

Integrating Wargaming into the Canadian Operational Planning Process: An Experimental Approach

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Abstract

The rapidly evolving modern combat space presents military institutions with increasing uncertainty as to the success or failure of their force concepts and designs. Emerging and novel capabilities such as autonomous systems, sophisticated information related capabilities (IRCs), and artificial intelligence, in addition to an ever more multivariate operating environment, requires re-evaluation of the planning process and the need for rigorous and informed debate on the conduct of modern operations. Wargaming is a crucial tool by which militaries assess their decision-making concerning conduct of tactics, techniques, and procedures, but remains underutilized for harmonizing modern Command and Control (C2). In contrast to other uses of wargaming, experimental wargames focus on hypothesis testing, enabling the creation of concrete examples and case studies of future operating environments. These assist in indicating what the employment of new capabilities on the modern battlefield will look like and ground discussion under a set of common rules. This paper will explore the theoretical background of experimental wargaming and describe the benefits it holds for the modern joint planning process. It proposes that forces be open to experimental wargaming as a tool to explore future scenarios and new approaches, foster healthy debate across ranks and services, and encourage increased involvement of military members in the too often obscured wargame design process.

1 OF WAR AND REASON

War is a problem marked by indeterminacy, defined by those conditions so complex we require alternative means to deal with their imprecision [1]. War cannot be fully understood, systematized, and made into a logical set of practical certainties; it is a political accelerant that ignites entire systems of governance, forming the crucible for violent rapid change. History has seen what happens when war occurs 'as the philosophers thought it should'. Enlightenment wars saw line infantry move in perfect rows; to them war was beautiful, orderly, and conducted by those of 'the most sublime faculty of mind, to reason' [2] (145) yet always to the heavy cost of human life. Since the wars of the enlightenment, individual brilliance in warfare has been outweighed by an opposing institutional intelligence, a common understanding and language that comprehended the issue of war, adapting to its constant flux, the ever evolving political, societal, and economic chimera that it is. To quote Nolan:

"We walk the knife edge always between misunderstood lessons of wars past and new mistakes waiting to be made by the next generation, which will not remember real war and might think it would like to try it." [2] (P581)

War has no reason, aside from understanding of the reasoning behind its conduct. It involves a series of decisions based on hypotheses regarding activity and effect, with the culmination of those effects leading to desired 'end states'. We want to win wars, not battles. To do so, we need to have debates within institutions that create knowledge about war without war's cost, not depend on the innate brilliance of individuals in the heat of the moment to answer the right questions.

For such reasons, wargames are a primary element of knowledge building in military research, creating artificial experiences in which players can make safe-to-fail decisions. In wargame environments, players form hypotheses about how their actions will impact the game state and how they can achieve victory using the tools at their disposal. By facilitating this type of iterative reasoning, wargames lay the groundwork for healthy debate, invigorated by competition that rewards creative thinking.

As a C2 function, the wargame is a central enabler to developing an informed and practical operational course of action (CoA). Its ability to explore complex emergent systems, encourage healthy discussion, and engage its designers in the investigation of diverse subject matter allows planners to not only understand the moving

pieces of a plan, but the decision-making considerations that go into both executing and countering a plan. This is distinct from standard forms of analysis that attempt to rationalize decisions through review of reports or other intelligence, being an experiential activity that requires all participants to not only know subjects, but to understand how to act on them. Yet for all wargaming's benefits, it remains seldom used in Canadian military circles to support the Operational Planning Process (OPP). In a statement that echoes as much in Canada as it does in the UK, Mouat notes that "in almost all cases, wargaming is practiced by a self-taught minority, informed by their individual career progressions and lacking a wider view that a formal professional education could provide." [3] Wargaming needs to become an inclusive tool that is readily available for understanding operational problems and used appropriately and wherever appropriate.

The following concept paper explores 'experimental wargaming', defined as a wargame built upon experimental objectives that test hypotheses and create case studies which provide internally valid perspectives on modern and future operating environments. The paper will first discuss wargaming as an epistemology, identifying its strengths and weaknesses. It will then outline wargaming's foreseen role in the Canadian OPP as an example of a key doctrinal planning process, discussing the challenges this presents. Finally, a proposed concept of further integrating wargaming in the OPP will be described, concluding on the steps that can be taken to utilize wargaming more often and effectively within planning processes in order to adapt within complex systems.

2 'WE WARGAME BECAUSE WE MUST'

"There are certain warfare problems that only gaming will illuminate", to quote Rubel. [1] Warfare as a problem does not have a solid structure in the context of a complex environment, meaning significant aspects are little known or understood and cannot be defined through fully systematic means. This is not to say that parts of warfare cannot be systematized. Standard Operating Procedures (SOPs), the technical specifics of arms and equipment, or the posture of forces may be known, and in high detail. For complicated problems involving only these known aspects, expert analysis is generally sufficient. However, in a complex system where there is a confluence of understood and unpredictable variables, individuals are left with a situation defined by events can only be explained in retrospect. This is where experiments are required in a safe-to-fail context to understand emergent patterns in a system [4].

Wargaming is defined by its focus on decision-making within a competitive environment. Players make decisions about strategies and react to other player decisions made, with success or failure being real possibilities [5]. It is an unstructured tool to visualize relationships between the different aspects of an unstructured problem, creating a map of a system based upon the variables present in the scenario. This allows for exploration of how humans interpret and act on information, while providing the results of those interactions.

A wargame involves players having the agency to interact with and affect the course of events in a shared narrative; without such agency an activity cannot be called a wargame. It therefore differs from other military research techniques, notably operations (or campaign) analysis and military exercises, due to its primarily qualitative outputs as well as the uninvolvement of actual military forces. While operations analysis utilizes expected values inputted into models and simulations to provide quantitative results as to what will happen, a wargame provides qualitative indications of how and why it could happen based on a series of decisions made. Exercises, alternatively, rely on the use of real forces in real-time to demonstrate quantitative measures of performance. In contrast, a wargame can occur across any amount of 'simulated' time and provide qualitative assessment of human decisions [6]. The value of wargaming thus lies in its unpredictability: "One thing a person cannot do, no matter how rigorous his analysis or heroic his imagination, is to draw up a list of the things that would never occur to him." [7] It is as such a uniquely exploratory tool.

This paper recognizes that wargaming encompasses a vast variety of methodologies and practices, both professional and consumer. Fundamentally, experimental wargaming distinguishes itself by its use of experimental design, using deductive reasoning to validate general theories of warfare with data collected from specific scenarios. This contrasts with observational games that inductively generate hypotheses and unveil the full range of possibilities that could occur [8]. This distinction is important, as experiments are fundamentally about creating internal validity, or answering hypothesis soundly within the confines of the experiment. Research that follows will then have external validity if the answers obtained are generalizable outside of the experimental context [8].

2.1 LIMITATIONS OF WARGAMES

For all its uses, wargaming is not a 'silver bullet' for answering all operational questions. It is a tool with

specific purposes and cannot solve all operational questions. The UKMOD wargaming handbook [8] outlines four key limitations of wargames relevant to this paper:

- Wargames are not ‘generally’ reproducible: Due to their inherent unpredictability and dependence on player decision-making, a wargame will never occur the same way twice. This is the case even if the same starting conditions and players are assembled, as players behavior will change based on lessons learnt from the last game.
- Wargames are not quantitative: Wargames are stochastic tools [6] as they do not produce expected values in most circumstances. Notwithstanding the inclusion of a mathematical system of adjudication, the outcome will vary from game to game based on the decisions taken by its participants. Instead of providing definite answers as to the interactions between variables, they produce insights into a problem.
- Wargames are not predictive: While demonstrating the possible outcomes that might occur, a wargame cannot prove a method works or predict the future. The benefit of a wargame is that they indicate a potential future that delivers lessons and new considerations.
- Wargames are only as good as its participants: If the participants in a wargame are uninformed to the subject matter or not acting in good faith to the goal of the activity, the wargame’s value may be minimal.

In addition to these, a concern, particularly amongst US practitioners, is in their practical difficulties; namely their cost [10]. High costs are due to wargames becoming increasingly associated with whole-of-government efforts, where operators, policy advisors, and even high-level decision-makers are seen as required to fulfil a ‘successful’ activity. High costs are also due to a propensity to include multiple rigorous adjudication techniques that may involve strenuous modelling and simulation and require additional staff to manage. Facilitators are furthermore required for a large player audience whose familiarity with typical wargaming mechanics, such as combat result tables or other common adjudication techniques, is usually low. Growing facilitation requirements restrict multiple play-throughs, potentially disallowing more developed insights into the subject. However, as will be later discussed, such

elaborate wargames are usually not necessary nor entirely productive, especially in the domain of planning.

While most of the limitations listed above cannot be fully addressed through a modification of wargame practice, they are indicative of the type of tool that wargaming represents. To reiterate, a wargame is fundamentally about decisions, and answering why, under set conditions, players will embark upon specific courses of action; it thereby uncovers relationships between otherwise unknown connected variables.

1.1 APPLYING EXPERIMENTAL WARGAMING

The consideration of utilizing experimental wargames is that the design must reflect the objective: to answer the hypothesis and provide internal validity to the activity. Rubel et al. note that for wargames to be classified as experimentation, their mechanics must not constitute an intervening variable in the experiment and ideally, but not necessarily, support multiple iterations [9].

In applying this scientific methodology to wargaming, Perla et al. [11] distinguishes three types of experimentation:

- Experiments designed to *explore* new ideas or phenomena;
- Experiments designed to *test* hypotheses;
- Experiments designed to *demonstrate* new concepts and their feasibility (or lack thereof).

Exploring, testing, and demonstrating lend themselves to an iterative process, where a series of games provides different forms of experimental knowledge to later be validated through external research. A subject that is not well understood, such as the role of social media on operational effectiveness, could be suitable for such an exploratory wargame. Once the subject is understood, hypotheses can be formulated about how to approach the issue in a more refined way, with specific independent and dependent variables tested repeatedly. Lastly, when a hypothesis has been tested and has internal validity, it can be further refined into a rigorous and detailed design, potentially using modelling and simulation. This process can be described as iterative experimentation, conducting increasingly rigorous wargames that lend themselves to an experimental research process.

2 WARGAMING IN THE OPERATIONAL PLANNING PROCESS

The Canadian Forces (CF) OPP is a structured process for determining the optimal method of accomplishing an assigned operational task and plan possible future tasks [12]. This paper explores the inclusion of experimental

wargaming in the OPP's deliberate planning as an analytical tool to understand and outline complex systems. The OPP's crisis planning process was not considered due to its time constraints. The OPP itself is divided into five stages:

1. Initiation: The OPP is triggered when a situation has changed sufficiently to present an operational problem requiring analysis and resolution.
2. Orientation: Analysts and operators build an understanding of the problem. This includes understanding the operating environment, the nature of the problem itself, the intent of command, success conditions, what tasks will be required to achieve success, and a mission statement.
3. Course of Action (CoA) Development: Multiple options to solve the problem are developed known as a CoAs. Each is a hypothesis that seeks to answer the problem question but remains untested and underdeveloped. During this process, CoAs are tested against one another by assessing available means to carry out the CoA and the potential actions of the enemy.
4. Plan Development: A CoA is selected and developed into a plan for execution. Issues or shortfalls are identified at this stage. Lastly, branch-plans, contingencies for changing force posture during the unfolding of operations, and sequel-plans, subsequent plans that carry on from the success of the operation.
5. Plan Review: The implementation of the plan into an operation will be monitored to see if it is still relevant and effective. This could result in minor changes or a reinitialization of the OPP.

Process [13]

Wargaming is sparsely mentioned in the 2008 CF OPP, noted as relevant only during stage three, to refine ideas into CoAs, and stage four, where a 'plan wargame' will be conducted to visualize all moving pieces of the operation [13].

Otherwise, the only official documentation of a role for wargaming in the OPP is from the Canadian Army, which describe wargaming's role in more detail. In its view, the purpose of a wargame in the OPP is to "enable the Commander and staff to visualize an operation or its critical parts," correctly noting that wargaming does not predict future outcomes but helps visualize the problem [12]. When describing the process of developing and implementing the wargame, official documentation seemingly exasperates some of the limitations of wargames. The following describes these limitations.

2.2 UNCLEAR AND BOUNDED GAME METHODS

Official guidance lists three methods to conduct a wargame:

- Avenue in Depth: The wargame examines one approach at a time.
- Belt Method: The wargame divides events between belts that crossect the operating area laterally.
- Box Method: The wargame focuses on events in specific locations and does not examine the entire front.

What is noticeable about these methods is they are not wargaming methodologies, but elements of the scenario. The specified methodology for conducting a wargame in this context is referred to in professional circles as a 'seminar game'. A seminar wargame is defined as a structured discussion between experts and is more of an exploratory analysis rather than an experimental activity. It builds understanding of what can happen, rather than the reasons why something could happen, the latter facilitating a deeper understanding of the situation required by planners [14]. As such, other forms of wargames would be more helpful for planning, depending on operational requirements. Experimentation's focus on understanding internal validity and human decision-making seemingly lends itself well to understanding operational dynamics. Why an enemy may choose a certain CoA over another provides more helpful information pertaining to the success of an operation than an exploration of the multitudes of potential outcomes. These types of experimentation also lend themselves well to including other factors that are prominent in modern wars, such as

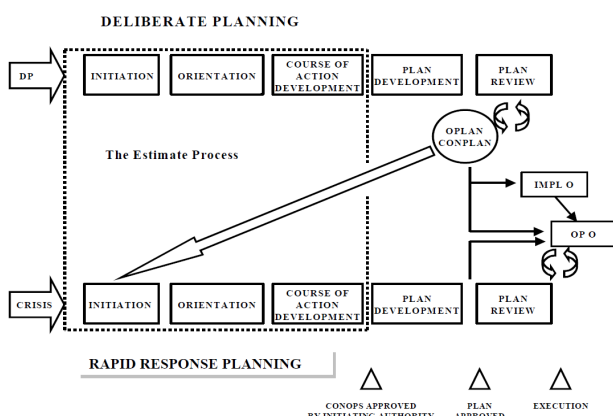


Figure 1: The Rapid Response and Deliberate Planning

inclusion of emergent technologies, irregular warfare, and the role of information. The suggested method in the OPP is suitable to providing an overview of the operation but has difficulties answering how complex systems featured in modern battlefields impact the plan [15].

2.3 SIZE AND SCOPE OF ACTIVITY

Staffing requirements for these wargames relate to an issue with wargames described earlier: they tend to become too large to be successfully utilized often or at all effectively. Canadian Army guidance lists 12 different teams/positions, with members being sourced from across a unit's headquarters including from the Chief-of-Staff office. This communicates that wargames require substantial turnout to be successful when this is usually not the case. A wargame can be initially contained to a small group of analysts and expanded as the problem becomes clearer, developing across iterations.

Another issue is that the scope identified is generally kept to either combat operations or 'stability operations'. There is no guidance to either limit the variables to what is essential for answering the operational hypotheses or how to include non-combat variables, such as the role of local populations, economic variables, and political dynamics.

2.4 LIMITED ROOM FOR ITERATION:

Due to the bounded game methodology and scope guidelines, there remains little room for iteration of a wargame during the planning process. This is primarily due to the wargame being represented as a decision-point, rather than a process which develops alongside the planning process itself.

3 INTEGRATING EXPERIMENTAL WARGAMING INTO OPERATIONAL PLANNING PROCESS

Military planning ultimately requires tools that can help understand indeterminant problems and complex environments. As discussed, wargaming provides such a tool, permitting visualization of the multiplicity of relationships between variables in operations. There remains a perception that wargames are logistically difficult to accomplish. However, wargaming, to be genuinely useful for military planning, should not consistently require massive sums of resources, complex simulations, or months of planning. Such large-scale games have their uses, but they do not reflect the entirety of gaming techniques available to explore problems.

This paper proposes experimental wargaming specifically as a way to further enhance planning and recommends two methodological approaches to ensuring its successful implementation.

The first approach is to treat an experimental wargame as not single large event, but as a series of contained iterative activities which build upon one another through the planning process. The wargame should increase in detail and complexity as the planning process is followed. With each step, not only will the specific operational problem become further understood by those involved, but considerations for the most appropriate and effective CoA will also become clearer. In early stages, the wargame should remain relatively 'simple', whereby it can be played repeatedly and retain its experimental suitability. Later iterations can increase the complexity of the wargame but must be careful to allow for control of experimental variables.

The second approach is that as the wargame is developed through the planning process, it should be leveraged as a tool to structure analysis. As such, the wargame would be a way to organize knowledge about the operational problem. Operational analysts would effectively become designers who must make decisions on how best to represent the key factors they have included in their wargame design. Being able to accurately abstract dependent and independent variables in a complex situation would provide an indication that operators understand the role of these variables in the larger context.

The objective of the next section will be to describe an envisioned role of wargaming in the OPP. This will focus on stages 2-4, as these are the key moments where wargaming are relevant. Stage 1, initiation, and stage 5, plan review, are areas where wargaming would not be relevant and will not be covered.

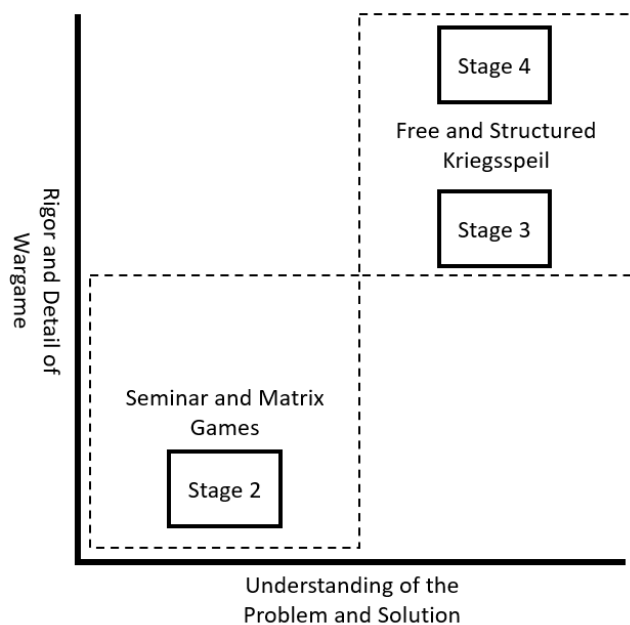


Figure 2: Relationship between OPP stages and wargame design.

3.1 STAGE 2 - ORIENTATION: EXPLORATORY WARGAME

After initiating the OPP, analysts would begin to build a shared understanding of operational conditions and goals. The wargame's primary focus at this stage would be to understand relationships between variables. Wargame design would be led by the analysts, who could be assisted by a trained designer, if required. The end product would be a wargame that would facilitate a discussion of the problem between analysts.

This *exploratory* wargame would be akin to a matrix game, which is defined by few rules, low logistical and preparation requirements, and low time investment. In matrix games, players take on roles relevant to the scenario and determine their role's actions, arguing for why these actions should succeed in the presence of a referee and other players. The adjudication mechanism is managed by an umpire or player consensus and relies on successful argumentation of a team's actions. Randomizing factors, such as dice, can also be used. Matrix games offer an exploratory method of experimentation beneficial to the orientation process, as they are not fiercely competitive, but help players collaboratively generate a credible narrative [16]. Indeed, much of the utility wargames provide is due to their narrative storytelling, allowing participants to better internalize the scenario in question [17]. While these wargames require subject matter experts to plan, such individuals should already be present in the OPP process,

helping to understand the problem environment. Exploratory experimentation in this stage would then allow for analysts to ask 'why' or 'how' the problem is occurring, creating a shared basis for further experimentation in stage 3.

3.2 STAGE 3 - CoA DEVELOPMENT: TESTING WARGAME

The lessons generated from wargaming in the orientation phase can then be directly translated into a *testing* wargame to assist with CoA development. It is in this stage of the OPP that wargaming tends most often to be associated as a means to test various options for solving the operational problem. However, the 'wargame' described in the OPP is in fact a CoA analysis, which walks through a proposed course of action with a 'Red cell' present to provide feedback [18]. Genuine wargames, by contrast, require meaningful decisions and the ability to analyze why these decisions were taken. If a CoA analysis explores *what* can occur, a wargame in this stage would produce deeper understanding of *why* certain outcomes may or may not occur. Its role would be answering questions about how CoAs would succeed or fail in the operational scenario. The CoA functions as a hypothesis asserting that by a certain method the operational problem can be solved. The experimental wargame would be able to include all potential CoAs and see them conducted in multiple play-throughs. In addition, depending on the game design, it could also provide insights into the key decision points into each CoA, how the posture of forces and asymmetrical access to information could impact the CoA, and allow for new CoAs to be produced based on lessons learnt.

A wargame focused on *testing* hypotheses would benefit from a kriegsspiel design philosophy, a method that uses rigid or semi-rigid adjudication to determine outcomes of actions. Moves are played using a tabletop map, units with predetermined statistics, and abstractions for non-combat factors. The CoA development game would build upon the previous exploratory wargaming, incorporating elements of players' prior decisions into the game mechanics. The benefits of the kriegsspiel are twofold for CoA and experimental development. First, as these wargames are played using pre-established rules, they can be reset once play ends to test a different or the same CoA. Secondly, because kriegsspiel wargames present rigid adjudication, the mechanics of the experiment can be isolated with far higher certainty than an 'open' wargame. This rigidity also allows for uncomplicated data collection and would produce valid statistics for further analysis. Developing a kriegsspiel usually requires a baseline: a detailed set of statistical and other facts about the operational environment,

which can be time-consuming to generate and develop into mechanics. However, several consumer wargames, many used in military education, already exist that can potentially be repurposed for the CoA Development. An example is the Next War Series [17] which has been used by the Marine Corps War College to investigate great power conflict. Many of these wargames can be simplified to be conducted multiple times and have existing systems that are easily modified by analysts to reflect actual operational conditions.

3.3 STAGE 4 - PLAN DEVELOPMENT: DEMONSTRATION WARGAME

Once a CoA is selected, it is developed into a detailed plan for execution. Orders are drafted and approved by the chain-of-command. The OPP also calls for a plan wargame to be conducted. This is similar to the CoA analysis, where each phase of the plan will be described, and the red cell will provide feedback. The plan wargame is a rehearsal, providing knowledge about what is envisioned to happen and what difficulties may arise.

The integration of experimental wargaming into this process would see the plan wargame replaced or supplemented by a *demonstration* wargame, with outcomes and lessons from the previous stages accumulated into a more rigorous and detailed kriegsspiel. The wargame at this stage could also include professional modelling and simulation, as the plan would be detailed enough to be represented in such a manner. Examples of such practice have been conducted using software like *Command: Professional Edition*, an air-naval simulator used by the US Marine Corps Warfighting Lab [19]. The goal of the wargame would be to *demonstrate* the feasibility of the CoA in front of the commander and validate the internally valid principles found during stage 4. Issues found in the plan would occur from the dynamic interactions and decisions made by the opposing red cell.

A demonstration wargame would create unique understanding of the plan for the commander, including key decision points in the operation and an understanding of where to place branches and sequels, based on the red cell's approach. As in actual operations, it would call on dynamic decision-making from both sides with differing information. The wargame would set the conditions for productive discussion on the approach itself, as decisions needing to be made under the auspices of success or failure would promote articulated responses. The detail and rigor of the wargame could produce a more accurate picture of the operating space

compared to a walkthrough. For example, reasons for decisions made by the red cell would provide insights into how blue cell force posture changed their approach to the operation. Essentially, the wargame would place the commander and staff in a situation evoking aspects of the actual conduct of operations, where decisions would need to be made with limited information in a dynamic environment. The requirement to make hard decisions with a lack of complete information or the lack of specific capability are valuable to see before the actual conduct of an operation.

Concerns regarding logistics and cost would be alleviated by the iterative wargaming process, as analysts involved in the previous wargames could assist operators and the command staff. It would entail a smaller requirement of subject matter experts and support staff compared to a wargame commissioned only for this stage in the process. Despite the wargame only being conducted once due to the logistics involved, the multiple observations from previous wargames conducted in stage 3 could be leveraged to provide sufficient observations and verify the CoA's validity [8].

4 TOWARDS AN INCLUSIVE CULTURE OF WARGAMING

The OPP seeks to understand a problem and hypothesise solutions to meet those challenges. Experimentation, through the use of wargaming, provides an additional means by which a planning process can be conducted, enabling key insights into the logic behind decisions for or against the plan in question. Experimentation promotes the development of new ideas and questions the validity of potentially outdated practices. Understanding not what can happen, but why something has happened provides value to the OPP by validating an approach towards a problem. It forces understanding before acting. Wargaming is also a participatory process, in which players work together to dynamically solve a problem under the conditions of competition. It is a structured way to conduct a conversation on the elements of warfighting. It allows stakeholders to question their preconceptions and advance understanding within pre-established bounds and rules on the premise that it is better to disagree and debate about the CoA before the battle has begun. The value of wargaming is thus not limited to the play and analysis of the results. Rather, the value is in the design process of the game, where an understanding of a problem is built over time. Too often, practitioners forget that the design process is as important as the game itself: the subject needs to be understood to such a degree that designers

know what is important to represent in detail, and what can be abstracted.

For all these reasons, treating wargaming as a 'one-off' project, as contemporary militaries tend to do, rather than iterative and repeatable processes, forgoes key insights that wargaming can generate. The iterative process is crucial to successful wargaming, as it provides a means by which to structure insights and knowledge within a warfighting concept. It encourages hard decisions amongst the staff, showing what is important and what is not, unveiling factors that may not otherwise have been considered. Starting from high-creativity and free wargaming methods to ones with high rigor and detail allows an experimental wargaming process to support plan development and build key practices in military design and research.

To return to the first thoughts of this paper: war is an unstructured problem. Lest we find ways to structure it in advance of operations, real consequences arise; that is to say, lives are lost. Structured and productive debates over how our militaries can improve their decisions and understand the decisions of adversaries are fundamentally about how to avoid critical mistakes through superior knowledge and capability. The wargame thereby represents a crucial tool by which such debates can be had.

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