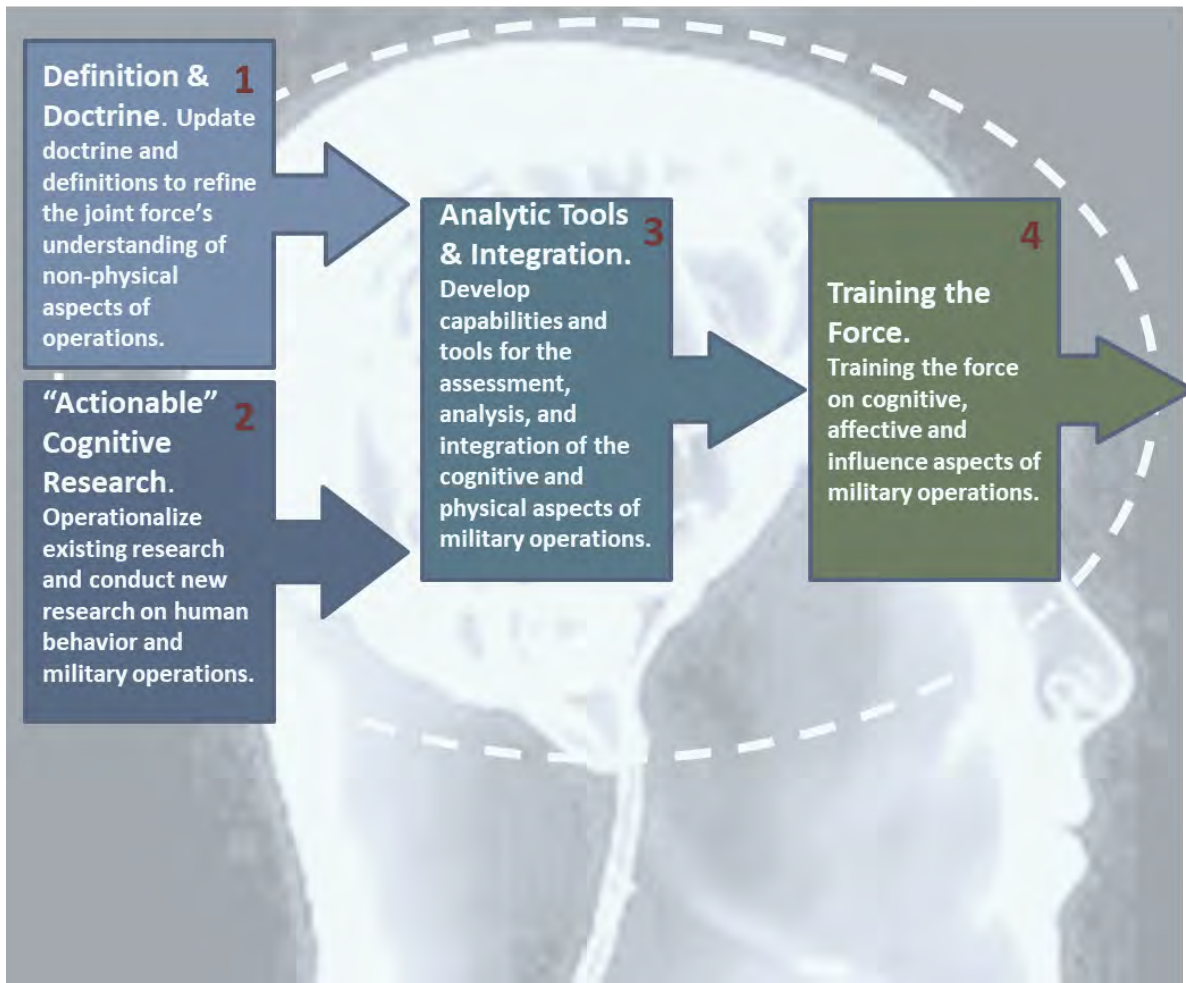This publication is cleared for public release.

A Cognitive Capabilities Agenda

A Multi-Step Approach for Closing DoD's Cognitive Capability Gap

Strategic Multi-Layer Assessment Office

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Forward

By CAPT Joseph A. DiGuardo, Jr. (USN)
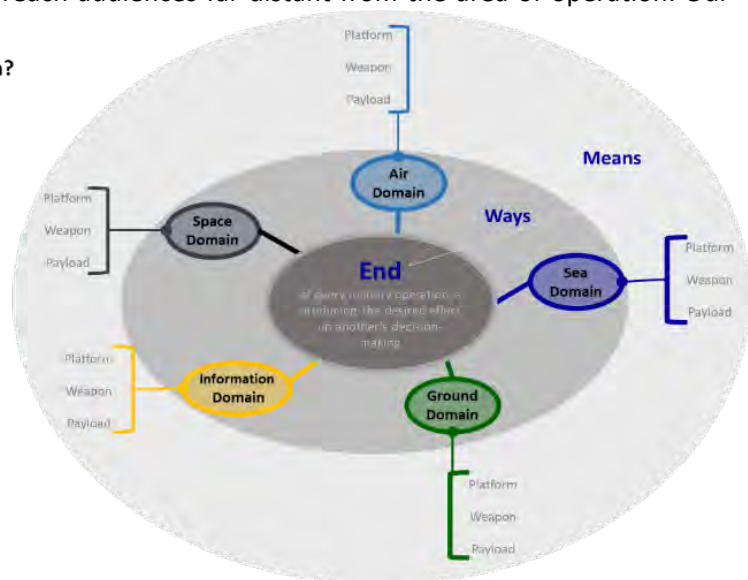Vice Deputy Director for Global Operations, Joint Staff (J39)

The objective of this white paper is to both highlight and provide steps to mitigate a potential US vulnerability: The capability to efficiently plan and implement operations focused on influencing human perceptions and understanding. In the following pages we refer to this as the "cognitive aspects of military operations." In essence however, it refers to military operations intended to impact the cognitions, perceptions and decision-making of human leaders and populations in order to achieve tactical, operational and strategic objectives.

Our opponents are already maneuvering against the US and our allies in the cognitive environment to great effect. Russia's *Information Confrontation* doctrine, ISIS' use of social media, North Korea's public displays of missile and nuclear programs, and China's expansion in the South China Sea are examples of military maneuvers intended to impact US decision-making cycles, to undermine US public confidence in the military's ability to defend against threats to US security, or to cause to US to expend resources where we may not have otherwise.

At present, the US military largely considers operations focused on the cognitive effects as "information operations (IO)." IO is seen primarily as a tactical enabler, rather than non-kinetic weapons systems that can significantly affect the strategic environment. In today's world though, all military activities are also "information operations" that increasingly reach audiences far distant from the area of operation. Our most pressing strategic objectives, like deterrence and compellance, are ultimately mental concepts without physical reality. They live in the brain. Since war is a human endeavor, all military operations affect the thinking and the behavior of our human adversaries. This white paper begins with the presumption that the ability of the United States to understand, cause and track the effectiveness of US messages, whether in the form of physical activities or narrative campaigns, is an area in which the US must compete.

One way to do so is to evolve our thinking about the "ends, ways and means" of military operations. In this framework the strategic "end" is a cognitive effect on another actor. In this framework the "end" of

military operations is the same: to produce a cognitive effect will achieve or supplement physical maneuvers to achieve mission objectives.

To illustrate the "ways" consider this example: we currently use "cyberspace" or "cyber" to represent a domain, a platform, a weapons system and a payload. That unclear taxonomy confuses our ability to employ cyber capabilities effectively, to develop policy, doctrine and strategies and to understand command and control relationships. However, if we consider cyber as a part of the broader information domain we can more easily compare it to the operational construct we now employ and by doing so, normalize its use.

Thinking about the "ways" as conflict domains leads us to "means" generally categorized as platforms, weapons and payloads. In the air domain, for example, one platform is the aircraft, a weapon system is the missile and the payload is the explosive. In the maritime domain a platform may be a ship, the weapons system is a missile, and the payload is an explosive. Seen in this way, means in the information domain include platforms that include cyberspace, public affairs, military deception and Military Information Support Operations (MISO). The weapons systems include the internet, printed news, television, radio, Key Leader Engagements (KLEs), policies, and military operations; and the payload is data. Data as code, data as a message, a video or as action or deliberate inaction. A data payload can be delivered via the appropriate weapon system from the desired platform in the information domain to have the effect we want to achieve.

To draw further on the framework, we must consider how we examine the requirements that are used to create our means. At present we build and employ "means" through a capability lens. Perhaps we think this way because our military culture drives us to be biased toward the environments in which we have been trained to operate. Regardless though, by breaking our capability-centric bias and reconsidering "means" through a threat-based lens we can more clearly conceptualize a multi-domain security posture. If we start with the threat and then apply the required means (weapon system, payload or platform) via the ways of any domain we will achieve the cognitive effect (end) required to most effectively achieve military objectives (deny, disrupt, degrade, defeat…). For example, an operation that that is meant to degrade an Integrated Air Defense System (IADS) (i.e., a threat in the ground domain) that threatens our strike fighters (in the air domain), can be achieved by delivering a data payload like a bid corruption package (information domain), through the weapons system of a downlink from a satellite (space domain).

The realities of rapid changes in technology, connectivity and communications have dramatically altered our perceptions of the battlefield. The ability of the United States to successfully shape the battlefield is still imperative for achieving success in this new reality. However, doing so in the current security environment requires the willingness to adjust our views of what is possible to achieve with physical power alone. While physical power is an indispensable element of combat operations, blending US physical power with enhanced capability to impact how our adversaries think about the world will allow us to optimize our military platforms, weapons and payloads in each conflict domain in order to achieve our objectives.

The following pages discuss some steps and recommended actions that DoD might take to begin this process.

Cognitive Capabilities Agenda Recommendations

Summary of Recommendations

	Recommended Actions
Step 1: Definitions and Doctrine Update	• Convene command and service working groups to study means of amending current planning processes to require explicit integration of "cognitive" objectives and effects in campaign planning while causing the least disruption to current practice.
	• Convene conferences and joint working groups to develop a community of practice to update definitions of military concepts and the addition of new concepts required by doctrinal updates
	• Amend doctrine to include cognitive objectives at the front end of the joint planning process, including these as part of the Commander's Intent and the concept of the operation.
Step 2: "Actionable" Cognitive Research	• Systematically mine existing and conduct new social science research to enhance the joint force's understanding of human behavior in security environments.
	•Create field research teams to support the cognitive aspects of military operations.
	• Invest in applied research that translates well-established bodies of academic literature into operationally-relevant, actionable information but does not necessarily require field research or data collection.
	• Establish "joint venture" programs to bridge human behavior research and military operations. Ventures could take the form of co-authored studies, command special projects, etc.
	• Provide researchers access to DoD and USG data and/or human subjects (for the latter investigate OSD policies and facilities for internal review boards (IRB's) operation.
	• Create an SMA II Follow-on Team to operationalize the many processes, cognitive decision frameworks, and cognitive analysis and planning tools. These should be done as a joint venture with a DoD office that agrees to field test the eventual tool or capability
Step 3: Analytic Tools and Integration	• Invest in software tools and models only after operational research to support them has been completed. Look to combine various analytic tools into inter-operable suites to aid the joint force in applying them without having to learn each individually.

	• Require cognitive impact assessment and justification as part of the acquisition process for materiel.
	• Convene working groups of researchers, operators and computer and data engineers to form a community of practice around development of tools to support assessment of the specific cognitive aspects of military operations as well as integration of cognitive and physical objectives and effects in campaign planning.
Step 4: Train and Educate the Force	• Establish a cognitive training community of practice that includes representatives from relevant organizations to close the cognitive capability gap by training the force as soon as possible to use cognitive operations and maneuver in future campaigns.
	• Identify further programs for Joint Professional Military Education accreditation across the DOD enterprise. This standard of evaluation contains key benchmarks for critical assessment and application that broaden the cognitive analytical capacity of the force.
	• Expand lessons learned from traditional tactical, operational, and strategic levels into academic year timetables. Building an expectation of review and sharing best-practices into the JPME educational system will benefit both established programs and start-ups as both adapt to the changing contexts of conflict.
	• Foster greater cross-organizational "cross-pollination" among military education and training programs and organizations and academics working in relevant behavioral sciences.

SMA White Paper

A Cognitive Capabilities Agenda

A Multi-Step Approach for Closing the Cognitive Capability Gap

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The Strategic Multi-Layer Assessment (SMA) team conducted a year-long project for USSOCOM on the growing prevalence of Competition Short of Armed Conflict (CSAC), or use of "Gray Zone" tactics by US adversaries. Key findings from the study include first, the immediate need to incorporate the "human / cognitive domain" into military planning to avoid the strategic surprise that gray zone tactics intend. Second, the study highlighted the current deficit in the joint force of operationally-applicable human / cognitive domain information and expertise. During its final project review, the study's Senior Review Group (SRG) noted that "...the changing nature of conflict means that the US Department of Defense (DoD) needs to start changing the way it thinks as a whole, and the results of this SMA effort can play a valuable role" in broadening our understanding of the strategic and operational environment to incorporate the human/cognitive aspects of military operations. Reflecting on the deficit in US capabilities in the cognitive environment the SRG asked: "Who is going to craft the appropriate messages? Who is going to provide the necessary tools? Who is going to use these tools? These are questions that we need to answer."

This s white paper is a brief effort to suggest an initial outline that might be undertaken to address these questions.

Introduction

The purpose of this white paper is to highlight what we believe is a significant vulnerability in US defense capabilities and to suggest concrete steps that might be taken to address this deficit. Our assumption is that for the foreseeable future the US will continue to face a rapidly changing set of security challenges increasingly in conflict domains other than land, sea and air. This is in part the ironic result of US physical military dominance. US supremacy has already altered Chinese, Russian, North Korean, and Iranian choices to pursue their own security goals in ways that limit the possibility of facing US forces in direct, conventional conflict. As much as we may like it to be the case, it is unlikely that US prowess in the material domains has significantly altered the enduring security objectives of US adversaries. Rather, it appears to have forced adversaries to operate in ways that displace the significance of US lethal dominance. The most significant development is an adversarial focus on efforts that shape and manipulate the attitudes and behaviors of populations or opponent forces by manipulating information

and otherwise preying on human perceptual vulnerabilities. It is the "domain" of human cognition. In the following pages we argue that superiority in the physical domains (e.g., land, sea, air) <u>must</u> be matched with operational mastery of the cognitive environment. Without it, the joint force will continue to struggle to achieve favorable, enduring strategic outcomes

Problem: The Cognitive Capability Deficit

Like cyber enablers, the cognitive aspects of military operations impact mission effectiveness in every conflict domain. Every US military action communicates in some way and alters the cognition of relevant actors the joint force is attempting to persuade. The threat perceptions, worldviews, beliefs, intent, etc. that condition human behavior are cognitive constructs with no physical reality; they are governed by human knowledge, emotion, will, and desire. The implication is that military doctrine, planning, and acquisitions that focus only on physical effects are insufficient to achieve national security objectives. This is not to argue that dominance in the physical conflict domains is unimportant. Rather, it is an acknowledgment that superiority in the air, at sea, and on land does not guarantee that the US will prevail in security environments that increasingly target the cognitive aspects of military operations.

> **Cognitive Aspects of Military Operations (CAMO)**
> *We take CAMO to refer to and include the three key mental functions impacting formation of perception, intent, decision making, and behavior. These are: cognition which refers to modes of knowledge and information processing, affect which refers to emotion and feeling; and conation which refers to impulse, yearning and striving to carry out an act. In this paper we define CAMO as the sum of these governances.*

As noted above, there is growing evidence that US adversaries have recognized the deficiency in US cognitive capabilities and have pursued ways to exploit it to their advantage via gray zone and other technologically-focused tactics.[1]   Notably, this was demonstrated by ISIS in the social media campaign that took many in the US defense establishment by surprise; North Korean and Iranian apparent discounting of the credibility of US deterrent threats; Russian activities in Crimea; and Chinese "island building" in the South China Sea. Each represents a means of achieving warlike aims without resorting to war. While there is also growing recognition within the US defense establishment that national security relies on cognitive outcomes as much or more than it does on physical strength, DoD investments, authorities, doctrine, and training have not kept pace with this reality. **The unfortunate result of these oversights is that, despite an overwhelming physical dominance, the US military routinely fails to achieve campaign objectives because it is largely incapable of predictably influencing human behavior.**
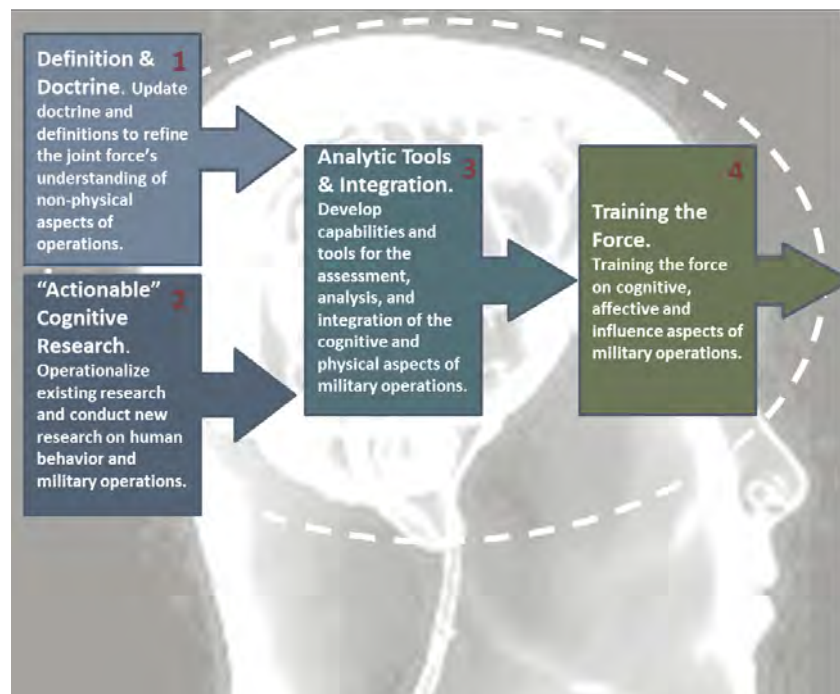
Closing the Gap

Defending US national interests in the current and future security environments requires an immediate effort by the Department of Defense (DoD) to question and refine its foundational paradigms--and more importantly, its practices–to account for the cognitive aspects of military operations. DoD must act

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[1] History is replete with examples of new technologies altering the outcomes of war. In many cases however, more important than the actual technology are the adversary's perceptions of the new capability. Changes in technology herald changes in doctrine, as much as in tactics. Consider for example, the Maginot Line. Its importance was not as a "monument to stupidity", but as an example of cognitive factors shaping the technology of war. Prior to the war, defensive decisions were based largely on assumptions about German technology as much as the density of the Ardennes forest and the strength of Belgian neutrality. In all three factors, cognitive perceptions of technological advantage were a key starting point for analyzing future conflict and its outcomes.

quickly to rebalance the limited bureaucratic focus and underfunding of its capabilities to address the cognitive aspects of military operations, and serious consideration should be given to the prospect that future security environments will continue to move along the path laid by advances in the information environment and demand fewer kinetic actions in favor of expanded modes of persuasion and behavior influence. The SMA team together with USG agencies, think tanks, academia, and industry has identified four steps DoD can take to initiate a systematic program to enhance US capabilities related to the cognitive aspects of military operations. These are: 1) Updating definitions and doctrine to account for the cognitive aspects of military operations; 2) Expanding production of operationally "actionable" cognitive research; 3) Developing appropriate tools for planning and assessing the cognitive aspects of military operations; and 4) training focus on cognitive step and actions is below. the force to human factors. Each recommended discussed

Closing the Cognitive Capability Gap

Definition & Doctrine. 1 Update doctrine and definitions to refine the joint force's understanding of non-physical aspects of operations.

"Actionable" Cognitive Research. 2 Operationalize existing research and conduct new research on human behavior and military operations.

Analytic Tools & Integration. 3 Develop capabilities and tools for the assessment, analysis, and integration of the cognitive and physical aspects of military operations.

Training the Force. 4 Training the force on cognitive, affective and influence aspects of military operations.

The 4 Steps

Step 1: Definitions and Doctrine. Update doctrine and definitions to include refined understanding of the cognitive aspects of military operations

Expanding the Lexicon

Words matter. Consider the military definition of "maneuver":

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> *"a movement to place ships, aircraft, or land forces in a position of advantage over the enemy; a tactical exercise carried out at sear, in the air, on the ground, or on a map in imitation of war; the operation of a ship, aircraft, or vehicle, to cause it to perform desired movements; employment of forces in the operational area through movement in combination with fires to achieve a position of advantage in respect to the enemy in order to accomplish the mission".*

This definition references only physical actions and neglects the human cognition, decisions and behaviors that ultimately determine strategic outcomes. Similarly, "area of influence"[2] and "combat assessment"[3] among other terms betray the implicit assumption that military operations involve physical terrain and munitions only. Even the term "operational art," which does speak to the cognition of commanders and their staffs, does so in reference to the "skill, knowledge, experience, creativity, and judgment" of *US forces* to integrate "ends, ways, and means." It neglects to specify the cognitive effects adversaries and other relevant actors. Where cognitive approaches to influence foreign decision makers and audiences is mentioned, it is tellingly listed as a "support activity" to other activities, not as a core function of a military operation.[4] One of the first requirements for improving US capabilities in the cognitive realm is to develop a common and precise lexicon for military professionals, analysts and planners to use to discuss the non-physical aspects of military operations. Commonly understood definitions that are clear and precise enable a commonly understood logic for doctrine, training, operations, and assessments so that the joint force may access an intangible challenge.

Updating Doctrine

Another critical step in closing DoD's cognitive capability gap is to update joint planning doctrine to allow planners to understand an adversary's or a population's perceptions and other drivers of human behavior *at the outset of the planning process*. Not only must doctrine integrate planning of both physical and cognitive considerations, but this must be done in a way that preserves joint force lethality. Importantly, it must be clearly enough articulated that the joint force can quickly adapt to the changes in education, training, plans, and operations.

Fortunately, we believe just a few changes to current tactical and strategic planning doctrine can vastly improve the strategic effectiveness of US military operations. First, doctrine should be amended to require that all commanders, planners and operators recognize the "action-as-narrative" facet of military activities. As noted, all operations communicate and affect the perceptions and behaviors of relevant actors either directly affected by these operations, or as distant observers of these operations.

Second, doctrinal publications must include cognitive objectives at the outset of planning. These objectives must be a part of the Commander's intent and the concept of the operation. Doctrine should be amended to require identification of cognitive objectives as the foundation of operations. The intelligence community must be able to produce behavioral analysis that is usable as a foundation for operations. Commanders and staffs must translate strategic goals into behaviors, analyze the drivers of

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[2] "A geographical area wherein a commander is directly capable of influencing operations by maneuver or fire support systems normally under the commander's command or control. (JP 3-0)" http://www.dtic.mil/doctrine/new_pubs/dictionary.pdf

[3] "The determination of the overall effectiveness of force employment during military operations. Combat assessment is composed of three major components: (a) battle damage assessment; (b) munitions effectiveness assessment; and (c) reattack recommendation" http://www.dtic.mil/doctrine/new_pubs/dictionary.pdf

[4] Military information support operations (MISO) is defined as "planned operations to convey selected information and indicators to foreign audiences to influence their emotions, motives, objective reasoning, and ultimately the behavior of foreign governments, organizations, groups, and individuals in a manner favorable to the originator's objectives. (JP 3-13.2http://www.dtic.mil/doctrine/new_pubs/dictionary.pdf

specific behaviors for relevant actors, devise an operational approach to change those factors and encourage behaviors that are favorable to mission success.[5]   Finally, commanders must approve cognitive objectives for *every* operation, and ensure their staff estimates how well the operation conveys those messages in execution as a weighted criterion in course of action development. It is critical to note that this will require detailed planning, and will fail if only adopted in a wave-top fashion.

These suggestions align with the emerging Joint Concept for Operating on the Information Environment (JCOIE). The central idea of the JCOIE is that to, "… achieve enduring strategic outcomes, the Joint Force must build information into operational art to design operations that deliberately leverage the inherent Informational aspects of military activities." Instead of assigning a small group of information operations (IO) experts to integrate information or more broadly, cognitive objectives, into military operation

Step 1: Recommended Actions
• Convene command and service working groups to study means of amending current planning processes to require explicit integration of cognitive objectives and effects in campaign planning while causing the least disruption to current practice.
• Convene conferences, joint working groups to develop a community of practice to update definitions of military concepts and addition of new concepts required by doctrinal updates
• Refine and socialize updated concepts such as the JCOIE; amend current and write future doctrinal publications to include cognitive objectives at the front end of the joint planning process; including these as part of the Commander's Intent and the concept of the operation.

planning, future commanders will be responsible for building this into operational design at the beginning of the operation process. The behavior of relevant actors will become foundational to operational design.

> **Step 2: Actionable Cognitive Research.** Foster a program to create "actionable research" agendas and programs consisting of both translation of existing academic knowledge and funding new research to refine understanding of the impact of human emotions, cognition, and heuristic responses on the behaviors that define real-world security environments (e.g., cooperation, competition, conflict, and conflict resolution

Developing perception and cognition-based military operations requires an effort to refine our current understanding of human behavior. While the social and behavioral sciences have made great strides in explaining human cognitive and affective response to environmental stimuli on the individual and group levels, this academic research is not always directly applicable to military operations. This produces three types of knowledge gaps: 1) **failures of translation** of existing academic work into "actionable

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[5]   Examples include joining host nation security forces, ceasing violent behavior, reducing human rights abuses, moving along designated routes to displaced persons camps, and participating in democratic government rather than resorting to violence.

research" relevant to operational environments in a way that will support indications and warning (I&W), behavioral expectations, success metrics and other mission planning requirements; 2) **failures of awareness** of the power and applicability of behavioral sciences to military operations; and 3) **failures of interest** among academic researchers. Quite often the types of questions and availability of outlets for peer-reviewed publication that are requirements for academic tenure and promotion are not the same as those available and of highest interest to the joint force. This means that in many cases researchers lack the professional incentive to take on the issues of human behavior in specific security environments that are most useful to operators. The solid and *methodologically-sound* research is simply not being done. What is needed to produce the human behavioral knowledge base necessary for filling the cognitive capability are teams of applied social science researchers, independent of deployed tactical units, conversant in multiple analytic methodologies that can properly collect field data, and apply the correct analytic methods to operational questions. This type of "actionable researcher" straddles the line and translates between the university research community and DoD, to include answering command-specific operational needs.[6]

Simultaneous with doctrine and definition updates, DoD must fund the development and execution of a systematic and goal-directed research program to expand the joint force's base understanding of human behavior in the context of military operations. The focus on research directly and immediately applicable to military operations and plans marks the difference between the proposed program and traditional academic research.

The importance of providing for *methodologically valid* social science data collection efforts to this endeavor cannot be overstated. This is the perhaps unexciting key to research that is often overlooked. Lacking real-world data, researchers' interests in human behavior are limited to methods such as war-gaming and computational modeling. While these approaches *can be* (and have been) generated without a solid empirical foundation, unless the researcher's intent is initial exploratory research, training, or a proof-of-concept, they *should not be*. This is because lacking the foundation of correctly collected social science data, "actionable" conclusions drawn from these approaches are inevitably biased in stochastic ways. The insidious habit of presenting of the results of these efforts without noting the dearth of foundational data leaves operational consumers with misplaced confidence in the results. On the other hand, for specific types of questions and when the human behavioral foundation is solid, war gaming and computational modeling can provide actionable insights.

The suggested "Actionable Research" agendas listed below target some of the most pressing security operations-relevant gaps in understanding human behavior. They can be used as the bases for formulating fully fleshed-out research designs that are systematic, cumulative and include experimental and qualitative and quantitative quasi-experimental approaches.

Initial "Actionable Research" Agendas Laying the Basis for Cognitive Capabilities

AGENDA 1 - Main Research Question: *What factors are most important in predicting individual and group behaviors in specific operational environments?*

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[6] Two examples are the "Mosul Review Group" conducted by TRADOC/AWG to expand and apply contextual lessons learned, and "UW University" through SOCEUR and USASOC that focuses on the evolution of unconventional warfare in the contemporary environment with peer competition.

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Step 2: Recommended Actions

- How do people of different cultures, social structures, age and demographic groups respond to specific threats and operational contexts?
- At what point do threat perceptions (stakes, risk, perceived opportunity, etc.) prompt different populations to aggression (flight, co-option, etc.)?
- What are the cognitive impacts on immediate and future behaviors of different forms of messaging and physical operations in specific operational contexts?
- How do perceptions of threat propagate through different operational environments (urban, rural, contested, non-contested) and demographics (age, culture)

AGENDA 2 - Main Research Question: *What deters, who, when and how?*

The often-overlooked secret of deterrence scholarship is that the assumptions underlying much of it, while elegant, lack explanatory power, empirical support, and the nuance required by operators trying to identify effective strategies to deal with real world conditions. Existing theoretical frameworks are insufficient to suggest whether, for example, we should expect coercive threats to be more likely to deter an adversary that is acting as a proxy for an emerging regional power, or the regional power itself. Addressing these gaps is vital in a security context increasingly characterized by constant low-level conflict that threatens to unravel the traditional escalation management mechanisms.

- Once triggered how might an actor's threat response be moderated? Are there de-escalation tactics beyond messages that downplay the perceived threat?
- Which forms of deterrence (e.g., positive, negative, reassurance) are most effective in different operational contexts and at different levels of analysis (e.g., national decision makers, group actions, individual actions)? How do people of different cultures, social structures, age and demographic groups respond to different forms of deterrence and in which types of operational environment?

AGENDA 3

Main Research Question: *Which factors most affect US ability to influence populations in various operational settings?*

- Are actions always louder than words? What are the relative weights of physical, verbal, textual and aural messages? How are these optimized to achieve mission success in different types of operational environment and among different demographics?
- What are the most important factors explaining influence and the lack of influence on population behavior in different security environments? Reputation? Threat? Perception of trustworthiness? Dignity violations? Demographics? Etc.
- How do US forces improve popular perceptions of their trustworthiness and credibility?
- What triggers a person's choice to accept or reject outside influence in various operational environments?
- What are the *causal* effects of US military operations or activities of various types and in various contexts?
- How might the joint force leverage common psychological responses to improve operational approaches?

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- Create systematic and directed social science research agendas to provide the missing linkages between academic, theoretical studies, non-data based studies, or not readily actionable research and operational-level gaps in understanding of human behavior in security environments.

- Consider creating Cognitive Capability Field Research Teams expert in various social science methods and data sources to gather foundational data for use in conducting "Actionable Research" that using research designs that will produce results directly and immediately applicable to operational needs. Teams should be multi-disciplinary and can consist of qualified faculty members from the US military academies and other social scientists expert in *applied* research.

- Invest in applied research that translates well-established bodies of academic literature into operationally-relevant, actionable information but does not necessarily require field research or data collection.

- Establish "joint venture" programs between scholars of human behavior whose research would benefit from close interaction with military operators and operators who could use expert knowledge to create mission applicable research. Ventures could take the form of co-authored studies, command special projects, etc.

- Provide researchers access to DoD and USG data and/or human subjects (for the latter investigate OSD policies and facilities for internal review boards (IRB's) operation.

- Low hanging fruit: Consider creating an SMA II Follow-on Team to operationalize the many processes, cognitive decision frameworks, and cognitive analysis and planning tools into operational capabilities. These should be done as a joint venture with a DoD office that agrees to field-test the eventual tool or capability

Step 3: Analytic Tools and Integration. Develop capabilities and visualization tools for assessment, analysis and integration of the cognitive and physical aspects of military operations

Cognitive effects are on par with physical effects for both offensive and defensive purposes; domestically and internationally; and at all levels of operations. At present the joint force has numerous, even redundant, systems, frameworks, and tools to help operators assess, analyze and visualize the physical and cyber aspects of military operations. What it lacks are tools to help analysts evaluate human behavior relative to perceptions, beliefs, and ideas and other mental constructs. Planning and execution of all military activities must be grounded in well-established social science theory and methods. Working to design tools and methods that combine insights from many social science disciplines (economics, social psychology, political science, sociology, etc.) will yield the most comprehensive analyses of many of the issues at the core of US defense, including: individual and collective mobilization; deterrence effectiveness and failure; influence and message credibility in different theaters of operation; nuclear de-escalation decision making; terrorist activities and

deterrence of terror attacks. Again, note that each of these issues is a cognitive construct. In other words, they exist mainly in the in the beliefs and perceptions of opponents.[7]

Development and purchase of analytic systems and tools is the third of the four steps. It is essential that software tools, AI and computational tools help military operators and others understand specific human behaviors in specific types of operational environments. **The importance of designing tools based in well-founded cognitive social science research cannot be overstated.** Developing tools absent of valid behavioral science insights seriously risks operational effectiveness.

Step 3: Recommended Actions
• Invest in software tools and models only after operational research to support them has been completed. Look to combine various analytic tools into inter-operable suites to aid the joint force in applying them without having to learn each individually. [8]
• Require cognitive impact assessment and justification as part of the acquisition process for materiel.
• Convene working groups of researchers, operators and computer and data engineers to form a community of practice around development of tools to support assessment of the specific cognitive aspects of military operations as well as integration of cognitive and physical objectives and effects in campaign planning.

Step 4: Training the Force. Train and educate the force on cognitive operations and the integration of cognitive and physical objectives and plans.

No doctrine, planning process, tools or advanced concept of maneuver is of any value unless it can be explained to, and applied by the troops who would institute it. Training and educating the force to consider, plan for and execute the integrated cognitive-physical objectives of military operations is crucial. An initial step is to leverage available assets to form a cognitive training community of practice that includes representatives from organizations developing cognitive concepts and working doctrinal updates, from teams conducting actionable research, and from the communities developing analytic tools to close the cognitive capability gap. The training community is where the results of the other steps will be applied to enable the force to use cognitive operations in future campaigns.

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[7] In fact, the same methods and analyses also help us understand the impact of emerging technologies in human-machine integration, AI, autonomous vehicles, and so on by addressing how people use, think and believe about the technology, as much as what they feel about it, and ultimately, what they will do with it.

[8] This requirement could be met by an analytic tool currently known as "Project Noor." Project Noor is intended to meld the outputs of several analytic tools, including Athena, and its development is supported by the Joint Staff, TRADOC, DARPA, Air Force Research Labs and others. The initial proof of concept for Project Noor was demonstrated to the CENTCOM Commanding General and selected staff during June 2017, and they agreed that it has great potential, with further development, to help joint force planners better understand relationships between nodes and to identify if/then relationships.

In some circumstances it is possible to begin initial training and education of the force in cognitive maneuver in parallel with developing doctrine. The precedent for this type of development is the attack the network concept that was developed and refined during 2006 to 2016 when the Secretary of Defense authorized the Joint Improvised Explosive Device Defeat Organization (JIEDDO) to seek means of countering the human networks supporting IED attacks. In this case, it will not be necessary to stand up an entirely new organization to implement training for cognitive operations and maneuver if the existing training community can learn from past situations to find the most effective ways to develop cognitive operations training.

Development of state-of-the-art training and educational programs in cognitive operations and maneuver will require the support of experts researching human behavior and using applied behavioral research (e.g. behavioral economists). While every effort should be made to reach beyond DoD, expert input may also be sought from university-affiliated research centers and or specialized university programs that focus on military application of concepts.[9]

Analytic Tool Development

Successful training in cognitive operations must enable our force to influence the will of host nation populations, and analytic tools can greatly assist in the effort. During training or operations, analytic tools can assist users in filtering and sorting through vast amounts of data, both structured and unstructured, to better understand relationships between online and offline nodes, identify which human actors are most likely to influence large segments of populations, and to better understand causal relationships, such as likely long-term outcomes from selecting a course of action (CoA).

Capabilities Integration

The community of practice for the cognitive aspects of military operations also should leverage the capability integration community through the capabilities based assessment (CBA) that supports each concept. The CBA is the first step in the Joint Capabilities and Assessment System (JCIDS), which is guided by the principles of; describing needs in terms of capabilities, describing needs from a joint perspective, and having a single general or flag officer oversee each Department of Defense (DoD) functional portfolio. CBAs also align well with training development based on their six elements: scenarios, functions, types of solutions, capabilities, concepts of operation, and measures of effectiveness. By remaining involved in the development of the CBA for the JCOIE and other related joint concepts, the cognitive capabilities community will be able to rapidly develop cognitive operations and maneuver training that fully meets the needs of the joint force.

Institutionalization

The final step is to institutionalize education in the cognitive aspects of military operations. This is vitally important if the cognitive gap in US defense planning operations is to be filled.[10]   The concept of

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[9] These organizations were invaluable in developing the concept of attack the network into training programs.   For example, during 2009, Dr. Ian McCullough and Dr. Anthony Johnson (then Army majors) both deployed to Afghanistan while serving as full-time professors at USMA and as leaders of the USMA Network Science Center. They had developed a training program that applied social network analysis (SNA) to targeting human networks in support of counter-IED operations - Advanced Network Analysis and Targeting (ANAT) training. The (then) Majors presented a pilot course of ANAT training to active duty members at Bagram Air Base. The pilot course was highly successful, ANAT training went on to be applied successfully in both Afghanistan and Iraq, and it is still being trained today. Coincidentally, Dr. McCullough and Dr. Johnson have since retired from active duty and are still applying their considerable skills and experience at the Applied Physics Lab.

[10] There are already some institutionalized programs of the sort envisioned. For example, the Army Special Operations Center of Excellence runs its Captains Career Course with strong emphasis on critical thinking as more than a pre-mission checklist. Integrated throughout the program are practical exercises along the tactical and operational spectra, giving students the

cognitive maneuver gains true value when it is applied by a force in which each member has a general level of education and competence in human behavior as well as a cadre highly educated in human cognition, social psychology, and political and social behavior. Because our adversaries are outmaneuvering us in the cognitive aspects of military operations, educating and training the force to apply cognitive maneuver must begin as soon as possible. The efficient, effective way to do so is to form a cognitive maneuver training community of practice that can leverage available expertise and resources

Step 4: Recommended Actions
• Identify further programs for JPME accreditation across the DOD enterprise. This standard of evaluation contains key benchmarks for critical assessment and application that broaden the cognitive analytical capacity of the force.
• Expand lessons learned from traditional tactical, operational, and strategic levels into academic year timetables. Building an expectation of review and sharing best-practices into the JPME educational system will benefit both established programs and start-ups as both adapt to the changing contexts of conflict.
• Establish a cognitive training community of practice that includes representatives from relevant organizations to close the cognitive capability gap by training the force as soon as possible to use cognitive operations and maneuver in future campaigns.
• Foster greater cross-organizational "cross-pollination" among military education and training programs and organizations and academics working in relevant behavioral sciences.

from across the DoD and its partners.

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chance to learn and refine analytical skills within familiar settings. These utilize operational experience to push into realistic scenarios, thereby fostering adaptability within emerging conflicts. Regional Studies also provide similar opportunities, with a tighter focus on the specific contexts students will face downrange. Both programs rely on military cadre and civilian educators with academic and practical expertise across all geographic combatant commands. The Operational Design Course accomplishes similar tasks, with a current country simulation for ARSOF students preparing for deployments in that region. As the JPME flagship institution for strategic irregular warfare studies, the National Defense University's College of International Security Affairs (CISA) combines academic rigor with real-world application to support the joint operator in developing cognitive tools necessary for conventional and special operations in the "human domain." Students from across the joint, interagency, intergovernmental, and multinational spectrum, participate in graduate programs focused on specific problems (CT-Ft. McNair), regional alignments (South/Central Asia-Ft. McNair), and operational approaches to both (Joint Special Operations-Ft. Bragg). These programs culminate with a capstone Master's Thesis that engages scholarly and practitioner communities on significant strategic security challenges facing US and partner nation decision-makers. Cognitive factors play a central role in many of those research projects and their application afterwards.

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