WMD battlefield*
- *Replicating the future OE for training*
- *Sustainment on the non-contiguous battlefield*
- *Agile acquisition (payload vs platform and software vs payloads)*



"We need a degree of jointness, in my opinion, in which no one military service dominates and no domain has a fixed boundary."

Admiral Harris, USPACOM

Urban operations in the twenty-first century are not just another type of operation; they will become this century's signature form of warfare.

Atlantic Council, "The Future of the Army"

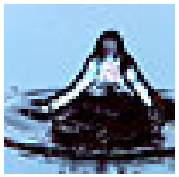
"In ancient times a force of 100K occupied a single square KM, by Napoleon's day a 100K force occupied 20 square KMs, by WWI 250 square KMs, end of the 20th Century 3,500 KMs in some conflicts."

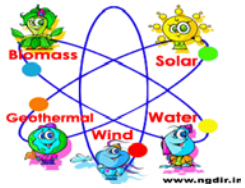
Trevor Depuy,
"Attrition: Forecasting Battle Casualties and Equipment Losses in Modern War"

Advances in more lethal weaponry likely to make war more bloody, not less

12 Trends We Are Watching (1 of 2)

Resource Competition



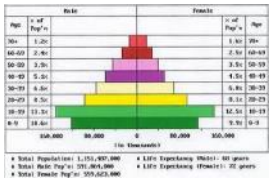


Need for resources significant … energy, minerals, food and water … impact on the balance of power … driving the emergence of new and unexpected regional hegemony

Economic Rebalancing

Huge debt crisis in the U.S. and Europe provides a significant security challenge … rising economic powers provide the potential for a new balance of power

Demographics and Urbanization

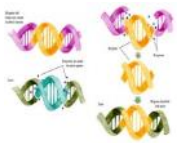


The movement of people to escape conditions reshapes global fault lines … increasing urbanization induces governance challenges … places current downward trends in violence in peril

Collective Intelligence

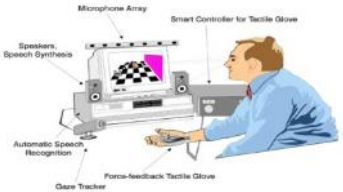
Shared or group intelligence that emerges from the collaboration and competition of many individuals…involves consensus, social capital and formalisms such as voting systems, social media and other means of quantifying mass activity

Increase level of Human Performance



Efforts to overcome the current limitations of the human body through natural or artificial means… Prosthetics, Human genetic engineering, Neural implants, Nano-medicine

Human Computer Interaction



Decreasing hardware costs & miniaturization … specialized hardware … distributed computing leading to rapid computerization by people previously left out of the "computer revolution"

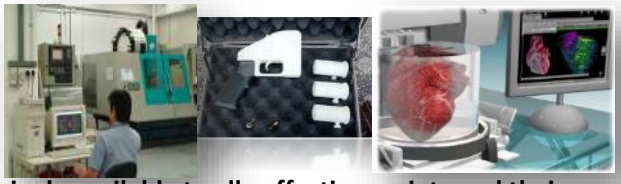
Technology moves slowly until suddenly it doesn't

12 Trends We Are Watching (2 of 2)

Robotics

11 countries with known operational armed UAVs… estimated 1,308,000 operational industrial robots by the end of 2014… In 2011, 2.5 million service robots for personal and domestic use were sold

Technology, Engineering & Manufacturing



Increasingly available to all…affecting society and their surroundings in a number of ways…The production of goods for use or sale using labor and machines, tools, chemical and biological processing, or formulation

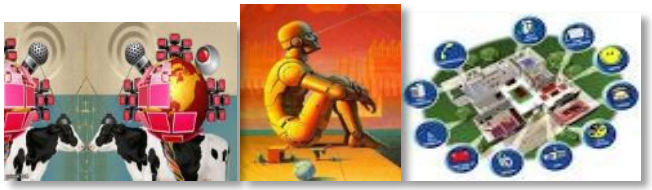
Big Data

The world's technological per-capita capacity to store information has roughly doubled every 40 months since 1980s; as of 2012 every day 2.5 quintillion (2.5×10^{18}) bytes of data were created

Cyber & Space

Over 50 countries with a presence in space…Only 10 countries with launch capability (including Iran)… 120 countries have, or are developing, cyber espionage or cyber war capabilities.

Complexity



Digitization of massive amounts of information… smart systems that communicate interdependently… the decreasing cost of computing power… the increasing ease of communicating rich content across distances…participation in the formal economy, and the wholesale rewriting of industry norms and business models

Power Generation & Storage

US electricity demand to increase 18 % by 2020…China alone accounting for 71% of global energy consumption growth in 2011…Coal now accounts for 30.3% of global energy consumption

Machines now have the same word error rate as humans

Gerasimov Doctrine

- Wars no longer declared
- Color revolutions can occur quickly
- Non-military methods at times are more effective than military ones
  - Protest potential of the population, covert military measures, information operations, use of special forces
  - Crisis regulation operations can be used as open military employment of forces
- Contemporary war:

1) Noncontact or remote engagement;

2) Levels of war leveling due to information technologies;

3) Use of joint mobile forces in recon and information environment growing;

4) No fly zones, blockades, and use of private military used more often;

5) Asymmetric methods of confrontation under development

6) Precision-guided munitions, robotics, unmanned aerial vehicles, and weapons with new physical principals will be main method of engagement

"No goal will be achieved in future wars unless one belligerent gains information superiority over the other."

Near Peer Competitor Russia

Strategy/Doctrine:

Non-Linear Warfare/ Local Wars Under Conditions of Informatization

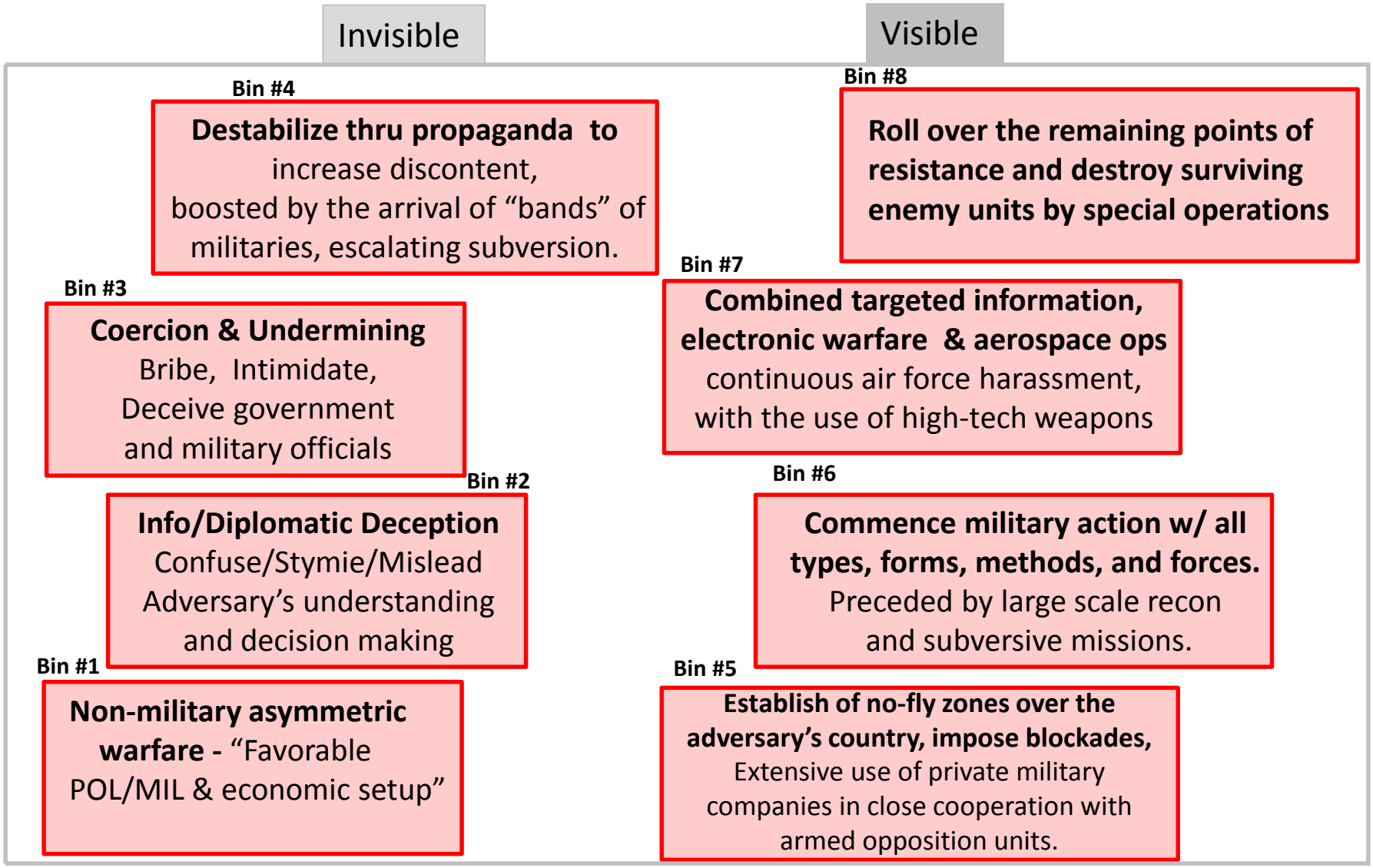
- De-escalatory Use of Nuclear Weapons
- Conflict Short of War…ambiguity
- Non—Military Means (DImE) Gerasimov 's theory is 4:1
- 80-90% propaganda and 10-20% violence
- Anti Access/Area Denial
- Secure the Near Abroad
- Integration of proxies, surrogates, & paramilitary

Capabilities:

- Deny U.S. Space and Cyber Capabilities…use of EW
- Fires throughout the depth of the battlefield; missiles, rockets, arty…PGM and area affects
- Condensed Sensor-Shooter timelines
- Large conventional ground forces, New Look Reforms
- Extensive Air Defense Umbrella
- *Information Confrontation - Informatization*

"Either you are flying 5th generation or you are simply dead."
General Mike Hostage

Modern Russian Approach Bins vs. Phases



Russian Arsenal 2020

- **Goal: Modernize by 2020**
- **Primary combat formation is the separate combined-arms brigade (either motorized or tank)**
  - A Battalion Tactical Group (BTG) is a motorized rifle or tank battalion of 2-4 companies with attached ATGM, artillery, reconnaissance, engineer, and rear support platoons
  - "Contractees are substantially increasing the combat capability of sub-units and military units. In our districts, including the Southern Military District, battalion tactical groups [BTGs], which are fully manned by contract service soldiers, have been created. **There are now 66 of such BTGs, at the end of 2016 there will be 96, next year 115, and the year after [2018] 125."** GEN Gerasimov
- **Continued improvement of artillery systems**
  - Improved ranges, targeting, munitions, automated fire control, and reconnaissance

Use of fire support as an organic element of a BTG or recon-strike complex is increasing

Fire Support Systems Comparison

Self-Propelled Howitzer Lethality					
Name	Armament	Range	Extended Range	Maximum Rate of Fire	Ammo Storage
Paladin	155mm, 39 cal	22.6 km	40 km Excalibur	4/min	39
PzH 2000	155mm, 52 cal	30 km	55-60 km	8/min	48
CAESAR	155mm, 52 cal	30 km	55-60 km	6/min	18
AS-90	155mm,	24.9 km	30 km	6/min	48
2S19 MSTA-S	152mm, 48 cal	24.7 km	30 km	6-8/min	50
2S35 Koalitsiya	152mm, 48-52 cal	30-40 km	70 km ?	16-20/min	60-70

Fire Support Systems Comparison

Rocket Artillery Lethality				
Name	Armament	Range	Extended Range	Maximum Rate of Fire
MLRS	227mm	70-84 km GMLRS	300 km ATACMS/LRPF	6-12 rkts or 2 missiles
PHL03 (CHN)	300mm	130-150 km		
BM-21	122mm ML	20-40 km		
Tornado-G	300mm	40-70 km		
BM-30 SMERCH	300mm MC	120 km		
Iskander-M			400-500 km	

Russian Capabilities and Limitations

Capabilities

- Good enough
- Limited ability to project/sustain
- Sophisticated, integrated defenses in Western Military District
- Wide variety of kill chains to locate and destroy targets
  - Formidable fires, targeting, and EW capabilities
- Frequently, ratio of artillery units to supported maneuver units 1:1
- Less reliant on multiple digital networks

Limitations

- Defense budget notably smaller
- Still a force in transition
- As Russians move out of their IADS, they become increasingly vulnerable to air power
- Largely dependent on conscripts serving 12-month terms
  - Not all units fully manned
  - Field a single task-organized BTG on short notice using predominately contract service personnel
- Mission command and joint force operations immature

Recon-Strike; Recon-Fire

- Autonomy of combat assets – Reconnaissance and C2 intrinsic to platforms and units
  - Decentralization of authority regarding RISTA, targeting C3, and strike capabilities has empowered tactical ground units
- Continued trend towards high-precision
- UAS at Battalion FDC and Battery COP
  - By 2014, 200+ UAS to inventory
  - 14 UAS companies—plans for dedicated UAS company for each MRB consisting of mini-platoon and short-range platoon
  - Not currently weaponized but in planning
- Electronic Warfare Support (ES) and Electronic Attack (EA) Capabilities manned primarily with contract servicemen
- Fielding of new long-range precision strike weapons

Fires Enablers and Shortfalls

Capabilities

- Artillery
  - Increased ranges
  - Reduced crew requirements
  - Universal, unmanned turrets
  - Upgraded fire-control equipment
  - Laser warning and screening system
  - Ammo storage and loading
- Rockets
  - Remote operation
  - Satellite navigation
  - Pod-based loading system
  - Multi-caliber (122, 220, 300mm)

Limitations

- Massed, not precision
- At strategic distances, limited capability to conduct nonnuclear precision strikes
- Not network centric…yet
- Difficulty attacking moving targets
- Constrained by uneven procurement of high-end recon-strike capabilities
- No recent experience against near-peer adversary

Artillery Positions

How to Survive Russian Recon-Strike

- **Training**
  - Train in GPS/communications denied environments
  - Concealment, cover, entrenchments, dispersal, deception, signature management, C-UAS
  - Vehicle/equipment identification
- **Electronic Protection (FM 6-02.53)**
- **Intelligence-Fires Mission Command**
- **Mobility and Responsiveness**
- **Improve counterbattery targeting, tempo and authorities**
- **Integrate SHORAD assets**
- **Mobile Fires Abatement Panels and protective technologies**
- **Prioritize Russian C2 Nodes (Fire Direction Centers) and EW Sensors and Assets**

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Email comments to
Mr. Dwayne D. Hynes
dwayne.d.hynes.civ@mail.mil