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Designing in Complex Security Contexts: Enabling Frame Awareness through Sharks, Dollar Signs, and Police Badges

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Keywords
Design
Innovation
Facilitation
Complexity
Security

Received
November 20, 2020
Accepted
May 27, 2021

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Abstract
Over the last decade, the emergence of military design theorists, educators, and practitioners has coagulated into a community of practice internationally and across multiple armed forces. This new group of military academics and professionals demonstrates a keen interest in developing and expanding the notion of "designing for war." For military design theory, there are unexpected design contributions from postmodern philosophy, non-Western concepts, and other highly subjective and alternative fields and practices that provide insight and novel thought for human opportunities within the dynamic and complex conflict contexts of the 21st century. Many of these novel constructs are not available in mainstream commercial design applications, methods, or theory — they were developed for military design contexts and are largely unknown outside of the community of practice for security contexts. Part of this lack of exposure is inevitable, given the classification requirements of many design efforts. This article presents one of the most popular military design techniques used by the Joint Special Operations University (JSOU), a military education platform in Tampa, Florida. JSOU is part of the US Special Operations Command (USSOCOM) and provides tailored education to Special Operations Forces (SOF) worldwide.

http://www.journals.elsevier.com/she-ji-the-journal-of-design-economics-and-innovation
https://doi.org/10.1016/j.sheji.2021.05.006

> "There are several stages of creative thought: first, a stage of preparation in which the problem is consciously worked over; then a period of incubation without any conscious concentration upon the problem; and then the illumination which is later justified by logic.... Indeed, it is sometimes almost as if the problem had to be forgotten to be solved."[1]

> "Mr. Vaughn, what we are dealing with here is a perfect engine, ah, aneating machine. It's really a miracle of evolution. All this machine does isswim and eat and make little sharks. And that's all. Now why don't you take a long close look at this sign. Those proportions are correct."[2]

Since the early twentieth century, a formal design movement has combined artistry, the industrialization of society, and an unavoidable overlap of designing for commercial applications and designing within warfare and security contexts.[3] The military (or security) design movement—a subset of the broader multidisciplinary design movement—is a recent development, dating back to the mid-1990s.[4] For those unfamiliar with how militaries apply design, or confused on military design in praxis differentiating from general design methodologies, militaries adapt the broader praxis of general design and refashion it for one overarching purpose: designing to transform future security contexts into novel advantage for the design benefactors.[5] This has less to do with designing new user experiences or generating novel products and more with consideration of societal, organizational, cultural, and political design challenges where the complexities of dynamic human interaction do include the application of organized violence for institutional, group, or political objectives. Essentially, designing the tools and instruments of war requires select design methodology, model, and theory, while designing security affairs and war itself seems to need another.

This interdependent relationship between military institutions and commercial design activities dates back prior to the Industrial Revolution, the Age of Enlightenment, and the development of modern Western society.[6] The military design movement (unlike the civilian or commercial variants) tailors design thinking towards specific security and defense contexts for state-sponsored organizations. These entities deal with the application or threat of organized violence to accomplish national strategic and policy goals. Design is contextually aligned not towards commercial ends—new user experiences, new products, new services, etcetera—but toward security and policy affairs requiring the potential or active utilization of organized violence often within a complex, competitive control system.[7] In the last decade, an emergence of military design theorists, educators, and practitioners has come together into a community of practice internationally and across multiple armed forces building upon original Israeli Defense Force military design theories from the 1990s.[8] This new group of military academics and professionals has shown a keen interest in developing and expanding the notion of "designing for war."[9] The term "war" is applied here in a holistic sense—it includes the broad range of security and defense-related activities, preparations, and investments by nation-states dedicated to everything from humanitarian relief and peacekeeping to high-intensity total war contexts. Just as designing toward commerce is

1 Julian Jaynes, *The Origin of Consciousness in the Breakdown of the Bicameral Mind*, 3rd ed. (Boston: First Mariner Books, 2000), 44.

2 Peter Benchley and Carl Gottlieb, *Jaws*, directed by Steven Spielberg (1975; Universal City, CA: Universal Studios Home Entertainment, 2000), DVD.

3 Magdalena Droste, *Bauhaus: 1919–1933*, ed. Angelika Taschen and Nicole Opel, trans. Jane Michael and Karen Williams, 2nd ed. (Köln: Taschen, 2019); Ellen Lupton and J. Abbott Miller, eds., *The ABCs of Triangle, Square, Circle: The Bauhaus and Design Theory*, 2nd ed. (New York: Princeton Architectural Press, 2019); Klaus Krippendorff, "Propositions of Human-Centeredness: A Philosophy for Design," in *Proceedings of the Conference Doctoral Education in Design: Foundations for the Future*, ed. David Durling and Ken Friedman (Stoke-on-Trent, UK: Staffordshire University Press, 2000), 55–64, available at https://dl.designresearchsociety.org/cgi/viewcontent.cgi?article=1028&context=conference-volumes; Aaron P. Jackson, *Design Thinking in Commerce and War: Contrasting Civilian and Military Innovation Methodologies* (Maxwell AFB: Air University Press, 2020), available at https://www.jstor.org/stable/resrep27599.

4 Cara Wrigley, Genevieve Mosely, and Michael Mosely, "Defining Military Design Thinking: An Extensive, Critical Literature Review," *She Ji: The Journal of Design, Economics, and Innovation* 7, no. 1 (2021): 104–43, DOI: https://doi.org/10.1016/j.sheji.2020.12.002.

5 Oliver Jones, Philippe Beaulieu-Brossard, and Ben Zweibelson, "Design Leadership as Performance Theory: On the Epistemological Responsibilities of Pushing the Joke Too Far in Complex Warfare," in *The Handbook of Military Sciences*, ed. Anders Sookermany (Basel: Springer International Publishing, forthcoming).

6 Ben Zweibelson, "The Multidisciplinary Design Movement: A Frame for Realizing Industry, Security, and Academia Interplay," *Small Wars Journal* (2019): 1–4, available at https://smallwarsjournal.com/jrnl/art/multidisciplinary-design-movement-frame-realizing-industry-security-and-academia-interplay.

7 See Dr. David Kilcullen's discussion of Bernard Fall's system of competitive control within the broader theoretical discourse of normative systems. David Kilcullen, *Out of the Mountains: The Coming Age of the Urban Guerrilla* (New York: Oxford University Press, 2013), 130–35.

equally a vast and varied landscape of disciplines, fields, and contexts, the capacity and capabilities of humanity to conduct security affairs features many different ways to design.

Today, a rich debate continues between defenders of the military legacy system for thought and action — traditional strategists, planners, and policymakers — along with distinct yet often isolated communities of military design practice.[10] Unlike the (dominant) defenders of existing military institutions, who are mostly united, proponents of the military design movement are fragmented — described metaphorically as an "archipelago" of sorts complete with "nomads" and "heretics."[11] This contentious design debate is further cast within a larger sea of other design disciplines related to industry and human-centered commerce examining design in security contexts.[12] For military design theory, there are unexpected design contributions from postmodern philosophy, non-Western concepts, and other highly subjective and non-scientific fields and practices that provide insight and novel thought for human opportunities within the dynamic and complex conflict contexts of the 21st century.[13] The military design community of practice appears to be aligning all of these strange bedfellows toward the peculiar defense and security considerations for complex, dynamic design needs despite the chaotic and fragmented aspects of the new design movement.

At the United States Special Operations Command (USSOCOM) in Tampa, Florida, a military design program operating out of the Joint Special Operations University (JSOU) provides tailored military design education and outreach to American and international partner nation special operations forces and conventional forces. USSOCOM is the US military's most elite and specialized force, responsible for some of the most demanding, dangerous, and specialized missions in all warfare and security or policy applications. Over the last half-decade, thousands of Navy SEALs, Green Berets, Marine Raiders, and US Army Rangers, as well as members of elite special operations organizations across the globe throughout partners and allied nations have sent their personnel to experience JSOU's unique military design education. Many of the techniques, methods, and heuristic aids at the university were developed for military design contexts and are largely unknown outside of the small community of practice for military design.

Part of this lack of exposure is inevitable due to the secrecy of SOCOM activities and the classification requirements of many design efforts or design applications in real-world security contexts. However, the university's basic and advanced design courses are frequently provided at an unclassified level. Many lectures, products, and techniques are available openly across a variety of media-sharing platforms.[14] In this article, we present one of the most popular heuristic aids used in the university's basic design course. Readers can experience the first design activity that thousands of Special Operations operators, support enablers, and staff personnel undertake at the university campus in Tampa, online in distance courses, and in mobile educational activities around the globe. We explain how and why it provides significant value to military organizations seeking greater critical and creative thinking towards complex defense and security challenges.

8 Ofra Graicer, "Between Teaching and Learning: What Lessons Could the Israeli Doctrine Learn from the 2006 Lebanon War?," *Experticia Militar* (October 2017): 22–29, available at https://aodnetwork.ca/wp-content/uploads/2017/08/Graicer-O._Between-Teaching-and-Learning_2017-2.pdf; Ofra Graicer, "Self Disruption: Seizing the High Ground of Systemic Operational Design (SOD)," *Journal of Military and Strategic Studies* 17, no. 4 (June 2017): 21–37, available at https://jmss.org/article/view/58253; Yotam Feldman, "Dr. Naveh, or, How I Learned to Stop Worrying and Walk through Walls," *HAARETZ.Com* (blog), October 25, 2007, https://www.haaretz.com/misc/article-print-page/1.4990742.

9 Philippe Beaulieu-Brossard and Philippe Dufort, "Introduction to the Conference: The Rise of Reflective Military Practitioners" (presentation, Hybrid Warfare: New Ontologies and Epistemologies in Armed Forces, Canadian Forces College, Toronto, October 16–17, 2016); Aaron P. Jackson, "Introduction: What is Design Thinking and How is It of Use to the Australian Defence Force," in *Design Thinking: Applications for the Australian Defence Force*, ed. Aaron P. Jackson (Canberra, Australia: ADC Publications, 2019), 1–27, available at https://www.defence.gov.au/ADC/Publications/documents/joint_studies/JSPS_3_Design_Thinking.pdf; Zweibelson, "Multidisciplinary Design Movement"; Christopher Paparone, "Designing Meaning in the Reflective Practice of National Security: Frame Awareness and Frame Innovation," in *Design Thinking: Applications for the Australian Defence Force*, ed. Aaron P. Jackson (Canberra, Australia: ADC Publications, 2019), 89–104, available at https://www.defence.gov.au/ADC/Publications/documents/joint_studies/JSPS_3_Design_Thinking.pdf.

10 Aaron P. Jackson, "Civilian and Military Design Thinking: A Comparative Historical and Paradigmatic Analysis, and Its Implications for Military Designers" (paper presented at IMDC 2019: Innovation Methodologies for Defense Challenges, Lancaster, UK, February 28, 2019), 1–31; Jackson, *Design Thinking in Commerce and War*; Beaulieu-Brossard and Dufort, "Introduction to the Conference"; Zweibelson, "Multidisciplinary Design Movement."

11 Philippe Beaulieu-Brossard and Philippe Dufort, "Conclusion: Researching Reflexive Military Practices," *Journal of Military and Strategic Studies* 17, no. 4 (2017): 273–89, available at

https://aodnetwork.ca/wp-content/uploads/2017/08/PBB-PhD-JMSS-Conclusion-2017.pdf; Philippe Beaulieu-Brossard, "Encountering Nomads in Israel Defense Forces and Beyond," in *Concepts at Work: On the Linguistic Infrastructure of World Politics*, ed. Piki Ish-Shalom (Ann Harbor, MI: University of Michigan Press, 2021), 91–117.

12 Phil Gilbert, "The Art of War: Accelerating Innovation by Scaling the Design Mindset" (lecture, IMDC 2019: Innovation Methodologies for Defense Challenges, Lancaster, UK, February 27, 2019), available at https://www.youtube.com/watch?v=m7mr3VlCiow; Jackson, "Civilian and Military Design Thinking"; Ben Zweibelson, "Designing through Complexity and Human Conflict: Acknowledging the 21st Century Military Design Movement" (lecture with Phil Gilbert, SPADE 2018: Rethinking Defense and Security in the Digital Age, Copenhagen, Denmark: IBM, 2018); Beaulieu-Brossard, "Encountering Nomads in Israel."

13 Matt Mathews, "Interview with BG (Ret.) Shimon Naveh," Combat Studies Institute (November 1, 2007): 1–10, available at https://smallwarsjournal.com/documents/mattmatthews.pdf; Shimon Naveh, Jim Schneider, and Timothy Challans, *The Structure of Operational Revolution: A Prolegomena*, A Product of the Center for the Application of Design (Fort Leavenworth, Kansas: Booz Allen Hamilton, 2009); Ofra Graicer, "'Beware of the Power of the Dark Side': The Inevitable Coupling of Doctrine and Design," *Experticia Militar* (2017): 30–37, available at http://aodnetwork.ca/wp-content/uploads/2017/08/naveh_experticia-militar-ed.2_2017.pdf; Haridimos Tsoukas and Mary Jo Hatch, "Complex Thinking, Complex Practice: The Case for a Narrative Approach to Organizational Complexity," *Human Relations* 54, no. 8 (2001): 979–1013, DOI: https://doi.org/10.1177%2F0018726701548001; Paparone, "Designing Meaning."

14 Aaron Jackson, "A Historical and Paradigmatic Analysis of Civilian and Military Design Thinking," YouTube video, 57:02, posted by Think JSOU, May 6, 2019, https://www.youtube.com/watch?v=-3Lk-6LMOQUY; Nathan Schwagler, "What Would Dali Do?," YouTube video, 54:18, posted by Think JSOU, March 9, 2018, https://www.youtube.com/watch?v=G_zc44oxOq0; Ben Zweibelson, "Special Operations and Design Thinking: Through the Looking Glass of Organizational Knowledge Production," *Special Operations Journal* 2, no. 1 (2016): 22–32, DOI: https://doi.org/10.1080/23296151.2016.1151753; Ben Zweibelson, "Change Agents for

Academic Focus, Andragogic Orientation, Data Collection, and Modeling

This article presents one of the premier design activities used in the introductory design course. JSOU provides adult-level education oriented towards complex security contexts and customized within a Special Operations range of mission sets, course objectives, organizational requirements, and long-term career development milestones for Special Operations Forces professionals. While faculty have extensive records concerning the number of iterations and student demographics—not to mention the thousands of student drawing examples completed through this design exercise—this article reflects a qualitative approach. We avoid any explicit data analysis due to the subjective aspects of the exercise parameters. Because students form teams and engage in extensive discourse prior to creating a wide range of symbols and drawings, a quantitative analysis could only be conducted if precise studies and data collection were carried out during future activities. Nevertheless, as of May 2021 over 750 military students have completed the basic design course, and an estimated additional 1,000 participants have done so during lectures, non-standard events, and other activities.[15]

Most students are mid- to senior-level professionals with 5–15 years of experience from across US Department of Defense services and international partners and allies. We have selected and included photographs of actual student drawings, with analysis and conclusions derived from JSOU design faculty experiences and observations in a qualitative assessment coupled with analysis of the thousands of historical images of student work. Future research could attempt a quantitative analytic measuring of all student drawings for specific pattern analysis. Still, it would also need to determine how inter-team discussions and concepts erased or abandoned during each exercise portion should be accounted into any analytic rendering. Student explanation takes place orally, and thus an analysis of the drawings alone would be insufficient for most quantitative efforts. We present these general findings to explain the design model used in the exercise, the metaphoric devices employed to link theory to the data available (student drawings and behaviors), and the facilitation methodology to readers interested in reproducing the exercise.

Diving into the Deep End: Immediate Student Immersion

On the first day of the university's basic military design course, design students are assembled into teams of five to eight (typically 20–25 students divided into 4–5 design teams). After brief introductions, the teams are asked to conduct what faculty call "the *Jaws* Exercise," which serves as an icebreaker activity.[16] Although seemingly innocuous at first, as this article will later explain, the exercise provides significant insight for students into how and why they think the way they do. It shows how the powerful social construction of reality by military institutionalisms frequently prevents the military from applying anything but convergent and non-reflective practice.[17] These institutionalisms essentially render innovation and creativity

off-limits unless pursued in institutionally sanctioned and recognized ways.[18] Further, this exercise highlights not only the lack of divergent thinking that often occurs, but also the tendency for dominant language (unbeknownst to the participants), ritualized group metaphors, and the institutionally shared illusion of convergent, legacy concepts to be misidentified as new, creative, and innovative—when in fact they are entirely dependent on previously held beliefs and patterns.[19] As Julian Jaynes articulated,

> "Abstract words are ancient coins whose concrete images in the busy give-and-take of talk have worn away with use.... We tend too much to think of language as being solid as a dictionary, with a granite-like permanence, rather than as the rampant restless sea of metaphor which it is."[20]

This exercise focuses designers' attention directly on how they think, why their language functions as it does, and how their institution—military in this case—enforces particular blinders upon design practitioners, despite the very institution attempting to avert their gaze and continue to employ it toward all security challenges.

At JSOU, design facilitators opt for immediate design immersion by moving the design students into this exercise right after administrative and opening remarks for the course. Students are intentionally given an active-learning challenge while being paired with an entirely unfamiliar team of fellow students for the first time. An element of competition is almost automatically present due to social and institutional qualities of the predominantly military or defense-oriented audience, yet this design challenge intentionally avoids using a military- or defense-themed topic to design upon. The *Jaws* exercise (Table 1) is entirely removed from warfare or security affairs, creating the first subtle yet intentional, "forced cognitive tool drop."

The two-part whiteboard exercise begins with simple instructions to the students. They are informed that they will watch a brief, five-minute video from the classic horror movie *Jaws*, after which they will be tasked as a design team to use the whiteboards to explain the scene they observed in the clip. The faculty craft the instructions carefully, asking the students to consider the differences between "describe the scene" and "explain the scene."

The significance of explaining versus describing is critical. It is often misunderstood, particularly within military organizations that emphasize analytic optimization within a systematic approach to warfare—inputs lead to outputs; end-states established with reverse-engineered planned activities coupled with known variables and quantified effects—that seeks description as paramount.[21] In the administrative portion leading to the *Jaws* exercise, students introduce themselves but are also asked to tell the class what their all-time favorite food or meal is and why. In nearly every class, students provide a mix of answers, with some focusing on the ingredients and method for preparing their favorite meal, and others telling a deep narrative concerning the meaning and symbolism of their favorite meal, such as "hunting deer in the mountains with my grandfather and father is the only time a venison steak tastes best to me." Facilitators unpack these responses once students complete their introductions by clarifying which answers were descriptive (what-centric, recipe-based, method of cooking, content-focused) and those

the SOF Enterprise: Design Considerations for SOF Leadership Confronting Complex Environments," *Special Operations Journal* 3, no. 2 (2017): 127–40, DOI: https://doi.org/10.1080/23296151.2017.1384274.

15 JSOU's design education program was adapted by multiple military universities and units, and by several international military organizations in the period between 2019–2021. At those locations, multiple additional Jaws exercises were also conducted. That data was not included in this study.

16 JSOU design faculty members Ben Zweibelson and Nathan Schwagler co-created and improved the *Jaws* exercise while working as contractors supporting the SOCOM enterprise. For the tutorial video on the exercise, see Think JSOU, "The '*Jaws* Exercise': What SOCOM Design Students Experience in the First Hour of Design Education," YouTube video, 38:03, posted by Think JSOU, April 10, 2020, https://www.youtube.com/watch?v=kf_IQ5uCS8g.

17 Phil Williams, "The Global Crisis of Governance," in *Beyond Convergence: World Without Order*, ed. Hilary Matfess and Michael Miklaucic (Washington, D.C.: Center for Complex Operations; Institute for National Security Studies, 2016), 22–23; Jean-Pierre Protzen and David J. Harris, *The Universe of Design: Horst Rittel's Theories of Design and Planning* (New York: Routledge, 2010), 151–62; Karl E. Weick, "Drop Your Tools: An Allegory for Organizational Studies," *Administrative Science Quarterly* 41, no. 2 (1996): 301–13, DOI: https://doi.org/10.2307/2393722; Karl E. Weick, "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster," *Administrative Science Quarterly* 38, no. 4 (1993): 628–52, DOI: https://doi.org/10.2307/2393339; Christopher Paparone and George Reed, "The Reflective Military Practitioner: How Military Professionals Think in Action," *Military Review* (March-April 2008): 66–76, available at https://www.researchgate.net/publication/256485955.

18 Ben Zweibelson, "Preferring Copies with No Originals: Does the Army Training Strategy Train to Fail?," *Military Review*, no. 1 (2014): 15–25, available at https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20140228_art006.pdf; Christopher Paparone and George Topic Jr., "Training Is Déjà Vu; Education Is Vu Jàdé," *Army Sustainment* (May-June 2017): 15, available at https://alu.army.mil/alog/2017/MayJun17/PDF/185942.pdf; Jackson, *Design Thinking in Commerce and War.*

that were more explanatory (why-centric, narrative- and experience-based, contextual, subjective to the participant). This establishes the first learning point for students entering into the *Jaws* exercise and helps provide signposts for them to consider whether they are setting upon simply describing something or more deeply explaining it.

Design students entering this exercise normally articulate description with "what-centric," reductionist thinking,[22] while explanation depends on "why-centric" thinking that requires abstraction, holism, and an up and out orientation versus down and in. Paparone posits military professionals tend to rely on an institutional frame that is "underpinned by an objectivist ontology, stratified epistemology, and the reductionist methodology of *positivism*."[23] This configures most students to prioritize military terminology arranged in doctrinally proscribed sequences in what is often criticized as a techno-language of acronyms and metaphoric devices exclusive to defense organizations.[24] Left unchecked, military students in most any design activity will automatically move toward using precise (and rigid) terms and language that reinforces indoctrinated decision-making processes inculcated across nearly all military professionalization, training and education.

Before the video begins, the faculty give them one last surprise instruction, stipulating that they cannot use any words on the boards or in the drawings. The teams can only draw pictures and symbols to explain the scene. This is intentional and the second subtle forced cognitive tool drop effort of the exercise. Military culture breeds a strong analytic approach and mindset that normally uses precise and descriptive language, doctrine, and set patterns for knowledge production.[25] Military design teams allowed to write words on the board will typically manufacture doctrinally adherent mission statements, targeting diagrams, or some other familiar and institutionally sanctioned way of expressing ideas, such as SWOT analysis or perhaps a military center of gravity critical vulnerability list[26] of the movie scene. These outputs are predictable, will all look nearly identical in institutional composition, and not useful for this exercise. Thus, the design faculty force the designers to drop their tools at the onset, forbidding them from using any words in their drawings.[27]

The students are given fifteen minutes to sketch their first drawing after watching the *Jaws* clip. The clip lasts only a few minutes but contains a wide range of content, opinions, arguments, character development, emotion, and logical positions. JSOU's design faculty selected a scene that occurs early in the horror film depicting a very dynamic and complex engagement. However, design facilitators at JSOU or inspired by JSOU have conducted this same exercise using other film or television clips that feature different, equally dynamic and challenging interactions for students to consider.

With regard to the *Jaws* scene, which occurs quite early on in the film, the audience and the characters are only beginning to make sense of what is happening. At this point in the film, none of the characters has actually seen the shark, nor has anyone established (or retained any concrete evidence of) the shark as a viable threat. The scene consists of characters Mayor Vaughn, the mayor of Amity Island; Police Chief Brody; and oceanographer Matt Hooper arguing in front of the island's billboard that vandals recently

19 Paparone and Reed, "Reflective Military Practitioner," 66–76; Christopher Paparone, "On Metaphors We Are Led By," *Military Review* 77, no. 6 (2008): 55–64, available at https://cgsc.contentdm.oclc.org/digital/collection/p124201coll1/id/241/rec/1; Jaynes, *Origin of Consciousness*, 48–66; Gareth Morgan, *Images as Organizations*, updated ed. (London: Sage Publications, 2006); Donald A. Schön, *Displacement of Concepts* (London: Tavistock Publications, 1963).

20 Jaynes, *Origin of Consciousness*, 51.

21 Grant Martin, "A Tale of Two Design Efforts (and Why They Both Failed in Afghanistan)," *Small Wars Journal* (2011): 16, available at https://smallwarsjournal.com/jrnl/art/a-tale-of-two-design-efforts-and-why-they-both-failed-in-afghanistan; Christopher Paparone, "How We Fight: A Critical Exploration of US Military Doctrine," *Organization* 24, no. 4 (2017): 516–33, DOI: https://doi.org/10.1177/1350508417693853; Christopher Paparone, *The Sociology of Military Science: Prospects for Postinstitutional Military Design* (New York: Bloomsbury Academic Publishing, 2013); Jackson, "Introduction."

22 Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1964), 1–5.

23 Paparone, *The Sociology of Military Science*. Emphasis original.

24 Paparone, "On Metaphors We Are Led By"; Paparone, "How We Fight"; Christopher Paparone and William Davis Jr., "Exploring Outside the Tropics of Clausewitz: Our Slavish Anchoring to an Archaic Metaphor," in *Addressing the Fog of the COG: Perspectives on the Center of Gravity in US Military Doctrine*, ed. Celestino Perez (Fort Leavenworth, Kansas: Combat Studies Institute Press, 2012), 65–80, available at https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/COG.pdf; Ben Zweibelson, *Gravity-Free Decision-Making: Avoiding Clausewitz's Strategic Pull*, Army Research Papers, no. 8 (Australia: Directorate of Future Land Warfare, 2015): 30–34, available at https://researchcentre.army.gov.au/sites/default/files/160427_msp_arp_zweibelson_web_final_b5.pdf.

25 Paparone, "On Metaphors"; Paparone, "How We Fight."

26 Christopher Schnaubelt, Eric Larson, and Matthew Boyer, *Vulnerability Assessment Method (VAM) Pocket Guide: A Tool for Center of Gravity Analysis* (Santa Monica: Rand Corporation, 2014), available at https://www.rand.org/content/dam/rand/pubs/tools/TL100/TL129/RAND_TL129.

Table 1 ***Jaws* exercise session plan.**

JAWS Exercise Outline
(Exercise Structure & Organization)

SETUP and PREPARATION

- Divide group into Design Teams of 4–8 participants.
- Supply teams with whiteboard and markers in a space adequate to accommodate team collaboration around whiteboard while maintaining separation from other groups.
- Provide adequate viewing venue/area with sufficient audio/video capabilities for group to watch and hear video clip.
- *JAWS* clip located at: https://www.youtube.com/watch?v=fGoekw7e-3U&spfreload=10.

Event	Description	Time Allotted	Running Time	Instructor/Facilitator Notes
1.0	**PART 1**			
1.1	Initial discussion with group on difference between "description" and "explanation."	5 mins	:05	Initial discussion to setup the instructions to "explain" the scene.
1.2	Initial Instructions and playing/watching of movie clip.	5 mins	:10	Direct the students to watch a short clip of a scene from the classic horror movie *JAWS*, following which each team will be given 10 mins to "draw" their "explanation" of the scene. Emphasize that they CANNOT use any words … only drawings and/or symbols.
1.3	Team time for first drawing on whiteboards.	10 mins	:20	Hold team to no more than 10 mins to draw their explanation. Ensure no words are written on the boards.
1.4	Team debriefs of first drawing. Each team elects one representative to talk about their drawing, as well as the team discussion around it.	15–20 mins*	:40	*Dependent on # of teams. Provide each team equal time to brief their first drawing to the other teams.
1.5	Team self-rating of drawing on a Description–Explanation scale.	1 min	:41	Have teams quickly rate their respective drawings on a scale of 1–10, where 1 = highly descriptive, and 10 = highly explanatory.
1.6	Team reflection on convergent aspects and patterns, if present, in their drawings. Group and Instructor discussion on "why" this happens.	5 mins	:46	Despite words being eliminated, teams tend to converge around the same "descriptive" drawing representations and symbols to articulate what they would have written in words, if allowed.
2.0	**PART 2**			
2.1	Part 2 instructions and second playing/re-watching of same movie clip.	5 mins	:51	Direct the students to re-watch the same scene, following which they will be given another 10 mins to attempt another drawing explaining the scene. Instruct that not only can they still NOT use words as before, but they additionally CANNOT use any of the drawing representations, symbols, or concepts from their first drawing. Prompt them with "How do you draw a shark if you cannot draw the shark itself?" Intent to introduce "abstraction" on "why" we fear sharks, or horror, or uncertainty.
2.2	Team time for second drawing on whiteboard.	10–15 mins	1:05	If whiteboard space permits, have them preserve their first drawing on the whiteboard. Recognize that additional time may be need to be provided here as teams will often require more time for discussion.
2.3	Final Team debriefs. Each team elects a different representative to talk about their second drawing, as well as the team discussion around it.	15–20 mins*	1:25	*Dependent on # of teams. Provide each team equal time to brief their second drawing to the other teams.
2.4	Team self-rating of second drawing on a Description–Explanation scale.	1 min	1:26	Have teams quickly rate their respective drawings on a scale of 1–10, where 1 = highly descriptive, and 10 = highly explanatory. Do they adjust their initial rating on their first drawing?
2.5	Closeout of the exercise. Group and instructor discussion on the convergent–divergent movement of their two drawings.	5 mins	1:30	Discuss convergent and divergent thinking. Introduce how design and planning feature cognitive difference.

pdf; Paparone and Davis Jr., "Exploring Outside the Tropics of Clausewitz."

27 Often, students will complain that they are "not good at drawing." Facilitators typically explain that artistic ability can hinder design teams, because without them, teams form little emotional attachment to their drawings and are more at ease "wiping the slate clean" and shifting to iterative sessions of design. Typically, teams that feature an artist tend to rally around the skill of that person, and once a "nice drawing" is on the board, the team often moves to defend and protect the art, thus disrupting and losing out on the necessary and critical iteration of drawing and erasing.

28 Willemien Visser, "Schön: Design as a Reflective Practice," *Collection: Art+Design & Psychology*, no. 2 (2010): 21–25, available at https://hal.inria.fr/inria-00604634; Paparone, "Designing Meaning"; Donald A. Schön, *Frame Reflection: Towards the Resolution of Intractable Policy Controversies* (New York: Basic Books, 1994); Beaulieu-Brossard and Dufort, "Introduction to the Conference."

29 Weick, "Drop Your Tools."

defaced with spray paint. Mayor Vaughn demands actions from the police chief to find the vandals. Chief Brody takes this opportunity to reveal to the mayor a far more dangerous and pressing problem to the island than errant hooligans with paint cans and brings with him the scientific expert to sway the mayor to accept his security recommendations.

It's a memorable scene in the movie, and aside from highlighting the tremendous acting skills of the cast and the powerful writing and storyline of the film, it also demonstrates multiple perspectives on a complex, ill-structured challenge within an emergent, fluid, and dynamic context where no one holds "the truth." Any clear, predictable solutions are out of reach, or they conflict with equally compelling counterarguments and stakeholder interests. The perpetual fog of uncertainty hangs over each individual attempting to make sense of the situation and plot a safe and reliable course. Tempers flare, and egos are clearly on display as the chief, scientist, and mayor argue, illustrating a complex web of power, information, fear, loyalty, pride, and obligation. While other scenes can easily be substituted, the JSOU design faculty particularly enjoy using this one due to the complexity of the scene and the distance from anything military or security-oriented in warfare or foreign policy applications. Designers working with other audiences might seek to pair a similar scene that disrupts or inhibits institutional preferences using the same logic.

Patterns Emerge: Sharks, Dollar Signs, and Police Badges

The first set of design drawings are of greater utility to the students in becoming reflective practitioners[28] than they are to the facilitators. For the design facilitators conducting the exercise, whatever the teams draw for the first round are often only useful for shaping the cognitive tool drop that will take place during the second round.[29] Facilitators have little interest in these first drawings other than encouraging as much ideation and symbol/drawing application as the teams can muster. As the second part of the exercise reveals, everything added to the first drawing helps create the right conditions for divergent thinking in the second portion. One might anticipate that with so many design teams, the restriction on using language or favored military heuristic aids, and a complex movie scene to explain, a wide range of images must manifest. Yet, despite these expectations, several reliable patterns have emerged after observing thousands of military design students complete this exercise. First-round drawings tend to express convergent and highly descriptive accounts of the movie scene, often featuring near-identical pictures and metaphors regardless of the military team composition.

Students typically draw a police badge or symbols of police equipment and uniforms to represent Chief Brody, a lab beaker or other scientific object for Hooper. Almost universally, the mayor is depicted with a dollar sign or some other similar cash-fixated object. The shark is virtually always drawn as a "toothy" shark, usually eating people depicted in stick-figure form. Sometimes the shark is symbolized with a fin or the sharp tooth alone. Most drawings include other details such as water, a beach, the billboard, and military teams also usually link the objects structurally using geometric

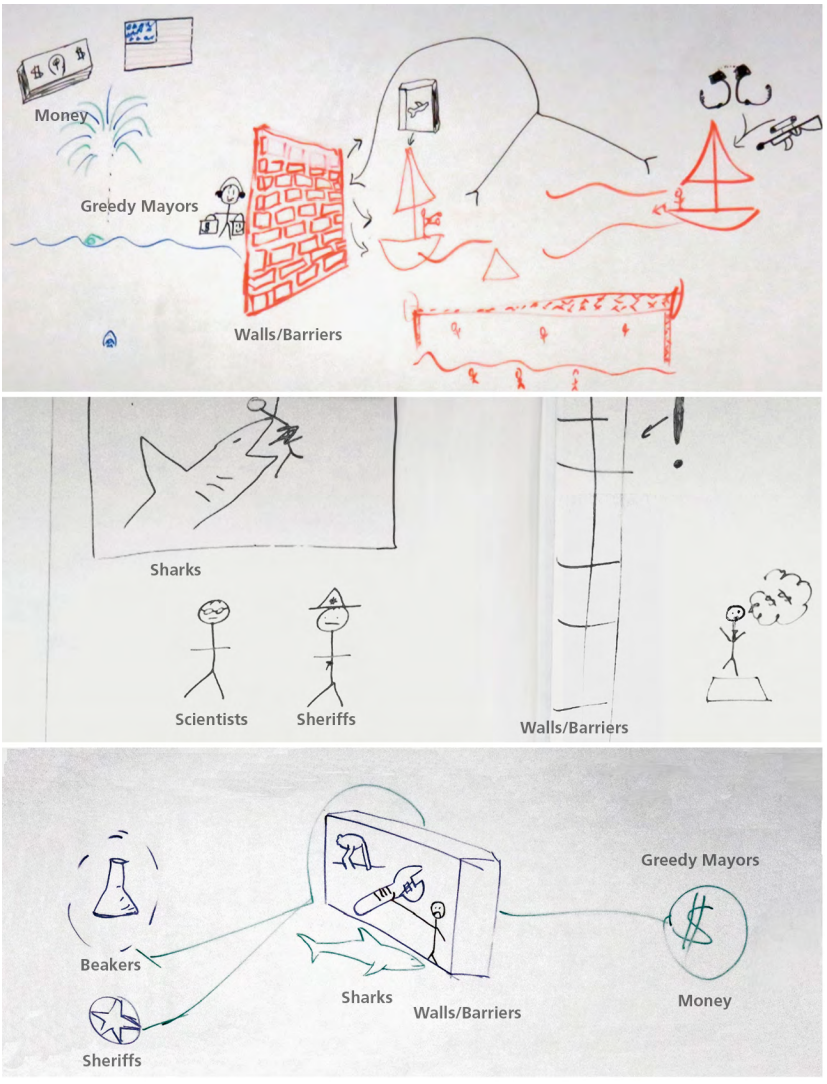


Figure 1
Examples of student "first drawings," with reliable convergence observed. Image created in 2020. (These are student graphics photographed and made into this original article graphic by the authors. As the authors made this article through a Department of Defense (US government) capacity, there is no copyright applicable here. This applies to all relevant images.)

relationships or a linear, easily communicated left-right sequence of comprehension (see Figure 1). Often, a central icon organizes the entire drawing with a shark fin symbol used in the middle, similar to a military-specific "center of gravity" element found in service doctrine, and all other symbols orbiting the shark construct. The drawings maintain an overarching composition grounded in classical mechanics logic (trinities, pyramids, hierarchies, squares, quadrants, left-to-right construction, central to outward order of production). While this predictive behavior—regardless of military audience for the first drawing evolution—is interesting, design facilitators find what students omit from the first drawing far more valuable for unlocking student self-awareness of what is going on "above the board" within social, cultural, and organizational processes.[30]

No student team draws themselves (the actual team or indication of "self") in any first drawings, in that the actual design team executing the

30 Karl E. Weick, "Reflections: Change Agents as Change Poets—On Reconnecting Flux and Hunches," *Journal of Change Management* 11, no. 1 (2011): 7–20, DOI: https://doi.org/10.1080/14697017.2011.548937; Zweibelson, "Change Agents for the SOF Enterprise."

task will remain removed. This is akin to scientists in a lab being external to and removed as a factor from their isolated experiment. It demonstrates their paradigm frame implicitly as one that prefers analytic optimization, objectivity, and uniformity over space and time.[31] This is important—getting the design students to formally reflect upon their preferred paradigm or cognitive frame for making sense of reality in military communities is almost always a functionalist one, where objectivity, analysis, reductionism, and linear causality factor significantly in the formation of the methods, doctrine, language, and metaphors behind the language itself.[32] Teams rarely draw or refer to the movie scene as a "movie" or reference things such as the audience, film director, camera crew, scriptwriters, or anything outside of being completely immersed within the movie scene as if designers were there observing it in real-time. In hundreds of design teams representing thousands of students in numerous iterations of the *Jaws* exercise, university faculty recall only two or three teams ever considering the movie scene as a movie in the first round, with not a single team ever drawing themselves in the first picture. Most participants instead draw variations of what is shown in the first graphic above as well as the figures below (Figures 2, 3). This pattern maintains whether considering American military audiences, European, Middle Eastern, mixed groups of international military professionals, or non-military participants such as governmental, academic, or industry representatives.

Student teams rarely draw an antagonist other than the shark in their first drawing, although on rare occasions a group creatively rejects using the shark and breaks from the norm. Regardless of what they drew for the first drawing, when facilitators ask them to rank their first drawings on a scale of one to ten, where one represents exceptional description, and ten corresponds to high explanation, the teams also tend to self-assess their work as more explanatory than descriptive. Perhaps due to a highly task-oriented culture,[33] military design teams usually self-assess their first effort as moderately to highly explanatory. When they complete the second part of this exercise and are asked to refer back to this grading of their first drawing, teams typically reduce their first self-assessed scores or grant themselves even higher explanatory scores for their second drawing. In retrospect, and at the end of this exercise, most participants have a more sophisticated and critically self-reflective stance on convergent and divergent thinking, which likely influences their rescoring of their first attempt to a lower score.[34]

Dropping Tools: Above the Board and Beyond the First Drawing

Once again, the content of what student teams draw in the first exercise is less important to the facilitators. Faculty expect that anything put into the first drawing represents the design teams' primary or favored conceptual tools—the symbols, metaphors, and indicators of the preferred paradigm. In the second part of the exercise, anything and everything drawn in the first image will influence the second drawing as the design facilitators move the teams toward divergence and reflection on whatever content occurred

31 Linda Putnam, "The Interpretive Perspective: An Alternative to Functionalism," in *Communication and Organizations: An Interpretive Approach*, ed. Linda Putnam and Michael Pacanowsky (Beverly Hills: Sage Publications, 1983), 31–54, DOI: https://doi.org/10.4135/9781446262757; Ben Zweibelson, "Rose-Tinted Lenses: How American Functionalist Strategy Inhibits Our Appreciation of Complex Conflicts," *Defence Studies Journal* 16, no. 1 (2016): 68–88, DOI: https://doi.org/10.1080/14702436.2016.1147924; Gibson Burrell and Gareth Morgan, *Sociological Paradigms and Organisational Analysis: Elements of the Sociology of Corporate Life* (Portsmouth, UK: Heinemann, 1979)

32 Burrell and Morgan, *Sociological Paradigms*; Majken Schultz and Mary Jo Hatch, "Living with Multiple Paradigms: The Case of Paradigm Interplay in Organizational Culture Studies," *Academy of Management Review* 21, no. 2 (1996): 529–57, DOI: https://doi.org/10.5465/amr.1996.9605060221; Dennis A. Gioia and Evelyn Pitre, "Multiparadigm Perspectives on Theory Building," *Academy of Management Review* 15, no. 4 (1990): 584–602, DOI: https://doi.org/10.5465/amr.1990.4310758; Jackson, "Civilian and Military Design Thinking."

33 Paparone, "How We Fight"; Jackson, *Design Thinking in Commerce and War*; Ketti Davison, "From Tactical Planning to Operational Design," *Military Review* (September-October 2008): 33–39, available at https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20081031_art009.pdf.

34 The authors acknowledge several biases likely operate in this context that exceed the scope of this case study. Military professionals tend to foster a high desire to excel, and institutionally modern militaries are criticized for exhibiting a "zero defect culture" that may influence how military design students self-evaluate in this activity (as well as most any other).

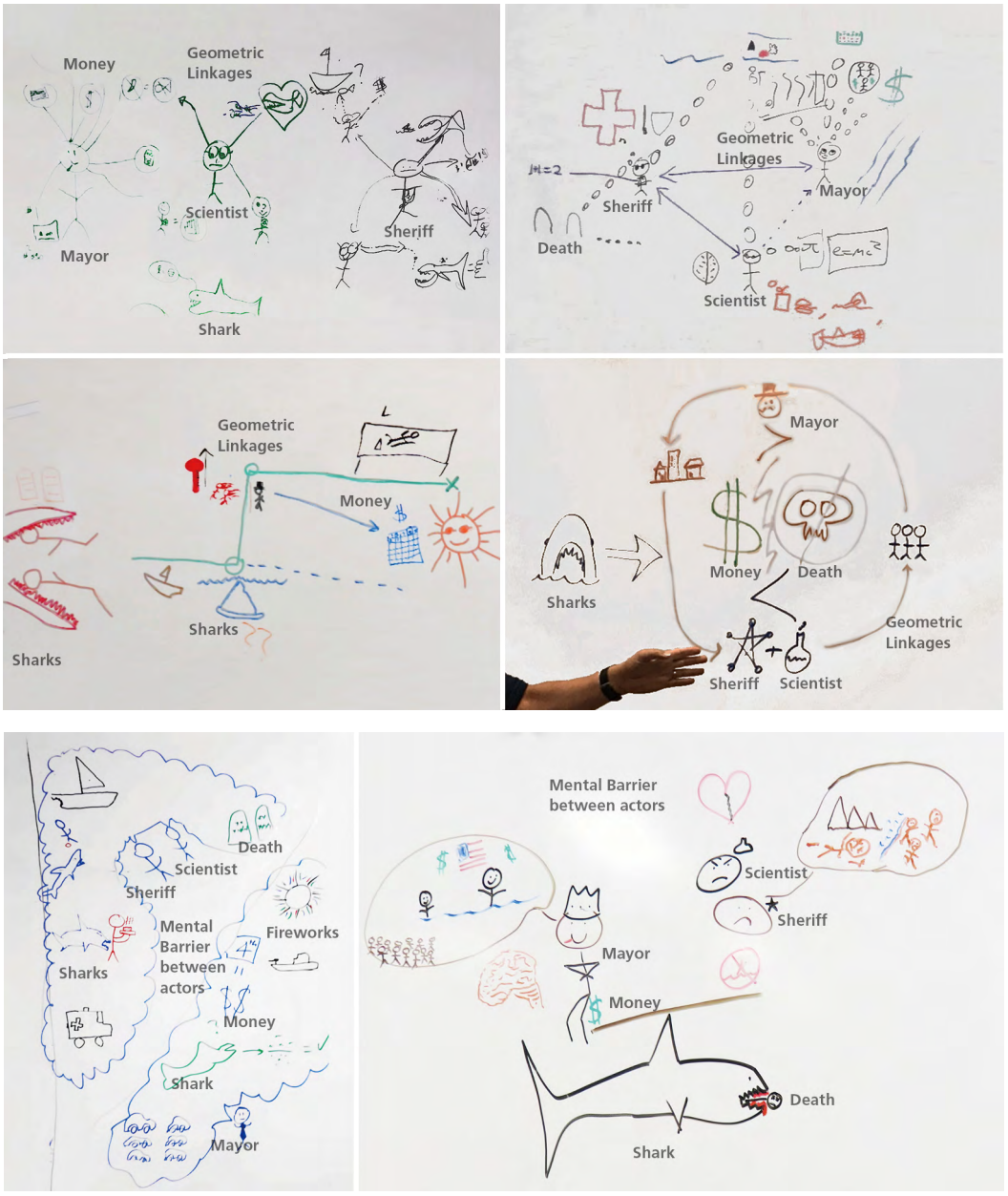


Figure 2 (top)
More examples of students' "first drawings," using geometric linkages. Image created in 2020.

Figure 3 (bottom)
More examples of students' "first drawings," illustrating the mental barrier between actors. Image created in 2020.

in the first drawing. The design team discourse that occurs before each drawing session is critical in that they become reflective toward their preferred paradigm through observing not just how their own team generated content within a convergent pattern, but that all the teams in the class did the same. As Klaus Krippendorff has stated, "Discourses construct vastly different realities into which the ideas of a discourse are inscribed and, in turn, become available for inquiry and elaboration…. Different discourses not only construct incommensurate realities, their pursuit of different paradigms yields different kinds of knowledge."[35]

At the beginning of the exercise, a facilitator will ask a design class

35 Krippendorff, "Propositions of Human-Centeredness," 2.

of military professionals how they feel about the creativity and divergent thinking abilities of special operations forces, or if the class is composed more of international or general-purpose forces (military services and forces outside of special operations), the same inquiry regarding that group versus all others. Nearly all groups observed, regardless of their service branch, nationality, or specialization, tend to regard smaller, elite forces as often (not always) a bit more creative and plastic in thinking versus larger, general-purpose forces. This could indicate aspects of the special operations selection process for entry into elite forces or potentially the tendency of psychological profiles of those striving to join those organizations.[36] There may be cultural and social influences at play here as most of the entertainment industry celebrating military forces in films, television, and literature appear preferential toward special operations contexts, stories, and organizations. It could also merely be bias, due to the design facilitators' working within a special operations university over time.

Once the first drawing is completed and each team presents their image to the other teams, a facilitator asks them whether, collectively, all of the shark scene drawings appear convergent or divergent in nature. Typically, although not always, all of the teams will appear quite convergent, with many sharing similar or even identical concepts and symbols. In hundreds of examples through the university's design program, facilitators have seen nearly identical team drawings emerge quite frequently in an uncanny fashion that strongly indicates a preferred or dominant paradigm for military organizations, as well as indications concerning shared metaphors, epistemological choices on logics, and shared narrative structures based on an overarching military belief system.[37]

Moving from Total Convergence towards Complete Divergence: Why a Shark?

With the first set of design team drawings completed, the facilitators next move the teams into reflective practice necessary in military design. Often, there is a strong pattern of shared symbols and concepts across the groups, reflecting convergent thinking and general uniformity in the highly descriptive frames they create. Military professionals remain keenly focused on finding a desired end state, seeking to nest it with established objectives so as to reliably move towards a reverse-engineered "problem identification, problem clarification, problem-solution pairing, execution and evaluation of solution application" mindset.[38] This "ends–ways–means" construct permeates nearly all modern military decision-making and knowledge construction from the smallest tactical to the broadest strategic efforts and defines nearly all military doctrine, professional military education, training, and language.[39] This really is the crux of the design exercise and precisely what any design facilitator will confront if attempting to apply design concepts to most any military group. The primary military institutional driver is, thus, military science—with this design movement ushering in novelty and normative thinking on what is needed next. Or, as Krippendorff explains, "Science inquires into what is, design into what could be."[40] The tension between the

36 David Grossman, *On Killing: The Psychological Cost of Learning to Kill in War and Society* (Boston: Little, Brown and Company, 1995).

37 Paparone, "Designing Meaning"; Aaron P. Jackson, "Towards a Multi-paradigmatic Methodology for Military Planning: An Initial Toolkit," *The Archipelago of Design* (blog), March 4, 2018, https://aodnetwork.ca/towards-a-multi-paradigmatic-methodology-for-military-planning-an-initial-toolkit/; Jackson, "Civilian and Military Design Thinking"; Schultz and Hatch, "Living with Multiple Paradigms"; Burrell and Morgan, *Sociological Paradigms*.

38 Naveh et al., *Operational Revolution*; Jeffrey W. Meiser, "Ends + Ways + Means = (Bad) Strategy," *Parameters* 46, no. 4 (2016): 81–85, available at https://ssrn.com/abstract=3762221; Jeremiah R. Monk, *End State: The Fallacy of Modern Military Planning* (Montgomery: Air War College, 2017), 1–16, available at https://apps.dtic.mil/sti/pdfs/AD1042004.pdf; Matthew Lauder, "Systemic Operational Design: Freeing Operational Planning from the Shackles of Linearity," *Canadian Military Journal: Operational Planning* 9, no. 4 (2009): 41–49, available at http://www.journal.forces.gc.ca/vo9/no4/08-lauder-eng.asp; Ben Zweibelson, "One Piece at a Time: Why Linear Planning and Institutionalisms Promote Military Campaign Failures," *Defence Studies Journal* 15, no. 4 (2015): 360–74, DOI: https://doi.org/10.1080/14702436.2015.1113667; Paparone, *The Sociology of Military Science*.

39 Justin Kelly and Michael Brennan, "The Leavenworth Heresy and the Perversion of Operational Art," *Joint Forces Quarterly*, no. 56 (2010): 367; Meiser, "Ends + Ways + Means"; Anders Sookermany, "Military Education Reconsidered: A Postmodern Update," *Journal of Philosophy of Education* 51, no. 1 (2017): 310–30, DOI: https://doi.org/10.1111/1467-9752.12224; Paparone, "How We Fight."

40 Krippendorff, "Propositions of Human-Centeredness," 2.

two clearly manifests during the two *Jaws* drawing sessions. With only the tools to solve specific military problems, how does a person design unrealized—unimagined, yet-to-be, not yet existing—applications against unimagined military developments that reject all existing tools and solutions?

Military professionals apply that solution-oriented mindset across simplistic, complicated, complex, and even chaotic contexts[41] indiscriminately—and often unknowingly—so military design facilitators use the second part of the *Jaws* exercise to introduce what Donald Schön terms "reflective practice."[42] Instead of automatically applying the solution mindset—thereby ignoring the personal ontological and epistemological choices that socially construct one's frame for making sense of reality—reflective practitioners are nudged into becoming self-aware of their individual frame and the limits of that frame, and exploring beyond those limitations into the overlaps, tensions, and potential interplay of other, alternative paradigms considering the same complex reality.[43]

The design facilitators ask the teams to watch the same *Jaws* clip again, after which they are given an additional fifteen minutes as a group to once again attempt to draw and explain the clip on the boards. The new twist, however, is that any images, symbols, or concepts applied in the first *Jaws* drawing are forbidden from inclusion in this second challenge. Typically, this means most teams can no longer use sharks, shark teeth, water, beaches, sheriff badges, dollar signs, or the other common symbols used in the first drawings.[44] Virtually all groups draw a shark or parts of a shark in their first drawing, and therefore the facilitators must clarify that once a part of a shark is used, the entire concept of "shark" is now off-limits for the second exercise.

Before the students watch the clip a second time, the facilitators try to prompt some deeper conversations about the scene, including why nearly all military design teams never draw themselves in that first drawing. These prompts highlight the (typical) epistemological orientation towards the analytic, optimization mindset dominant in military culture, as well as the powerful influence of what multiple critics term "pseudoscientific" belief systems promoted in military decision making methods, language, and structure.[45] Rarely does the first drawing encompass elements of film genre, the different ways western society is entertained by horror films, or the financial and cultural aspects of the movie industry.

To generate reflective discussion, facilitators then ask the teams why Hooper first described the great white shark by its scientific and Latin title to the small-town mayor or whether Hooper and Chief Brody had any differences in their agendas concerning the shark itself. Mayor Vaughn is typically characterized in the first drawings as greedy, foolish, stubborn, or even as a bad guy.[46] Often, students are unaware of any patterns or themes occurring across multiple student group drawings until the facilitators highlight them and engage in this design discourse. A perceptive student with a psychological operations background once pointed out, "The mayor had his information campaign hacked by some local kids, and now the entire tourist population is about to walk right past that [billboard] and his messaging campaign will be ruined." These cues nudge the design teams

41 David Snowden and Mary E. Boone, "A Leader's Framework for Decision Making," *Harvard Business Review*, November 2007, https://hbr.org/2007/11/a-leaders-framework-for-decision-making.

42 Natalie M. Ferry and Jovita M. Ross-Gordon, "An Inquiry into Schön's Epistemology of Practice: Exploring Links between Experience and Reflective Practice," *Adult Education Quarterly* 48, no. 2 (1998): 98–112, DOI: https://doi.org/10.1177%2F074171369804800205; Paparone and Reed, "Reflective Military Practitioner," 66–76; Visser, "Schön: Design as a Reflective Practice," 21–25; Donald A. Schön, "Knowing-in-Action: The New Scholarship Requires a New Epistemology," *Change: The Magazine of Higher Learning* 27, no. 6 (1995): 27–34, DOI: https://doi.org/10.1080/00091383.1995.10544673; Schön and Rein, *Frame Reflection*.

43 Schultz and Hatch, "Living with Multiple Paradigms"; Haridimos Tsoukas, "Refining Common Sense: Types of Knowledge in Management Studies," *Journal of Management Studies* 31, no. 6 (1994): 761–80, DOI: https://doi.org/10.1111/j.1467-6486.1994.tb00638.x; Gioia and Pitre, "Multiparadigm Perspectives"; Marianne Lewis and Andrew Grimes, "Metatriangulation: Building Theory from Multiple Paradigms," *Academy of Management Review* 24, no. 4 (1999): 672–90, DOI: https://doi.org/10.5465/amr.1999.2553247; Shirley-Ann Hazlett, Rodney McAdam, and Séamus Gallagher, "Theory Building in Knowledge Management: In Search of Paradigms," *Journal of Management Inquiry* 14, no. 1 (2005): 31–42, DOI: https://doi.org/10.1177%2F1056492604273730.

44 It is important for design facilitators to stress that any idea used in the first drawing renders that idea off-limits in the second one. If a shark tooth, fin, or tail is used, then sharks are off-limits entirely. One design facilitator that conducted this exercise with a group of soldiers in Iraq in February 2020 failed to stress this point, and many students simply drew a different part of the shark or drew a sheriff with a gun instead of a badge in the second drawing.

45 Paparone, *The Sociology of Military Science*; Grant Martin, "Deniers of 'The Truth': Why an Agnostic Approach to Warfare Is Key," *Military Review* 95, no. 1 (2015): 42–51, available at https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20150228_art011.pdf; Aaron P. Jackson, *The Roots of Military Doctrine: Change and Continuity in Understanding the Practice of Warfare* (Fort Leavenworth,

towards abandoning their preferred tools and viewing the video a second time with a fresh perspective. It also breaks the designers out of reapplying the same ideas, model, and rationalization concerning the challenge beyond the first drawing. Design theorist Bruce Archer notes: "Different design problems, and different classes of design activity, will call for different techniques and different emphases at various stages."[47] The same mental models paired to the available data through the same institutionalized metaphors (language and doctrine) rarely suffice in true divergent ideation. Otherwise, we end up with the same drawings of sharks, police badges, and dollar signs, over and over.

Students watch the video a second time, often struggling with the notion of representing the shark without drawing a shark plus many similar concerns based upon the panoply of symbols now off-limits in the second round. Group discussions immediately following the second viewing tend to be more active: groups go much deeper into conversation. The time it takes for them to go to the board and commit to concepts is longer. Groups also tend to seem more expressive and animated and to enjoy their interactions once the second exercise eliminates the most favored metaphors and constructs. This transition away from institutionally programed decision-making toward critical and reflective "why are we doing this" design practice is significant if not essential to the success of this exercise.

The student teams, with necessary facilitator assistance, begin to move away from convergent descriptions, groupthink, and reductionism and towards greater abstraction, divergent thinking, and experimentation. The tool dropping sequences and the mutual sharing of drawings further impress upon the designers why and how institutional preferences and normalized paradigms operate almost invisibly until an exercise such as this helps illuminate such institutionally desired cognitive patterns. Preliminary self-reflection begins to occur through "why-centric" discussions that encourage abductive reasoning instead of the "what-centric" logical underpinnings of deductive and inductive inquiry dominant earlier. In other words, students see the shadows on the wall of Plato's cave and begin to suspect something more is at play.

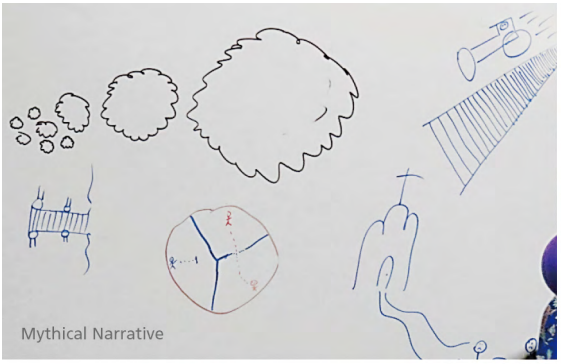
The second drawings by most (but not all) groups tend to be more divergent, with a wide range of different concepts, symbols, and logical structures applied (Figures 4, 5). A minority of design groups repeat their first drawings, simply substituting similar items such as putting a euro symbol for the dollar sign, an orca whale for the shark, a river for the beach, and so on. These groups tend to struggle with realizing their frame. In social paradigm research, there are numerous theories and proposals on how and why an established paradigm may generate incommensurability (inability to acknowledge other perspectives beyond the dominant paradigm) and single-paradigm devotion.[48] Facilitators can draw from this research to better understand how and why some design teams can get "stuck" repeating the same symbols, logic, methods, or models over and over. Other group drawings that deviate strongly can help facilitators highlight divergence to design teams that are unable to drop their tools and move away from description.

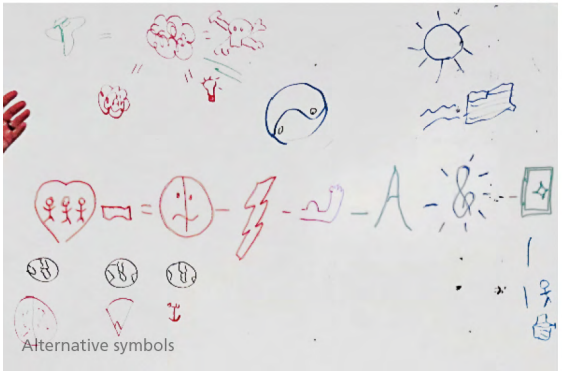
Kansas: Combat Studies Institute Press, 2013); Naveh et al., *The Structure of Operational Revolution*.

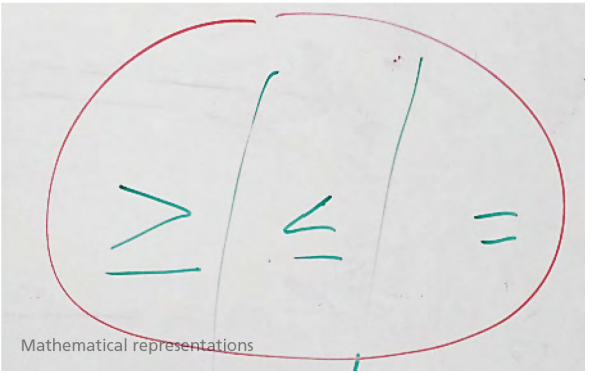
46 Perhaps the most typical drawing done by students in the first exercise is a composition, often in a triangle or simple geometric shape, linking a police badge with the dollar sign for the mayor, and a scientific item for Hooper. The shark is often in the center or dominating the image, with a beach and stick figures representing tourists being eaten. Frequently, the mayor is depicted negatively, with the chief and the scientist in some moral or ethically superior status of knowing the proper course of action to solve the problem. This pattern occurs often across multiple design teams without anyone looking at anyone else's work.

47 Bruce Archer, *The Structure of Design Processes* (PhD dissertation, Royal College of Art, London, 1968), 3, available at https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.697935.

48 Gioia and Pitre, "Multiparadigm Perspectives"; Gary Weaver and Dennis Gioia, "Paradigms Lost: Incommensurability vs Structurationist Inquiry," *Organization Studies* 15, no. 4 (1994): 565–90, DOI: https://doi.org/10.1177/017084069401500404; Schultz and Hatch, "Living with Multiple Paradigms"; Ben Zweibelson, "Thinking Beyond the Books: Sociological Biases of Our Military Institutions," *Air and Space Power Journal* 30, no. 2 (2016): 15–37, available at https://apps.dtic.mil/sti/pdfs/AD1015708.pdf.







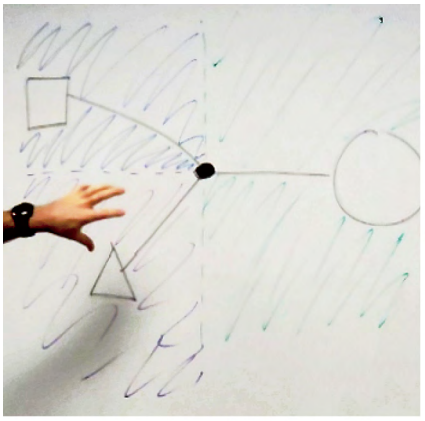
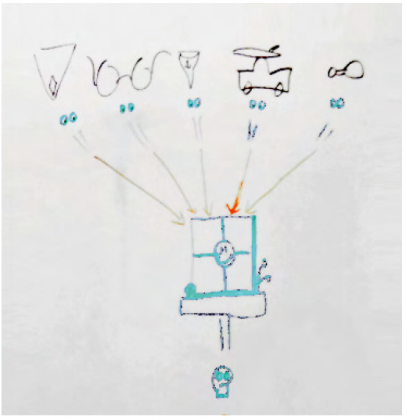
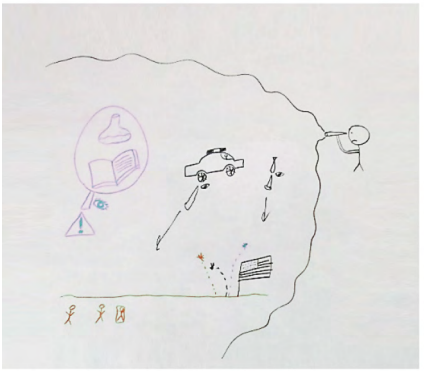


Image of geometric shapes, shading, and a central "singularity."



A range of items all being comprehended through a window that distorts and blurs them, making people happy but also resulting in violent death.



Person and telescope viewing three distinct processes independently acting.

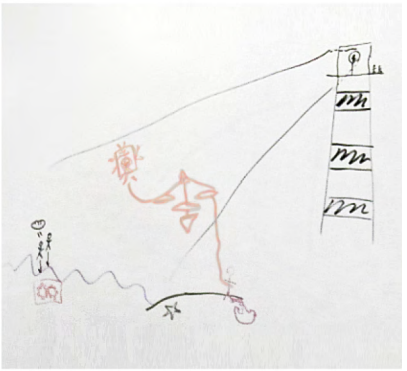


Image of a lighthouse, fear tying people with anchors on a beach, and eating machines consuming victims.

Figure 4 (top)
Divergence in action: examples of students' "second drawings." Image created in 2020.

Figure 5 (bottom)
More examples of students' "second drawings." Image created in 2020.

Often, the second series of *Jaws* drawings are starkly different across the board, indicating that once military professionals are denied their favorite cognitive tools, including language, doctrinal procedures, and convergent practices, they can move towards experimentation, divergence, and the conditions for innovation. While many of the second drawings may not be valued by the teams as more explanatory than their first version, the teams should recognize that if a military commander received the first set of drawings, they would have received essentially the same descriptive construct done four times without providing more than one perspective. The second set of drawings moves closer to providing a military commander with a wider, dissimilar, and potentially paradoxical range of concepts on the same challenge. Israeli military commander Gal Hirsch, reflecting on his own experience learning and applying military design, emphasizes the necessity of divergent ideation to explore alternative designs in warfare. "I began to understand principles of force application in greater depth than ever before — far beyond the linear, mechanical aspects. A force can be deployed using endless variations of functionality, profiles, and signatures, all tailored to the context and the need."[49]

Even though this military design exercise uses a shark movie clip, it highlights how difficult it can be for military personnel to generate iterations of divergent and experimental options concerning actual complex security and defense challenges. In other words: if the members of the organization reliably produce the same shark drawings over and over — all the while expecting each iteration to be new and innovative despite using identical perspectives and tools — then how exhaustive is their critical reflection of their preferred decision-making methodologies and warfare/security models? How flexible is their ability to improvise, innovate, or transform if they maintain overarching obedience or servitude toward a rigid military paradigm that restricts decision-making within codified doctrine, processes, precise institutional language, and socialized group reinforcement (groupthink)? How great is their collective capacity to experiment with divergent, potentially game-changing concepts?

Diving Deeper: Fostering Thinking about Thinking

At the time of this writing, several thousand students have done this exercise in formal JSOU design courses, with another thousand also exposed to it during various design lectures, workshops, and executive sessions.[50] The *Jaws* exercise allows military organizations to quickly experience design fundamentals necessary in military design practice. In Figure 6 below, we graphically depict how facilitators move students cognitively away from the institutionally dominant mode of framing toward increasingly divergent and abstract designs. First, the exercise leads individuals towards greater self-awareness of their preferred frame for making sense of reality.[51] Frequently, that frame is established and enhanced through the constant reinforcement of institutional values, language, and logics, a process often devoid of self-reflection. Facilitators need to bring a room full of highly intelligent, highly specialized, highly trained military professionals toward

49 Gal Hirsch, *Defensive Shield: An Israeli Special Forces Commander on the Front Line of Counterterrorism, the Inspirational Story of Brigadier General Gal Hirsch* (Jerusalem, Israel: Gefen Publishing House, Ltd, 2016), 131.

50 Over the last few years, the JSOU design program has provided basic and advanced design education to over 1,600 special operations professionals in the established 5-day courses. In addition, the JSOU design team have conducted design lectures, workshops, and custom consultations with another few thousand special operations and general purpose forces, and government and other agency personnel across a wide range of security, academic, and industry settings.

51 Paparone, "Designing Meaning"; Schön, *Frame Reflection*; Kees Dorst, *Frame Innovation: Creating New Thinking by Design* (Cambridge, MA: MIT Press, 2015); Zweibelson, "Multidisciplinary Design Movement."

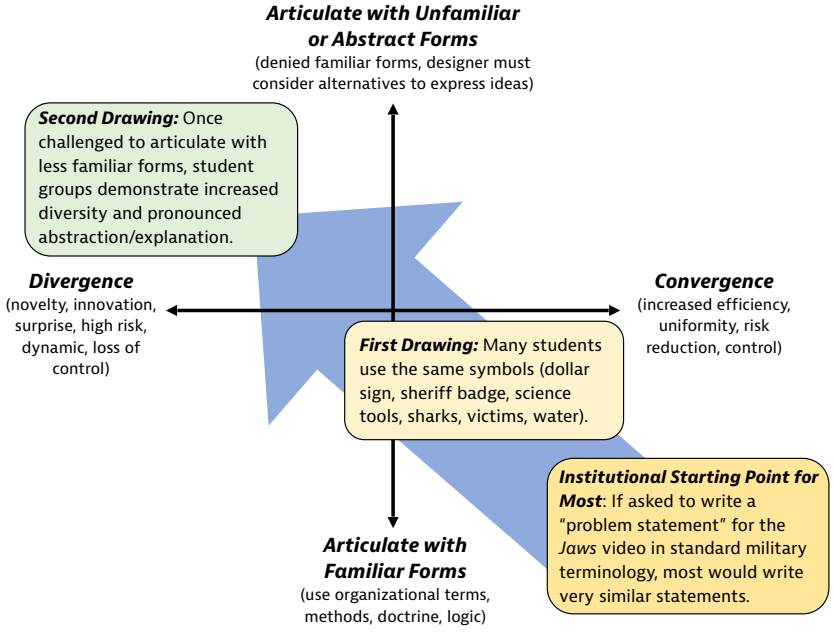


Figure 6
Moving from articulating in the familiar to abstraction and divergence. Image created in 2020.

the realization that while they may indeed be quite creative, they still consistently generate nearly identical first drawings in this exercise (at first). The facilitators can call attention to what otherwise remains in the institutional background, controlling and shaping all major behaviors.[52] Why do creative people default to institutionally sanctioned (or indoctrinated) modes of thinking through established models, select theories, and particular language driven by preferred metaphoric devices?

Institutional over-processing of divergent thinking is not exclusive to the military. Viktor Papanek leveled a similar critique at the design community of the 1970s: overt process emphasis at the expense of divergent, innovative, imaginative design. "We have failed to distinguish the means from the ends, and we have made mechanical what should have remained manual, and we have made automatic that which might have been more rationally replaced with an entirely different system."[53] Papanek's critique was oriented towards commercial designers, but his observations parallel the modern military institution's over-emphasis on technical rationalism — the widespread belief in modern security and defense organizations that warfare is a reduceable, quantifiable construct that can be controlled, measured, and predicted through systematic, preferably scientific knowledge.[54]

Done correctly, the *Jaws* exercise helps design students shift away from reductive process thinking — detailed (systematic) description in service of analytic optimization — towards a different (often paradoxical) mode of "systemic thinking" and abductive reasoning encouraged in most military design praxis.[55] To accomplish this, the facilitators force the students to perform cognitive tool drops[56] within the *Jaws* exercise. They must relinquish formalized constructs (doctrinal form, standardized military language, and so on) and familiar heuristic aids (military mission statements, target diagrams,

52 Peter L. Berger and Thomas Luckmann, *The Social Construction of Reality: A Treatise in the Sociology of Knowledge* (New York: Anchor Books, 1966); Paparone and Reed, "Reflective Military Practitioner"; Donald A. Schön, "Generative Metaphor: A Perspective on Problem-Setting in Social Policy," in *Metaphor and Thought*, ed. Andrew Ortony, 2nd ed. (Cambridge, UK: Cambridge University Press, 1993), 137–63, DOI: https://doi.org/10.1017/CBO9781139173865.011.

53 Victor J. Papanek, *Design for the Real World: Human Ecology and Social Change* (New York: Pantheon Books, 1971), 258.

54 Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York: Basic Books, 1984), 3–4.

55 Paparone, "How We Fight"; Siniša Malešević, *The Sociology of War and Violence* (Cambridge, UK: Cambridge University Press, 2010), 57; Hirsch, *Defensive Shield*, 203; Manuel DeLanda, *Assemblage Theory* (Edinburgh: Edinburgh University Press, 2016), 16–17.

56 Weick, "Drop Your Tools."

SWOT analysis graphics, and institutional favorites such as the military center of gravity analysis[57] model, for example).

The *Jaws* exercise helps design students recognize the difference between convergent and divergent thinking. In the first part, despite having military language taken away, the teams mostly rely on shared, relatively uniform symbols and typically produce convergent concepts. Yet, by the second drawing, the design teams take highly divergent paths, leading to a wider range of ideas and often a deeper, more explanatory approach to framing the movie scene. Taken together, the value highlighted in the two exercise portions demonstrates that when a military leader requests out-of-the-box thinking and a more diverse range of options, the military organization may end up producing extremely similar concepts that are convergent without realizing it.

Military professionals frequently associate analysis with experience to reach explanation—essentially believing that given enough time and data, one can gain sufficient knowledge to control and predict even in complex systems.[58] Many military design advocates, complexity theorists, and experts from disciplines such as sociology and postmodern philosophy refute this. Some suggest that no amount of description can ever lead to any useful form of explanation. Non-reflective designers are guilty of Russell Ackoff's maxim, which might be paraphrased as "Doing the wrong things right only makes us more right at being wrong."[59] Until the facilitators forbid the familiar cognitive and referential tools (words, symbols, and such), design teams often continue to circle a highly descriptive process in the exercise, unable to distinguish between convergent and divergent thinking. Nor does it occur to them to reflect upon their tendency to continually describe without moving towards explanation in their work.

For military strategists and operational planners familiar with highly structured, linear decision making methodologies, an essential portion of their structured decision making process involves the creation of distinct courses of action that the organization subsequently puts through some sort of simulation or wargame in order to provide the commander with the best recommendation for how to proceed to accomplish a given mission.[60] This occurs across the world in nearly all militaries using some form of this dominant decision making methodology, at every level, from tactical to strategic.[61]

Yet, one frequent shortfall in the construction and evaluation of various courses of action in warfare or security applications has to do with a lack of true divergence in these constructs. Arguably, the differences between them are superficial and frequently maneuver-based, often associated with geographical, terrain or military task-organization combinations in order to differentiate from other proposed courses to evaluate. Although there are exceptions, it is less common for each of the different proposed military solutions to *reflect genuine divergence or generate novelty in warfare*. It is particularly uncommon for any of them to intentionally violate established doctrine or organizational practices and institutional norms, as the very methodological rules within linear military planning prevent such proposals from being contemplated in the first place.[62] Consider, for example, that constraints are commonly identified and established several steps into the process before

57 Kurt VanderSteen, "Center of Gravity: A Quest for Certainty or Tilting at Windmills?," in *Addressing the Fog of the COG: Perspectives on the Center of Gravity in US Military Doctrine*, ed. Celestino Perez (Fort Leavenworth, Kansas: Combat Studies Institute Press, 2012), 33–64, available at https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/COG.pdf; Dale Eikmeier, "Modernizing the Center of Gravity Concept—So It Works," in *Addressing the Fog of the COG: Perspectives on the Center of Gravity in US Military Doctrine*, ed. Celestino Perez (Fort Leavenworth, Kansas: Combat Studies Institute Press, 2012), 133–69, available at https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/COG.pdf; Paparone and Davis Jr., "Exploring Outside the Tropics of Clausewitz"; Zweibelson, "Gravity-Free Decision-Making."

58 Schön, *Reflective Practitioner*, 3–4; Brian P. Bloomfield, Gibson Burrell, and Theo Vurdubakis, "Licence to Kill? On the Organization of Destruction in the 21st Century," *Organization* 24, no. 4 (2017): 441–55, DOI: https://doi.org/10.1177/1350508417700404; Alex Ryan, "A Personal Reflection on Introducing Design to the US Army," *The Overlap* (blog), November 5, 2016, https://medium.com/the-overlap/a-personal-reflection-on-introducing-design-to-the-u-s-army-3f8bd76adcb2.

59 Russell Ackoff, *Redesigning the Future: A Systems Approach to Societal Problems* (New York: Wiley, 1974), 8.

60 Meiser, "Ends + Ways + Means"; Paparone, "How We Fight"; Monk, *End State*, 1–16.

61 Justin Kelly and Michael Brennan, *Alien: How Operational Art Devoured Strategy* (Carlisle, PA: U.S. Army War College, 2009), available at https://publications.armywarcollege.edu/pubs/2027.pdf; Davison, "From Tactical Planning to Operational Design"; Aaron P. Jackson, "A Tale of Two Designs: Developing the Australian Defence Force's Latest Iteration of Its Joint Operations Planning Doctrine," *Journal of Military and Strategic Studies* 17, no. 4 (2017): 174–93, available at https://jmss.org/article/view/58261; Kelly and Brennan, "Leavenworth Heresy," 360–74; Martin, "Deniers of 'The Truth'"; Martin, "A Tale of Two Design Efforts," 1–16.

62 Zweibelson, "One Piece at a Time"; Meiser, "Ends + Ways + Means"; Christopher R. Paparone and James A. Crupi, "The Principles of War as Paradox," *Proceedings: Independent Forum on*

National Defense 131, no. 10 (2005): 39–44, available at https://www.usni.org/magazines/proceedings/2005/october; Kelly and Brennan, *Alien: How Operational Art Devoured Strategy*.

63 Dorst, *Frame Innovation*; Sylvain Bureau, "Entrepreneurship as a Subversive Activity: How Can Entrepreneurs Destroy in the Process of Creative Destruction?," *M@n@gement* 16, no. 3 (2013): 204–37, available at https://management-aims.com/index.php/mgmt/article/view/4026; Zweibelson, "Change Agents for the SOF Enterprise."

64 Schön, *Frame Reflection*; Paparone and Reed, "Reflective Military Practitioner"; Paparone, "Designing Meaning."

65 Dorst, *Frame Innovation*, 15.

a military force develops possible courses of action, which then begs the question, "How do you think *outside* the box after you've intentionally placed yourself *in* a box?" The *Jaws* exercise disrupts existing institutional practices by demonstrating how careful design application of reflective practice can generate truly divergent options, despite the increase in conceptual risk associated with iterative experimentation and prototyping in design.

Lastly, the *Jaws* exercise introduces an organization to two key tensions inherent to the process of thinking about thinking. When military leaders desire innovation and out of the box thinking to generate novel concepts, they must consider whether they are fostering the necessary conditions for such innovation and disruptive creativity to emerge.[63] Is the organization putting forth something radical and potentially game-changing that requires sophisticated leader interaction so that the larger organization accepts and incorporates that change, or is the staff providing three similar options that all rely upon the same "dollar sign, shark, police badge" constructs that tend to reinforce institutional norms and the established (or legacy) frame for the organization? The *Jaws* exercise creates a forum for leaders to contemplate how their organization communicates, thinks, and thinks about thinking. Provided that the teams become accustomed to ideating iteratively along divergent paths, while self-aware of their institutional tendencies toward perceiving reality in various ways relative to security challenges, the military leader can determine how much they actually desire innovation versus increasing organizational efficiencies without disrupting established legacy practices.

Conclusions

The *Jaws* exercise generates several significant outcomes when used for basic design education. First, it helps design students to experience what otherwise would be an abstract concept impossible to present in a lecture or reading: the shift from a solution-oriented mindset to that of a reflexive practitioner capable of perpetually enabling a learning mindset, able to oscillate from convergent to divergent processes and from creative to critical reflexive examination.[64] The exercise encourages design students to let go of existing cognitive tools to progress into greater reflection and experience a design shift from group convergent behaviors toward divergent ones. Breaking out of the convergent, reductionist mode of problem-solving to apply design toward complex, dynamic security challenges is unlikely to be accomplished through passive learning or briefings on design concepts. This *Jaws* exercise immerses students: they *experience* the shift. Kees Dorst highlights the allure of convergent planning when he says,

> "Conventional problem-solving requires us to stop the world, isolate the problem, and come up with a one-off solution…. This approach is curiously nonexperimental, and underlying it is the apparent need to attain complete closure before the solution is put into action."[65]

However, the *Jaws* exercise in the second stage disrupts this by deconstructing and challenging the underlying logic in a postmodern sense. The more tools the team puts on the board in the first phase of the exercise, the

better, as these symbols and their corresponding convergent-oriented logic are soon displaced and removed from designer utilization. Part of the second tool drop is to reinforce the first with respect to language and dominant sense-making logic. When design students are forced to eliminate their preferred military planning language, they still default, whether intentionally or not, to using the metaphors behind the language. Thus, the first drawing is nearly always a graphical depiction of what they would have written in planning language if the first tool drop had not occurred. In essence, the successive removal of tools is a delayed, multi-layered endeavor by the design facilitators to gradually shift design teams away from these overarching and quite dominant institutional forces of convergent thought, uniformity, analytic optimization, and description.

The second drawings are often entirely unlike the first drawings and represent a cognitive shift in the designers from convergent thought towards divergent thought and from description towards explanation. Slowly depriving the teams of their favorite cognitive expressions of ideas initiates a forced abstraction of thought by first restricting language and subsequently removing the associated metaphoric devices associated with the same terminology. For example, a student that wishes to declare the shark as "the primary problem or threat to target for destruction" will draw a shark eating people in the water. But it will not be apparent to the student to consider why humans associate gruesome and horrible things with sharks, which are predatory animals simply acting in accordance with a normal biological process (the human victims are like fish). They automatically conclude the shark's behavior is abhorrent and problematic. Only with the first tools removed can the designers become reflective and consider the "why" of what they think, and hence whether the shark is, in fact, the problem, or if perhaps the problem is socially constructed and contextual to human societies.

There are many design heuristic aids and facilitation exercises that provide some of the learning outcomes of how the *Jaws* exercise functions. While other design exercises work towards different learning objectives, this exercise provides immediate designer self-reflection on convergent and divergent expressions. The realization of how most groups draw their first drawing convergently even after being deprived of their favorite articulation tools is essential and requisite for them to subsequently appreciate how most teams in the second drawing adopt a divergent trajectory. The key ingredient here is participatory design: the teams work together and thus are part of the learning journey. This does not imply designers work without disagreement or debate. Designers must engage in deep appreciation of themselves, the system, and the social constructs within the security design challenge.

The *Jaws* exercise acts as a useful team-building exercise to lead off any military design education due to its collaborative nature. Facilitators can enhance and illuminate minority viewpoints by forcing teams to use different design briefers each time, disrupting any dominant personalities in a design team wishing to talk for the group each time, and moving markers into the hands of quiet, passive design students that are less willing to try putting ideas on the whiteboard. Paramount to any design activity is facilitating the discourse among the design teams as they navigate the challenge and added

pressure of having their favored tools removed from use and accounting for the ever-present competitive nature of military professionals when working on a task in different teams.

The *Jaws* exercise can be conducted with a handful of whiteboards, a video player, and groups of design students in nearly any learning environment. It has been performed successfully around the globe, including in war zones, war colleges, conference centers, and museums, as well as classified military settings. Ultimately, it is not what is drawn on the boards themselves that matters. Rather, the shift the design students make from a solution mindset toward a learning mindset becomes both the key output of *Jaws* and a stepping stone for additional design praxis on whatever topic may require critical and creative collaboration.

Some may assert that key experts in security affairs and highly experienced military professionals should use knowledge and experience—the past—to articulate how their military organization should confront change or uncertainty in war. Yet this highlights a key tension in how military designers are often a minority and controversial (even considered heretical, nomadic, disruptive) group within the military community of practice.[66] Richard Buchanan frames a similar tension between the scientific community, which uses analytic logic, and designers, who often adopt a multidisciplinary (theoretical and practical) approach. "This creates one of the central problems of communication between scientists and designers, because the problems addressed by designers seldom fall solely within the boundaries of any one of these subject matters."[67] Military designers do not exist to reinforce or enable further planning or conventional strategic models and theories … they operate to critically explore, reflect, challenge and at times replace institutionally stagnant or irrelevant constructs so that the organization transform toward a new, emergent defense entity.

The first step in breaking the rules to explore and imagine unforeseen design innovation is to realize *where the rules are and why they are even there*, and the design consequences and opportunities of disrupting, dismantling, and transforming the institutional apparatus generating the rules in the first place. Otherwise, military designers remain cognitively trapped within methodological repetition and incremental revision, repeating activities and evaluating how effectively one follows the institutional norms and expectations despite the strategic goal for novelty, innovation, and change. The *Jaws* exercise is a technique for designers seeking to break out of static or stagnant modes of thinking and achieve greater self-reflectivity. Design praxis aims to liberate military minds to accomplish what is yet to be imagined but remains desperately needed by a military organization encountering the unexpected and dangerously different in war.

Declaration of Interests

There are no conflicts of interest involved in this article. This article was approved for public release using the US Special Operations Approval process with a Security Review, Public Affairs Review, and OPSEC review. All documentation from these reviews is available upon request.

66 Graicer, "Beware of the Power of the Dark Side"; Naveh et al., *The Structure of Operational Revolution*, 26; Ofra Graicer, *Two Steps Ahead: From Deep Ops to Special Ops — Wingate the General*, special ed. (Dayan Base, Tel Aviv, Israel: Israeli Defense Forces, 2015), 39; Philippe Beaulieu-Brossard, "Systemic Operational Design or How I Began to Worry about the Dual Use of Critical Concepts" (outline written in the course of fieldwork, University of Ottawa, Canada, June 1, 2015), 8; Beaulieu-Brossard, "Encountering Nomads in Israel."

67 Richard Buchanan, "Wicked Problems in Design Thinking," *Design Issues* 8, no. 2 (1992): 14, DOI: https://doi.org/10.2307/1511637.

References

Ackoff, Russell. *Redesigning the Future: A Systems Approach to Societal Problems*. New York: Wiley, 1974.

Alexander, Christopher. *Notes on the Synthesis of Form*. Cambridge, MA: Harvard University Press, 1964.

Archer, Bruce. *The Structure of Design Processes*. PhD dissertation, Royal College of Art, London, 1968. https://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.697935.

Beaulieu-Brossard, Philippe. "Systemic Operational Design or How I Began to Worry about the Dual Use of Critical Concepts." Outline written in the course of fieldwork, University of Ottawa, Canada, June 1, 2015.

Beaulieu-Brossard, Philippe, and Philippe Dufort. "Introduction to the Conference: The Rise of Reflective Military Practitioners." Presentation, Hybrid Warfare: New Ontologies and Epistemologies in Armed Forces, Canadian Forces College, Toronto, October 16–17, 2016.

Beaulieu-Brossard, Philippe, and Philippe Dufort. "Conclusion: Researching Reflexive Military Practices." *Journal of Military and Strategic Studies* 17, no. 4 (2017): 273–89. https://aodnetwork.ca/wp-content/uploads/2017/08/PBB-PhD-JMSS-Conclusion-2017.pdf.

Beaulieu-Brossard, Philippe. "Encountering Nomads in Israel Defense Forces and Beyond." In *Concepts at Work: On the Linguistic Infrastructure of World Politics*, edited by Piki Ish-Shalom, 91–117. Ann Harbor, MI: University of Michigan Press, 2021.

Benchley, Peter, and Carl Gottlieb. *Jaws*. DVD. Directed by Steven Spielberg. Universal City, CA: Universal Studios Home Entertainment, 2000. First published 1975.

Berger, Peter L., and Thomas Luckmann. *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*. New York: Anchor Books, 1966.

Bloomfield, Brian P., Gibson Burrell, and Theo Vurdubakis. "Licence to Kill? On the Organization of Destruction in the 21st Century." *Organization* 24, no. 4 (2017): 441–55. DOI: https://doi.org/10.1177/1350508417700404.

Buchanan, Richard. "Wicked Problems in Design Thinking." *Design Issues* 8, no. 2 (1992): 5–21. DOI: https://doi.org/10.2307/1511637.

Bureau, Sylvain. "Entrepreneurship as a Subversive Activity: How Can Entrepreneurs Destroy in the Process of Creative Destruction?" *M@n@gement* 16, no. 3 (2013): 204–37. https://management-aims.com/index.php/mgmt/article/view/4026.

Burrell, Gibson, and Gareth Morgan. *Sociological Paradigms and Organisational Analysis: Elements of the Sociology of Corporate Life*. Portsmouth, UK: Heinemann, 1979.

Davison, Ketti. "From Tactical Planning to Operational Design." *Military Review* (September-October 2008): 33–39. https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20081031_art009.pdf.

DeLanda, Manuel. *Assemblage Theory*. Edinburgh: Edinburgh University Press, 2016.

Dorst, Kees. *Frame Innovation: Creating New Thinking by Design*. Cambridge, MA: MIT Press, 2015.

Droste, Magdalena. *Bauhaus: 1919–1933*. Translated by Jane Michael and Karen Williams. Edited by Angelika Taschen and Nicole Opel, 2nd ed. Köln: Taschen, 2019. First published 1990.

Eikmeier, Dale. "Modernizing the Center of Gravity Concept — So It Works." In Perez, *Addressing the Fog of the COG*, 133–69. https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/COG.pdf.

Feldman, Yotam. "Dr. Naveh, or, How I Learned to Stop Worrying and Walk through Walls." *HAARETZ.Com* (blog), October 25, 2007. https://www.haaretz.com/misc/article-print-page/1.4990742.

Ferry, Natalie M., and Jovita M. Ross-Gordon. "An Inquiry into Schön's Epistemology of Practice: Exploring Links between Experience and Reflective Practice." *Adult*

Education Quarterly 48, no. 2 (1998): 98–112. DOI: https://doi.org/10.1177%2F074171369804800205.

Gilbert, Phil. "The Art of War: Accelerating Innovation by Scaling the Design Mindset." Lecture presented at IMDC 2019: Innovation Methodologies for Defense Challenges, Lancaster, UK, February 27, 2019. https://www.youtube.com/watch?v=m7mr3VlCiow.

Gioia, Dennis A., and Evelyn Pitre. "Multiparadigm Perspectives on Theory Building." *Academy of Management Review* 15, no. 4 (1990): 584–602. DOI: https://doi.org/10.5465/amr.1990.4310758.

Graicer, Ofra. *Two Steps Ahead: From Deep Ops to Special Ops — Wingate the General*, special ed. Dayan Base, Tel Aviv, Israel: Israeli Defense Forces, 2015.

Graicer, Ofra. "Self Disruption: Seizing the High Ground of Systemic Operational Design (SOD)." *Journal of Military and Strategic Studies* 17, no. 4 (June 2017): 21–37. https://jmss.org/article/view/58253.

Graicer, Ofra. "'Beware of the Power of the Dark Side': The Inevitable Coupling of Doctrine and Design." *Experticia Militar* (2017): 30–37. http://aodnetwork.ca/wp-content/uploads/2017/08/naveh_experticia-militar-ed.2_2017.pdf.

Graicer, Ofra. "Between Teaching and Learning: What Lessons Could the Israeli Doctrine Learn from the 2006 Lebanon War?" *Experticia Militar* (October 2017): 22–29. https://aodnetwork.ca/wp-content/uploads/2017/08/Graicer-O._Between-Teaching-and-Learning_2017-2.pdf.

Grossman, David. *On Killing: The Psychological Cost of Learning to Kill in War and Society*. Boston: Little, Brown and Company, 1995.

Hazlett, Shirley-Ann, Rodney McAdam, and Séamus Gallagher. "Theory Building in Knowledge Management: In Search of Paradigms." *Journal of Management Inquiry* 14, no. 1 (2005): 31–42. DOI: https://doi.org/10.1177%2F1056492604273730.

Hirsch, Gal. *Defensive Shield: An Israeli Special Forces Commander on the Front Line of Counterterrorism, the Inspirational Story of Brigadier General Gal Hirsch*. Jerusalem, Israel: Gefen Publishing House, Ltd, 2016.

Jackson, Aaron P. *The Roots of Military Doctrine: Change and Continuity in Understanding the Practice of Warfare*. Fort Leavenworth, Kansas: Combat Studies Institute Press, 2013.

Jackson, Aaron P. "A Tale of Two Designs: Developing the Australian Defence Force's Latest Iteration of Its Joint Operations Planning Doctrine." *Journal of Military and Strategic Studies* 17, no. 4 (2017): 174–93. https://jmss.org/article/view/58261.

Jackson, Aaron P. "Towards a Multi-paradigmatic Methodology for Military Planning: An Initial Toolkit." *The Archipelago of Design* (blog), March 4, 2018. https://aodnetwork.ca/towards-a-multi-paradigmatic-methodology-for-military-planning-an-initial-toolkit/.

Jackson, Aaron P., ed. *Design Thinking: Applications for the Australian Defence Force*, Canberra, Australia: ADC Publications, 2019.

Jackson, Aaron P. "Civilian and Military Design Thinking: A Comparative Historical and Paradigmatic Analysis, and Its Implications for Military Designers." Paper presented at IMDC 2019: Innovation Methodologies for Defense Challenges, Lancaster, UK, February 28, 2019.

Jackson, Aaron. "A Historical and Paradigmatic Analysis of Civilian and Military Design Thinking." YouTube video, 57:02. Posted by Think JSOU, May 6, 2019. https://www.youtube.com/watch?v=-3Lk6LMOQUY.

Jackson, Aaron P. *Design Thinking in Commerce and War: Contrasting Civilian and Military Innovation Methodologies*. Maxwell AFB: Air University Press, 2020. https://www.jstor.org/stable/resrep27599.

Jaynes, Julian. *The Origin of Consciousness in the Breakdown of the Bicameral Mind*, 3rd ed. Boston: First Mariner Books, 2000. First published 1976.

Jones, Oliver, Philippe Beaulieu-Brossard, and Ben Zweibelson. "Design Leadership as Performance Theory: On the Epistemological Responsibilities of Pushing the Joke

Too Far in Complex Warfare." In *The Handbook of Military Sciences*, edited by Anders Sookermany. Basel: Springer International Publishing.

Kelly, Justin, and Michael Brennan. *Alien: How Operational Art Devoured Strategy*. Carlisle, PA: U.S. Army War College, 2009. https://publications.armywarcollege.edu/pubs/2027.pdf.

Kelly, Justin, and Michael Brennan. "The Leavenworth Heresy and the Perversion of Operational Art." *Joint Forces Quarterly*, no. 56 (2010): 360–74.

Kilcullen, David. *Out of the Mountains: The Coming Age of the Urban Guerrilla*. New York: Oxford University Press, 2013.

Krippendorff, Klaus. "Propositions of Human-Centeredness: A Philosophy for Design." In *Proceedings of the Conference Doctoral Education in Design: Foundations for the Future*, edited by David Durling and Ken Friedman, 55–64. Stoke-on-Trent, UK: Staffordshire University Press, 2000. https://dl.designresearchsociety.org/cgi/viewcontent.cgi?article=1028&context=conference-volumes.

Lauder, Matthew. "Systemic Operational Design: Freeing Operational Planning from the Shackles of Linearity." *Canadian Military Journal: Operational Planning* 9, no. 4 (2009): 41–49. http://www.journal.forces.gc.ca/vo9/no4/08-lauder-eng.asp.

Lewis, Marianne, and Andrew Grimes. "Metatriangulation: Building Theory from Multiple Paradigms." *Academy of Management Review* 24, no. 4 (1999): 672–90. DOI: https://doi.org/10.5465/amr.1999.2553247.

Lupton, Ellen, and J. Abbott Miller, eds. *The ABCs of Triangle, Square, Circle: The Bauhaus and Design Theory*, 2nd ed. New York: Princeton Architectural Press, 2019. First published 1991.

Malešević, Siniša. *The Sociology of War and Violence*. Cambridge, UK: Cambridge University Press, 2010.

Martin, Grant. "A Tale of Two Design Efforts (and Why They Both Failed in Afghanistan)." *Small Wars Journal* (2011): 1–16. https://smallwarsjournal.com/jrnl/art/a-tale-of-two-design-efforts-and-why-they-both-failed-in-afghanistan.

Martin, Grant. "Deniers of 'The Truth': Why an Agnostic Approach to Warfare Is Key." *Military Review* 95, no. 1 (2015): 42–51. https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20150228_art011.pdf.

Mathews, Matt. "Interview with BG (Ret.) Shimon Naveh." Combat Studies Institute (November 1, 2007): 1–10. https://smallwarsjournal.com/documents/mattmatthews.pdf.

Meiser, Jeffrey W. "Ends + Ways + Means = (Bad) Strategy." *Parameters* 46, no. 4 (2016): 81–85. https://ssrn.com/abstract=3762221.

Monk, Jeremiah R. *End State: The Fallacy of Modern Military Planning*. Montgomery: Air War College, 2017. https://apps.dtic.mil/sti/pdfs/AD1042004.pdf.

Morgan, Gareth. *Images as Organizations*, updated ed. London: Sage Publications, 2006.

Naveh, Shimon, Jim Schneider, and Timothy Challans. *The Structure of Operational Revolution: A Prolegomena*, A Product of the Center for the Application of Design. Fort Leavenworth, Kansas: Booz Allen Hamilton, 2009.

Papanek, Victor J. *Design for the Real World: Human Ecology and Social Change*. New York: Pantheon Books, 1971.

Paparone, Christopher R., and James A. Crupi. "The Principles of War as Paradox." *Proceedings: Independent Forum on National Defense* 131, no. 10 (2005): 39–44. https://www.usni.org/magazines/proceedings/2005/october.

Paparone, Christopher. "On Metaphors We Are Led By." *Military Review* 77, no. 6 (2008): 55–64. https://cgsc.contentdm.oclc.org/digital/collection/p124201coll1/id/241/rec/1.

Paparone, Christopher, and George Reed. "The Reflective Military Practitioner: How Military Professionals Think in Action." *Military Review* (March-April 2008): 66–76. https://www.researchgate.net/publication/256485955.

Paparone, Christopher, and William Davis Jr. "Exploring Outside the Tropics of Clausewitz: Our Slavish Anchoring to an Archaic Metaphor." In Perez, *Addressing the Fog of*

the COG, 65–80. https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/COG.pdf.

Paparone, Christopher. *The Sociology of Military Science: Prospects for Postinstitutional Military Design*. New York: Bloomsbury Academic Publishing, 2013.

Paparone, Christopher. "How We Fight: A Critical Exploration of US Military Doctrine." *Organization* 24, no. 4 (2017): 516–33. DOI: https://doi.org/10.1177/1350508417693853.

Paparone, Christopher, and George Topic Jr. "Training Is Déjà Vu; Education Is Vu Jàdé." *Army Sustainment* (May-June 2017): 15. https://alu.army.mil/alog/2017/MayJun17/PDF/185942.pdf.

Paparone, Christopher. "Designing Meaning in the Reflective Practice of National Security: Frame Awareness and Frame Innovation." In Jackson, *Design Thinking*, 89–104. https://www.defence.gov.au/ADC/Publications/documents/joint_studies/JSPS_3_Design_Thinking.pdf.

Perez, Celestino, ed. *Addressing the Fog of the COG: Perspectives on the Center of Gravity in US Military Doctrine*. Fort Leavenworth, Kansas: Combat Studies Institute Press, 2012. https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/COG.pdf.

Protzen, Jean-Pierre, and David J. Harris. *The Universe of Design: Horst Rittel's Theories of Design and Planning*. New York: Routledge, 2010.

Putnam, Linda. "The Interpretive Perspective: An Alternative to Functionalism." In *Communication and Organizations: An Interpretive Approach*, ed. Linda Putnam and Michael Pacanowsky, 31–54. Beverly Hills: Sage Publications, 1983. https://doi.org/10.4135/9781446262757.

Ryan, Alex. "A Personal Reflection on Introducing Design to the US Army." *The Overlap* (blog), November 5, 2016. https://medium.com/the-overlap/a-personal-reflection-on-introducing-design-to-the-u-s-army-3f8bd76adcb2.

Schnaubelt, Christopher, Eric Larson, and Matthew Boyer. *Vulnerability Assessment Method (VAM) Pocket Guide: A Tool for Center of Gravity Analysis*. Santa Monica: Rand Corporation, 2014. https://www.rand.org/content/dam/rand/pubs/tools/TL100/TL129/RAND_TL129.pdf.

Schön, Donald A. *Displacement of Concepts*. London: Tavistock Publications, 1963.

Schön, Donald A. *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books, 1984.

Schön, Donald A. "Generative Metaphor: A Perspective on Problem-Setting in Social Policy." In *Metaphor and Thought*, edited by Andrew Ortony, 137–63. Cambridge, UK: Cambridge University Press, 1993. DOI: https://doi.org/10.1017/CBO9781139173865.011.

Schön, Donald A. *Frame Reflection: Towards the Resolution of Intractable Policy Controversies*. New York: Basic Books, 1994.

Schön, Donald A. "Knowing-in-Action: The New Scholarship Requires a New Epistemology." *Change: The Magazine of Higher Learning* 27, no. 6 (1995): 27–34. DOI: https://doi.org/10.1080/00091383.1995.10544673.

Schultz, Majken, and Mary Jo Hatch. "Living with Multiple Paradigms: The Case of Paradigm Interplay in Organizational Culture Studies." *Academy of Management Review* 21, no. 2 (1996): 529–57. DOI: https://doi.org/10.5465/amr.1996.9605060221.

Schwagler, Nathan. "What Would Dali Do?" YouTube video, 54:18. Posted by Think JSOU, March 9, 2018. https://www.youtube.com/watch?v=G_zc44oxOq0.

Snowden, David, and Mary E. Boone. "A Leader's Framework for Decision Making." *Harvard Business Review*, November 2007. https://hbr.org/2007/11/a-leaders-framework-for-decision-making.

Sookermany, Anders. "Military Education Reconsidered: A Postmodern Update." *Journal of Philosophy of Education* 51, no. 1 (2017): 310–30. DOI: https://doi.org/10.1111/1467-9752.12224.

Think JSOU. "The '*Jaws* Exercise': What SOCOM Design Students Experience in the First Hour of Design Education." YouTube video, 38:03. Posted by Think JSOU, April 10, 2020. https://www.youtube.com/watch?v=kf_IQ5uCS8g.

Tsoukas, Haridimos. "Refining Common Sense: Types of Knowledge in Management Studies." *Journal of Management Studies* 31, no. 6 (1994): 761–80. DOI: https://doi.org/10.1111/j.1467-6486.1994.tb00638.x.

Tsoukas, Haridimos, and Mary Jo Hatch. "Complex Thinking, Complex Practice: The Case for a Narrative Approach to Organizational Complexity." *Human Relations* 54, no. 8 (2001): 979–1013. DOI: https://doi.org/10.1177%2F0018726701548001.

VanderSteen, Kurt. "Center of Gravity: A Quest for Certainty or Tilting at Windmills?" In Perez, *Addressing the Fog of the COG*, 33–64. https://www.armyupress.army.mil/Portals/7/combat-studies-institute/csi-books/COG.pdf.

Visser, Willemien. "Schön: Design as a Reflective Practice." *Collection: Art+Design & Psychology*, no. 2 (2010): 21–25. https://hal.inria.fr/inria-00604634.

Weaver, Gary, and Dennis Gioia. "Paradigms Lost: Incommensurability vs Structurationist Inquiry." *Organization Studies* 15, no. 4 (1994): 565–90. DOI: https://doi.org/10.1177/017084069401500404.

Weick, Karl E. "The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster." *Administrative Science Quarterly* 38, no. 4 (1993): 628–52. DOI: https://doi.org/10.2307/2393339.

Weick, Karl E. "Drop Your Tools: An Allegory for Organizational Studies." *Administrative Science Quarterly* 41, no. 2 (1996): 301–13. DOI: https://doi.org/10.2307/2393722.

Weick, Karl E. "Reflections: Change Agents as Change Poets — On Reconnecting Flux and Hunches." *Journal of Change Management* 11, no. 1 (2011): 7–20. DOI: https://doi.org/10.1080/14697017.2011.548937.

Williams, Phil. "The Global Crisis of Governance." In *Beyond Convergence: World Without Order*, edited by Hilary Matfess and Michael Miklaucic, 21–46. Washington, D.C.: Center for Complex Operations; Institute for National Security Studies, 2016. https://cco.ndu.edu/Portals/96/Documents/books/Beyond%20Convergence/BEYOND%20CONVERGENCE%20%20World%20Without%20Order%20.pdf?ver=2016-10-25-125406-170.

Wrigley, Cara, Genevieve Mosely, and Michael Mosely. "Defining Military Design Thinking: An Extensive, Critical Literature Review." *She Ji: The Journal of Design, Economics, and Innovation* 7, no. 1 (2021): 104–43. DOI: https://doi.org/10.1016/j.sheji.2020.12.002.

Zweibelson, Ben. "Preferring Copies with No Originals: Does the Army Training Strategy Train to Fail?" *Military Review*, no. 1 (2014): 15–25. https://www.armyupress.army.mil/Portals/7/military-review/Archives/English/MilitaryReview_20140228_art006.pdf.

Zweibelson, Ben. *Gravity-Free Decision-Making: Avoiding Clausewitz's Strategic Pull*, Army Research Papers, no. 8. Australia: Directorate of Future Land Warfare, 2015. https://researchcentre.army.gov.au/sites/default/files/160427_msp_arp_zweibelson_web_final_b5.pdf.

Zweibelson, Ben. "One Piece at a Time: Why Linear Planning and Institutionalisms Promote Military Campaign Failures." *Defence Studies Journal* 15, no. 4 (2015): 360–74. DOI: https://doi.org/10.1080/14702436.2015.1113667.

Zweibelson, Ben. "Rose-Tinted Lenses: How American Functionalist Strategy Inhibits Our Appreciation of Complex Conflicts." *Defence Studies Journal* 16, no. 1 (2016): 68–88. DOI: https://doi.org/10.1080/14702436.2016.1147924.

Zweibelson, Ben. "Thinking Beyond the Books: Sociological Biases of Our Military Institutions." *Air and Space Power Journal* 30, no. 2 (2016): 15–37. https://apps.dtic.mil/sti/pdfs/AD1015708.pdf.

Zweibelson, Ben. "Special Operations and Design Thinking: Through the Looking Glass of Organizational Knowledge Production." *Special Operations Journal* 2, no. 1 (2016): 22–32. DOI: https://doi.org/10.1080/23296151.2016.1151753.

Zweibelson, Ben. "Change Agents for the SOF Enterprise: Design Considerations for SOF Leadership Confronting Complex Environments." *Special Operations Journal* 3, no. 2 (2017): 127–40. DOI: https://doi.org/10.1080/23296151.2017.1384274.

Zweibelson, Ben. "Designing through Complexity and Human Conflict: Acknowledging the 21st Century Military Design Movement." Lecture with Phil Gilbert presented at SPADE 2018: Rethinking Defense and Security in the Digital Age, Copenhagen, Denmark: IBM, 2018.

Zweibelson, Ben. "The Multidisciplinary Design Movement: A Frame for Realizing Industry, Security, and Academia Interplay." *Small Wars Journal* (2019): 1–4. https://smallwarsjournal.com/jrnl/art/multidisciplinary-design-movement-frame-realizing-industry-security-and-academia-interplay.