National Defence Défense nationale

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Towards a Systemic Approach to Sense-Making in Operational Design

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JCSP 48

Exercise Solo Flight

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CANADIAN FORCES COLLEGE – COLLÈGE DES FORCES CANADIENNES

JCSP 48 – PCEMI 48
2021 – 2022

Exercise Solo Flight – Exercice Solo Flight

Towards a Systemic Approach to Sense-Making in Operational Design

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> *[In] war more than any other subject we must begin by looking at the nature of the whole; for here more than elsewhere the part and the whole must always be thought of together.*
>
> — Carl von Clausewitz, *On War*

INTRODUCTION

Operational art is the cognitive function that serves as the 'conceptual bridge' between strategy and tactics.[1] The product of operational art is the "…planning, preparing, conducting, and sustaining [of] campaigns and major operations aimed at accomplishing strategic or operational objectives in each theatre."[2] The skilful application of operational art ensures that tactical actions serve strategic ends, and translates abstract strategic goals into mechanical terms that tactical commanders can accomplish.[3] This ensures that tactical successes build to contribute to the achievement of operational and subsequently strategic goals. As it is often quoted from Soviet General and military theorist Alexander Svechin, "Tactics make the steps from which operational leaps are assembled; strategy points out the path".[4]

Looked at conversely, left unrestrained by the logic of operational art, the exploitation of tactical success can outpace support and sustainment, potentially compromising future engagements. Equally, tactical victories can come at such a price that they are deleterious to the broader war effort or divert critical – and often limited – resources from other operations or fronts. At best, tactical actions unguided by

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[1] Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory* (London; Portland, OR: Frank Cass, 1997), doi:10.4324/9780203044308; Wilson C. Blythe, "A History of Operational Art," Military review 98, 98, no. 6 (2018): 49.

[2] Milan Vego, "On Operational Art," Strategos 1, 1, no. 2 (2017): p.21.

[3] Blythe, "A History of Operational Art," 49.

[4] A. Svechin and Kent D. Lee, *Strategy* (Minneapolis, Minn: East View Publications, 2004), p.15.

operational art risk irrelevancy, and at worst, they risk undermining the achievement of vital operational or strategic objectives.

While the precise origins of operational art remain debated, key contributions to its conceptualisation and theorisation can be drawn from classic military theorists, such as Clausewitz and Jomini, as well as prominent practitioners, such as Napoleon, and 19th century and early 20th century American, Prussian, German, and Soviet military thinkers. Combined with an industrial age, predominantly linear and mechanistic approach, the application of operational art in many Western militaries has come to be enshrined in doctrinal operational planning processes, such as Australia's *Joint Military Appreciation Process*, Canada's *Operational Planning Process*, the North Atlantic Treaty Organisation's (NATO) *Allied Joint Doctrine for the Planning of Operations*, and the United States' (US) *Joint Planning*.[5] These approaches to planning have many advantages when dealing with tactical and 'complicated' operational problems, however are ill-suited and inadequate for dealing with the 'complex' operational problems characteristic of contemporary warfare.[6]

This essay contends that existing Western military operational planning processes are insufficient to adequately account for the complexities of contemporary warfare, and

[5] For the purposes of this paper the Western militaries analysed includes Australia, Canada, NATO and the US; however, it is noted that it would most likely include many other Western militaries given their common roots in operational art and operational planning. Australian Defence Force, "ADFP 5.0.1 Joint Military Appreciation Process" (Canberra: Australia: Australian Department of Defence, August 15, 2019); Canadian Armed Forces, "The Canadian Forces Operational Planning Process (OPP)" (Ottawa: Department of National Defence, April 1, 2008); US Joint Staff, "Joint Publication 5-0 Joint Planning," 2020; NATO, "Allied Joint Doctrine for the Planning of Operations," AJP-5 (NATO, 2019).

[6] James K. Greer, "Operational Art for the Objective Force," Military review 82, 82, no. 5 (2002): no. 5; John F Schmitt, "A Systemic Concept for Operational Design," US MC Warfighting Laboratory, 2006; William T. Sorrells et al., "Systemic Operational Design: An Introduction," 2005.

proposes that a systemic approach to sensemaking in operational design may provide a more optimal framework.

This essay is divided into two sections. The first section discusses the history and evolution of operational art and operational design in Western military doctrine. This includes the origins of operational art in the US's AirLand Battle doctrine in the 1980s, the subsequent evolution in Western military planning processes in the 1990s and 2000s, and culminates with the introduction of operational design in respective operational planning processes in the 2010s. This serves to contextualise the subsequent discussion, and highlights the lineage of linear reductionism that has been ingrained in Western military operational planning doctrine since its inception. The second section proposes a systemic approach to sensemaking in operational design as an alternative schema that may provide a more optimal framework to existing Western military operational planning processes. This includes a conceptual overview of sensemaking, a framework for sensemaking, and some key systems theory concepts relevant to sensemaking in operational design. Each of these sub-sections build on one another to describe a systemic approach to sensemaking in operational design – combining the conceptual framework of sensemaking with the mental discipline of systems thinking.

THE HISTORY AND EVOLUTION OF OPERATIONAL ART AND DESIGN IN WESTERN MILITARY DOCTRINE

The origin of operational art in Western military doctrine

Operational art was introduced into Western military doctrine in the 1980s through the development of the US's AirLand Battle, and was formalised in the release of Field

Manual (FM) 100-5 *Operations* in 1986.[7] The operational design construct for AirLand Battle was developed from a study of military theory, history, and practice, which were synthesised to form the conceptual origins of the US's understanding of operational art and the operational level of war.

Among the key theoretical foundations that formed the basis of this approach were the works of Clausewitz, Jomini, Triandifilov and Tuchachevsky.[8] This combined the abstract concepts of centres of gravity, fog, friction, and culmination from Clausewitz; with the more rational concepts of decisive points and lines of operation from Jomini; all within the practical framework provided by the Soviet concepts of the 'operational level of war' and 'deep operations' provided by Triandifilov and Tuchachevsky.[9] As noted by prominent military design theorist and former Director of the US School of Advanced Military Studies (SAMS) Col (retd.) James Greer, "…because it was the lens through which all activity was viewed at the time, the entire theoretical approach was grounded in Newtonian logic and linear determinism."[10]

These theoretical underpinnings were complemented by an analysis of several historical campaigns and major operations, including: the concept for large formation operations and the development of the all-arms corps capable of fighting independently of the main army employed by Napoleon; and the importance of manoeuvre demonstrated by von Moltke the Elder in the Austro-Prussian and Franco-Prussian wars of 1866 and

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[7] Greer, "Operational Art for the Objective Force," no. 5.
[8] Ibid.; Sorrells et al., "Systemic Operational Design: An Introduction."
[9] Greer, "Operational Art for the Objective Force," no. 5.
[10] 'Newtonian Logic' refers to Newton's broad view that the universe is governed by rational and understandable laws, which are revealed through experimentation and observation. Ibid., p.2; I Bernard Cohen, *The Newtonian Revolution* (Cambridge University Press, 1983).

1870.[11] In addition, analysis of the campaigns fought by Grant in the American Civil War, as well as the German Army's application of 'Blitzkrieg' and Russian 'deep operations' in World War II, provided insights into the arrangement of battles and military operations in time, space, and purpose.[12]

Finally, theory and history were synthesised with observation of practical application from the Arab-Israeli wars of 1967 and 1973 in conjunction with Cold War preparations to defend Eastern Europe from attack by the Soviet Union – a conflict that was anticipated to involve large-scale, high-intensity combat, if it were to eventuate.[13] The amalgam of lessons from theory, history, and observed practice was forged into the US's conceptual understanding of operational art and the operational level of war. This was enshrined in AirLand Battle and published in the 1986 version of FM 100-5 *Operations*. Given the US's central role in NATO during the Cold War, this was quickly adopted by NATO nations and represents the origin of operational art in Western military doctrine.[14]

From its origin, the application of operational art became intrinsically linked with operational planning among many Western militaries, and although it has evolved since its inception, with the publication of numerous US and allied doctrinal updates since 1986, it has retained its foundational logic.[15] This is based on classical theoretical and

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[11] Greer, "Operational Art for the Objective Force," no. 5.
[12] Ibid.
[13] Ibid.
[14] Ibid.
[15] On the US side alone this has included, but not limited to, JP 5-0 *Doctrine for Planning Joint Operations* in 1995, which became JP 5-0 *Joint Operation Planning* in 2006, was updated in 2011, became JP 5-0 *Joint Planning* in 2017, and was last updated in 2020.

historical roots, and a predominantly linear, deterministic approach.[16] In many instances, as operational art has been institutionalised through Western military doctrine it has been transposed from its abstract and creative origins into a linear, analytical, and reductionist process.

The evolution of Western military operational planning

The operational planning processes that evolved in Western military doctrine throughout the 1990s and 2000s "… [tended] to apply a technical rationalist approach that [broke] problems into component parts before problem solving via linear reverse-engineering of solutions."[17] These processes, represented graphically in Figure 1, generally commenced with the receipt of strategic or higher-level guidance, from which a 'desired end state' for the prospective operation or campaign was developed. Then, through a process of detailed analysis and reverse-engineering, a campaign plan – complete with objectives, effects, centres of gravity, and lines of effort (alternatively termed 'lines of operation') – was developed to connect the desired end state back to the present.[18]

[16] Sorrells et al., "Systemic Operational Design: An Introduction."

[17] Aaron P Jackson, "A Brief History of Military Design Thinking," Medium, 2019, https://medium.com/@aaronpjackson/a-brief-history-of-military-design-thinking-b27ba9571b89#_edn23.

[18] Ben Zweibelson, "Linear and Non-Linear Thinking: Beyond Reverse-Engineering," Canadian Military Journal 16, 16, no. 2 (2016): 27–35.

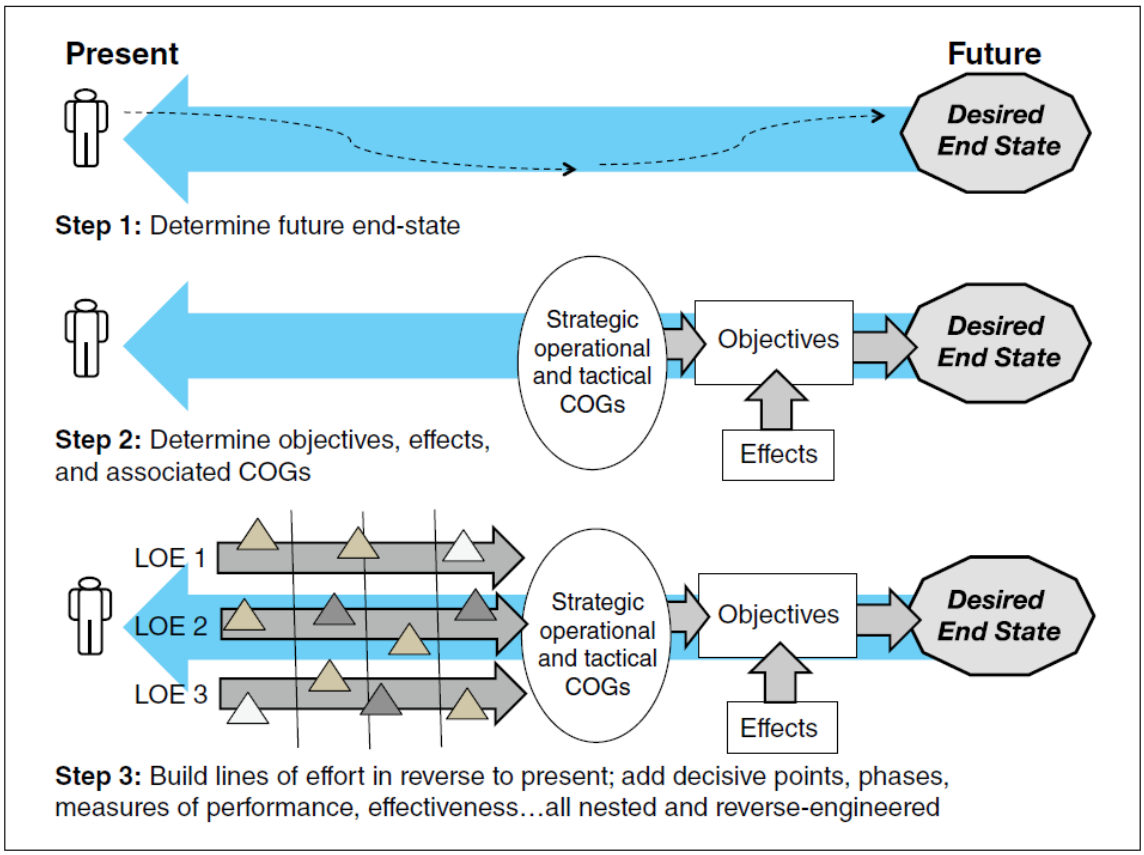

Figure 1 - Representation of linear, reverse-engineering approach to operational planning
Source: Zweibelson, "Linear and Non-Linear Thinking: Beyond Reverse-Engineering," p.29.

Underlying these processes was the presumption that military problems could be decomposed into linear and isolatable chains of causation, their constituent parts analysed and resolved, prior to reintegration into a coherent and cohesive solution.[19] Moreover, they presumed that the entire system could be isolated from external influences and held in its 'as analysed' state in a type of 'suspended animation' long enough for the sequence of tactical actions to be executed to reach the desired end state.[20] This approach to operational planning – founded on the presumption that war is linear, albeit extremely

[19] Ibid.; Sorrells et al., "Systemic Operational Design: An Introduction."
[20] Zweibelson, "Linear and Non-Linear Thinking: Beyond Reverse-Engineering," 27–35; Sorrells et al., "Systemic Operational Design: An Introduction."

complicated – combined with the information technology revolution in military affairs, produced the concepts of 'Network Centric Warfare' and 'Effects Based Operations' as apogees of this school of thought.[21] The central idea being, that with ever increasing volumes of information and data, and given sufficient computing power, the behaviour of such systems, however complicated, could be analysed, understood, and a suitable operational plan developed, that would lead to the desired outcome.

When this approach to operational planning met failure, "…the reaction [was] to re-configure the methodology, or adjust the familiar tools (lines of effort, centres of gravity, or end states) within the confines of the analytical approach," in what former US Army Officer and prominent military design thinker Dr Ben Zweibelson terms 'Jominian Hindsight'.[22] This is based on Jomini's theory that victory is determined by the proper combination of his principles – be it mass, speed, and surprise – therefore, if any commander fails, 'Jominian Hindsight' rationalises this with, "You did not apply my principles correctly."[23] This was one rationalisation for the US's lack of operational and strategic progress in Afghanistan and Iraq in the 2000s, despite their overwhelming tactical dominance.

The introduction of operational design into Western military operational planning

Based on an increasing realisation that existing operational planning processes were inadequate in accounting for the complexity of contemporary operations, combined with the emerging popularity of the Israeli Defence Force's 'Systemic Operational

[21] Rebecca Jensen, "Doctoral Thesis - Chapter 2: Operational Art and Design" (University of Calgary, 2019), 64.
[22] Zweibelson, "Linear and Non-Linear Thinking: Beyond Reverse-Engineering," p.29.
[23] Ibid., p.30.

Design' (SOD) in the mid-2000s, the US military began investigating alternative approaches to better address the operational problems it was facing in Afghanistan and Iraq in the mid- to late-2000s.[24] The initial fascination with SOD resulted in its introduction as an elective course at SAMS in 2006, and subsequently inclusion as part of the core curriculum in 2008. [25] This was accompanied by a rapid succession of US Army publications addressing the application of design thinking in operational planning, including the 2011 version of JP 5-0 *Joint Operation Planning,* under the label of 'operational design'.

Despite significant enthusiasm to revolutionise the existing operational planning processes to more aptly address the complexities of contemporary warfare, the array of US military publications ultimately obfuscated the conceptual underpinnings and methodologies of operational design as they were translated into doctrine.[26] This, combined with some cultural resistance in the military establishment, has greatly diminished the transformative impact design thinking may have otherwise had in elevating operational planning processes from their linear, deterministic roots, to address the complex, non-linear problems characteristic of 21st century warfare.

The doctrinal operational design methodology has evolved since 2011, with the latest iteration contained in the 2020 version of JP 5-0 *Joint Planning*. This version defines operational design as "…the analytical framework that underpins planning. Operational design supports commanders and planners in organising and understanding

[24] Jackson, "A Brief History of Military Design Thinking"; Schmitt, "A Systemic Concept for Operational Design"; Greer, "Operational Art for the Objective Force," no. 5; Sorrells et al., "Systemic Operational Design: An Introduction."

[25] Jackson, "A Brief History of Military Design Thinking."

[26] Ibid.

the [Operational Environment] as a complex interactive system." [27] The process includes the development of an environment frame and a problem frame prior to developing an 'operational approach' (the solution frame).[28] While this is similar to the two-tiered process of 'problem definition' and 'problem solution' that is central to several civilian design methodologies, it diverges substantially, in that the 'problem solution' (the 'operational approach') is developed using the traditional, linear operational planning process previously described.[29] As Australian military design thinker, Dr Aaron Jackson describes, this approach to "…operational design subordinate[s] the *problem definition* aspect of design as a step within a technical rationalist planning methodology."[30] Despite the diminished benefits of such a constrained approach to operational design, similar processes have been included in the operational planning doctrine of several Western militaries, including Australia, NATO, the United Kingdom, and the US.

The key issue with this bifurcated approach to operational design – applying a linear solution frame to a non-linear problem frame – is that complex, "…non-linear approaches cannot be 'broken down into manageable chunks' with the intent of re-assembling them into a linear sequence that maintains the essence of non-linearity."[31] In other words, we cannot establish a non-linear understanding of a complex situation involving a violent extremist organisation or great power competitor, and then seek to

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[27] Staff, "Joint Publication 5-0 Joint Planning," p.IV-1.
[28] Staff, "Joint Publication 5-0 Joint Planning."
[29] Jackson, "A Brief History of Military Design Thinking."
[30] Ibid.
[31] Zweibelson, "Linear and Non-Linear Thinking: Beyond Reverse-Engineering," p.30.

develop a solution using a linear, reductionist approach, without losing a significant portion of the contextual substance of either the problem, the solution, or both.[32]

To address this issue, a comprehensive or integrated, non-linear approach to both the problem frame and solution frame needs to be considered, which is dramatically different to the current conception of linearly connecting the dots from the desired end state back to the current state. To this end, a systemic approach to sensemaking offers an alternative to the existing Western military approach to operational design.

TOWARDS A SYSTEMIC APPROACH TO SENSEMAKING IN OPERATIONAL DESIGN

What is sensemaking?

Sensemaking is the process of making sense of a complex world. However, it is also more than this, as from this understanding, we are able to decide what our subsequent actions will be. There is no single, universally agreed definition of sensemaking, however it is generally understood to refer to processes "…through which people work to understand issues or events that are novel, ambiguous, confusing, or in some other way violate expectations."[33] Put more colourfully, sensemaking is the process of answering the questions, "what's going on here?", and "what do I do next?".[34] It is a

[32] Ibid., 27–35.

[33] Sally Maitlis and Marlys Christianson, "Sensemaking in Organizations: Taking Stock and Moving Forward," Academy of Management Annals 8, 8, no. 1 (2014): p.57.

[34] Karl E Weick, Kathleen M Sutcliffe, and David Obstfeld, *Organizing and the Process of Sensemaking*, vol. 16, Driving Desired Futures 16 (Berlin, Boston: DE GRUYTER, 2014), p.412, doi:10.1515/9783038212843.216.

process of gathering information and interpreting it in conjunction with our own experiences to understand our environment, make decisions, and take action.[35]

In his seminal work on the topic of sensemaking, *Sensemaking in Organizations*, American organisational theorist Dr Karl E. Weick, describes seven characteristics of sensemaking that distinguish it from other explanatory processes such as understanding, interpretation, and attribution.[36] The seven characteristics, detailed below, are: (1) Grounded in identity construction; (2) Retrospective; (3) Enactive of sensible environments; (4) Social; (5) Ongoing; (6) Focused on and by enacted cues; and (7) Driven by plausibility rather than accuracy. Although presented broadly as a sequence, they are intended to characterise the overall process of sensemaking, not as a method or check-list for making sense of a given situation.

Grounded in identity construction. This characteristic highlights the centrality of identity and identity construction to sensemaking, and how this identity influences how we see the world.[37] This identity influences how we select, interpret, and retain information from what is available, which fundamentally influences the process of sensemaking.[38] This is of particular relevance to military staff engaged in operational design, as their identity is a combination of personal and professional factors, including:

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[35] Policy Horizons Canada, *The Future of Sense-Making: Examining Changes to the Ways We Think, Act, and Behave* (Government of Canada, 2021), https://go.exlibris.link/9rnkN5Gy.

[36] Karl E Weick, *Sensemaking in Organizations*, vol. 3, 3 (Sage, 1995), p.17.

[37] M Coetzee and A Wilkinson, "En Route to a PhD: Mapping the Journey through a Sensemaking Lens," South African Journal of Higher Education 34, 34, no. 4 (2020): 27–44; Jean Helms Mills, Amy Thurlow, and Albert J. Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," Qualitative research in organizations and management 5, 5, no. 2 (2010): 182–95, doi:10.1108/17465641011068857.

[38] Coetzee and Wilkinson, "En Route to a PhD: Mapping the Journey through a Sensemaking Lens," 27–44.

parents, upbringing, family, friends, religion, rank, branch or service, and corps or specialisation.

Retrospective. This characteristic describes how we use past experiences to interpret current events in a comparative process.[39] By comparing the present to similar or familiar events from the past, we give meaning to our current situation, relying on our past experiences to make sense of our present reality. In military contexts, this can manifest in staff 'imagining the past and remembering the future' – where they predict future events based on flawed reasoning and a misunderstanding of past events.[40]

Enactive of sensible environments. This suggests that sensemaking is about making sense of an experience within our environment, which can be either constrained or created by the same environment that it has created.[41] The enactment occurs through cognitive processes and preconceptions about the environment or context that we are in.[42] This process is iterative, as the environment and the aspects we are making sense of perpetually influence each other, with the environment that has been created by the sensemaker reinforcing their sense of the environment.[43]

Social. This characteristic acknowledges that sensemaking is a social activity, contingent on our interactions with others, as well as an organisation's rules, routines,

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[39] Helms Mills, Thurlow, and Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," 182–95.

[40] Zweibelson, "Linear and Non-Linear Thinking: Beyond Reverse-Engineering," p.30.

[41] Helms Mills, Thurlow, and Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," 182–95.

[42] Weick, *Sensemaking in Organizations*, vol. 3, vol. 3.

[43] Helms Mills, Thurlow, and Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," 182–95; Coetzee and Wilkinson, "En Route to a PhD: Mapping the Journey through a Sensemaking Lens," 27–44.

symbols, and language.[44] Additionally, even though an individual may be making sense on their own, they "…are embedded in a sociomaterial context where their thoughts, feelings, and behaviours are influenced by the actual, imagined, or implied presence of others."[45] This is of central importance for military staff, as operational planning is almost exclusively conducted in a collective environment. In addition, the operational plan that is subsequently developed is communicated to a higher, often strategic level, element for approval, and also to a lower, often tactical level, element for implementation or execution.

Ongoing. Sensemaking is a dynamic, iterative and perpetual process, as we continuously make sense of the world around us and project past experiences on possible futures.[46] This occurs in a continuous stream, as the environment, our interactions, and our understanding are constantly changing, while we simultaneously seek to make sense of what is occurring.[47]

Focused on and by enacted cues. Sensemaking involves interpreting and explaining sets of cues from the environment.[48] This requires focussing on certain elements, while completely ignoring others, using past experience to determine which

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[44] Helms Mills, Thurlow, and Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," 182–95.

[45] Maitlis and Christianson, "Sensemaking in Organizations: Taking Stock and Moving Forward," p.66.

[46] Coetzee and Wilkinson, "En Route to a PhD: Mapping the Journey through a Sensemaking Lens," 27–44; Helms Mills, Thurlow, and Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," 182–95; Weick, *Sensemaking in Organizations*, vol. 3, vol. 3.

[47] Coetzee and Wilkinson, "En Route to a PhD: Mapping the Journey through a Sensemaking Lens," 27–44.

[48] Sally Maitlis, "The Social Processes of Organizational Sensemaking," Academy of Management journal 48, 48, no. 1 (2005): 21–49, doi:10.5465/AMJ.2005.15993111.

cues will be incorporated to make sense of a situation.[49] These cues are then placed into frameworks, mental models, or some other form or representational heuristic from which they are interpreted.[50]

Driven by plausibility rather than accuracy. This final characteristic highlights that plausibility in our derived meaning is more important than accuracy. As Weick describes, "I need to know enough about what I think to get on with my projects, but no more, which means sufficiency and plausibility take precedence over accuracy."[51] This is because accuracy takes time to derive and determine, and may not always be attainable, whereas, if plausibility is accepted, we can make sense of the situation and move on.[52] This is embodied in the military maxim, 'an 80% solution on time is better than a 100% solution delivered late.'

Taken together, the seven characteristics described by Weick outline the key elements involved in sensemaking. These characteristics were initially proclaimed to be interrelated and of equal importance, with each being "…a self-contained set of research questions that relates to the other six,"[53] albeit that one or another could be more dominant depending on the context. However, subsequent research has highlighted that identity construction and plausibility play a more pivotal role in sensemaking than what is described in Weick's original conceptualisation.[54] This limitation in the original

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[49] Helms Mills, Thurlow, and Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," 182–95.

[50] Coetzee and Wilkinson, "En Route to a PhD: Mapping the Journey through a Sensemaking Lens," 27–44.

[51] Weick, *Sensemaking in Organizations*, 3:p.62.

[52] Coetzee and Wilkinson, "En Route to a PhD: Mapping the Journey through a Sensemaking Lens," 27–44.

[53] Weick, *Sensemaking in Organizations*, 3:p.18.

[54] Helms Mills, Thurlow, and Mills, "Making Sense of Sensemaking: The Critical Sensemaking Approach," 182–95.

conceptualisation is somewhat implicitly acknowledged in a subsequent publication, *Organizing and the Process of Sensemaking*,[55] where Weick, Sutcliffe, and Obstfeld highlight the significance of identity and plausibility in dedicated sub-sections, indicating their acknowledged centrality and prominence in the sensemaking process.

While Weick's seven characteristics provide the conceptual foundations for sensemaking, they do not constitute a method for applying sensemaking to a given situation. They describe *what* sensemaking is, not *how* to do it. In this pursuit, the 'synthesis framework' developed by American designer and founder of the Austin Centre for Design, Jon Kolko, described below, is instructive.

A framework for sensemaking

In his article, *Abductive Thinking and Sensemaking: The Drivers of Design Synthesis*, Kolko outlines an abductive approach to sensemaking in design synthesis, which he terms a 'synthesis framework'.[56] Although Kolko refers to this as a 'synthesis framework' it can equally be thought of as a 'framework for sensemaking', as the outcome of the process is to make sense of the situation and inform subsequent action – which are the fundamental aspects of sensemaking. Described as "an action-framework of synthesis,"[57] it is instructive for application in operational design. The three key activities in Kolko's framework, detailed below, are: prioritising, judging, and forging connections.[58]

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[55] Weick, Sutcliffe, and Obstfeld, *Organizing and the Process of Sensemaking*, vol. 16, chap. 4.

[56] Jon Kolko, "Abductive Thinking and Sensemaking: The Drivers of Design Synthesis," Design Issues 26 (MIT Press - Journals, January 1, 2010), 15, doi:10.1162/desi.2010.26.1.15.

[57] Ibid., p.21.

[58] Ibid., 15.

Prioritising. This involves reviewing, curating, and comparing the large volume of data and information gathered during the research phase of a design process to produce a hierarchical data structure.[59] In this process, an implicit scale of importance is derived, from which the data and information can be compared. While the scale is subjectively derived, its use is then generally objectively applied (ie. the scale may be inferred inductively or abductively,[60] not arbitrarily, and once derived, it is consistently applied to all data or information in the system). The designer determines which data is more important than others, eventually yielding multiple elements that can be seen as complimentary, and creating a prioritised, hierarchical data structure.

Judging. As not all data or information identified in the research phase is of equal relevance, it must be triaged in order to determine which is most important to the current problem-solving context.[61] Through the process of *prioritisation*, the designer develops an understanding of relevance, against which all data in the hierarchical structure is compared. This involves significant abductive thinking, as it "…require[s] a constant reassessment of the current state as compared to the unknown end state."[62]

Forging of connections. The final activity in the framework is to identify the relationship between the discrete elements of data or information through "…the introduction of a credible (although rarely validated) story of why the elements are related."[63] This is an inherently abductive process, and the most important part of the

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[59] Ibid.
[60] The three inference concepts of deduction, induction, and abduction are discussed subsequently in this paper.
[61] Ibid.
[62] Ibid., p.22.
[63] Ibid.

synthesis framework, as it is not the discrete elements of data or information that are of central importance, but the relationships between them.

While Kolko's framework describes a general process for design synthesis (or sensemaking) which is applicable to military contexts, a few key points are worth noting. First, the framework was developed based primarily on insights and experience from the private and commercial sector, not the public or military sectors. This is evident in his references to user research sessions, clients, and product development. Although it was conceived for a private or public sector audience, the framework remains applicable to operational design, with military intelligence replacing research sessions, superior commanders and superior headquarters replacing clients, and plan development replacing product development.

Second, while Kolko does not directly reference the conceptual foundations of Weickian sensemaking, the framework is conceptually consistent with Weick's characteristics of sensemaking. Kolko references Klein, Moon, and Hoffman's, *Making Sense of Sensemaking 1: Alternative Perspectives,*[64] in his theoretical discussion of sensemaking, which forms the conceptual foundation for the framework. As Klein, Moon, and Hoffman's work is derived from, and directly references, the Weickian concept of sensemaking, therefore Kolko's framework too is consistent with Weick's characteristics of sensemaking.

[64] G. Klein, B. Moon, and R. R. Hoffman, "Making Sense of Sensemaking 1: Alternative Perspectives," IEEE intelligent systems 21, 21, no. 4 (2006): 70–73, doi:10.1109/MIS.2006.75.

Finally, Kolko's framework is founded on abductive reasoning, as he views synthesis as an inherently abductive process.[65] This is important to note, as it is a key point of departure from traditional military planning processes, which typically apply deductive or inductive reasoning. Whereas in deductive reasoning the truth of the premises guarantees the truth of the conclusion (ie. if all As are Bs, and Z is an A, therefore Z is a B), in abductive reasoning the best explanation is inferred from an observation or set of information, which may be incomplete (ie. given observation A, and possible explanations H_1, H_2,…., H_n of A, an observer may infer that H_i best explains A).[66] An illustrative example of abductive reasoning is awakening one morning to find your partner and car gone, and inferring that they have gone to the store to collect supplies for breakfast. There are many possible explanations for their absence – some more worrisome than others – however a trip to the store may be the most likely explanation. This differs slightly from inductive reasoning, where a general principle is inferred from a wider body of knowledge (ie. general principle B is inferred from a wider body of knowledge A, where A gives good reason to accept B, but does not guarantee it).[67]

In addition to outlining the synthesis framework, Kolko proposes three methods for its application – reframing, concept mapping, and insight combination.[68] Reframing involves shifting semantic perspective – re-embedding the product, system, or service in a new context, so that different associations and hidden links can be explored.[69] Similar to

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[65] Kolko, "Abductive Thinking and Sensemaking: The Drivers of Design Synthesis," 15.
[66] Igor Douven, *Abduction*, ed. Edward N. Zalta, The Stanford Encyclopedia of Philosophy (Metaphysics Research Lab, Stanford University, 2021).
[67] Ibid.
[68] Kolko, "Abductive Thinking and Sensemaking: The Drivers of Design Synthesis," 15.
[69] Ibid.

changing the direction, angle, or aperture when viewing an object in the physical world, reframing can lead to unique and novel observations about the subject of the design activity. Concept mapping involves organising and graphically depicting the variables of the design activity so that the relationships between them can be understood and a representation of the system developed. A concept map forms connections between entities (nouns) by describing relationships (verbs).[70] In addition, they provide a visual way to understand the relationships between entities through direct connections, as well as proximity, size, shape, and scale. Finally, insight combination involves pairing insights from the gathered data – either from observation (I saw this) or experience (I know this) – with design patterns relevant to the core domain, to create design ideas.[71] This allows observations, experience, and insights to be combined in a constructive and disciplined manner to create new design ideas and concepts. While all three methods could be applied to operational design, concept mapping is of key interest, as part of a systemic approach to sensemaking.

A systemic approach to sensemaking in operational design

Drawing together the Weickian characteristics of sensemaking, with the synthesis framework introduced by Kolko, points towards a systemic approach to sensemaking in operational design. A systemic approach is proposed, as it "…seeks to understand and represent subjects as interactively complex wholes functioning within a broader environment."[72] This frames contemporary warfare as a complex system of many interrelated and interdependent elements or agents, each acting individually according to

[70] Ibid.
[71] Ibid.
[72] Schmitt, "A Systemic Concept for Operational Design," p.23.

its own circumstances and requirements, but in so doing, having global effects that simultaneously changes the circumstances and requirements of all the other agents.[73] This is analogous to playing a game of chess where all of the pieces are connected by rubber bands. The three key attributes of complex systems are: (1) all variables are interconnected and interdependent; (2) they are sensitive to initial conditions – small changes to initial conditions can have dramatic consequences on the system behaviour; (3) the output and input are non-linear and not proportional.[74]

Applying a systemic approach provides the mental discipline to the sensemaking framework. This places the system in the context of the broader environment, seeking to first understand it holistically, and then the role it plays in the broader environment.[75] Thus, it is considered *expansionist*, in contrast to the *reductionist*, analytical approach of traditional operational planning processes.[76] They key artefact developed in this approach is a system model, which explains the workings of the system and its interaction with the environment. This is then iteratively refined over time, based on feedback and events in the real world.[77] Key system models that may be constructed during the systemic sensemaking process include: an iceberg model; a causal loop diagram; a stock and flow diagram; or a connected circle (see Figure 2 for examples).[78] The system model replaces the concept map from the Kolko synthesis framework.

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[73] Daniel H Kim, *Introduction to Systems Thinking*, vol. 16, 16 (Pegasus Communications Waltham, MA, 1999), vol. 16; Schmitt, "A Systemic Concept for Operational Design."

[74] Sorrells et al., "Systemic Operational Design: An Introduction."

[75] Schmitt, "A Systemic Concept for Operational Design."

[76] Ibid.

[77] Ibid.

[78] Leyla Acaroglu, "Tools for Systems Thinkers: Systems Mapping," Medium, 2017, https://medium.com/disruptive-design/tools-for-systems-thinkers-systems-mapping-2db5cf30ab3a.

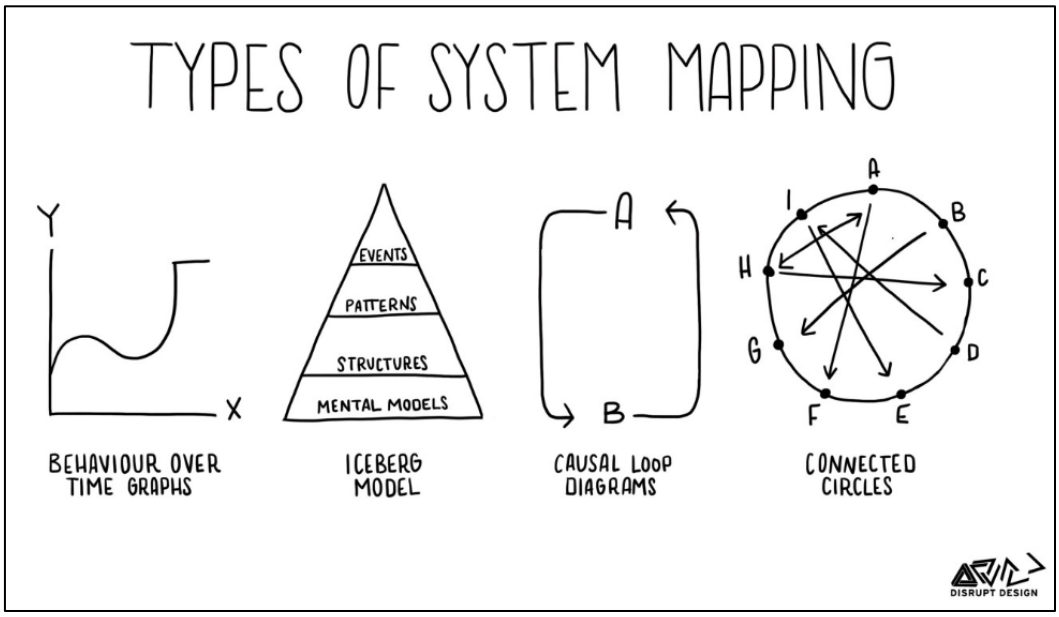

Figure 2 - Examples of System Maps
Source: Acaroglu, "Tools for Systems Thinkers: Systems Mapping."

From the system map, insights can be drawn and potential intervention points identified.[79] In addition, the system map also constitutes a rich visual representation of the situation that can be used as a communication tool to assist in translating the abstract concepts developed during the sensemaking process into tangible actions for implementation and execution at the tactical level.

Once sufficient understanding of the situation has been generated, it then falls to the skill, knowledge, experience, creativity and judgement[80] of the operational designer or staff to develop an appropriate operational approach – recalling that the purpose of sensemaking is to not only answer the question "what's going on here?", but also, "what do I do next?"[81] It is important that the operational design is communicated without

[79] Ibid.
[80] Staff, "Joint Publication 5-0 Joint Planning."
[81] Weick, Sutcliffe, and Obstfeld, *Organizing and the Process of Sensemaking*, vol. 16, chap. 4.

undue abstractness or esotericism, as it will need to be further developed into an operational or campaign plan, from which it must be able to be translated into mechanical terms for tactical commanders to accomplish.

CONCLUSION

This essay contends that existing Western military operational planning processes are insufficient to adequately account for the complexities of contemporary warfare. This is based on their foundations in linear reductionism, and bifurcated approach to operational design, if applied. It proposes that a systemic approach to sensemaking in operational design may provide a framework that more optimally accounts for the complexities of contemporary warfare and, by extension, the application of operational art. This is founded on the conceptual framework of sensemaking combined with the mental discipline of systems thinking.

Such an approach represents a significant departure from traditional Western military operational planning processes, which would require some key challenges to be overcome if it is to be implemented effectively. Firstly, systems thinking and sensemaking require people to think in both creative, non-linear, and expansionist terms, as well as analytical, linear, and reductionist terms. This will significantly challenge existing military officer professional education systems. Secondly, such an approach does not immediately mesh with existing operational plan or campaign plan development processes, nor would it necessarily produce the mechanical terms required for execution at the tactical level. A deliberate approach would need to be charted that connects the outcomes from the sensemaking process into tangible and functional terms that can be

developed into cohesive operational or campaign plans, and translates the abstract concepts into practical activities that can be accomplished at the tactical level. This will likely require a degree of both organisational change and institutional learning. Finally, and most importantly, it will need to overcome a degree of institutional inertia and resistance. Existing processes that are familiar, and which people have become comfortable, will not be easily dispensed, particularly when they are replaced with an unfamiliar, abductive and more free-forming framework. This will likely require a gradual and measured transition to avoid 'startling the horses.'

If these challenges are unable to be overcome, then it will likely alienate a substantial portion of the military establishment and become a convenient scapegoat for the first operational failure, replacing 'Jominian Hindsight' as a rationalisation, and providing the justification for its ultimate rejection. Alternatively, if such an approach can be effectively implemented, it could allow military staff to unlock and access the full potential of applying a non-linear approach to both problem and solution framing in operational design, and more optimally address the complexities of contemporary warfare.

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