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INFORMATION WARFARE IN THE HIGH-END FIGHT

by

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The U.S. military is adept at coordinating fires and maneuver of forces associated with the kinetic aspects of engagements; it has also proven effective in the non-kinetic realm of the information environment. Despite decades of military operations in the information environment, there has been limited success in integrating these capabilities with those associated with operations in the physical environment. The U.S. Navy and U.S. Marine Corps have identified gaps in their ability to effectively coordinate events in these environments in support of a common operational objective. This research focuses on the convergence between the information and physical environments as it affects the ability to effectively employ non-kinetic and kinetic munitions. Our efforts seek to discover the gaps and redundancies in the capabilities at the theater level of command that interfere with operational efficiencies. Additionally, we examine the current organizational structures associated with each type of operational capability and identify gaps and redundancies that may be contributing to inefficient coordination of fires and maneuver across the theater of operations. Our findings suggest that certain behavioral conditions, developmental considerations, necessary non-lethal reference point dissemination, and poorly defined information capabilities have contributed to overreliance on kinetic munitions and underutilized non-kinetic munitions.

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INFORMATION WARFARE IN THE HIGH-END FIGHT

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LIST OF ACRONYMS AND ABBREVIATIONS

CCDR	Combatant Commander
CMO	Civil-Military Operations
DOD	Department of Defense
DON	Department of the Navy
EW	Electronic Warfare
IA	Information Assurance
IO	Information Operations
IP	Internet Protocol
IRC	Information Related Capability
ISR	Intelligence, Surveillance, and Reconnaissance
JCS	Joint Chiefs of Staff
JEMSO	Joint Electromagnetic Spectrum Operations
JP	Joint Publication
KLE	Key Leader Engagement
MILDEC	Military Deception
MISO	Military Information Support Operations
MOE	Measures of Effectiveness
MOP	Measures of Performance
NATO	North Atlantic Treaty Organization
NLRP	Non-Lethal Reference Point
NPS	Naval Postgraduate School
OIE	Operations in the Information Environment
OPSEC	Operation Security
PA	Public Affairs
SC	Strategic Communication
SECDEF	Secretary of Defense
STO	Special Technical Operations
TTP	Tactics, Techniques, and Procedures
USMC	United States Marine Corps
WEZ	Weapon Engagement Zone

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I. INTRODUCTION AND RESEARCH APPROACH

Since the Cold War ended, the United States (U.S.) has sustained a globally influencing, highly lethal, and geographically expansive military (Brose, 2020, p. 188). The confidence resulting from this powerful certainty and the strategic lessons learned from recent conflicts against economically and technologically inferior forces have encouraged reliance on traditional warfare platforms that project power and precision strike capabilities with their assigned payload sets (Brose, 2020, p. 49). This reliance on existing platforms and technological capabilities to deter conflict and maintain security becomes more standardized practice with each confirmed Department of Defense (DOD) Budget (Brose, 2020, p. 213). However, America's approach to global military supremacy has diminished its ability to fight future conflicts (Rid & Hecker, 2009, p. 78). As a professional in National Security Affairs, Dr. Zachary Shore (2008) identifies this dangerous complacency as "Static Cling" which he defines as, "the cognition trap that prevents us from either recognizing or accepting a changing world" (p. 184). Within this readiness gap, near peer competitors to the U.S. are boldly (and creatively) expanding their means to challenge American defenses.

Weapon systems technology, capabilities, and international tension are expanding at an alarming rate. In 2019, Russia added a second hypersonic nuclear capable missile to its arsenal that advertises a speed exceeding 20 times the speed of sound (Bratersky, 2021, para.5). In 2020, the U.S. Office of the Secretary of Defense announced that China possessed the world's largest navy, ground-launched ballistic missiles and ground-launched cruise missiles with ranges exceeding American ground-launched ballistic missiles, and one of the world's largest integrated air defense systems (DOD, 2020, p. ii). China has also been actively stealing intellectual property from the U.S. to expeditiously close the gap between U.S. and Chinese military capabilities and gain better insight into exploitive countermeasures (Brose, 2020, p. 36).

Extending beyond continually expanding physical arsenal displays of power, American adversaries are also exerting pervasive international influence by capitalizing on integrated operations in the information environment (OIE) that redefine conventional

confrontations. Both state and non-state adversaries to the U.S. are capitalizing on the effects achieved from creatively incorporating physical assets and technological capabilities into larger strategic objectives. The U.S. Central Intelligence Agency Director William Burns stated that Russia's current (2021) buildup of military forces along the Ukrainian border threatens Ukrainian leadership while also attempting to exhibit a stationary projection of dominance toward the United States (*Open Hearing: Worldwide Threats*, 2021). Likewise, North Korean propaganda videos such as the one filmed in 2017 at a patriotic military concert celebrating the 105th birth anniversary of Kim Il Sung depicting an intercontinental ballistic missile destroying a city very reminiscent of San Francisco amid a burning American flag in front of a U.S. National Cemetery (Bacon, 2017, para. 2) similarly seek to change behaviors through exerting international influence.

These military operations reaching beyond the physical impact of conventional munitions are not limited to misinformation, disinformation, and psychological operations. Expanding connectivity and reliance on internet and software-based technologies are encouraging advanced cyber-attack opportunities extending across the physical, logical, and social network layers to produce logical and physical effects (Joint Chiefs of Staff [JCS], 2018, pp. I-2 to I-4). According to the recently founded (December 2019) U.S. Space Force's Mission Statement, outer space is definitively another defense operating environment that serves to, "protect U.S. and allied interests in space and to provide space capabilities to the joint force… acquiring military space systems, maturing the military doctrine for space power, and organizing space forces to present to our Combatant Commands" (U.S. Space Force). International space and space-technology (including satellite) pursuits are dramatically expanding and challenging pre-existing battlefield definitions. Additionally, expansive manipulation of the electromagnetic spectrum is defining new tactics for electronic warfare (EW) that impact maneuver element decisions and effectiveness. As General Berger (38th Commandant of the United States Marine Corps [USMC]) describes in his Force Design 2030, "We have shortfalls in… high-endurance, long-range unmanned systems with Intelligence, Surveillance, and Reconnaissance (ISR), Electronic Warfare (EW), and lethal strike capabilities"

(Department of the Navy [DON], 2020, p. 2). These shortfalls require innovative solutions exploiting all aspects of the information and physical environments.

American warfare and its associated munitions must constantly adapt to all perceived and actual threats in order to maintain superiority, deter unnecessary conflict, and respond effectively and efficiently should aggravated conflict occur. With the expanding physical reach and capabilities resulting from information availability and technological development, traditional approaches to payload choice and employment must adjust in order to remain applicable and successful throughout the theater of operations.

Modern targeting efficiency depends on weapon systems capable of integrating kinetic and non-kinetic payloads. However, this emphasis on non-kinetic and kinetic munitions remains vague, sporadically defined, and therefore often neglected as a viable and necessary component to target development and payload choices. According to Mr. S. Iatrou, NPS senior lecturer (personal communication, May 10, 2021) kinetic munitions can be defined as applied energy in the physical domain, while non-kinetic munitions can be defined as applied energy in the cognitive domain. Applied energy in the physical domain tangibly transits from point of release to target impact and the applied energy in the cognitive domain encompasses actions taken across the electromagnetic spectrum, in the cyber-domain, and throughout behavioral interactions. These definitions do not constrict either munition (kinetic or non-kinetic) from producing effects in either the information or physical environments, nor do they constrain kinetic to lethal effects and non-kinetic to non-lethal effects.

The confusion and lack of specificity surrounding non-kinetic fires has resulted in hesitancy to select them as munition choices. Non-kinetic fires are not sufficiently understood, are not well defined within the DOD, and subsequently are not reinforced as necessary response measures. Non-kinetic fires are also delivered through multiple different Information-Related Capabilities (IRC) that each encompass various occupational specialties, require specific technical proficiencies, and do not always deliver results at the same rate as kinetic fires. Conversely, kinetic fires can be mechanically described and produce tangible results that have many physical attributes. These consistent physical

results and the methodical process to match kinetic payload to desired effect on targets has resulted in over-reliance on kinetic options.

Although non-kinetic munitions operate differently than kinetic munitions, their integration across the range of operations is increasingly more apparent and necessary. As near peer competitors to the U.S. aggressively pursue similar non-kinetic technological integration at a pace uninhibited by democratic procedures and requirements, American resources must address these new threats spanning the information and physical environments. While kinetic munitions will always be required for defense, non-kinetic munition integration can maximize their effectiveness or mitigate their use (allowing for greater physical capability sustainment during combat).

This research attempts to identify possible impedances preventing non-kinetic and kinetic munition integration across the range of military operations and propose increased means for alleviating the friction incurred by those circumstances. This research focuses on both the information and physical environments to uncover operational hindrances toward understanding and employing non-kinetic munitions as either solitary fires or in conjunction with kinetic fires. Within the information environment, emphasis falls on behavioral aspects of the defense institution. Within the physical environment, this research explores force development factors, non-kinetic targeting points, misunderstood capabilities, and application relevancies. This research concludes with a summary of identified deficiencies in the information and physical environments and associated corrective measures.

II. THEORETICAL FOUNDATIONS

A. ADDRESSING COGNITIVE BIASES

A significant requirement for successfully integrating kinetic and non-kinetic fires across the theater of operations is acknowledging and addressing cognitive biases inhibiting information operations. As the director of research and education at the Canadian Special Operations Command, Emily Spencer (2018) defines cognitive biases as, "mental shortcuts" that facilitate expeditious decision making (p. 87). Bias in itself is not inherently malicious, detrimental, or exclusionary. Due to the high rate and large magnitude of operational information collection and processing, Spencer (2018) explains that certain cognitive biases may actually expedite decision-making because, "cognitive biases are simplified information processing strategies" (p. 89). This speed enables commanders to maintain tempo in accordance with actions on objective. However, certain cognitive biases impede willingness to employ and capitalize on non-kinetic munitions.

Kinetic munition payloads have specific effects with results that are largely consistent, reliant, and repeatable. Kinetic munitions also reflect physical tangibility and represent observable force protection capabilities. Non-kinetic munitions are often intangible and have aspects that cannot be observed under the same conditions as kinetic. Because of this disparity, the potential for over-reliance on kinetic weapons systems can be more common and immediate. While many cognitive biases may be present, the confirmation bias, availability heuristic, and mere exposure effect are all potential hindrances toward effectively and efficiently employing non-kinetic fires in place of (or concurrent with) kinetic munitions.

The confirmation bias suggests that individuals exhibit a tendency to seek and believe claims that support their previously established beliefs (Spencer, 2018). In tactical and operational environments, this bias may inadvertently affect individual military occupational specialty training schools. When contemporary U.S. military commanders and decision makers are beginning their profession and learning the skill sets necessary for a varied and unique range of operating environments, most future leaders are

impressionable and formed under circumstances where they have only known their country to be a global superpower (Brose, 2020, p. 86). Furthermore, the majority of occupational specialties (as is appropriate) are warfare centric and support forward forces in the physical environment.

Significant training is required to operate various weapons systems and corresponding confidence that probabilities of hit and kill will remain consistent are necessary pre-requisites for employment. Warfighters are instructed on kinetic systems' individual mechanical specifications, rates of fire, effective ranges, and associated employment considerations affected by human engagement (USMC). These physically controlled and maintained parameters reinforce historical conceptions and accounts of American military prowess and technological superiority. Despite the necessities of kinetic weapons system employment and payload options in the physical environment, it is also important to consider reliance levels on their usage. If the military is developed to predominantly believe that kinetic munitions are the sole, major, or singular option for response measures, that will reinforce a confirmation bias that excludes the use of non-kinetic munitions as standalone or complimentary options. While it may appear counterintuitive in military environments to encourage focus on alternative ways to consider a problem and solution, willful attention to counterintuitive processes alleviates the negative effects of confirmation bias (Spencer, 2018, p.91) and enables opportunities for non-kinetic options.

When anecdotes of U.S. military supremacy are recounted, analyzed (which is a natural process for strategists), and coupled with extensive weapon system availability, the potential grows for unintended cognitive bias influence. In these instances, the availability heuristic may incline commanders to choose kinetic options when non-kinetic options may be more appropriate. The availability heuristic suggests that greater memory availability of an event leads to stronger belief in that event recurring (Spencer, 2018, p.90). Historical over-reliance on kinetic options has resulted in a majority of similar responses to conflict.

Developing military leaders with historical narratives is not wrong. Recognizing (and appropriately matching) adversarial threats to appropriate responses while understanding the implications of those threats greatly benefits from prior case studies and

analysis. However, awareness of availability bias presence and potential effect is also important. If left unchecked, the availability bias may lead to assumptions based on historical actions that are not the best option for the given scenario. Furthermore, those scenarios may not require or respond to the same reactions that were initiated under prior circumstances. Re-evaluating responses with respect to objective factors such as tempo, objectives, and the adversary's unique nature can counter availability bias influence (Spencer, 2018, p.90) and facilitate the creative integration and employment of non-kinetic munitions.

Similar to the confirmation bias and availability heuristic, the mere exposure effect is an additional cognitive bias that can unduly influence military forces toward neglecting the possibility and subsequent advantages of integrating non-kinetic opportunities into their concepts of operation. The mere exposure effect suggests a tendency to rely on things simply because of familiarity with them (Spencer, 2018, p. 93). Within the scope of military operational planning, there is substantial familiarity and trust in kinetic fires and maneuver that deepens with successful mission executions. Considering the tangible and physical nature of kinetic exposure (individual weapons systems, aircraft, naval capabilities, ground assets, etc.) surrounding forces have more difficulty recognizing the non-kinetic equivalence. Additionally, the mere exposure effect may exasperate reliance on kinetic munitions because of their historical success. The more kinetic munitions effectively demonstrate effects on targets, the stronger the corresponding risk grows of viewing them as primary choices. Because non-kinetic exposure exists in much more logical and intangible spaces, there is more difficulty countering the reliance on kinetic. Although challenging, recognizing the effect of mere exposure effect is a significant component to enabling more non-kinetic integration. Military planners and commanders must strive to remember that system proficiency and familiarity do not necessarily dictate best value choices (Spencer, 2018, p. 93).

Understanding the definitions of cognitive biases and the various extents to which they might be present across commands and operational environments can alleviate some of the unintentional friction inhibiting non-kinetic opportunities. Although it is more

difficult to interpret non-kinetic payloads and subsequently measure effects on target, that frustration cannot discount OIE as viable measures.

B. ADDRESSING INFLUENCE FACTORS

Similar to cognitive biases, commanders and operational planners must consider the associated influence factors affecting non-kinetic integration throughout the theater of operations. Because of the military's institutional hierarchy, commanders and senior leaders should be acutely aware of the influences they exert over the men and women they lead. As an experimental social psychologist, Robert Cialdini (1984) describes that professional titles (or equivalent command levels, billet titles, and occupational specialties within the military context) can influence more profoundly than the person bearing that title (p. 222). These command titles are necessary for maintaining good order and discipline, assuming varying levels of responsibility, and ensuring operational coordination and communication. However, there is risk associated with authoritative influence in the defense establishment. This influence can either promote or hinder embracing non-kinetic operations as conducive to furthering operational objectives.

Since military leaders who coordinate fires and plan maneuvers at tactical levels are generally more senior in rank and experience, it becomes incumbent upon those positions to be aware of their influence that may already be affected by cognitive biases and focused on employing kinetic fires. As Cialdini further describes, symbols of authority can directly influence behavior (1984, p. 222). If those symbols are leaders who are already exhibiting exaggerated tendencies for kinetic targeting, the resulting operations will become even more difficult for non-kinetic integration.

III. FINDINGS

A. CREATIVITY

The U.S. military is a well-disciplined, organized, and hierarchical system with rigid structural processes and fixed operational procedures. This description and these practices are necessary for efficient mission execution and proficiency sustainment. The skills and control measures to develop a force capable of these expectations are largely focused on successfully executing kinetic fires in the physical environment. Professional development and integration of non-kinetic systems operators is far less emphasized. For example, the USMC Technical Information Operations Officer is a secondary military occupational specialty received after postgraduate education at Naval Postgraduate School (NPS). This secondary nature of the "8834" (Technical Information Operations Officer) billet designation is limiting. Furthermore, of the 334 U.S. Marines eligible and selected for advanced education opportunities on the fiscal year 2021 Commandant's Career Level Education Board, only one individual was selected for the Information Warfare Systems program (Commandant of the Marine Corps, 2020).

This focus on kinetic systems is not inherently negative. However, these developmental efforts result in warfighters that are significantly more proficient and capable of executing kinetic operations and deficient on non-kinetic alternatives. While this is understandable due to the potentially catastrophic physical ramifications associated with employing kinetic weapons systems, future engagements will require understanding and exploiting non-kinetic systems for success. The hesitancy to employ non-kinetic systems due to fear of unintended outcomes will increase if kinetic munitions are routinely employed instead of appropriate non-kinetic options.

While kinetic tactical and operational expertise is required for strategic objectives, it does produce gaps for successfully integrating non-kinetic fires. Assessing the criteria for understanding the dynamic employment of non-kinetic fires requires a scope that appreciates the relatively young formal adoption of "information" as a function inherently tied to operation success. While OIE are not unique to contemporary warfare, it was not

until July 2017 that the Chairman of the Joint Chiefs of Staff institutionalized "Information" as the seventh joint function (JCS, 2017, p. iii) and January 2019 that the USMC officially adopted "Information" as the seventh Marine Corps Warfighting Function (Department of the Navy, 2019, p. 1). Recognizing "information's" immaturity comparable to the other six functions, the joint community must anticipate and collaborate on addressing the resultant implications for service and mission interoperability.

Information Related Capabilities (IRC) have different structures and can facilitate more diverse (non-kinetic) effects on target than kinetic effects' results. While kinetic capabilities may produce results extending beyond the physical environment (e.g., psychological effects in the cognitive domain), non-kinetic information capabilities are routinely tailored throughout the physical, information, and cognitive domains to produce effects. Figure 1 describes the relationship between IRC integration in the information environment and delivery of non-kinetic effects. In order for complementary support of kinetic and non-kinetic employment, the DOD needs to facilitate greater information operation capability training for the force at large and more creativity among information operation officers.

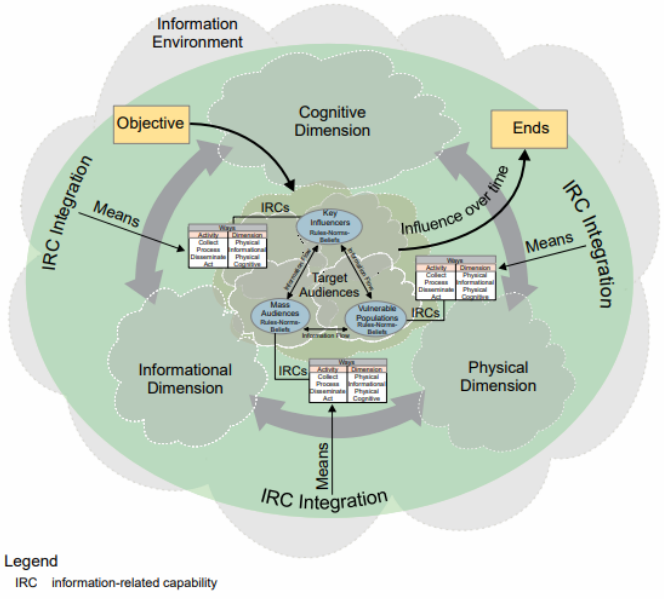

Figure 1. Influence Leads to Achievement of an End(s). Source: Joint Chiefs of Staff (2014).

While technical proclivity and capacities for understanding math and science are increasingly more important to keep pace with software-dependent weapons systems, expanding network capabilities, and adversary innovations, emphasis should also be placed on creatively applying available resources (kinetic and non-kinetic) throughout physical, information, and cognitive domains. Technical understanding combined with creative processing results in greater lethality, sustainment, and awareness of effects throughout the battlespace (Brose, 2020, p. 234). Creative approaches to varying degrees of conflict exploit operations in the information environment that use non-kinetic munitions to achieve specified results (Paul, 2016, p. 88).

These operations in the information environment offer varied tactical options and can contribute to retaining kinetic munitions and associated payloads. Many non-kinetic munitions do not require resource expenditure in the same manner as kinetic munitions to shape the battlefield and thereby economize the cost and performance of kinetic munition employment. As cited in Hagy (2013), Sun Tzu (5th century B.C.E) aptly describes the economic prowess of non-kinetic fire integration, "to fight and conquer in all your battles is not supreme excellence; supreme excellence consists in breaking the enemy's resistance without fighting" (Hagy, 2013, para.2). Non-kinetic munitions can also maximize the effect of these retained kinetic rounds by efficiently shaping the battlespace in a manner that prepares the physical domain for the payload's effect. Deciding how kinetic and non-kinetic munitions can complement each other's contributions to the operational scenario requires that operators be able to both understand the mechanisms and think critically about the payload effects.

B. TRAINING

In addition to creativity for non-kinetic munition implementation and broader incorporation of OIE, the target audience for identifying and challenging disinformation needs to expand. Disinformation tailored to American forces and targeting specific operating levels across the theater of operations inhibits situational awareness. Adversaries can appreciate the direct influence social media and instantaneous news afford and the effect it can have on those who receive and react to what they experience (Teo, 2008, p.

20). Operating in this confusion can lead planners to avoid non-kinetic fires while making poor tactical choices. Misinformation and disinformation can instill doubt that increases potential for misinterpreting signals intelligence and operationally relevant data.

Additionally, misinformation, disinformation, and false narratives can provoke otherwise unintended actions. This danger compounds when, "Tactical mistakes… can instantly have strategic effects when picked up through new media and amplified in the mass media" (Rid & Hecker, 2009, p. 132). Combating the effects of manipulative information will increase non-kinetic target specification and mitigate unwanted influence. Because successful implementation of non-kinetic munitions requires the ability to simultaneously counter (identified) adversarial non-kinetic measures, all defense levels (strategic, operational, and tactical) require awareness of misinformation's scope. As a National Security Specialist, Ephraim Kim (1988) explains the effects adversarial influence can incur on decision-making, "Strategic deception is aimed at manipulating and distorting the perception of reality held by the opponent's policy makers and analysts in order to project a desired image and achieve strategic advantages" (p. 143). Countering adversarial deception and mitigating its effects enables effective offensive and defensive non-kinetic implementation.

Adversarial propaganda targeting the United States military constitutes an overt effort to exert influence. This action is non-kinetic in nature (although propaganda can be used to provoke violence, discord, and mistrust). Despite this tactic not resulting in physical payload detonations, it warrants a response and demonstrates the potential offensive and defensive nature of non-kinetic munitions. This type of propaganda also emphasizes the rising trend of scenarios that require non-kinetic munition response availability.

From small units to large forces, non-kinetic operation integration would become more institutionally viable with repeated and tailored reinforcement training to encourage understanding of the capabilities and personnel involved (Paul, 2016, p. 93). The form, fit, and function of these trainings require tailoring to promote retention, awareness, and alleviate hesitancy to trust non-kinetic capabilities. Additionally, creating an unclassified structural non-kinetic "handbook" would assist translating the technical and often intangible components of non-kinetic fires through a physical and simplified vehicle.

Similar to occupational specialty references, a grade/rank specific overview of non-kinetic information operation staff, high-end capabilities (including IRC explanations), and supportability specific to operational contexts and units would encourage integration at various levels.

C. NON-KINETIC TERMINOLOGY STANDARDIZATION AND NLRP INTEGRATION

In order for non-kinetic fires to better integrate with kinetic fires at all levels of operation, non-kinetic fire development and associated payload assignment needs to closely resemble kinetic fires' equivalent processes. Figure 2 demonstrates the current standardized process for identifying targets (kinetic and non-kinetic).

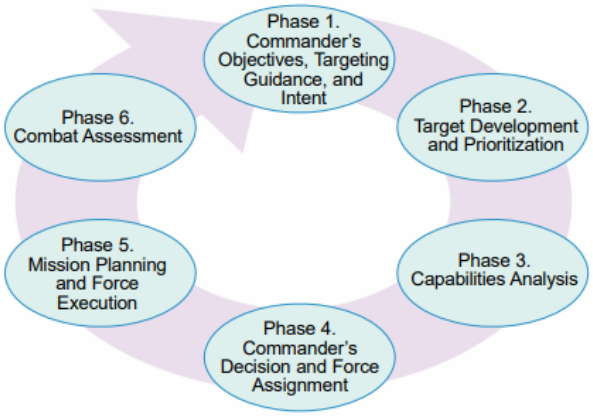

Figure 2. Joint Targeting Cycle. Source: Joint Chiefs of Staff (2019).

While this cycle accounts for both kinetic and non-kinetic targets and the process is the same, different considerations must be incorporated for each phase. These separate (but often complimentary) considerations add to commanders' planning and information processing requirements. Furthermore, the overlapping nature of the joint targeting cycle for both kinetic and non-kinetic fire operations emphasizes the need for specific requirements and effects desired in both information and physical domains. Within both Joint Publications (JP) 3–09, *Joint Fire Support* (2019) and JP 3-13, *Information*

Operations (2014), there are no mentions of "kinetic" nor are there mentions of "non-kinetic." This disassociation between fires, information operations, and kinetic versus non-kinetic munition types complicates the recognition of non-kinetic munitions' place within the concept of operations. Additionally, this gap hinders exploiting the information environment to enhance kinetic operations in the physical domain.

Instead of "kinetic" and "non-kinetic," JP3-09, *Joint Fire Support* (2019) describes fire effects as "lethal" and "nonlethal" (JCS, p. viii). While this is a true description of potential fire effect intentions, further description of munition types (kinetic versus non-kinetic) is required. Not all non-kinetic fires are nonlethal (B. Stegner, personal communication, April 29, 2021), nor are all kinetic fires lethal.

JP 3-09, *Joint Fire Support* (2019) further exacerbates understanding of non-kinetic fires when it describes "Information-Related Activities" (JCS, p. IV-6). Although only a slight discrepancy, the JP 3-13, *Information Operations* (2014) describes the same functions as "information related capabilities" (JCS, p. xiv). This deviation is slight but de-values the integrity of the actual capabilities because the definition itself is not definitive. Furthermore, JP 3-09, *Joint Fire Support* (2019) states, "Some information-related activities supporting joint fires include:…" (JCS, p. III-12) and then proceeds to list four of the 14 published IRCs: Military Deception (MILDEC), Military Information Support Operations (MISO), Operations Security (OPSEC), and Special Technical Operations (STO) capabilities. Under another section, JP3-09, *Joint Fire Support* (2019) lists cyberspace operations, offensive space control, and electronic attack as joint fire support capabilities that are separate from information-related activities (JCS, p. x). JP3-13, *Information Operations* (2014) lists the same four IRCs from JP3-09, *Joint Fire Support* (2019) in concert with the other 10: Strategic Communication (SC), Joint Interagency Coordination Group, Public Affairs (PA), Civil-Military Operations (CMO), Cyberspace Operations, Information Assurance (IA), Space Operations, Intelligence, Joint Electromagnetic Spectrum Operations (JEMSO), and Key Leader Engagement (KLE) (JCS, pp. II-5 to II-13). All 14 IRCs are viable options for integrating non-kinetic fires in support of the scheme of maneuver.

Kinetic fires require target locations to exist in the physical domain. Non-kinetic fires do not. To account for this disparity while still enabling commanders to employ non-kinetic fires in support of the maneuver and fires elements, NLRPs exist and are developing into more widely accepted standards (W. Stegner, personal communication, April 29, 2021). Kinetic payloads are selected based on many criteria that ultimately results in physical impact on a specified aim point intended to shape the battlefield. NLRPs are non-kinetic fire aim point equivalents (W. Stegner, personal communication, April 29, 2021). These non-kinetic aim points help bridge the targeting process divide between munition types. Because IRCs can vary techniques and employment levels, non-kinetic targets may exist across cognitive, physical, and informational domains and can be more dynamic than kinetic targets.

Specifically, NLRPs seek to accommodate the Joint Targeting Cycle with non-kinetic equivalence. During Phase 2 (target development and prioritization), NLRPs substantiate the unique nature of non-kinetic weapons. As William Stegner (a leader in NLRP development and dissemination) explains, NLRPs can accommodate the fact that for many OIE tasks, the physical location may not be sedentary or a fixed mark that can be tracked and isolated (such as an internet protocol (IP) address) (W. Stegner, personal communication, April 29, 2021). With this non-kinetic target aim point defined, the commander can more easily conduct Phase 3 (capabilities analysis) and understand how the individual IRCs correlate to achieving desired effects. For Phases 4 and 5 (Commander's decision and force assignment, and mission planning and force execution) the commander and planning staff are provided a more specific and detailed overview of the non-kinetic effects in the information and physical environments. With this more substantiated understanding of non-kinetic expectations and the benefits associated, planners are afforded greater situational awareness on the integrated nature of their kinetic and non-kinetic payloads.

Considering joint doctrine publication deficiencies for kinetic and non-kinetic munition definitions and the benefits of NLRP adoption, DOD doctrine requires amendment to supplement both areas. Under JP3-13, *Information Operations* (2014) section titled, "Relationships and Integration" it describes Information Operations (IO) as

use of, “capabilities as force multipliers to create a desired effect” and defines the 14 individual IRCs while stressing their mutual supportabilities (JCS, p. 30). However, this same section does not stress the mutual supportability between non-kinetic effects achieved via IRCs and kinetic munition effects.

Joint publications need to reflect kinetic and non-kinetic munition “types” which correlate the physical and information environments. Additionally, these publications should specify lethal and nonlethal as the effects of these two munitions (jointly or separately). With these corrections in place, the joint training definition found in *Joint Training Manual for the Armed Forces of the United States* (2015) which states that, “training, including mission rehearsals, of individuals, units, and staffs using joint doctrine and tactics, techniques, and procedures (TTP) to prepare joint forces or joint staffs to respond to strategic, operational, or tactical requirements that the CCDRs consider necessary to execute their assigned or anticipated missions” (JCS, p. A-1) could be fulfilled. Non-kinetic and kinetic munition along with NLRP integration into joint doctrine would facilitate required joint training.

Although commanders benefit from the introduction and implementation of NLRPs, there is more translation required for correlating non-kinetic targeting to non-information operation specific leadership. Most contemporary command structures have developed and operated in environments that relied extensively on kinetic strike and countermeasure for power projection and deterrence. In order to maximize the efficiency of NLRPS, greater understanding of non-kinetic weapon system pairing to effects on target should be reinforced at command levels. If the administrative details encompassing information concepts of operation can be effectively communicated with command and fires sections, there is larger potential for complimentary implementation. Describing actual munitions, JP 3-09, *Joint Fire Support* (2019) explains that they, “are used to create desired effects on targets (JCS, p. 18)” but does not specify that these effects have to be developed by a specific munition type.

While available doctrine and resources for referencing NLRP criteria is still largely in developmental stages, shared functional understanding is required for joint interoperability (B. Stegner, personal communication, April 29, 2021). Like any

warfighting function, individual services will naturally tailor concepts of operation and non-kinetic fire employment within their respective operating environments. However, in future conflicts, all components of the DOD will need to understand the basic capabilities and interoperability of non-kinetic targeting.

D. TESTING

Proficiency builds competence, confidence, and trust in weapons systems and operational maneuvers. This proficiency develops during basic training, is reinforced through military occupational specialty training, and is verified prior to deployment through various stages of pre-deployment joint training exercises. At various stages in warfighters' development and training, many live-fire exercises are unique to kinetic munitions. The precision and skill necessary to employ various weapon systems in pursuit of commander's objectives across the range of operations requires aggressive repetition. These exercises result in trust between operator and system and similar trust between commander and operators.

This same model designed to build tactical proficiency and trust needs to reciprocate within non-kinetic operations. There are currently no required information operation-specific deployment preparatory training exercises equivalent to the multi-tiered kinetic exercises (B. Stegner, personal communication, April 29, 2021). Non-kinetic fires require payload and targeting to achieve a desired effect. Because of this, more emphasis needs to be focused on developing and training designated non-kinetic operators.

In many ways, IRCs and NLRPs for OIE parallel kinetic weapon development processes in the physical environment. When integrated as means to achieve effects across physical, information, and cognitive domains, IRCs and NLRP identifications offer various opportunities to influence and disrupt adversary capabilities. However, these opportunities require dedicated field experimentation, analysis, evaluation, and shared critique to foster expansive trust and more routine use at all levels.

Non-kinetic munitions are technically varied and often incorporate multiple occupational specialties operating in concert with each other. Because of this complex nature and the ramifications for kinetic operations executing concurrently, operators in the

information environment must strive for proficiency equivalent that of kinetic system operators. Since information operation planning and targeting is executed with kinetic tasking across the fleet, non-kinetic operators need to train and develop under similar pipelines. From individual proficiency tests to increasingly larger unit led exercises (culminating in joint environment scenarios executing both kinetic and non-kinetic fires), the warfighters preparing and executing information operations should be thoroughly tested on the range of non-kinetic munitions delivered through available IRCs across the physical, information, and cognitive domains. Once training is conducted in conjunction with previously standardized deployment preparations, the symbiotic nature of kinetic and non-kinetic fires will more easily fuse into the new standard mode of operations.

Upon recognizing the importance of establishing non-kinetic munition operator training, direction needs to be focused on the criteria for establishing those proficiency metrics. Unlike kinetic munitions in the physical environment that result in largely objective effects (payload matched to desired effect on target), the same standards are not exactly reciprocal for non-kinetic munitions. Apart from Measures of Performance (MOP) and Measures of Effectiveness (MOE) for non-kinetic operations which, "help accomplish the assessment process by qualifying or quantifying the intangible attributes of the information environment (JCS, 2014, p.72)" there need to be additional performance attributes associated with training and retention.

Kinetic and non-kinetic munitions and targeting procedures share objective performance criteria when considered administratively, but their payload decisions and effects cannot be measured similarly. Furthermore, non-kinetic munition effects are even more detailed when evaluated against which IRC was utilized and how the NLRP was defined. In a study published by the British Journal of Management (2016) that was conducted to measure organizational performance, findings suggested that combined objective and subjective data collections can be as accurate as purely objective data (Singh S et al., 2016). This approach may be both appropriate and necessary for gauging the success of uniquely separate but complimentary non-kinetic targeting and munitions. The multi-varied effects of successful non-kinetic munitions are not as objectively quantifiable as kinetic munitions.

Officers and warfighters within the Information Operations Staff and Information Operations Cell should be afforded more dedicated physical space, equipment, and personnel to exercise IRC employment focusing on adversary threats (real and perceived). These individuals must also remain proficient with current technological capabilities and electromagnetic effects. Non-kinetic training exercises designed to simulate deployment operations and incorporating all levels of command with kinetic operations as appropriate will more substantially engrain joint interoperability and trust. Furthermore, these exercises could progressively reinforce approval processes, applicability, and creative problem solving.

Establishing integrated and complex training exercises to develop IRC proficiency and tactical capabilities with kinetic operations will become even more beneficial by developing a formal collection of related "After Action Reports" specifically for information operations resulting from these exercises. Despite the changing nature of the information and operating environments, implementing a shared and reinforced means of communication specific to non-kinetic employment lessons including IRC integration with kinetic systems and NLRP assignment would capitalize on the overall training's effectiveness. This resource should be detailed enough to require appropriate classification but accessible for all Technical IO Officers, IO Cell components, NPS Professors from the Schools of Information Sciences and Defense Analysis, and associated staff who can provide scientific considerations for current technological events. Additionally, this consortium of similar billets and responsibilities could further be broken down by particular information related capability, service, billet, etc., while still retaining the ability to communicate laterally.

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IV. ANALYSIS

A. THREAT ENVIRONMENT

A critical component to successfully integrating kinetic and non-kinetic operations throughout the theater of operations is simply to reinforce and highlight the contemporary importance and applicability of OIE. From the early 1990s through most of the past decade, the U.S. largely existed as the world's preeminent military superpower (Brose, 2020, p. 4). However, competitors are catching up very quickly and contemporary threats are far more provocative, organized, funded, and technologically capable than what current American military forces have addressed and learned from for the past 30 years. Furthermore, these adversaries are already employing non-kinetic warfare (Brose, 2020, p. 29).

With the dawn of the information age, technological capabilities became boundless. While America has strongly relied on its longstanding supremacy predicated on proven (though aging) platforms and weapons systems (Brose, 2020, p. 228), adversaries have become more creative and technologically invested in the means to match and exceed the United States (Brose, 2020, p. 91). China, Russia, North Korea, and Iran are state actors willing and able to assert themselves on a global scale. Although current rhetoric and demonstrations have not yet provoked or escalated into direct armed conflict, American adversaries are preparing in depth for confrontation. Although there is no present, formal declaration of war between the United States and its largest competitors, these adversaries are far from inactive in their pursuit of achieving global influence and economic, political, and military supremacy.

In the physical domain, China is actively ignoring United Nations Convention on the Law of the Sea and building extensive military bases in the South China Sea (Campbell & Ratner, 2018) and after Russia annexed Crimea in 2014 (Pifer, 2019) it has demonstratively continued to try and re-assert itself as a global superpower (Remler, 2020). Politically, both China and Russia seek to supersede the United States economically and militarily.

As cited in Anthony Cordesman's strategic response analysis (2019), China's 2019 Defense White Paper, *China's National Defense in the New Era* claims that the United States has, "provoked and intensified competition among major countries, significantly increased its defense expenditure, pushed for additional capacity in nuclear, outer space, cyber and missile defense, and undermined global strategic stability" (2019, para. 4). China has also covertly invested research and resources into "Assassin's Mace" weapons that exploit rivals' capabilities (who may have more conventional military strength) while exacerbating sustainment operations which creates more vulnerabilities (Rickard, 2008, p. 4). These weapon systems incorporate technological advantages and creatively seek to efficiently exploit American reliance on hardware and weapons platforms (Brose, 2020, p. 32).

As a professional within the IO community, Molly McKew (2017) cites General Valery Gerasimov's 2013 article, "The Value of Science Is in the Foresight" (commonly known as the Gerasimov Doctrine), to demonstrate how it clearly defines Russia's approach to contemporary conflict: "The very 'rules' of war have changed. The role of nonmilitary means of achieving political and strategic goals has grown, and, in many cases, they have exceeded the power of force of weapons in their effectiveness. … All this is supplemented by military means of a concealed character" (McKew, 2017, para. 3). American competitors are embracing non-kinetic targeting and munitions. In order to deter conflict, American military services must also aggressively integrate OIE.

Externally, adversaries have shed inhibition and openly demonstrate their kinetic weapons, capabilities, and technologies. In response to military parades, advertised missile tests, and propaganda bolstering false narratives, the U.S. needs to resist reverting to mirror-imaging presumed kinetic munition quantities and assumed capabilities and instead anticipate adversarial perspective and intention (Shore, 2008, p. 181). With the constantly expanding range of social media platforms and opportunities for online manipulation there is extensive opportunity for spreading false news and pushing narratives that shape global perceptions.

False adversarial propaganda promulgated to undermine the United States and incite confusion is both threatening and combative. The information age extended the

interpretation of battle space engagement areas. American adversaries also take advantage of the United States' freedom of information accessibility and online expression. America's liberal approach to information dissemination and consumption is especially vulnerable to manipulation from adversaries who control the media. As a leader in counterproliferation analysis, Deborah Yarsike Ball (2017) explains, "Putin sees information operations as central to his efforts to undermine Western institutions and alliances and achieve the twin goals of breaking apart NATO and discrediting liberal alternatives to his autocratic rule' (2017, p. 11). In China, nearly all social and searchable internet applications are censored by the government's "Great Firewall" (Wang, 2020). Within these arenas non-kinetic targeting and munitions will continue to become more applicable and necessary. For strategic planners and military tacticians, adversarial influence and false propaganda will affect decisions at all levels. Countering misinformation and disinformation in the information and cognitive domains while minimizing their impact on operational maneuvers requires effective electronic warfare application and counterpropaganda conducted at the right levels with effective targeting.

Adversaries have watched the U.S. operate in conflict for many years. These nations understand many of America's physical maneuvers and operating techniques. They also recognize the temptation to match and exceed weapons systems. If an adversary can distract the United States' attention away from non-kinetic capabilities and integration, it can exploit the reciprocal fact that America may in fact be making itself more susceptible to non-kinetic strikes (Sciutto, 2019). American adversaries recognize that innovative approaches to non-kinetic weapons systems and payloads can directly negate the perceived strength associated with large quantities of traditional kinetic systems (Sciutto, 2019, p. 248).

In order to address these aggressive maneuvers and prepare for future conflicts with organized, funded, and technologically advanced adversaries, the United States must embrace non-kinetic fire's importance and merge its capabilities into offensive and defensive operations. As kinetic weapons systems and adversarial range (across multiple domains) becomes more dynamic and lethal, forces will need to minimize time spent in the weapon engagement zone (WEZ). If the U.S. relies primarily on kinetic munitions and

neglects to incorporate non-kinetic capabilities, it will be introducing unnecessary and dangerous vulnerabilities. Gaining more diverse capabilities to operate further outside the WEZ and with more non-kinetic options enables greater risk assumption and response time.

The definition and interpretation of battlefields and conventional warfare are changing. These changes are not unique to a single state or nation. Additionally, these changes create friction for planners, policy makers, and those who have become fluent under previous operating conditions. Previous warfare doctrine and practice necessitated physical domain control and exploitation. As military platforms become more dependent on software, machine learning grows more resilient and capable of processing immense loads of information, artificial intelligence becomes more adaptable, network connectivity and control of the electromagnetic spectrum become harder to defend against exploitation, and influence techniques grow more calculated, OIE becomes more critical to facilitating kinetic munition's success (Brose, 2020, p. 173).

Considering national capabilities, international threat postures, and the changing nature of war and conflict, greater attention needs to shift toward defining information operation "needs" in order to definitively recognize non-kinetic applicability. In addition to identifying these needs, the U.S. must assume a more collective effort toward embracing non-kinetic and kinetic response mechanisms. Non-kinetic capability and information operations have to be understood not just as viable options but in many cases as the correct response (in part or whole). As Dr. Everett M. Rogers (1962) describes, "one dimension of compatibility is the degree to which an innovation is perceived as meeting the needs of the client system. When felt needs are met, a faster rate of adoption usually occurs" (p. 246). Due to the nature of most non-kinetic operations and the relatively small allotment of specialists and personnel (compared to the rest of the military and kinetic operators), experiencing and disseminating the benefits of information operations is challenging. However, trust in kinetic fires' effects does not require non-kinetic exclusion. Dr. Rogers (1962) continues to explain, "Compatibility of an innovation with a preceding idea can either speed up or retard its rate of adoption. Old ideas are the main mental tools that individuals utilize to assess new ideas and give them meaning" (p. 243). While understandable, it is an incomplete view to measure non-kinetic munitions through the lens

of kinetic understanding. Although non-kinetic techniques are not new ideas, the composition and implementation of information operations must remain continuously innovative.

In many aspects, information capabilities and non-kinetic fires are conceptually different than previous operations across the same domains. These differences can exacerbate the ability for associations between conventional, kinetic operations and innovative, non-kinetic capabilities. Despite initial difficulties recognizing the complementary nature of non-kinetic and kinetic capabilities, many individuals may be tempted to associate quality with perceived effect (Lewin, 1936, p. 19).

It is important to remember that non-kinetic and kinetic munitions can rarely be measured by the same standards. However, this does not diminish the quality of either capability. Dr. Kurt Lewin (1936) comments how, "it is clear that one must distinguish between 'appearance' and the 'underlying reality' in a dynamic sense" (p. 19). The United States' present international relations and the varying hostilities of peer adversaries should direct focus toward appreciating information operations as a more comprehensive and natural addition to defense posture. Assumptions based on the "appearance" of physical munitions and their calculated payloads cannot blind decision-makers from recognizing the need and impact of non-kinetic fire effects.

As many adversaries continue to develop economically and centralize more political control, their technological focus on military capabilities is shifting toward larger arsenals of more diverse munitions applicable to information and physical environments (Brose, 2020, p. 198). Defensive planning that relies too heavily on kinetic munition quantities and capabilities is dangerous. Larger arsenals can become larger vulnerabilities and susceptible to enemy exploitation. Additionally, large, and complex kinetic munitions will always be constrained by defense acquisition system resources and processing.

B. EXPANSION AND SUSTAINMENT

In addition to administrative and conceptual transitions toward more fully adopting non-kinetic munitions throughout military operations, the DOD must increase financial and resource investment in information capabilities, research, and development (Paul, 2016, p.

5). In fiscal year 2020, $718.3 billion were allotted to the DOD. Of this amount, approximately $7.462 billion went toward emerging technologies, $14.1 billion went toward space operations, and $9.6 billion went toward cyber operations (Under Secretary of Defense, 2020, pp. 2–4). While this may appear relatively small in comparison to overall spending on platforms, kinetic munitions, and sustainment requirements, this dedicated investment needs to maximize returns for strategic planning and warfighter functionality.

Capitalizing on talent, minimizing bureaucracy, and incorporating end user input are critical for maximizing non-kinetic systems development (Brose, 2020, p. 228). As the current and future non-kinetic systems become more dynamic, reliable, and interoperable with existing military systems, they will also become more trusted (Brose, 2020, p. 124). By nature of its democratic government, the U.S. has to work more creatively to meet these end goals and compete with its adversaries. China's "Civil-Military Fusion" unites civilian researchers, commercial technology industries, and military/defense industries in an effort to turn the People's Liberation Army into the most technologically advanced military in the world (U.S. Department of State, 2020). China's Communist Government can control the pace at which it achieves military dominance (kinetic and non-kinetic). In turn, the U.S. has to adapt to the same problem (achieving technological supremacy for its military) within the bounds of Constitutional processes.

A key ingredient for balancing kinetic hardware and legacy platform functionality in the DOD with non-kinetic munitions includes adapting commercial technology into military systems (Brose, 2020, p. 106). The acquisitions process for non-kinetic systems technology should not necessarily mimic the equivalent process for service-specific hardware platforms, munitions, and kinetic technology. Software engineering is relatively young when compared to hardware design (Rendon & Snider, 2019, p. 110). Non-kinetic systems need better defined design parameters that account for applicable interoperability with existing kinetic systems.

V. CONCLUSIONS

This thesis attempted to identify the historical circumstances and present conditions contributing to the need for non-kinetic munition integration with kinetic munitions throughout military operations. After establishing the need, this thesis sought to discover the gaps and deficiencies within the physical and informational environments that are impeding non-kinetic/kinetic munition integration and offer solutions to overcoming these obstacles. The future of warfare and American roles within combat will fundamentally require incorporation and exploitation of OIE. Greater attention focusing on the behavioral, developmental, and procedural aspects of military operations are necessary in order to determine the extent of practices that inhibit non-kinetic munition integration within the DOD.

Behavioral research indicates cognitive bias and influence factors can deter confidence and reliance on non-kinetic munitions. Cognitive biases and influence factors require more consistent acknowledgement, understanding, and response measures to minimize potentially inhibiting effects that result in reinforcing over-reliance on kinetic warfare options. To counter this, the DOD should focus on defining (and standardizing) non-kinetic definitions throughout joint and service specific publications. Additionally, these defining resources should approach non-kinetic munitions and their payloads' potential for producing effects within the information and physical environments with the same methodical attention as kinetic systems. Incorporating such definitions and concepts throughout joint doctrine and service publications will facilitate better understanding of non-kinetic targeting, available payloads and associated effects, and enable further development of information operation roles, training, proficiency, and testing. Dedicated testing and required training exercises for non-kinetic munitions will facilitate confidence using IRCs at all levels of command and creativity in support of maneuver elements. Continued NLRP development and dissemination will advance this incorporation and substantiate non-kinetic fires' place within payload developments and targeting cycles.

Advanced research should continue to identify existing barriers in the physical environment and potentially inhibiting aspects of the information environment that prevent non-kinetic munition integration. Further, this continued research should work to discover the

underlying processes contributing to these barriers in order to alleviate those constrictions and prevent recurring impedance. Suggested areas for study include disseminating and maintaining consistently defined non-kinetic munitions and information environment descriptions from strategic level joint documents down through service-specific publications and doctrine. Accompanying the standardization and incorporation of these definitions, joint and service-specific non-kinetic testing range development requirements must develop in order to ensure IRC understanding and proficiency. These non-kinetic live-fire training exercises spanning strategic, operational, and tactical levels of joint and service-specific efforts require effectiveness metrics that enable information planners and commanders to evaluate combat readiness. These exercises must also be intertwined with information planners' required pre-deployment exercises and sustainment proficiencies. Additionally, these exercises and training environments must enable and share creative approaches to employing and exploiting information tools and capabilities alongside kinetic munitions.

Part of developing creativity to maximize effectiveness and adapt to various threat levels also requires sustained pursuit of commercial technology incorporation (Brose, 2020). Research into the means and effects of evaluating and encouraging civilian software and technology tailored to non-kinetic munition development will increase opportunities for information capabilities independent (and in support of) kinetic munitions while directly enhancing tools for information operators. Additionally, pursuit of technology that enables non-kinetic effectiveness will alleviate reliance on platform-centric warfare (Brose, 2020, p. 76) that stifles response opportunities to adversarial provocations. Identifying and addressing individual aspects preventing non-kinetic munition integration facilitates focus on required and corresponding institutional changes.

Sustaining the integration of kinetic and non-kinetic munitions across the theater of military operations will require broad attention and joint focus to ensure effective support for maneuver elements and information operations. As the U.S. continues to deter conflict and promote international security despite near-peer competitors growing increasingly more confrontational, non-kinetic munition options will become more necessary for success. This integration will amplify force readiness, lethality, and flexibility to dynamically respond to changing operating environments.

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