



NATO and Intermediate Force Capabilities: Why Human Effects Matter

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Abstract: On February 24, 2022, when Russia invaded Ukraine, the international order changed as sharply and abruptly as it did on the morning of the September 11, 2001, terrorist attacks when the North Atlantic Treaty Organization (NATO) invoked Article V for the first time in NATO's history. As a result of Russia's invasion, NATO's demand for deterrence capabilities—with the hope that Article V is never again necessary to exercise—is more urgent now than at any time in the 21st century. Because lethality is absolutely necessary but not sufficient, NATO must develop and maintain capabilities that complement lethal force with intermediate force options to complete the deterrence equation across the entire competition continuum.

Intermediate Force Capabilities (IFCs) can deliver immediate value to NATO countries, providing leaders and policymakers with Non-Lethal Weapons (NLW) options that can deter enemy actions, as necessary, below the level of lethal combat operations. IFCs, a term introduced into the U.S. Department of Defense in 2020 to define capabilities that bridge the gap between presence and lethal effects, encompass NLWs as well as other additional capabilities and technologies that have utility below the level of armed conflict.

Keywords: intermediate force capabilities, non-lethal weapons, simulation, agent-based, modeling, security forces, gray zone.

Introduction

On February 24, 2022, when Russia invaded Ukraine, the international order was impacted sharply and abruptly. Russia's invasion put the North American Treaty Organization (NATO) on center stage. As a contribution to international security, NATO's deterrence capabilities take many forms. From nuclear weapons to cyberattacks, to be effective, deterrence must be scalable across a conflict spectrum that includes non-kinetic actions. Because lethality is certainly necessary but not sufficient, NATO must develop and maintain capabilities that complement lethal force with intermediate force options. Intermediate capabilities complete the deterrence equation across the entire competition continuum.

Both NATO's 2030 Strategic Concept and responses following the Russia-Ukraine war envisage deterrence measures that can be scalable across the spectrum of conflict.¹ Often called a competition continuum, the "gray zone" refers to aspects of strategic and operational campaigning that are below the level of a lethal armed conflict between opposing and irreconcilable wills. Gray zone warfare, also called hybrid warfare, includes aspects of irregular warfare.

In addition to gray zone warfare, there are also phases of political conflict other than lethal dominance. Lethal domination is not the only phase of warfare. It also involves shaping the upcoming conflict, deterrence, initiative seizing, stabilization, and the enablement of civil authority. Lethal weapons are singularly insufficient to achieve the goals of these five other phases, especially in this modern age when political conflicts are held in the public eye.² Intermediate Force Capabilities (IFCs) can deliver immediate value to NATO countries, providing leaders and policymakers with Non-Lethal Weapons (NLW) options that can influence enemy actions, as necessary, below the level of lethal combat operations.

Intermediate Force Capabilities

IFCs, a term introduced into the U.S. Department of Defense (DoD) in 2020 to define capabilities that fill the span from presence and lethal effects, encompass NLWs as well as other additional capabilities and technologies that have utility below the level of armed conflict. IFCs include weapons, devices, and munitions used to slow, stop, and/or divert an adversary's actions.³ They bridge the tactical

¹ Susan LeVine, "Beyond Bean Bags and Rubber Bullets: Intermediate Force Capabilities Across the Competition Continuum," *Joint Forces Quarterly*, no. 100 (2021): 19-24, <https://ndupress.ndu.edu/Media/News/News-Article-View/Article/2497112/beyond-bean-bags-and-rubber-bullets-intermediate-force-capabilities-across-the/>.

² Krista Romita Grocholski et al., *How to Effectively Assess the Impact of Non-Lethal Weapons as Intermediate Force Capabilities*, Research Report RRA654-1 (Santa Monica, CA: RAND Corporation, 2022), <https://doi.org/10.7249/RA654-1>.

³ Wendell B. Leimbach Jr., "DoD Intermediate Force Capabilities: Bringing the Fight to the Gray Zone," PowerPoint presentation available upon request, Joint Intermediate Force Capabilities Office.

and strategic gaps between presence and lethal effects while minimizing casualties and collateral damage. IFCs include legacy law enforcement NLWs and leap-ahead technology, now available to provide a new generation of capabilities with extended ranges and durations of effects against personnel and materiel to support missions across the competition continuum framework of the National Defense Strategy. IFCs provide a range of scalable options that offer an appropriate level of force when it is desired to minimize risk to innocent civilians or the surrounding environment.⁴

IFCs benefit the Joint Force and NATO operations. IFCs support efforts to partner, persist and operate forward by giving Commanders effective and tailorable counters to gray zone tactics. IFCs' discriminate and relatively reversible effects, which are neither likely nor intended to cause death or serious injury, also reduce the risk of escalating a conflict and conserve valuable lethal weapons for use elsewhere.⁵ IFCs complement lethal force by helping service members to discern uncertain situations, isolate targets, enhance force protection, and mitigate the risk of collateral damage or casualties. IFCs afford service members engaged in irregular warfare within the ground, maritime, and air domains more deter/defeat options. Overall, these adaptive measures enhance the Joint Force's adaptability and capability to survive asymmetric, unpredictable events. At a minimum, IFCs can provide a low-risk, non-lethal means of supporting our partner-building capacity with the host nation and allied security forces.⁶

Because IFCs can offer discriminate and reversible effects without causing unnecessary destruction or loss of life, they can support NATO's strategic objectives without unintentionally initiating, escalating, or prolonging hostilities. IFCs strongly align with the NATO 2030 Strategic Concept and represent a suite of capabilities that respond effectively to the demand signals for new risk management protocols following Russia's unprovoked attack on Ukraine. IFCs will enable NATO's senior leaders to expand decision time and space, providing options to validate that a perceived hostile action is, in fact, hostile while simultaneously bridging the gap from presence to lethal effects without reducing the overall force design of lethality.

Non-Lethal Weapons

As a subset of IFCs, NLWs provide operating forces needed capabilities to clear personnel, control group movements, target selected individuals, and secure without destroying. NLWs are designed and primarily employed to incapacitate personnel or materiel immediately, minimizing fatalities, significant injuries to personnel, and collateral damage. DoD Directive 3000.3E establishes that NLWs

⁴ Leimbach Jr., "DoD Intermediate Force Capabilities: Bringing the Fight to the Gray Zone," 3.

⁵ Stacia A. Hylton, "Use of Force," U.S. Marshals Service Policy Directives, accessed July 23, 2019, <https://cops.usdoj.gov/pdf/use-of-force.pdf>.

⁶ Hylton, "Use of Force," 3.

aim to achieve effects that “minimize the probability of producing fatalities, significant or permanent injuries” yet also are not required to “eliminate risk of those actions entirely.” While NLWs are not required to have a zero probability of producing fatalities or permanent injuries⁷, NLW developers are required to characterize (in requirements as well as test and evaluation) both injury potential and weapon effectiveness against the target.⁸ When developing new NLW systems or deciding to employ an existing one, knowledge of the potential of the system to cause unintended injury is an important component. Like other weapon systems, NLWs must also establish reliability and effectiveness metrics to determine the extent to which the intended effect is achievable. For NLW, the human effects aspects of effectiveness and injury potential are frequently the most important constraints bounding the developmental trade space.

Human Effects and Reversibility

Human effects are the physical impact on, or behavioral response of, a human resulting from a stimulus or a set of stimuli. The human effects characterization process ensures the development and fielding of non-lethal weapons capabilities that meet the escalation of force needs of Warfighters and enable confidence in the effectiveness and understanding of the risks. Additionally, human effects knowledge can support operational commanders by informing the development of non-lethal weapons tactics, techniques, procedures (TTPs), and training.⁹

U.S. DoD Instruction (DoDI) 3200.19 defines the policies, responsibilities, and procedures for the characterization of the human effects of non-lethal technologies and systems. Human effects characterization is the formal process for describing the compendium of physiological- and behavioral-effects knowledge associated with a given NLW. The Instruction establishes the risk of significant injury (RSI) as the metric used to describe the reversibility of NLW effects as it relates to humans. RSI is specifically the likelihood, or probability, of a NLW directly causing injuries that are permanent, including death, or requiring greater than Limited First Responder Capability (LFRC) (including self-aid, buddy-aid, and combat lifesaver skills) in order not to be permanent. A permanent injury is formally defined in DoDI 3200.19 as “physical damage to a person that permanently impairs physiological function and restricts the employment or other activities of that person for the rest of his or her life.” When injuries are not permanent and do not cause death, the LFRC distinction is used to draw the line between

⁷ Department of Defense Directive 3000.3, “DoD Executive Agent for Non-Lethal Weapons (NLW), and NLW Policy,” April 25, 2013, Incorporating Change 2, August 31, 2018, <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/300003p.pdf?ver=2018-10-24-112944-467>.

⁸ Department of Defense Instruction (DoDI) 3200.19, “Non-Lethal Weapons (NLW) Human Effects Characterization,” May 17, 2012, Incorporating Change 1, September 13, 2017, https://irp.fas.org/doddir/dod/i3200_19.pdf.

⁹ DoDI 3200.19, “Non-Lethal Weapons (NLW) Human Effects Characterization,” 8.

the categories of “significant” and “not significant.” An injury that requires greater than LFRC in order not to be permanent is considered significant.¹⁰

Furthermore, DoDI 3200.19 requires that for any non-lethal technology or system, RSI must be identified by the combat developer (the command or agency that formulates doctrine, concepts, organization, material requirements, and objectives; representing the user community role in the material acquisition process).¹¹ The purpose of RSI is to assist in materiel development and provide Commanders with the level of risk associated with the intended use of the NLW. Warfighters, through combat developers, determine this risk based on a concept of operations for a non-lethal capability. This determination is deliberative, driven by the intended mission use, and informed by human effects experts. RSI is, therefore, the build to DoD specification for non-lethality. Describing the trade space between the risk of significant injury and effectiveness is central to NLWs’ development.

Capabilities for Commanders

NLWs provide Commanders options for escalation and de-escalation of force, making them more effective in situations in typical recent operations. The characterization of human effects for NLW has become more defined and advanced, building on knowledge and lessons learned. Today, it is guiding NLW development in its earliest stages, focused first and foremost on warfighter needs as expressed by combat developers. Thus, continually improving the human effects characterization process is key to improving NLWs and IFCs.

Combatant Commands use defined Standing Rules of Engagement (ROE) and interpret them for their unique application. Task Force Commanders take Standing ROEs (as interpreted) and apply them in a way that is permissibly more conservative but not more lenient than the Standing ROEs. The Joint Intermediate Force Capabilities Office (JIFCO) maintains Combatant Liaison Officers at each of the geographic Combatant Commands to facilitate this process. Additionally, a better understanding of relationships between IFCs, ROE, and effectiveness is needed. It is important to emphasize that the physiological effects that NLW stimuli produce on targeted personnel are not the end goal of NLWs. Commanders require an understanding of how to employ a suite of NLWs to effect predictable behavioral changes in these targets. To do this requires a mapping of physiological effects to behavioral outcomes.

Behavioral Effects

The nature of NLWs is to influence human behavior. NLWs tend to correspond to two major categories: counter-personnel and counter-materiel weapon systems. Counter-personnel NLWs aim to incapacitate, deter, distract, suppress, or

¹⁰ DoDI 3200.19, “Non-Lethal Weapons (NLW) Human Effects Characterization,” 8.

¹¹ DoDI 3200.19, “Non-Lethal Weapons (NLW) Human Effects Characterization,” 8.

move a human-targeted individual. This can be done through various means: sound and light, pressure waves, directed energy, malodorants, electro-muscular stimulation, and more. In these cases, a physical stimulus is delivered, a physiological response is caused, and ultimately a change in behavior is the result. For example, when a flashbang grenade is used, a loud sound, a bright light, and a pressure wave impact the human target; the person feels the physiological effects and has some cognitive and emotional reactions. These effects can cause the person to change their behavior. The extent that their behavior has been modified is one measure of the effectiveness of the weapon system. Behavioral effectiveness can be difficult to measure because humans can think, feel, and behave in a dynamic interaction with each other and their environment. Sometimes the focus is on measuring the physiological effect in place of the behavioral change because it is easier to measure and can offer other scientific advantages. For example, when a Human Electro-Muscular Incapacitation (HEMI) device is employed, the physiological effect of skeletal muscular incapacitation is so strong that behavioral control is no longer under the targeted human's volition. In this case, the physiological effect is a suitable effectiveness measure approximating behavioral change. For other NLWs, though, the physiological effect fails to capture the true consequence of the NLW. Additionally, NLWs are sometimes used in a scenario with multiple people or in a crowd situation. Whether the scenario involves one individual, multiple individuals, or a crowd, understanding human behavior is central to understanding NLW system effectiveness.

Beyond system effectiveness, understanding and ultimately being able to predict human behavior is important for better tactical and mission effectiveness. The continuum for applying knowledge of human behavior is broad. How we employ systems is just as important as the technology itself. This includes the full range of systems engineering (e.g., was the light beam the right color to be a warning?), but also, more broadly TTPs (e.g., were the tactics of employing the system effective?), RoE (Rules of Engagement – e.g., did the way we engaged allow for effective system employment?), cultural considerations (e.g., does the local culture influence the system's potential effectiveness?), and foundational psychology (e.g., did the extreme heat contribute to escalated tensions?). When the focus is on behavioral change and effective outcomes, then the full range of contributing factors needs to be considered. Likewise, a full range of creative and innovative solutions is possible. Often these innovative solutions offer a parsimonious solution as well. For example, if we know that extreme heat can make tempers flare, then perhaps tents and fans at a checkpoint or food distribution event would prevent aggressive escalation. Or, from basic psychology, if cameras are readily emplaced with signage highlighting their presence, perhaps aggressive escalation is prevented by reminding people of their personal identity and place in society (as well as knowing they could be identified and held accountable for their actions). Something as simple as a sign that clearly states a message can be extremely effective at very little cost – in this case, the challenge is not high-tech or expensive but having the awareness and foresight to know that such a

sign is needed. When we focus on the goal of changed behavior, a myriad of solutions presents themselves.

What We Know About Crowds

We now know that many old ideas about crowds do not correspond to the data.¹² Crowds are not homogenous, participants are not identical in motivation or behavior, and individuals neither lose their individuality nor benefit from some universal sense of anonymity. Rather, crowds are composed of small groups of people, “companion clusters,” who arrive, remain, and leave together.¹³ Nor are crowds uniquely distinguished by violence.¹⁴ Among the myriad crowds that gather every day for concerts, celebrations, or socializing, very few end in violence. Crowd participants can be influenced by or “catch” the emotions and behavior of others in the crowd, but this effect is conditional. The social identification of the individual determines this effect along with proximity.¹⁵

Research has also determined that security forces’ loss of legitimacy is often caused by a perceived mismatch between the severity level of a deployed weapon and the hostility level of those impacted.¹⁶ The resulting fear and anger from this and a few other processes can have dramatic effects on crowd behavior. Instead of losing their identities, crowd participants under these dynamics join into shared or new social identities that can pass emotions and create particular crowd dynamics.¹⁷ Threat and fear are two central emotions that have been linked to the outbreak of violence and can knit together disparate groups

¹² Clark McPhail, *The Myth of the Madding Crowd*, 1st Edition (Routledge, September 2017).

¹³ Benjamin Cornwell, “Bonded Fatalities: Relational and Ecological Dimensions of a Fire Evacuation,” *The Sociological Quarterly* 44, no. 4 (September 1, 2003): 617-638, <https://doi.org/10.1111/j.1533-8525.2003.tb00528.x>.

¹⁴ John M. Kenny et al., “Crowd Behavior, Crowd Control, and the Use of Non-Lethal Weapons,” Human Effects Advisory Panel Report of Findings (University Park, PA: Institute for Non-Lethal Defense Technologies Applied Research Laboratory, The Pennsylvania State University, January 1, 2001, https://live-cpop.ws.asu.edu/sites/default/files/problems/spectator_violence/PDFs/HEAP.pdf

¹⁵ Fergus G. Neville et al., “Self-Categorization as a Basis of Behavioural Mimicry: Experiments in The Hive,” *PLOS ONE* 15, no. 10 (October 30, 2020): e0241227, <https://doi.org/10.1371/journal.pone.0241227>; Clifford Stott, John Drury, and Steve Reicher, “On the Role of a Social Identity Analysis in Articulating Structure and Collective Action: The 2011 Riots in Tottenham and Hackney,” *The British Journal of Criminology* 57, no. 4 (July 2017): 964-981, <https://doi.org/10.1093/bjc/azw036>.

¹⁶ Clifford Stott et al., “Patterns of ‘Disorder’ During the 2019 Protests in Hong Kong: Policing, Social Identity, Intergroup Dynamics, and Radicalization,” *Policing: A Journal of Policy and Practice* 14, no. 4 (December 1, 2020): 814-835, <https://doi.org/10.1093/police/paaa073>.

¹⁷ Susan Aros, Anne Marie Baylouny, Deborah E. Gibbons, and Mary McDonald, “Toward Better Management of Potentially Hostile Crowds,” in *2021 Winter Simulation Conference (WSC)*, Phoenix, AZ, December 12-15, 2021, 1-12, <https://doi.org/10.1109/WSC52266.2021.9715452>.

in the crowd, generating a larger group with a stronger sense of self-efficacy. This larger group can pursue confrontational courses of action bolstered by numbers.¹⁸ However, these individuals do not lose their individuality and retain agency: some can and do leave the group if it does not match their view of the social identity. Therefore, while we can model it as an aggregate group, we must maintain the possibility of departure from group acts.

Behavioral Effects Science and Technology

The JIFCO has conducted ongoing research on the effects of IFCs on human behavior. Past and ongoing research is focused on two salient aspects: how human behavior can generally be influenced by IFCs, and the effects that each specific type of IFC will have on human behavior when employed. The elements of IFC and NLWs' human effects research involve identifying how human behavior can be influenced by IFCs, and the effects that each specific type of IFC will have on human behavior when employed relative to the goals of the mission.

In recent years the JIFCO has sponsored the development of an agent-based modeling capability (Workbench for refining Rules of Engagement against Crowd Hostiles – WRENCH) for these specific purposes. Simulation and experimentation using WRENCH will allow exploration of the possible NLW and ROE combinations to inform future NLW policy.

The Future of NLW Behavioral Effectiveness

Between systems engineering applications, tactical effectiveness, and mission effectiveness, understanding human behavior and being able to apply that knowledge is key. The objective of establishing a more robust agent-based crowd modeling simulation is to better understand the consequences of the use of NLW in crowd behavior. Responses of crowds to the use of IFCs are complex and difficult to predict; aspects of identity and group dynamics influence crowd response often unexpectedly. Agent-based crowd modeling and simulation has some science and technology challenges to work through. For example, aggregate behavior is a result of non-linear feedback processes, and crowds define a complex behavior system continuously evolving and operating at multiple scales simultaneously. It is essential to understand the motivating drivers of individual and social identity group behavior and how they change. How realistically the model represents the realities of things, such as identities, emotions, and social regularities, will determine its usefulness.

¹⁸ Randall Collins, "The Micro-Sociology of Violence," *British Journal of Sociology* 60, no. 3 (2009): 566-576, <https://doi.org/10.1111/j.1468-4446.2009.01256.x>; Anne Nassauer, "Situational Dynamics and the Emergence of Violence in Protests," *Psychology of Violence* 8, no. 3 (2018): 293-304, <https://doi.org/10.1037/vio0000176>; Norbert L. Kerr, "Illusions of Efficacy: The Effects of Group Size on Perceived Efficacy in Social Dilemmas," *Journal of Experimental Social Psychology* 25, no. 4 (July 1, 1989): 287-313, [https://doi.org/10.1016/0022-1031\(89\)90024-3](https://doi.org/10.1016/0022-1031(89)90024-3).

WRENCH models key physical, psychological, and social aspects of individuals and social identity groups that comprise a population in which crowds may form. Individuals have a dynamic interaction with their environment. When something changes, they can have immediate flashes of emotion. Those emotions can result in heightened action readiness which may or may not result in an immediate behavioral response since action readiness is a precursor for behavior but is not a determinant.¹⁹ Social contagion, a subtle influence of others in physical proximity, can also affect emotions. In addition to immediate emotional responses to an experience, emotion is known to be affected by cognitive interpretation of that experience. As discussed above, interpretations of actions of forces as being appropriate or excessive can affect fear and anger and contribute to changes in beliefs about the legitimacy of the forces. These emotional and cognitive processes heavily influence hostility levels. Many other factors come into play in driving behavior, such as the physical needs and injury levels of the individual, their personal goals or objectives, their sense of personal potency, and their social needs.

Social identities and social identity groups (SIGs) further influence crowd behavior. Individuals have social identities and may choose to join with others who have common identity(s) into a SIG that stays together and influences each other. In some cases, family membership will define a SIG, and other SIGs will form based on other social identities. These groups are not merely a sum of their component individuals, nor do they subsume the individuals into a single cohesive group. When a group forms, the individuals within retain their ability to react to the environment individually while also being influenced by the group. For modeling purposes, when a SIG first forms, it will initially take on the aggregate characteristics of the individual members, but as the members continue to react and adjust to their environment over time, the SIG changes more slowly; changes in individual members of a group do not instantly alter the group as a whole. The result is dynamic SIGs and individuals. Generally, people in a group will tend to stay in a group, but if an individual changes their objectives to the point where their objective, emotions, or beliefs differ drastically enough from the group, they may leave the group. Crowds demonstrate such dynamic changes as people and companion groups leave while others join. There are different motivators to join with others, such as shared objectives, fear, or the desire to protect someone. And just like individuals can group together, smaller SIGs can join with other smaller SIGs to create much larger groups while still retaining their own agency.

Within WRENCH, a security force interacts with the population. If a potentially hostile crowd forms, the force members will use IFCs according to the specified ROEs to manage the crowd, with required lethal oversight. Within WRENCH, the ROEs also include some information on TTPs. There are varying types of IFCs that can be issued to the force members and a variety of ROEs that can be used.

¹⁹ Nico H. Frijda, Peter Kuipers, and Elisabeth Ter Schure, "Relations among Emotion, Appraisal, and Emotional Action Readiness," *Journal of Personality and Social Psychology* 57, no. 2 (1989): 212-228, <https://doi.org/10.1037/0022-3514.57.2.212>.

Custom ROEs can also be defined. This allows the testing to explore the effects of a variety of IFCs, alone or in combination, under different ROEs. Different force configurations can also be specified, along with differing stances toward the population.

Since different types of crowd characteristics will change the expected crowd response,²⁰ WRENCH has functionality allowing the specification of a variety of population characteristics. These include not only population size, demographics, and initial SIG configurations but also numerous different attributes that could affect crowd response. The general stance of the population toward the forces and initial emotions, objectives, and beliefs can be configured along with other culture-specific details such as desired personal space.

The vision for the WRENCH simulation program is to gain insights into the operational and strategic implications of incorporating various NLWs into the force continuum under different ROEs. In the near term, the effects of using different TTPs for existing NLWs will be explored. Interactive engagement with WRENCH will increase understanding of the potential benefits of using different NLWs and ROEs in a variety of operational environments. Large-scale simulation and experimentation using WRENCH can help explore the possible NLW and ROE combinations and could inform future NLW policy. The JIFCO human effects team's research aims to offer demonstrative, foundational illustrations for NATO wargaming, planning, and employment of IFCs with a direct, immediate, and predictable impact.

Intermediate Force and NATO

Over the last 20 years, NATO has quietly and steadily built a strong foundation to begin the mainstreaming of intermediate forces. NATO—via the Science & Technology Organization and the Main Armaments Groups—has sponsored multiple initiatives, including a capabilities-based assessment. In addition, NATO Headquarters Emerging Security Challenges Division has supported several technology demonstrations and assessments. The NATO Industrial Advisory Group has conducted studies on non-lethal effects range extension, low-collateral damage effectors to counter small unmanned aerial systems, and the feasibility of scalable directed energy weapons from aircraft.

Under the NATO Army Armaments Group, the Joint NLW Capability Group is a permanent standing activity for standardization and related topics, including recent engagements with the NATO doctrine community on the doctrinal implications of IFCs. What is needed now—particularly in response to Russia's invasion of Ukraine, the prevalence of gray zone warfare, and NATO's enduring relevance on the world stage—is the strength of recognition by NATO and national

²⁰ Kathryn M. Zeitz et al., "Crowd Behavior at Mass Gatherings: A Literature Review," *Prehospital and Disaster Medicine* 24, no. 1 (January-February 2009): 32-38, <https://doi.org/10.1017/s1049023x00006518>.

leadership in the power of intermediate force as a complement to lethal force, making it a necessary component of NATO planning and preparedness.

Disclaimer

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