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'Prototype warfare': Innovation, optimisation, and the experimental way of warfare

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Abstract

In recent years, the concept of 'prototype warfare' has been adopted by Western militaries to accelerate the experimental development, acquisition, and deployment of emerging technologies in warfare. Building on scholarship at the intersection of Science and Technology Studies and International Relations investigating the broader discursive and material infrastructures that underpin contemporary logics of war, and taking a specific interest in the relationship between science, technology, and war, this article points out how prototype warfare captures the emergence of a new regime of warfare, which I term the *experimental way of warfare*. While warfare has always been defined by experimental activity, what is particular in the current context is how experimentation spans across an increasingly wide range of military practices, operating on the basis of a highly speculative understanding of experimentation that embraces failure as a productive force. Tracing the concept of prototype warfare across Western military discourse and practice, and zooming in on how prototype warfare takes experimentation directly into the battlefield, the article concludes by outlining how prototype warfare reconfigures and normalises military intervention as an *opportunity* for experimentation, while outsourcing the failures that are a structural condition of the experimental way of warfare to others, 'over there'.

Introduction

In April 2017, the US Department of Defense (DoD) published a memo announcing the Algorithmic Warfare Cross-Functional Team, codenamed Project Maven, to accelerate the incorporation of 'artificial intelligence and machine learning across [DoD] operations'.[1] The work of Project Maven focused on the development and deployment of machine learning algorithms to automate the extraction of 'objects of interests' and relevant activity across US surveillance footage. In the summer of 2018, Project Maven came under public scrutiny when it was revealed that the US DoD had contracted Google to help military analysts detect objects in video images. In a letter addressed to Google CEO Sundar Pichai, over four thousand Google employees stated that Google 'should not be in the business of war' and demanded the contract to be cancelled.[2] After months of protest, Google ended its work on Project Maven, although it maintained that it was 'eager to do more' for the US DoD in other fields of activity.[3]

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[1] US Deputy Secretary of Defense, 'Establishment of an Algorithmic Warfare Cross Functional Team (Project Maven)', Memorandum (25 April 2017), available at: {https://www.govexec.com/media/gbc/docs/pdfs_edit/establishment_of_the_awcft_project_maven.pdf} accessed 22 March 2021.

[2] Scott Shane and Daisuke Wakabayasi, '"The business of war": Google employees protest work for the Pentagon', *New York Times* (4 April 2018).

[3] Patrick Tucker, 'Google wants more work from the defense department', *Defense One* (6 November, 2019), {available at: https://www.defenseone.com/technology/2019/11/google-we-want-more-work-defense-department/161133/} accessed 8 December 2021.

The case of Project Maven has become central within academic and wider public debates related to the role of artificial intelligence (AI) in war and the emergence of so-called lethal autonomous weapons systems specifically.[4] Promoters of Project Maven have claimed that the project merely renders existing practices of data analysis more efficient and precise. Critical voices, however, point out that such investments 'are poised to automate the process of identifying targets, including people' and may well serve as the basis for the development of autonomous weapons.[5] Similarly, critical scholarship on security has situated Project Maven against the background of an already problematic targeting regime that operates on the basis of algorithmic calculations and 'pattern-of-life' analysis, and which has become entangled with pre-existing and more affective registers of race and gender.[6] As pointed out by Lucy Suchman, the automation of data analysis as pursued within Project Maven 'can only serve to exacerbate military operations that are at once discriminatory and indiscriminate in their targeting'.[7]

My own interest in Project Maven derives from a different observation, related to how the project represents a wider ambition on the part of Western militaries to rethink and revise our very *way of warfare*. As explained by Air Force Lt Gen. Jack Shanahan, in charge of the project, Project Maven served a wider purpose beyond the development of computer vision algorithms. It was supposed to be 'that pilot project – that pathfinder – that spark that kindles the flame front for artificial intelligence across the rest of the department'.[8] Understood as such, Project Maven marked the beginning of what Shanahan called '*prototype warfare*'.[9]

Prototype warfare, as described by Shanahan, centres on an overarching imperative of military innovation set against the backdrop of an increasingly fierce technological competition on the global stage.[10] At its core, prototype warfare represents a shift in how Western militaries develop

[4]For an overview of this debate, see, for example, Christof Heyns, UN Doc. A/HRC/23/47, 'Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions', United Nations (9 April 2013); Paul Scharre, *Army of None: Autonomous Weapons and the Future of War* (New York, NY: W. W. Norton & Company, 2018); Noel Sharkey, 'Saying "no!" to lethal autonomous targeting', *Journal of Military Ethics*, 9:4 (2010), pp. 369–83. For scholarship on the (potential) legality of lethal autonomous weapons systems and their ethical challenges, see Peter Asaro, 'On banning autonomous weapon systems: Human rights, automation, and the dehumanization of lethal decision-making', *International Review of the Red Cross*, 94:886 (2013), pp. 678–709; Denise Garcia, 'Future arms, technologies and international law: Preventive security governance', *European Journal of International Security*, 1:1 (2016), pp. 94–111; Heather M. Roff, 'Lethal autonomous weapons and jus ad bellum proportionality', *Case Western Reserve Journal of International Law*, 47 (2015), pp. 37–52; Robert Sparrow, 'Robots and respect: Assessing the case against autonomous weapon systems', *Ethics & International Affairs*, 30:1 (2016), pp. 93–116. For more on the concept of 'meaningful human control', see, for example, Rebecca Crootof, 'A meaningful floor for meaningful human control', *Temple International & Comparative Law Journal*, 30:1 (spring 2016), pp. 53–62.

[5]Lucy Suchman, Lilly Irani, and Peter Asaro, 'Google's march to the business of war must be stopped', *The Guardian* (16 May 2018), available at: {https://www.theguardian.com/commentisfree/2018/may/16/google-business-war-project-maven} accessed 22 March 2021.

[6]On 'algorithmic warfare' and algorithmic 'pattern-of-life' analysis, see Lucy Suchman, 'Algorithmic warfare and the reinvention of accuracy', *Critical Studies on Security*, 8:2 (2020), pp. 175–82; Louise Amoore, 'Algorithmic war: Everyday geographies of the war on terror', *Antipode*, 41:1 (2009), pp. 49–69; Katharine Hall Kindervater, 'The emergence of lethal surveillance: Watching and killing in the history of drone technology', *Security Dialogue*, 47:3 (2016), pp. 223–8; Lauren Wilcox, 'Embodying algorithmic war: Gender, race and the posthuman in drone warfare', *Security Dialogue*, 48:1 (2017), pp. 11–28.

[7]Suchman, 'Algorithmic warfare', p. 175.

[8]Cited in Jack Corrigan, 'Three-star general wants AI in every new weapon system', *Defense One* (3 November 2017), available at: {https://www.defenseone.com/technology/2017/11/three-star-general-wants-artificial-intelligence-every-new-weapon-system/142239/?oref=d-riv} accessed 22 March 2021.

[9]Jack Shanahan, 'Interview with Lieutenant General Jack Shanahan: Part 2', *Over the Horizon* (OTH) (14 April 2018), available at: {https://othjournal.com/2018/04/04/interview-with-lieutenant-general-jack-shanahan-part-2/} accessed 22 March 2021.

[10]Matthew A. Horning, Robert E. Smith, and Shaheen Shidfar, 'Mission engineering and prototype warfare: Operationalizing technology faster to stay ahead of the threat', in *Proceedings of the Ground Vehicle Systems Engineering and Technology Symposium* (GVSETS) (13–15 August 2019).

and acquire technology and weaponry. It promotes moving away from a focus on the mass production of high-end weapons to the development, rapid fielding, and testing of prototypes in specific operational environments, 'where units can fail early and fail small, to scale fast and learn fast'.[11] As formulated by the UK army as part of its own strategic conceptualisation of prototype warfare, prototype warfare this way involves more than the modification of existing acquisition processes.[12] It represents a broader 'mindset' or 'new approach' to military activity, which 'seeks to mimic the pace and intensity of wartime transformation by prioritizing experimentation and adaption' and encourage warfighters 'to take calculated risks with a higher than normal tolerance for failure, enabling them to learn, succeed and exploit catalytic ideas that deliver asymmetric advantage'.[13]

Tracing recent conceptions of 'prototype warfare' across Western military discourse and practice, my objective in this article is to map the contours of a new regime of warfare, which is emerging against the background of an overarching imperative of military innovation and speculative understanding of the potential role of 'AI' in warfare. Broadly defined, regimes of warfare are constellations of discourses, practices, interactions, technologies, and rationalities that constitute and organise war in a specific and (largely) shared way. As argued by Antoine Bousquet, historically, such shared ways of thinking about and organising the conduct of war have strongly been informed by an overarching scientific rationality.[14] What Bousquet defines as 'the scientific way of warfare' refers to this systematic and extensive deployment of scientific ideas 'to inform thinking about the very nature of combat and the forms of military organization best suited to prevail in it'.[15] As the regimes that Bousquet identifies are connected to the prevalence of a specific set of scientific ideas and technologies in a given period, this means that they are historically variable and always subject to change.

My argument in this article is that prototype warfare represents such a shift and is reflective of a broader transformation, or new regime of warfare. Specifically, I argue that the concept of prototype warfare captures the emergence of a profoundly *experimental way of warfare*, which is driven by an overarching experimental rationality,[16] and largely conducted 'by-experiment'.[17] While warfare has always been underpinned by experimental activity, what is particular in the current context is how experimentation spans across an increasingly wide range of military practices, into the actual (or simulated) battlefield, and across novel military-corporate assemblages. What explains this spatialisation of experimental practice and its ubiquity in contemporary warfare is a particular, highly speculative, understanding of experimentation that is increasingly

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[11]Arnel P. David, Jason Buckley, and Toby Whitmarsh, 'Prototype warfare: Inculcating a culture of adaption in the British Army', *Wavell Room Contemporary British Military Thought* (4 June 2019), available at: {https://wavellroom.com/2019/06/04/prototype-warfare-inculcating-a-culture-of-adaptation-in-the-british-army/#easy-footnote-bottom-6-13179}   accessed   9 December 2021.

[12]Website of the British Army, available at: {https://www.army.mod.uk/news-and-events/events/army-combat-power-demonstration/} accessed 22 December 2021.

[13]Toby Whitmarsh and Arnel David, 'If you are not first you are last: Gaining an adaptive edge through prototype warfare', *War Room*, US Army War College (21 May 2019), available at: {https://warroom.armywarcollege.edu/articles/if-you-are-not-first-you-are-last-gaining-an-adaptive-edge-through-prototype-warfare/} accessed 9 December 2021.

[14]Antoine Bousquet, *The Scientific Way of Warfare: Order and Chaos on the Battlefields of Modernity* (New York, NY: Columbia University Press, 2010).

[15]Bousquet, *The Scientific Way of Warfare*, p. 3.

[16]With governmental rationality, I refer to 'any relatively systematic way of thinking about government', in this case the government of war. See Mitchell Dean, *Governmentality: Power and Rule in Modern Society* (London, UK: SAGE Publications, 2010), p. 268. See also Graham Burchell, Colin Gordon, and Peter Miller (eds), *The Foucault Effect: Studies in Governmentality* (Chicago, IL: The University of Chicago Press, 1991).

[17]As explained in the below, my thinking here is based on some of the recent work on 'experimentality' as a form of 'government-by-experiment'. See Vinh-Kim Nguyen, 'Government-by-exception: Enrolment and experimentality in mass HIV treatment programmes in Africa', *Social Theory & Health*, 7:3 (2009), pp. 196–217. For a recent intervention within security studies that is also based on this line of thinking and that has shaped my work, see Claudia Aradau, 'Experimentality, surplus data and the politics of debilitation in borderzones', *Geopolitics*, online first (2020), pp. 1–21.

detached from a more narrow interpretation of experimentation as a scientific practice of replication and controlled testing and that embraces uncertainty and failure as a productive force. As Michelle Murphy writes, this kind of experimentation legitimises continued intervention and is largely self-perpetuating, hailing 'life as composed of composed of potential, of chances, of possibilities for becoming, of manipulable relations that can be triggered and altered, if only the right protocol and technique can be employed'.[18]

As I will argue, this speculative understanding of experimentation in the context of war has serious political implications. Driven by this kind of experimental rationality, the experimental way of warfare is largely immune to failure, or uninterested in the costs or aftermath of the experiments being deployed. Any result represents valuable data gained, and so failures only serve to advance further experimentation. This way, the experimental way of warfare is largely insulated from critique, as militaries can always point to lessons learned or to the future potential of the 'next' experiment. As part of this development, war and conflict become reconfigured mainly as an opportunity *to* experiment. Our wars become endless and everywhere, not because of the (discursive representation of) the enemy, but because of the broader experimental infrastructure that is created and that needs to be maintained.

In developing these arguments, empirically, my analysis traces the emergence of conceptions of prototype warfare across Western military discourse and practice, with a particular focus on how prototype warfare is taking experimentation directly into the battlefield, specifically when it comes to experimental practices of data collection and analysis, which are seen as foundational to the role of AI in warfare.[19] In so doing, I acknowledge, following Dan Öberg, that 'Western military discourse is by no means unitary', but 'traversed by logics depending on service branches as well as on power structures and debates within them.'[20] At the same time, tracing prototype warfare across different national contexts and levels of engagement, I do find that an overarching regime of warfare defined by experimentation can be identified. In analysing this regime or experimental way of warfare, I rely on a variety of publicly available sources, such as official policy documents, speeches, blogs, defence magazine articles, project descriptions, newspaper articles, video recordings of panels at defence trade shows, and information coming from freedom of information requests. Zooming in on how prototype warfare takes experimentation into the battlefield, my focus is on examples from the US, UK, and The Netherlands, which can be considered important drivers of prototype warfare, although my arguments are also relevant for other Western militaries. My objective is not to provide a full mapping of existing prototypes in this field, as this would be extremely difficult given the evolving and experimental character of these projects, as well as because of a more general lack of oversight of military practice and operations, but, rather, to map the broader contours of prototype warfare and the experimental way of warfare that it is shaping by relying on the sources mentioned.

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[18]Michelle Murphy, *The Economization of Life* (Durham, NC: Duke University Press, 2017), p. 81.

[19]Recent scholarship on the practices, technologies, and rationalities of machine learning points out how these technologies are themselves experimental. For example, building on the work of N. Katherine Hayles, Louise Amoore explains how the inductive or abductive logics of machine learning allow 'mathematics to be practiced as an *experimental science*' (p. 5). For Amoore, to view mathematics as an experimental science 'opens the way to understanding entangled and collaborative human and machine inferences that feel their way towards a solution', or that intuitively determine relevant patterns across large amounts of data (p. 5). Resonating with the anticipatory vision of the experimentation deployed within the experimental way of warfare that I define in this article, these intuitive and experimental practices of machine learning likewise thrive on uncertainty, contingency, and speculation: 'the experimental design of machine learning algorithms seems to profit from instability and uncertainty, [precisely] because these conditions yield data to the corpus of learning.' See Louise Amoore, 'Introduction: Thinking with algorithms: Cognition and computation in the work of N. Katherine Hayles', *Theory, Culture & Society*, 36:2 (2019), pp. 3–16; see also Louise Amoore and Rita Raley, 'Securing with algorithms: Knowledge, decision, sovereignty', *Security Dialogue*, 48:1 (2017), pp. 3–10; Luciana Parisi, 'Critical computation: Digital automata and general artificial thinking', *Theory, Culture & Society*, 36:2 (2019), pp. 89–121.

[20]Dan Öberg, '"Warfare as design": Transgressive creativity and reductive operational planning', *Security Dialogue*, 49:6 (2018), pp. 493–509 (p. 496).

My argument proceeds in four steps. I first examine the emergence of the experimental way of warfare as a distinct technoscientific regime of warfare, drawing on recent literature at the intersection of Science and Technology Studies (STS) and International Relations (IR) that examines how wars are made and made possible, with a specific focus on the entanglements of science, technology, and war. Next, I trace the concept of prototype warfare from its inception in the early 1990s to its current invocations across Western military discourse and practice, focusing on how the experimental way of way of warfare takes shape under this very term within the US, UK, and The Netherlands. Third, I zoom in on how prototype warfare takes experimentation into the actual or simulated battlespace, focusing on the case of the Land Information Manoeuvre Centre (LIMC), an 'experimental data center' established by the Dutch Army in March 2020 to collect and assess data to help crisis response and fight disinformation during the COVID-19 pandemic.[21] I conclude by calling for a more sustained research focus on the ways in which the experimental way of warfare contributes to the notion that our wars are endless and everywhere and accelerates and deepens existing vulnerabilities and asymmetries in war.[22]

The experimental way of warfare

This article builds on scholarship at the intersection of IR and STS investigating the broader 'configurations of people, things and processes that come together to make war possible and shape its mutable characteristics'.[23] Specifically, I am following a growing field of scholarship that focuses on the role of science and technology in assembling and executing warfare.[24] Antoine Bousquet has examined this relationship between war, science, and technology in detail in his book *The Scientific Way of Warfare*, starting from the premise that 'an ever more intimate symbiosis between science and warfare has established itself, with the increasing reliance on the development and integration of technology within complex social assemblages of war.'[25] In his book, Bousquet's interest is not so much with the direct role of science or scientists in building military technology, but with the diverse and historically situated ways 'in which scientific ideas have been systematically recruited to inform thinking about the very nature of combat and the forms of military organization best suited to prevail in it'.[26] What he terms 'the scientific way of warfare' refers to the 'array of scientific rationalities, techniques, frameworks of interpretation, and intellectual dispositions which have characterised the approach to the application of socially organised violence in the modern era'.[27]

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[21] Karel Berkhout, Esther Rosenberg, and Bram Petraeus, 'Hoe Defensie Zijn Eigen Bevolking in de Gaten Houdt', *NRC Handelsblad* (16 November 2020). All translations from Dutch to English are by the author, who is a native Dutch speaker.

[22] Here, I contribute to the abovementioned scholarship that has developed around the concept of 'algorithmic warfare', but also to existing work on 'remote warfare'. See, for example, Jolle Demmers and Lauren Gould, 'The remote warfare paradox: Democracies, risk aversion and military engagement', in Alasdair McKay, Abigail Watson, and Megan Karlshoj-Pedersen (eds), *Remote Warfare: Interdisciplinary Perspectives* (Bristol, UK: E-International Relations, 2021), pp. 34–47 (p. 34). On 'remote warfare', see also Jolle Demmers and Lauren Gould, 'An assemblage approach to liquid warfare: AFRICOM and the "hunt" for Joseph Kony', *Security Dialogue*, 49:5 (2018), pp. 364–81; Thomas Waldman, 'Vicarious warfare: The counterproductive consequences of modern American military practice', *Contemporary Security Policy*, 39:2 (2018), pp. 181–205.

[23] Antoine Bousquet, Jairus Grove, and Nisha Shah, 'Becoming war: Towards a martial empiricism', *Security Dialogue*, 51:2–3 (2020), pp. 99–118 (p. 103).

[24] Carol Cohn, 'Sex and death in the rational world of defense intellectuals', *Signs: Journal of Women in Culture and Society*, 12:4 (1987), pp. 687–718; Hugh Gusterson, *Nuclear Rites: A Weapons Laboratory at the End of the Cold War* (Berkeley, CA: University of California Press, 1998); Marijn Hoijtink and Matthias Leese (eds), *Technology and Agency in International Relations* (London, UK: Routledge, 2019); Allison Howell, *Madness in International Relations: Psychology, Security, and the Global Governance of Mental Health* (New York, NY: Routledge, 2011); Donald A. Mackenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1990); Nisha Shah, 'Gunning for war: Infantry rifles and the calibration of lethal force', *Critical Studies on Security*, 5:1 (2017), pp. 81–104; Bousquet, Grove, and Shah, 'Becoming war'.

[25] Bousquet, *The Scientific Way of Warfare*, p. 3.

[26] Ibid.

[27] Ibid., p. 4.

According to Bousquet, while the overarching role of science in shaping warfare has remained stable since the eighteenth century, the specific ways in which science and technology have informed our thinking about and conduct of warfare are historically variable and dependent on the prevalence of a particular set of scientific ideas and technologies in a given period. Bousquet identifies four distinct regimes of the scientific way of warfare, which are mechanistic, thermodynamic, cybernetic, and chaoplexic warfare.[28] At the core of each regime is a specific set of scientific ideas and a paradigmatic technology, respectively the clock, the engine, the computer and the network. Each of these technologies has shaped military organisation and the conduct of war in considerable ways. At the same time, all of these technologies could only become thinkable or possible as part of a broader regime of warfare and a distinct set of scientific rationalities. As Bousquet clarifies elsewhere, 'technology [does not] appear *ex nihilo*: it is the product of a particular human engagement with the world.'[29]

Building on the concept of the technoscientific regime of warfare, in this article I identify another transformation of warfare – or an emergent regime of warfare – that is linked to a highly speculative understanding of the current role of AI and digital technologies in warfare,[30] and defined by an overarching experimental rationality. Of course, the conduct of war has always been underpinned by experimental activity. There is a long history of experimentation with technology 'out in the field' of war and conflict, or as part of colonial, interventionist projects.[31] For instance, much has been written about medical experimentation on populations in war and on the production of gendered and racialised bodies for experimentation.[32] Popular histories of the US Defense Advanced Research Projects Agency (DARPA) or the Central Intelligence Agency (CIA), such as Sharon Weinberger's *The Imagineers of War*[33] or Annie Jacobsen's *The Pentagon's Brain*,[34] have similarly shown how war and experimentation with technology and weaponry have a long and entangled history. More recently, experimentation has been linked to counterinsurgency warfare and the deployment of future-oriented action (scenarios, exercises, gaming) and creative design thinking in the context of the Western wars in Afghanistan and Iraq.[35]

What is specific within the current context, however, is how experimentation has become truly distributed, informing an increasingly wide range of military practices and spanning across novel military-corporate assemblages. As such, experimentation has become centre stage in military thinking about the organisation of warfare, what I refer to here as the experimental way of warfare. In conceptualising the experimental way of warfare, I draw on recent work within anthropology and associated disciplines on 'experimentality' as a mode of governing that operates

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[28]Ibid.

[29]Antoine Bousquet, 'Chaoplexic warfare or the future of military organization', *International Affairs*, 84:5 (2008), pp. 915–29.

[30]I am not denying that AI has a much longer historical role in warfare, and that developments within the broader field of AI have always been closely connected to military funding and a strongly militarised vision of what AI can do, but the current, widescale investment in AI technology within the military domain is unmistaken. For more on the role of AI as a military technology, see Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: MIT Press).

[31]David Arnold, *Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth Century India* (Berkeley and Los Angeles, CA and London, UK: University of California Press, 1993); Helen Tilley, *Africa as a Living Laboratory: Empire, Development, and the Problem of Scientific Knowledge* (Chicago, IL: University of Chicago Press, 2011); Fouzieyha Towghi and Kalindi Vora, 'Bodies, markets and the experimental in South Asia', *Ethnos*, 79:1 (2014), pp. 1–18.

[32]Katja Lindskov Jacobsen, *The Politics of Humanitarian Technology: Good Intentions, Unintended Consequences and Insecurity* (London, UK: Routledge, 2015).

[33]Sharon Weinberger, *The Imagineers of War: The Untold History of DARPA, the Pentagon Agency that Changed the World* (New York, NY: Alfred A. Knopf, 2017).

[34]Annie Jacobsen, *The Pentagon's Brain: An Uncensored History of DARPA, America's Top-Secret Military Research Agency* (London, UK: Hachette UK, 2015).

[35]Dan Öberg, 'Warfare as design'.

'by-experiment' and that is driven by an overarching experimental rationality.[36] In her analysis of experimentality in 1970s Bangladesh, Michelle Murphy describes how experimental practice became ubiquitous, spreading across a distributed field of experts and producing a 'transnationally attached, locally organized patchwork of unevenly distributing funds, technologies, practices, infrastructure, experts, services, collectivities, and workers'.[37] Observing a 'creative explosion of Bangladeshi trials, pilot projects, and experiments' over the course of the 1970s, Murphy points out how experimentation transitioned from being a more or less centralised and spatially confined scientific practice limited to the lab, clinic, or field site, to a broader way of governing life and population as part of development practices.[38] As part of this process, Bangladesh became a key site for experimentation with new techniques and technologies, as well as a global model for this kind of governing by-experiment.

What makes experimentality in this and other contexts so generative, argues Murphy, is that it operates on the basis of a highly speculative or anticipatory vision of the experiments being deployed.[39] This speculative understanding of experimentation is what makes experimentality as a mode of governing largely self-perpetuating. As Vinh-Kim Nguyen argues, experimentality inverts 'the classical model whereby evidence of efficacy permits intervention', in the sense that, 'in this case intervention drives the need for self-validating evidence (that is, the intervention was effective).'[40] Even more so, experimentality distinguishes itself in the way in which it *thrives* on uncertainty or failure. Writes Murphy, 'if an experiment does not work, [this only means that] a better experiment is needed.'[41] The outcome is the reproduction of 'the infrastructure of experiment itself'.[42]

Extending these insights on experimentality to the context of war, I am approaching the experimental way of warfare as an emerging technoscientific regime that relies on experimentation as a shared way of thinking about and organising warfare today. As part of this development, experimentation increasingly spans across all levels of military engagement and brings together a diverse group of actors, including the military, tech start-ups, and venture capitalists, into experimental assemblages and informal partnerships.[43] The experimental way of warfare operates on a particular understanding of experimentation that is increasingly detached from a more narrow interpretation of experimentation as a scientific practice of replication and controlled testing, favouring a more speculative and entrepreneurial vision of experimentation (dominant within the surroundings of Silicon Valley) that is about acting fast, taking risks, and accepting, or adapting to, failure.[44] It is this speculative vision of the experiment that makes the experimental way of warfare largely immune to criticism linked to effectiveness or failure, as one can always point to lessons learned and a process of 'moving forward' to deflect from failures.

Strategic conceptions of prototype warfare, as they are currently being pushed by Western militaries, capture these aspects, while also taking experimentation as an embodied form into the battlefield. For example, a leading UK defence company defines prototype warfare as '*experimentation in contact*', which 'centers on a willingness to use experimental technologies, tools and

[36]Nguyen, 'Government-by-exception'. See also Murphy, *The Economization of Life*; Towghi and Vora, 'Bodies'; Aradau, 'Experimentality'; Melinda Cooper, 'The pharmacology of distributed experiment: User-generated drug innovation', *Body & Society*, 18:3–4 (2012), pp. 18–43.

[37]Murphy, *The Economization of Life*, p. 87.

[38]Ibid., p. 79.

[39]On this point, see also Cooper, 'The pharmacology'.

[40]Nguyen, 'Government-by-exception', p. 196.

[41]Murphy, *The Economization of Life*, p. 91.

[42]Ibid.

[43]Andrew Merrill, 'Start-Up War: Silicon Valley, the Pentagon and Wars Yet-to-Come' (PhD manuscript [in progress], University of Toronto). See also Emily Gilbert, 'Military geoeconomics: Money, finance and war', in Rachel Woodward (ed.), *A Research Agenda for Military Geographies* (Cheltenham, UK: Edward Elgar Publishing, 2019), pp. 100–14.

[44]Debbie Lisle, 'Failing worse? Science, security and the birth of a border technology', *European Journal of International Relations*, 24:4 (2018), pp. 887–910.

techniques at an earlier stage of readiness in live environments as part of a continuous cycle of learning and optimization'.[45] Similarly, a UK General conceptualises prototype warfare as 'a new, *democratized* approach to experimentation and innovation', which 'will extend to the battlespace, with deployed operations becoming the *ultimate laboratories* for innovation'.[46] Below, I will further examine this extension of prototype warfare into the battlespace, where experimentation serves primarily as a proof of concept or vehicle for constant learning (by doing). The next section, however, first traces the emergence of prototype warfare as a strategic concept across Western military discourse and practice, examining how the experimental way of warfare is taking shape under this concept.

Tracing prototype warfare

While the concept of prototype warfare has recently gained traction across Western military discourse, it was first coined in 1998 by a US Lieutenant Colonel, Robert R. Leonhard. In his book *The Principles of War for the Information Age*, Leonhard aimed to revise military doctrine 'as warfare progressed through the Industrial Age into the Information Age'.[47] He argued that in order to create technological advantage in the Information Age, militaries needed to adapt to prototype warfare as a radically different approach to warfighting. Leonhard observed that while technological change in the Industrial Age developed at a moderate tempo and that, as a result, 'mass production was the *sine qua non* of Industrial Age warfare', future warfare would 'feature a constant myriad of technological advances that [would] come at a tempo that disallows mass production'.[48] This meant that a new approach to technology development was needed that would favour the deployment of limited-production prototypes tailored to specific missions. In turn, such an approach would entail a new and more 'dynamic relationship among economy, organization, and training',[49] as well as a more general disposition towards experimentation, as part of which 'military forces [would] become comfortable with deploying novel weapons, supported by novel tactics, in hopes of achieving an operational advantage against an opponent'.[50]

Clearly, Leonhard's thinking on prototype warfare at the time was shaped by existing debates on the so-called Revolution of Military Affairs of the late 1990s. His ideas were also informed by military strategic thinking as it developed within the doctrine of network-centric warfare, as part of which military strategists proposed to decentralise military organisation, drawing from insights and the vocabulary offered by complexity theory and the information sciences.[51] Leonhard writes for instance that '[o]ne of the most exciting technologies of twenty-first century warfare is that of "situational awareness"', which is to be attained through a 'network of computers' through which a military commander and his subordinates would see each other digitally.[52] This network of computers would free militaries 'forever from the need for mass-based control' and allow them 'to come at the enemy in a patternless fashion that defies anticipation and complicates

[45]Qinetiq, 'Deploying Prototype Warfare', available at: {https://www.qinetiq.com/en/insights/deploying-prototype-warfare} accessed 22 March 2021, emphasis added.

[46]Mark Carleton-Smith, 'Foreword', *Defence Global* (November, 2018), available at: {https://edition.pagesuite-professional.co.uk/html5/reader/production/default.aspx?pubname=&edid=fc50d232-0df5-4759-bfaa-05e5761e5701} accessed 21 December 2021, emphasis added.

[47]Robert R. Leonhard, *The Principles of War for the Information Age* (New York, NY: Presidio/Ballantine Books, 1998), p. 33.

[48]Ibid., p. 69.

[49]Ibid., p. 198.

[50]Robert Kozloski, 'The path to prototype warfare', *War on the Rocks* (17 July 2017), available at: {https://warontherocks.com/2017/07/the-path-to-prototype-warfare/} accessed on 24 March 2021.

[51]Arthur K. Cebrowski and John J. Gartska, 'Network centric warfare: Its origins and future', *Proceedings of the U.S. Naval Institute*, 124:1 (1998), pp. 1–139.

[52]Leonhard, *The Principles of War*, p. 124.

the enemy's understanding'.[53] Prototype warfare would entail a shift away from mass as a means of control and towards 'patternless maneuver' or 'precision maneuver' enabled by digital communications and a decentralised and networked military command structure.[54]

Tracing its origins this way, we can see how prototype warfare does not present a clear epistemological break with conceptions of decentralised control and information superiority as they have been central to the doctrine of network-centric warfare. Indeed, to a large extent, the emergence of the prototype warfare concept appears to be about fulfilling earlier promises of a fully legible and malleable battlefield, this time by taking advantage of the technological advances that AI and new digital technologies appear to afford. Understood as such, the emergence of prototype warfare as a concept within Western military discourse and practice should be situated against the background of a highly performative and speculative rhetoric around the transformative potential of AI, specifically in relation to its proclaimed ability to improve and accelerate military decision-making,[55] or the way in which it can 'sift through today's data-rich environment', as a report by the North Atlantic Treaty Organization (NATO) puts it.[56] At the same time, prototype warfare is rooted in the widely shared belief across Western militaries that existing military innovation and acquisition strategies are excessively cumbersome and slow, and insufficiently capable of incorporating the latest technological advances. This is seen as particularly problematic in the context of what is presented as a wider technological competition in which competitors such as China and Russia are contesting Western technological superiority, or are at least narrowing the technology gap. Set against the backdrop of this global 'technological adoption race',[57] prototype warfare, as it is being articulated by Western militaries, represents and calls for a distinct approach to military innovation that centres on the rapid deployment of, and ongoing experimentation with, a smaller quantity of tailored systems. The main rationale is that prototyping enables militaries to adopt new technologies quicker, produce them at a lower cost, and increase the level of surprise.[58] Experimentation underpins this practice of prototyping as it 'puts prototypes into the Warfighter's hands for assessment in an operational context' and allows for an ongoing process of adaptation and learning.[59]

Within the US context, prototyping and experimentation first appeared as central strategic concepts within the context of the so-called Third Offset Strategy that was announced by the US DoD under President Barack Obama to sustain US military dominance within the broader field of AI.[60] Under the Third Offset, the US DoD launched a range of new programmes and offices, including Better Buying Power 3.0, a set of policies aimed at strengthening and streamlining US DoD innovation, which focused on 'increas[ing] the use of prototyping and

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[53]Leonhard, *The Principles of War*.

[54]Ibid., pp. 125–6.

[55]Marijn Hoijtink and Anneroos Planqué-van Hardeveld, 'Machine learning and the platformization of the military: A study of google's machine learning platform TensorFlow', *International Political Sociology* (2021), pp. 1–19.

[56]NATO Parliamentary Assembly Science and Technology Committee, Sub-Committee on Technology Trends and Security (STCTTS), 'Artificial Intelligence: Implications for NATO's Armed Forces, 149 STCTTS 19 E rev. 1 fin (13 October 2019), p. 4, available at: {https://www.nato-pa.int/download-file?filename=sites/default/files/2019-10/REPORT% 20149%20STCTTS%2019%20E%20rev.%201%20fin-%20ARTIFICIAL%20INTELLIGENCE.pdf} accessed 24 March 2021.

[57]Rob Murray, 'Building a resilient innovation pipeline for the alliance', *NATO Review* (1 September 2020), available at: {https://www.nato.int/docu/review/articles/2020/09/01/building-a-resilient-innovation-pipeline-for-the-alliance/index.html} accessed 24 March 2021.

[58]See, for example, Kozloski, 'The path to prototype warfare'.

[59]US Under Secretary of Defense, 'Implementation Directive for Better Buying Power 3.0: Achieving Dominant Capabilities through Technical Excellence and Innovation', Memorandum (9 April 2015), p. 13, available at: {https://www.acq.osd.mil/fo/docs/betterBuyingPower3.0(9Apr15).pdf} accessed 24 March 2021.

[60]Chuck Hagel, 'Defense Innovation Days', Opening Keynote (Southeastern New England Defense Industry Alliance), Secretary of Defense Speech (3 September 2014), available at: {https://www.defense.gov/News/Speeches/Speech/Article/605602/} accessed 5 January 2022.

experimentation',[61] and the Defense Innovation Unit Experimental (DIUx, now DIU), which was meant to be 'accelerating the adoption of commercial technology throughout the military and growing the national security innovation base'.[62] In so doing, DIU partners with the private sector 'including firms and academic institutions outside DoD's traditional orbit',[63] and operates on the basis of a new type of contracting, called Other Transactions, that can be used for prototyping activities. This allows the DIU to award 'prototype projects without the onerous rules and regulations of the traditional defense acquisition process'.[64]

In parallel with these strategic initiatives at DoD level, different service branches within the US military have established and expanded initiatives to increase the use of prototyping and experimentation. For instance, the US Army is investing, prototyping and experimenting under Army Futures Command, a new command structure founded in 2018, based in Houston, Texas. Army Futures Command hosts the annual Army Expeditionary Warrior Experiment, which is described as a 'live prototype assessment' with soldiers and units, and a 'perfect laboratory to bring industry, army labs, academia and the acquisition community together'.[65] Army Futures Command also leads Project Convergence, described as 'the centerpiece of the Army's campaign of learning',[66] as part of which the Army organises experiments every two weeks, culminating in an annual demonstration, to 'take the service's big ideas for future warfare and test them in the real world'.[67] Similarly, the US Air Force established the Research Laboratory's Strategic Development Planning and Experimentation Office in 2016 to 'institutionalize experiments as regular practice in the Air Force'.[68] Part of the Air Force Laboratory is AFWERX, a dedicated innovation unit that serves to facilitate the integration of commercial technology into the Air Force and that operates its own investment fund, AFVentures, to attract private investment and target early stage companies working on emerging technology.[69]

In the UK, the prototype warfare concept has also gained traction and informed a wide range of new activities and programmes. The British Army embraces prototype warfare as their main new approach to warfighting, defining it as 'a pathway to deliberately enable research, innovation, experimentation, demonstration then delivery – rapidly' and as 'an opportunity designed to secure competitive advantage via trial and error and adaptation'.[70] Prototype warfare within the British Army is driven by the Army Rapid Innovation and Experimentation Laboratory, an innovation unit that 'aims to bring expertise and cutting-edge technologies into direct contact with Army users', thereby 'challenging perceived barriers to the rapid prototyping and exploitation'.[71]

[61]US Under Secretary of Defense, 'Implementation Directive', p. 12.

[62]Defense Innovation Unit website, available at: {https://www.diu.mil/about} accessed 5 January 2022.

[63]Cheryl Pellerin, 'Hagel Announces New Defense Innovation, Reform Efforts', US Department of Defense (15 November, 2014), available at: {https://www.defense.gov/News/News-Stories/Article/Article/603658/igphoto/2001773969/} accessed 5 January 2022.

[64]Fred Kaplan, 'The Pentagon's innovation experiment', *MIT Technology Review* (14 January 2016), available at: {https://www.technologyreview.com/2016/12/19/155246/the-pentagons-innovation-experiment/} accessed 24 March 2021.

[65]Available at: {https://www.youtube.com/watch?v=tJzgc_IffM0} accessed 5 January 2022.

[66]Will Reinier, 'Campaign of Learning: US Army, AFC Introduce Project Convergence, US Army (10 September 2020), available at: {https://www.army.mil/article/238896/campaign_of_learning_u_s_army_afc_introduce_project_convergence} accessed 5 January 2022.

[67]Congressional Research Service, 'The Army's Project Convergence' (27 September 2021), available at: {https://sgp.fas.org/crs/weapons/IF11654.pdf} accessed 5 January 2022.

[68]Rachel S. Cohen, 'Experiments take root across the Air Force', *Air Force Magazine* (30 January 2020), available at: {https://www.airforcemag.com/experiments-take-root-across-the-air-force/} accessed 5 January 2022.

[69]Theresa Hitchens, 'Air force to pump new tech startups with $10M awards', *Breaking Defense* (25 February 2020), available at: {https://breakingdefense.com/2020/02/air-force-to-pump-new-tech-startups-with-10m-awards/} accessed 24 March 2021.

[70]British Army website, available at: {https://www.army.mod.uk/news-and-events/events/army-combat-power-demonstration/} accessed 5 January 2022.

[71]British Army website, available at: {https://www.army.mod.uk/news-and-events/events/army-combat-power-demonstration/} accessed 5 January 2022.

In 2022, the Army will open its new British Army Battle Lab, which will feature as the physical manifestation of the Army Rapid Innovation and Experimentation Laboratory, or as an 'engineering workshop' where soldiers and industry meet in a shared space to develop ideas and experiment with technology.[72] Experimentation will also take place as part of the Army's newly established Enhanced Light Force Battalion (ELFB), a unit that sits 'at the vanguard of the Army's approach to prototype warfare and develop capabilities to be tested on exercises and operations'.[73] Stationed in Cyprus, the main purpose of the unit is to be '"supercharging experimentation"' by trialling new technologies and integrating them into actual Army operations and way of fighting.[74]

To give a final example, in The Netherlands, the Defense Innovation Strategy, which was published by the Dutch Ministry of Defense (MoD) in 2018, strongly relies on prototyping and experimentation as a means of innovation.[75] Among the range of initiatives announced by the strategy is the deployment of Concept Development & Experimentation (CD&E), described as a specific approach to innovation that is based on the implementation of small-scale experiments and shorter innovation cycles.[76] In operationalising this CD&E approach, the Dutch MoD has established a variety of so-called field labs, where the military implements and tests specific ideas and technologies in collaboration with private partners, such as start-ups and (technical) universities. The Dutch Army has taken the lead in this space, creating, among other 'labs', the Robots and Autonomous Systems (RAS) unit and the Land Information Manoeuvre Center (LIMC), further discussed in the below. Both have embraced prototyping and experimentation to gain 'real-world' experience with new digital and autonomous technologies and demonstrate their value to the Dutch armed forces, seizing opportunities and taking action outside of formal frameworks of military acquisition and often without formal permission.

In summary, while not a new concept, prototype warfare has in recent years been gaining traction across Western military discourse and practice. Driven by a highly speculative rhetoric around the potential of AI technology and the problematisation of existing military innovation and acquisition strategies in the context of a performative global technological competition, prototype warfare operates as the strategic concept under which the experimental way of warfare is taking shape, assembling a range of new and experimental practices, technologies, and interactions. Prototype warfare is also the concept under which experimental practice and experimentation with new technologies is taken more explicitly into the (simulated) battlespace, or near the edge of battle. As a US Army Colonel puts it, 'the idea is the sooner we can bring things out here, *get them in the dirt*, get them in soldiers hands, the sooner we can learn'.[77] Again, while the military has a much longer history of engaging in experimental learning in actual operations or as part of simulated exercises, gaming and scenario planning, what is different in today's context is how experimentation becomes very much the end goal. In prototype warfare, the aim is to experiment on a constant basis, with the purpose of constant learning, optimising, and innovating. In this context, experimentation is supposed to happen *throughout*, in peacetime training and in actual combat, as part of a continuous cycle of learning and optimisation, and uninterrupted

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[72]'British Army "Battle Lab" to lead technology innovation for battlefield edge', *Defence Connect* (27 August 2020), available at: {https://www.defenceconnect.com.au/land-amphibious/6712-british-army-battle-lab-to-lead-technology-innovation-for-battlefield-edge} accessed 5 January 2022.

[73]British Army, 'New Experimentation Unit to Supercharge Army Transformation' (27 March 2021), available at: {https://www.army.mod.uk/news-and-events/news/2021/03/experimentation-battlegroup/} accessed 5 January 2022.

[74]Ibid.

[75]Ministerie van Defensie, 'Samen Sneller Innoveren: Innovatiestrategie Defensie' (16 November 2018), available at: {https://www.defensie.nl/downloads/publicaties/2018/11/16/defensie-innovatie-strategie-2018} accessed 5 January 2022.

[76]The Dutch MoD uses the term 'kort-cyclish innoveren' (short-cyclical innovation) as an alternative for prototyping. In recent years, the term has become a real buzzword.

[77]Stew Magnuson, 'Army's Project convergence continues on 10-year learning curve', *National Defense* (17 December 2021), available at: {https://www.nationaldefensemagazine.org/articles/2021/12/17/armys-project-convergence-continues-on-10-year-learning-curve} accessed 11 January 2022, emphasis added.

by failure.[78] By extension, I argue that this means that military intervention becomes itself reconfigured – and justified – *as* a learning experience and opportunity for further experimentation. Politically, much is at stake here: if warfighting becomes in and of itself experimental and failure instructive, how can we then resist military intervention in the experimental way of warfare?

Battlefield learning: The case of the Land Information Manoeuvre Centre

This section examines the extension of prototype warfare into the (simulated) battlespace, focusing on how the performed need to constantly learn from the deployment of new technology and optimisation of military operations enables and justifies ongoing experimentation on the actual battlefield. My arguments are embedded in a close analysis of recent innovation efforts within the Dutch military, which has been outspoken in its ambition to lead information- and innovation-led warfare and develop niche capabilities in technological innovation as an alternative way to protect national interests and exercise international influence. Specifically, I focus on the case of the Land Information Manoeuvre Centre (LIMC), 'an experimental data center', established by the Dutch Army in March 2020 for the purpose of engaging in open-source data collection and analysis, based on machine learning technology, to help crisis response and fight disinformation within the context of the COVID-19 pandemic. The work of LIMC had a particularly wide scope, exploring 'all available and relevant information, from open and semi-closed sources' to map networks, sentiments and behavioural dynamics on 'everything COVID-19-related that is also relevant for the military'.[79] This included data on anti-vaccination movements in The Netherlands, but also on protest movements, such as QAnon, 5G, and even the Dutch Black Lives Matter movement.

The Dutch public first learned about LIMC in November 2020, when national newspaper *NRC Handelsblad* published an article about the centre, which was titled 'How the Dutch Army Keeps an Eye on Its Own Population'.[80] Following the initial *NRC Handelsblad* article, it soon became clear that the Army did not have a legal basis for this kind of data collection on Dutch citizens, and that many within the military itself, including then-Defense Minister Ank Bijleveld, had been unaware of the (full scope) of the centre's activities. This, combined with criticism from the Dutch Parliament, impelled Bijleveld to temporarily pause all LIMC activities and to order an independent investigation into LIMC's methods and legal basis. After completion of the investigation in late 2021 and a subsequent Freedom of Information request on behalf of *NRC Handelsblad*, a collection of internal Ministry of Defense communications and documents was released, which reveal a lengthy discussion among military and policymaker units on the practices and legality of open-source data collection and analysis by LIMC.[81] These documents also provide us further insights into how the COVID-19 pandemic and crisis context was seized by those responsible within the Army as an opportunity to gain experience with open-source intelligence methods through real-world experimentation and the collection of real-world data.

Indeed, this broader objective of LIMC to experiment with new digital technologies and learn about them in a real-world setting was clearly articulated by the responsible Lieutenant Colonel, who instructed his subordinates on the first day of the new centre by saying: 'Prepare for experiments. We are reinventing ourselves.'[82] It was also formulated by the Commander of the Armed Forces, who authorised the establishment of LIMC on 19 March 2021 in his day order by giving LIMC as a formal assignment 'to provide the Armed Forces and other public authorities with new

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[78]Carleton-Smith, 'Foreword'.

[79]Berkhout, Rosenberg, and Petraeus, 'Hoe Defensie'.

[80]Ibid.

[81]These documents are available via this website: {https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2021Z18543&did=2021D39896} accessed 14 January 2022.

[82]Cited in Berkhout, Rosenberg, and Petraeus, 'Hoe Defensie'.

insights *in an experimental form* in the fight against COVID-19'.[83] More specifically, in his day order the Commander of the Armed Forces stated that LIMC was supposed to serve two main aims:

> To evaluate all available and relevant information, from of open and semi-closed sources, about the Covid crisis, to generate situational awareness and understanding … Hereby, military and civil decision making processes will be informed by insights and where possible an action perspective.[84]

And:

> [T]o improve military operations with the aid of new technologies and better use of information. This also means that new threats can be countered. With the LIMC, the Royal Netherlands Army can gain experience in bringing together information maneuver capabilities that offer insight, foresight and continuous action perspective in three dimensions (cognitive, virtual, physical).[85]

From this perspective, LIMC is part a wider ambition on the part of the Dutch military, and the Army specifically, to develop new capabilities in what it calls information-driven warfare, as an alternative to protect national interests and exercise international influence as part of coalition fighting. This ambition can be traced back to a report published by the Army in 2016 on 'Information as a Weapon, Means And End', which articulated the need to invest in 'in-house' intelligence capabilities.[86] Frustrated with the workings of the Military Intelligence and Security Service (MIVD), which the Army saw as being too much focused on strategic intelligence to support Army commanders in making tactical or operational decisions, the Army approached their intelligence branch, the Joint Intelligence, Surveillance, Target Acquisition & Reconaissance Commando (JISTARC), to meet this need. Seeking to leverage the potential of 'information as a weapon', JISTARC established unit 109 in 2019, with the aim to engage in open-source data collection and analysis and experiment with 'information maneuvering'.[87] However, even before the new unit was officially launched, it was already caught up in a legal debate about the use of open-source data as training data in these experiments. Unlike the MIVD, the Army has no legal basis to conduct open-source data collection and analysis, which means that JISTARC 109 is constrained by the General Data Protection Regulation (GDPR). This severely hampered the Army's ambition to collect with real-world data and experiment with it in a live-setting, even if JISTARC continued to look for a legal mandate to carry out those tasks.

Then came the COVID-19 crisis, which allowed the Army to move ahead with open-source intelligence, founding LIMC only a few days after The Netherlands went into a first lockdown. Although LIMC was established as a new and separate unit, it was almost entirely staffed by former JISTARC 109 members and initially based in the same location as JISTARC. Soon after its establishment, LIMC started reaching out to the Dutch COVID response task force offering its

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[83]Cited in ibid., emphasis added.

[84]Commando Landstrijdkrachten (CLAS), Fragmentary Order 003 Day Order 2020-710 (COVID-19) (19 March 2020), available at: {https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2021Z18543&did=2021D39896} accessed 19 January 2022.

[85]Ibid.

[86]Royal Dutch Army, 'Informatie als Wapen', Studie Delphi (2017).

[87]Hans van Dalen, 'On Mind War: Manoevreren op het Internetslagveld', *Militaire Spectator*, 189:9 (2020), pp. 405–17, available at: {https://www.militairespectator.nl/thema/operaties/artikel/mind-war} accessed 18 January 2022; Paul Ducheine, Corstiaan de Haan, and Norbert Moerkens, 'Informatiemanoeuvre en Nieuwe Traditieverbanden in de Koninklijke Landmacht', *Militaire Spectator*, 190:5 (2021), pp. 259–67, available at: {https://www.kvbk.nl/thema/geschiedenis-operaties/artikel/informatiemanoeuvre-en-nieuwe-traditieverbanden-de-koninklijke} accessed 18 January 2022.

services. As part of the COVID response task force, LIMC began to collect data from a range of sources, including information from military liaisons in hospitals and nursing homes, to predict logistical challenges and needs, such as material shortages and ICU occupancy rates. At the same time, LIMC started tracking public behaviour, sentiments, and networks based on open-source and semi-closed data on anti-vaccination and other protest movements. These data were processed, analysed, and visualised after which they were being disseminated to other organisations such as the national police and the National Coordinator for Counter Terrorism and Security (NCTV). LIMC continued doing so without a legal basis, until the publication by *NRC Handelsblad* revealed its existence in November 2020.

Overall, the case of LIMC reveals how much the imperative to experiment in 'real-life' settings shapes the Dutch Army's activities, with the COVID-19 pandemic merely serving as the 'perfect crisis' to move ahead with training and experimentation in the field of open-source intelligence gathering and analysis. 'Successful' experimentation with these technologies in the context of the COVID-19 crisis, the Army believed, would serve as a proof of concept and demonstrate the value of open-source intelligence and the importance of the Army possessing these capabilities within the domain of information-driven warfare, while lending credibility to the Army as an important player in this field. But the COVID-19 crisis also provided LIMC staff more directly with an opportunity to gain 'actual' experience and practice with open-source intelligence methods, using real data. This option was not available to JISTARC 109 prior to the COVID-19 crisis, and legally speaking it was not available to LIMC even during the crisis. However, the urgency of the pandemic and the performed need to act fast, take risks, and learn-by-doing allowed for this kind of experimentation and experimental data collection.

The emphasis on LIMC's experimental character eventually also became a way to ward off criticism. When the publication by *NRC Handelsblad* raised a series of questions in Parliament, Bijleveld responded by saying that the centre was merely 'experimental in character', and, therefore, that a legal basis for these kinds of activities was apparently irrelevant.[88] Bijleveld also stressed that she remained committed to continue the work of LIMC to advance the incorporation of new technologies into the Dutch military and to experiment with them in simulated and 'in the field' tests. Indeed, part of the reason why the case of LIMC is particularly revealing is that Bijleveld admitted that the Army used the pandemic as a pretext to collect and model data of Dutch citizens, because it could not experiment with these technologies and learn about them in actual combat at the time.[89] The suggestion, however, that this *would* have been the preferred option raises important questions about how the experimental way of warfare is or will be driving and justifying military intervention, and with what effects for those on the receiving end of the technologies deployed. These questions become all the more important in the light of the challenge of critiquing the experimental way of warfare as I will argue in the below conclusions.

Conclusions

This article has examined how Western militaries are increasingly experimenting with new digital and autonomous technologies, situating these developments against the background of an emerging and distinct regime of warfare, called 'prototype warfare'. As I have argued, prototype

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[88]Berkhout, Rosenberg, and Petraeus, 'Hoe Defensie'.

[89]This speaks to existing work that has studied how technologies are being developed, used, and tested in 'laboratories' in/ of the Global South before they move back to the Global North, but in this context, interestingly, that relationship is being reversed. Still, the Dutch Army has been forthcoming about its ambition to experiment with new technology in conflict settings (for example, as part of Operation Flintlock in the Sahel region), not in the least because this provides the Army with more legal room. For a discussion on the concept of the 'laboratory' within critical security studies, see, for example, Claudia Aradau, Marijn Hoijtink, and Matthias Leese, 'Technology, agency, critique: An interview with Claudia Aradau', in Hoijtink and Leese (eds), *Technology and Agency in International Relations*, pp. 188–203; Mike Bourne, Heather Johnson, and Debbie Lisle, 'Laboratizing the border: The production, translation and anticipation of security technologies', *Security Dialogue*, 46:4 (2015), pp. 307–25.

warfare is not simply a new doctrinal concept or reflective of how much conceptual and language innovation the military is producing, but rather denotes a wider and more structural transformation of how warfare is shaped and made possible. Specifically, I have argued that the concept of prototype warfare represents an *experimental way of warfare*, which is driven by an overarching experimental rationality and governed by-experiment, or constant experimentation and optimisation. It operates on the basis of a highly speculative understanding of the experiments being deployed, and, as such, it explicitly incorporates failure as part of an ongoing process of learning or 'moving forward'.

Understood as such, prototypes such as Project Maven or LIMC do not need to produce any new knowledge or work successfully to create effects. To the contrary, any demonstrated limitation or vulnerability of these kinds of projects and the technologies they deploy are grounds for further investment and experimentation. If an experiment fails, or the outcomes are uncertain, this only means that more experimentation or a better kind of experiment is needed. Again, as Murphy writes in her analysis of experimentality, '[n]o matter the result of the experiment, no matter if results are achieved as intended or if no change is measured (as often happened), what is reproduced is the infrastructure of the experiment itself.'[90] It is this speculative vision of the experiment that makes the experimental way of warfare described here largely immune to criticism linked to effectiveness.

But even if we want to raise critique based on other grounds, such as on legal grounds as happened in the example of the Dutch experimental data centre, or on ethical grounds such as in the case of Project Maven, such criticisms are often fenced off on grounds that these projects are 'mere' experiments. However, more than 'mere' experiments, the objective of this article has been to show that such projects are structural and part of a broader regime of experimentation that deserves our critical attention. Specifically, we should pay attention to how, as part of the experimental way of warfare, military intervention and violence become reconfigured and normalised as an opportunity *for* experimentation and learning, and with what effects for those who are who are commonly on the receiving end of the technologies with which our militaries are experimenting. This means highlighting how the risks and failures that are a structural condition of the experimental way of warfare are being outsourced to others, 'over there', and shedding light on the costs and aftermath of the experiments that are being deployed in the name of mere optimisation.

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[90]Murphy, *The Economization of Life*, p. 91.