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INTERNATIONAL HUMANITARIAN LAW AS A DECISION FRAMEWORK IN TECHNOLOGY-MEDIATED WARFARE: EVIDENCE FROM SCENARIO-BASED DRONE DILEMMAS IN MILITARY EDUCATION

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Abstract: *Contemporary military operations are increasingly mediated by advanced technological systems that distance human decision-makers from the physical battlefield. The widespread use of unmanned aerial systems (UAS) and networked targeting processes raises complex ethical and legal questions regarding the application of International Humanitarian Law (IHL) in technologically mediated environments. This study examines how military cadets interpret and apply core IHL principles when confronted with scenario-based dilemmas involving UAS operations. By analyzing decision-making patterns in contexts characterized by operational ambiguity, the research explores whether IHL functions as an effective cognitive framework or remains primarily theoretical knowledge within military education. The findings contribute to broader debates on military ethics, remote warfare, and the role of education in sustaining humanitarian norms.*
Keywords: *International Humanitarian Law; drone warfare; military ethics; decision-making; scenario-based training; military education; UAS*

1. INTRODUCTION

Contemporary military operations are increasingly conducted through technological systems that place the human decision-maker at a distance from the actual target. The proliferation of unmanned aerial systems (UAS), networked sensors, and integrated target acquisition processes has transformed the way lethal force is perceived, assessed, and executed. In such environments, ethical judgment is less grounded in direct sensory experience and more reliant on mediated information, data streams, and probabilistic assessments processed within compressed decision cycles. Recent research on technology-mediated warfare environments shows that remote operations reshape cognitive engagement, situational awareness, and the conditions under which legal and moral reasoning takes place [1], [2]. Against this background, a central question for military education emerges: to what extent do legal and ethical norms remain cognitively active when combat is experienced primarily through a technological interface?

2. INFORMATION

To situate the ethical dilemmas raised by drone-enabled operations, it is first necessary to clarify how technological mediation reshapes the conditions of military decision-making and the relationship between ethical reasoning and legal normativity. The transformation of warfare through digital technologies has fundamentally altered the conditions under which military decisions are formulated and justified. The growing reliance on UAS, algorithmic data processing, and remote targeting mechanisms has reshaped not only operational practices but also the normative frameworks governing the use of force. In this evolving context, ethical

reasoning in military decision-making emerges at the intersection of legal normativity, technological mediation, and professional military judgment.

Military ethics is commonly conceptualized in the literature as a normative domain concerned with regulating the conduct of hostilities through principles such as civilian protection, proportionality in the use of force, and accountability for military actions[3], [4], [5]. In contemporary conflict environments, ethical reasoning is closely embedded within the legal framework provided by International Humanitarian Law (IHL), which translates moral imperatives into binding norms governing the conduct of hostilities. Rather than functioning as separate domains, legal and ethical considerations increasingly intersect in operational decision-making, as IHL principles are incorporated into doctrine, training, and professional military practice [3], [4]. By separating operators from the physical battlespace and integrating targeting into distributed socio-technical networks, drone operations reconfigure perceptions of operational risk and complicate the attribution of responsibility across the decision chain, with potential implications for moral engagement[1], [2]. These developments raise a central question for military ethics and education: how do future military professionals internalize and apply IHL principles as normative guides for decision-making in technologically mediated operational environments?

On this basis, the analysis must be anchored in the normative framework that governs the conduct of hostilities, since in armed conflict ethical judgment is operationally meaningful only insofar as it aligns with binding IHL principles.

The principle of distinction obliges parties to an armed conflict to differentiate at all times between civilians and combatants and to direct operations exclusively against legitimate military objectives. It represents a fundamental rule of International Humanitarian Law aimed at the protection of the civilian population and is widely recognized as a cornerstone of customary international law[6].

The principle of proportionality prohibits attacks expected to cause incidental civilian harm that would be excessive in relation to the concrete and direct military advantage anticipated. Its application requires contextual judgment, as decision-makers must assess anticipated military gain against potential civilian harm under conditions of operational uncertainty [7]. Legal scholarship has consistently underlined that the application of proportionality involves contextual judgment rather than a purely technical calculation, requiring interpretation and assessment of anticipated military advantage and potential civilian harm [8].

The obligation to take precautions in attack further reinforces the protective logic of International Humanitarian Law. Parties to a conflict are required to take all feasible measures to minimize incidental civilian harm and to cancel or suspend attacks when circumstances change [7], [9]. This requirement reflects the dynamic character of contemporary military operations, where decisions must often be reassessed in response to evolving operational conditions and emerging information [4]. In technologically mediated warfare, where intelligence collection, targeting, authorization, and execution are often dispersed across complex socio-technical networks, attributing responsibility becomes increasingly intricate [2], [10].

These principles demonstrate that IHL functions not only as a legal regime but also as a normative structure shaping ethical orientation within military institutions.

Drone warfare has significantly reshaped the spatial, temporal, and cognitive dimensions of military operations. Unlike traditional combat, drone operations are characterized by physical distance between operators and targets, reliance on digitally mediated information, and distributed chains of decision-making involving multiple human and technological actors[1], [2]. These characteristics have generated divergent interpretations regarding the ethical implications of remote warfare. Some scholars suggest that physical and psychological distance may contribute to forms of moral detachment, potentially influencing how operators perceive

the consequences of military action [1], [2]. Others argue that the use of drone technologies may support compliance with International Humanitarian Law by enabling more precise targeting and potentially reducing incidental harm, thereby reinforcing certain humanitarian constraints on the use of force [11]. As decision-making processes become distributed across operators, commanders, intelligence analysts, and technological systems, accountability may become more diffuse and increasingly difficult to attribute within complex socio-technical decision chains [2], [10]. This evolution challenges classical understandings of military responsibility and raises important questions regarding how IHL principles are interpreted and operationalized within technologically mediated operational environments [2], [3], [4], [10].

Military education plays a decisive role in shaping the ethical and legal orientation of future military professionals. Beyond technical training, military academies function as institutional environments in which legal norms, ethical values, and professional identities are systematically transmitted and internalized.

Research in moral psychology indicates that ethical reasoning develops through cognitive processes shaped by education, socialization, and contextual experience [5], [12]**.** Within military contexts, scenario-based training has been identified as an effective method for developing decision-making under complex and morally ambiguous operational conditions, as it exposes learners to situations requiring the balancing of mission imperatives, risk, and legal constraints [13]. In technologically mediated warfare, the integration of ethical and legal instruction into technical military education becomes particularly significant. Consequently, analyzing cadets' responses to scenario-based dilemmas involving drone warfare offers a relevant empirical approach to assessing how IHL principles are internalized within military education.

Within this educational and normative context, "ethical orientation" can be specified as an observable form of ethical–legal reasoning, which becomes empirically accessible when abstract IHL obligations are translated into realistic scenario-based decision problems.

3. MATERIALS AND METHODS

The present study empirically examines how cadets from the "Nicolae Bălcescu" Land Forces Academy apply the principles of IHL when confronted with scenario-based dilemmas involving UAS operations and targeting processes. By analysing decision-making patterns in contexts characterized by operational ambiguity, the study seeks to determine whether IHL principles function in practice as effective reference points guiding military judgment in technologically mediated environments, rather than merely as a body of theoretical knowledge. Consequently, the findings are relevant not only for military pedagogy but also for broader debates on autonomy, remote warfare, and the continued relevance of humanitarian norms in digitally transformed battlefields. The main objective is to assess the extent to which students of the "Nicolae Bălcescu" Land Forces Academy apply the core principles of IHL-distinction, proportionality, precautions in attack, and responsibility [1]-when responding to ethical dilemmas derived from contemporary digitally mediated military operations involving unmanned systems.

The research design is comparative and based on a non-probabilistic purposive sample including two groups of students situated at different stages of training and exposed to distinct curricular experiences. The first group consists of all first-year students enrolled in the Military Leadership (ML) specialization (N = 79), representing the complete cohort of that specialization at the time of data collection, irrespective of its internal demographic and educational composition. The second group includes all third-year students enrolled in the Technical Systems Management (TSM) specialization (N = 49), representing the complete cohort of that specialization at the time of data collection, irrespective of its internal demographic and educational composition, none of whom had received curricular instruction specifically related to the use of unmanned aerial systems.

The inclusion of cadets from different educational stages and specializations was

intentional and directly aligned with the core objective of the study, namely, to examine whether International Humanitarian Law (IHL) principles function as operational cognitive decision frameworks in technologically mediated military contexts, rather than solely as theoretical knowledge acquired through formal legal instruction.

Through this comparison, the study seeks to identify differences in decision-making patterns associated with exposure to academic training related to unmanned systems, without formulating causal claims regarding the direct effect of specific courses on ethical decision behavior.

To examine ethical judgment in contemporary military contexts, a set of four scenario-based dilemmas was developed. Each dilemma operationalizes a fundamental principle of IHL as applicable to digitally mediated warfare. The scenarios were designed to reflect realistic operational environments characterized by incomplete information, civilian presence, dynamic tactical conditions, and remote targeting processes. These core principles and obligations of International Humanitarian Law, as codified in Additional Protocol I to the Geneva Conventions, include distinction (Article 48 AP I), proportionality (Article 51(5)(b) AP I), precautions in attack (Article 57 AP I), and command responsibility (Articles 86–87 AP I) [14]. Each of these principles was operationalized through a corresponding scenario-based ethical dilemma, ensuring a direct conceptual linkage between legal norms and empirical assessment. For analytical purposes, the responses were subsequently coded according to their alignment with reasoning consistent with IHL.

Participants' responses to each dilemma were recorded on a four-option ordinal scale, each option reflecting a distinct course of action. The study also incorporated sociodemographic and educational variables, including gender, area of origin (urban/rural), and military educational program.

The structure of the research instrument allows for the empirical examination of how IHL principles are integrated into military decision-making processes in technologically mediated operational settings, offering an applied approach to the relationship between military education and operational legal–ethical orientation.

Data analysis was conducted using descriptive statistical techniques aimed at identifying response distributions and patterns across the four scenario-based dilemmas. Given the comparative nature of the research design, the analytical strategy focused on examining how decision options were distributed across groups with different educational exposures and sociodemographic characteristics. Frequency distributions and percentage tables were used to identify dominant response patterns for each dilemma. Cross-tabulation analysis was employed to explore associations between dilemma responses and participant characteristics, including gender, area of origin (urban/rural), and educational program. This approach allows for the identification of differences in ethical–legal reasoning patterns without assuming causal relationships between variables. Responses were interpreted through the perspective of alignment with IHL-consistent reasoning.

Dilemma 1 (Distinction Principle)

As shown in Table 1, response option 2 was predominant across the entire sample, indicating a general tendency to postpone engagement in situations of uncertainty.

Table 1

Distribution of cadets' responses to Dilemma 1 (Distinction principle) by gender, area of origin, and study program (percentages).

Variable	Category	1. Authorizing the strike based on pattern-of-life analysis.	2. Delaying engagement until hostile intent or direct participation in hostilities is clearly established.	3.Executing the strike because the individuals are armed and located in an area of operations.	4.Delegating the decision to the drone operator based on real-time assessment
Gender	Male	15.0	**76.0**	3.0	6.0

	Female	10.3	**58.6**	13.8	17.2
Urban/rural area	Urban	13.0	**70.0**	7.0	10.0
	Rural	12.0	**68.0**	9.0	11.0
Program	ML	16.9	**75.9**	2.4	4.8
	TSM	8.7	**65.2**	10.9	15.2

This convergence toward delaying engagement under ambiguous intelligence conditions reflects the operational application of the IHL presumption of civilian status in situations of doubt, suggesting that the distinction principle is not merely recognized conceptually but appears to guide decision-making behaviour under uncertainty. Among male students, 76.0% selected option 2, compared to 58.6% of female students. Female respondents showed a higher dispersion toward alternative responses, with 13.8% selecting option 3 and 17.2% option 4. Differences by educational program were more pronounced. While 75.9% of ML students selected option 2, this proportion decreased to 65.2% among MTS students. At the same time, MTS students selected options 3 and 4 at higher rates. Rather than indicating weaker alignment with IHL, this broader distribution among MTS students may reflect greater sensitivity to operational ambiguity and a more differentiated assessment of situational variables, suggesting that exposure to technical-system training may encourage more context-dependent interpretation of targeting conditions. When analyzed by area of origin, both urban and rural students demonstrated similar response patterns, indicating that social background exerts limited influence on distinction-related decision patterns in this context.

As a full picture, all the results suggest that the principle of distinction functions as a dominant decision anchor across the sample, while educational background appears to influence the degree of variability and situational differentiation in its operational interpretation.

Dilemma 2 (Proportionality Principle)

As can be observed in Table 2, option 3—reflecting the cancellation or postponement of an attack when anticipated civilian harm is excessive—was the most frequently selected response across all subgroups. This dominant selection indicates that respondents generally recognized the need to balance anticipated military advantage against foreseeable civilian harm, suggesting that proportionality is operationalized as a comparative judgment rather than as a fixed rule.

Table 2

Distribution of cadets' responses to Dilemma 2 (Proportionality principle) by gender, area of origin, and study program (percentages).

Variable	Category	1. Approving the strike due to the strategic importance of the target.	2. Approving the strike if collateral damage remains within Rules of Engagement (ROE) limits.	3. Delaying or cancelling the strike if the anticipated civilian harm is excessive in relation to the concrete military advantage.	4. Executing the strike to maintain operational initiative and deterrence.
Gender	Male	4.0	21.0	**70.0**	5.0
	Female	0.0	37.9	**55.2**	6.9
Urban/rural area	Urban	2.0	28.0	**63.0**	7.0
	Rural	3.0	26.0	**65.0**	6.0
Program	ML	3.6	19.3	**72.3**	4.8
	TSM	2.2	34.8	**56.5**	6.5

Among ML students, 72.3% selected this option, compared to 56.5% of MTS students. Notably, 34.8% of MTS students selected option 2, compared to only 19.3% of ML students, indicating a broader distribution of proportionality-related judgments among the MTS group. Gender-based differences reinforce this pattern. While 70.0% of male students selected option 3, this proportion decreased to 55.2% among female students, who more frequently selected option 2 (37.9%). Analysis by area of origin revealed largely comparable distributions between urban and rural students, indicating that proportionality judgments were relatively consistent regardless of social background.

As an integrated perspective, these findings suggest that proportionality reasoning functions as a shared normative reference across the sample, while educational exposure appears to influence how rigidly or flexibly that principle is applied in complex targeting contexts.

Dilemma 3 (Precautions in Attack Principle)

As shown in Table 3, a strong convergence toward option 2—suspending or cancelling the strike and reassessing the situation—can be observed across the sample.

Table 3

Distribution of cadets' responses to Dilemma 3 (Precautions in attack principle) by gender, area of origin, and study program (percentages).

Variable	Category	1. Continuing the strike, since the target remains legitimate.	2. Suspending or cancelling the strike and reassessing timing or alternative means of engagement.	3.Accelerating the strike before the number of civilians increases.	4 Shifting the aim point to reduce civilian risk, even at the cost of reduced accuracy.
Gender	Male	3.0	**70.0**	6.0	21.0
	Female	6.9	**65.5**	6.9	20.7
Area of Origin	Urban	4.0	**69.0**	6.0	21.0
	Rural	5.0	**67.0**	7.0	21.0
Program	ML	1.2	**73.5**	4.8	20.5
	TSM	8.7	**60.9**	8.7	21.7

This dominant response indicates that respondents generally recognize the IHL obligation of constant care and the requirement to reassess an attack when new civilian presence alters the operational context.

The precautionary principle therefore appears to function as a dynamic decision rule, activated in response to changing battlefield conditions rather than applied as a static procedural formality. Among ML students, 73.5% selected option 2, compared to 60.9% of MTS students. At the same time, MTS students selected alternative precaution-related options (options 1 and 3) at higher rates. Gender differences were less pronounced but still visible. While 70.0% of male students selected option 2, the proportion decreased slightly to 65.5% among female students, who displayed marginally higher dispersion across alternative responses. Differences by area of origin were minimal, with urban and rural students exhibiting nearly identical distributions.

These findings suggest that the precautionary principle operates as a shared operational safeguard in dynamic targeting scenarios, while educational background appears to influence the range of precautionary interpretations considered under time pressure.

Dilemma 4 (Responsibility and Accountability Principle)

As shown in Table 4, most respondents attributed responsibility beyond the individual drone operator, with option 3—assigning responsibility to the broader chain of command - emerging as the dominant response.

Table 4

Distribution of cadets' responses to Dilemma 4 (Responsibility and accountability principle) by gender, area of origin, and study program (percentages).

Variable	Category	1. The drone operator, for executing the strike.	2. The commander who approved the engagement.	3. The chain of command, including intelligence, targeting, and authorization structures.	4. No one, because modern warfare is too complex to assign responsibility.
Gender	Male	6.0	23.0	**69.0**	2.0
	Female	3.4	31.0	**65.5**	0.0
Area of Origin	Urban	5.0	25.0	**68.0**	2.0
	Rural	4.0	29.0	**65.0**	2.0
Program	LM	6.0	13.3	**79.5**	1.2
	TSM	4.3	45.7	**47.8**	2.2

Among ML students, 79.5% selected option 3, compared to 47.8% of MTS students. However, MTS students showed a markedly higher tendency to select option 2 (45.7%), compared to only 13.3% of ML students. This pattern may reflect different emphases in interpreting responsibility: ML students appear to adopt a more doctrinally centralized view aligned with command responsibility, while MTS students may interpret accountability in more function-specific terms, focusing on the immediate decision authority within the operational chain. Gender-based differences were relatively small. While 69.0% of male students selected option 3, the proportion decreased slightly to 65.5% among female students, who again displayed a somewhat more diversified response pattern. This limited variation suggests that the principle of distributed responsibility is broadly internalized across the sample, with individual differences affecting the level of abstraction at which accountability is assigned rather than the recognition of responsibility itself. Analysis by area of origin revealed only minor differences between urban and rural respondents, reinforcing the finding that social background exerts limited influence on perceptions of accountability under IHL.

These results indicate that responsibility in technologically mediated warfare is generally understood as collective and structured, while educational exposure appears to shape how respondents conceptualize the distribution of accountability across the decision-making architecture.

4. DISCUSSION AND RESULTS

The results across the four dilemmas reveal a consistent pattern: respondents' decisions largely align with core principles of International Humanitarian Law, even when those principles are not explicitly referenced in the scenario wording. This suggests that IHL principles function not only as formal legal norms, but also as practical decision-guiding references embedded in the cognitive frameworks of military trainees. In situations characterized by uncertainty, incomplete information, and dynamic operational change, these principles appear to operate as stabilizing heuristics that structure judgment under pressure.

The principle of *distinction* emerged as a dominant decision anchor in ambiguous targeting conditions, with most respondents demonstrating caution consistent with the presumption of civilian status. At the same time, variations between educational groups indicate differences in how this principle is operationalized—either through more standardized rule-based reasoning or through more context-sensitive interpretation.

Similarly, *proportionality* was not treated as a rigid prohibition but as a comparative evaluative process, suggesting that trainees understand the need to balance military advantage against civilian risk rather than applying legal norms mechanically. This indicates that proportionality reasoning is integrated into operational thinking

as a judgment process rather than as a checklist item.

The third dilemma demonstrated that *precautionary reasoning* is widely internalized as a dynamic obligation. The willingness to suspend or reassess attacks when civilian presence changes confirms that the precautionary principal functions as a mechanism for adaptive decision control in rapidly evolving tactical contexts.

The results related to *responsibility* further reinforce this interpretation. The predominant attribution of accountability to the broader chain of command reflects an understanding of decision-making as distributed across multiple actors within a structured system, consistent with the doctrine of command responsibility. Educational exposure appears to influence the degree of variability in interpretation rather than the presence or absence of legal–ethical reasoning. Students with different training profiles do not reject IHL principles; instead, they appear to operationalize them with different levels of contextual flexibility. These patterns suggest that formal military education may contribute not only to knowledge acquisition but to the internalization of legal norms as practical cognitive tools. This has implications for how ethics and IHL are integrated into curricula related to emerging military technologies. In technologically mediated warfare—where direct sensory feedback is reduced, and decisions rely on mediated information—such internalized legal frameworks may play a crucial role in maintaining normative restraint and structured accountability.

5. CONCLUSIONS

The present study examined how military cadets apply core principles of International Humanitarian Law (IHL) when confronted with ethically and operationally complex dilemmas characteristic of technologically mediated warfare environments involving unmanned aerial systems and distributed decision architectures.

The findings demonstrate a consistent pattern of alignment with fundamental IHL principles - distinction, proportionality, precautions in attack, and responsibility - across the entire sample. This convergence suggests that IHL does not function solely as abstract doctrinal knowledge but operates as a practical cognitive framework guiding decision-making under conditions of uncertainty, incomplete information, and operational ambiguity. These results indicate that legal–ethical reasoning remains operationally relevant even in contexts where combat is experienced through technological mediation rather than direct physical engagement.

Importantly, the comparative design of the study, which included cadets from different educational stages and specializations, provides additional insight into the relationship between military education and ethical decision-making. The presence of IHL-consistent reasoning across both groups suggests that the internalization of humanitarian norms may emerge not exclusively through formal legal instruction but also through broader processes of professional military socialization, institutional norms, and integrated ethical training. At the same time, observed differences between educational programs were primarily reflected in the degree of variability and contextual flexibility of interpretation, rather than in the acceptance or rejection of IHL principles. This finding indicates that educational exposure may influence how legal norms are operationalized in complex technological environments, while their normative authority remains broadly recognized.

These empirical patterns provide direct support for strengthening the integration of IHL within military education, particularly in domains related to emerging defense technologies. The results suggest that when legal and ethical principles are embedded within professional training environments, they can function as effective decision-guiding structures even in technologically mediated operational contexts.

Based on these findings, several recommendations can be formulated to enhance the effectiveness of military education and training:

First, IHL principles should be systematically integrated into technology-oriented military curricula, particularly in courses addressing unmanned aerial systems, artificial intelligence, and digitally mediated targeting processes. Embedding legal–ethical reasoning within technical and operational instruction can

strengthen the ability of future military professionals to apply humanitarian norms in real-world operational contexts.

Second, scenario-based ethical training should be expanded and incorporated across multiple stages of military education. Scenario-based methods provide opportunities for cadets to engage in structured ethical reasoning under conditions of uncertainty, thereby reinforcing the practical applicability of legal norms in operational decision-making.

Third, military education programs should explicitly address the distributed nature of responsibility in technologically mediated warfare environments. Training should emphasize the role of command structures, intelligence validation processes, and authorization chains in shaping accountability, thereby reinforcing a systemic understanding of responsibility consistent with contemporary operational realities.

More broadly, the study contributes to ongoing debates regarding the ethical and legal implications of emerging defence technologies. As military operations become increasingly mediated by digital systems, ensuring that legal and ethical principles remain operationally effective becomes a critical institutional responsibility. The findings suggest that appropriately designed military education can play a central role in sustaining compliance with International Humanitarian Law while supporting responsible and accountable decision-making in technologically transformed operational environments.

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Dreptul Internațional Umanitar ca bază de decizie în războiul mediat de tehnologie: dovezi din dilemele scenariilor de utilizare a dronelor în educația militară

Rezumat: Operațiile militare contemporane sunt tot mai mult mediate de sisteme tehnologice avansate, care distanțează factorii decizionali umani de câmpul de luptă fizic. Utilizarea pe scară largă a sistemelor aeriene fără pilot (UAS) și a proceselor de țintire integrate în rețea ridică probleme etice și juridice complexe privind aplicarea Dreptului Internațional Umanitar (DIU) în medii mediate tehnologic. Acest studiu examinează modul în care cadeții militari interpretează și aplică principiile fundamentale ale DIU atunci când se confruntă cu dileme bazate pe scenarii care implică operații UAS. Prin analiza tiparelor de luare a deciziilor în contexte caracterizate de ambiguitate operațională, cercetarea explorează dacă DIU funcționează ca un cadru cognitiv eficient sau rămâne în principal la nivelul cunoașterii teoretice în cadrul educației militare. Rezultatele contribuie la dezbateri mai largi privind etica militară, războiul la distanță și rolul educației în menținerea normelor umanitare.

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