

Pandemics and Paradigms of Conflict

A Monograph

by

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Abstract

Pandemics and Paradigms of Conflict, MAJ Jared B. Hirschhorn, US Army, 56 pages.

The COVID-19 pandemic and the increasingly consequential gray zone demonstrate that significant war-like effects can be inflicted well outside the domain of physical combat. Yet, for the US military, much of the focus of modernization is on capabilities and technologies which increase performance in physical combat and large-scale combat operations (LSCO). The US Army Multi-Domain Operations (MDO) concept is part of this approach. Given historic US dominance in physical combat, it is worth considering what methods competitors and adversaries employ to achieve asymmetric advantages that avoid challenging the United States in this domain, and how the US might best respond. In order to make sense of this, this work explores the historic consequences of pandemics, asymmetries between Chinese and US concepts of war, and advances in biotechnology and synthetic biology. It concludes by synthesizing the findings of these sections into a set of ideas for strategy, technological and materiel approaches, and organizational change, with the goal of operating more effectively in the gray zone and increasing pandemic resilience.

Abbreviations

A2AD	Anti-Access Area Denial
BCT	Brigade Combat Team
BCT	Basic Combat Training
BRI	Belt and Road Initiative
BW	Biological Warfare
BSL	Bio Safety Level
BWC	Biological Weapons Convention
CBRN	Chemical Biological Radiological Nuclear
CCP	Chinese Communist Party
COVID-19	COronavIRus DIsease of 2019
DIME	Diplomatic, Information, Military, Economic
EPA	Environmental Protection Agency
GAO	Government Accountability Office
GCC	Geographic Combatant Command
GDP	Gross Domestic Product
GRU	Glavnoje Razvedyvatel'noje Upravlenije (Intelligence Directorate)
GZCC	Gray Zone Combatant Command
KGB	Komitet Gosudarstvennoy Bezopasnosti (Committee for State Security)
KNGW	Kinetic Next-Generation Warfare
LEED	Leadership in Energy and Environmental Design
LSCO	Large Scale Combat Operations
JP	Joint Publication
MCO	Major Combat Operations
MDO	Multi-Domain Operations
NAFTA	North American Free Trade Agreement

PRC	People's Republic of China
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus - 2
SOCOM	Special Operations Command
Syn-Bio	Synthetic Biology
UAV	Unmanned Aerial Vehicle
USMCA	United States Mexico Canada Agreement

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Research Question, Hypothesis

Research for this monograph started with several questions. What has been the impact of the COVID-19 pandemic? What lessons has it taught? Does it reveal anything about the changing character and nature of war? This required an understanding of the overall impact of pandemics, the state of biotechnology, and whether or not US adversaries consider employing pathogens such as SARS-CoV-2 as biological weapons. Initially, the research intended to examine the origin of SARS-CoV-2, but directive guidance to avoid this subject shifted the focus. Regardless of its origin, SARS-CoV-2 has had significant, widespread, and ongoing consequences. Therefore, the possibility that a pathogen like SARS-CoV-2 could be deployed deliberately, and what that implies for the United States, is an important consideration.

Historic US strength in the physical domain of armed combat has helped to uphold a framework of international relations decided upon by the allied powers during and immediately after WWII.¹ Underlying this strength was the economic power that accrued to the United States both as the only fully functioning economy at the end of the war, and as owners of the world's largest portion of high-quality farmland overlaid on top of the world's best network of inland waterways.² However, this dominance has encouraged US adversaries to seek asymmetric means of challenging the US and the west in general. Terrorism and guerilla warfare are two well-known examples. Biological weapons similar to SARS-CoV-2 also have the potential to be used as part of an asymmetric or gray zone strategy. This domain known as the gray zone has received more attention recently, but is something which has been historically neglected by the United States, which has historically oriented on strategies appropriate to its dominance within a western economic and military framework.

¹ A series of meetings and conferences during and after WWII was where the allied powers set the agenda and created a postwar system: Tehran 1943, Yalta 1945, Potsdam 1945, Bretton-Woods 1944, and Geneva 1947, accessed May 6, 2021, <https://history.state.gov/milestones/1937-1945>.

² Peter Zeihan, *The Accidental Superpower* (New York: Hachette Book Group, 2014), 52.

Clausewitz stated that the most far-reaching act of judgement for the statesmen and commander is to first establish what kind of war they are fighting.³ For many reasons, the United States is oriented towards a specific form of war exemplified by Desert Storm and World War II. If competitors or adversaries such as China implement asymmetric methods which expand the domain of conflict while avoiding US strengths in physical combat, this presents risk. This is a cognitive challenge which requires a different understanding of conflict. For the United States, figuring out an approach which best fits the need for a new understanding might be the only way to avoid a fundamental surprise based on an outdated paradigm.

Literature Review

Kuhn's *The Structure of Scientific Revolutions* and Zvi Lanir's *Fundamental Surprises* are two important works for understanding cognitive paradigms. In understanding the PRC's approach to warfare there is a vast quantity of literature in this space, and with a wide variety of viewpoints. This research drew significantly from Pillsbury's *100 Year Marathon*, Kilcullen's *The Dragons and the Snakes: How the Rest Learned to Fight the West*, Halper's edited collection *Three Warfares*, and the well-known PRC publication *Unrestricted Warfare*. Because of space limitations and risk considerations, the author focused more on hawkish sources. Robert R. Leonhard provides valuable perspective on the US cognitive approach. He argues that the US paradigm of warfare is high-tempo and high-frequency and not well-adjusted to low frequency methods such as "low-intensity conflict."⁴ The gray zone is a good example of a low-frequency approach which is mostly transparent to the US orientation on high-frequency physical combat.

The section on the historic impact of disease draws from a number of sources that help establish an understanding of how pandemics have shaped the world. Walter Scheidel's recently

³ Carl Von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1984), 88.

⁴ Robert R. Leonhard, *Fighting by Minutes* 2nd ed. (Self Published, 2017), p. 108-112.

published *The Great Leveler, Violence and the History of Inequality from the Stone Age to the 21st Century* was useful for understanding how pandemics have affected the economic and social structure of society. Kyle Harper's *The Fate of Rome: Climate, Disease, and the End of an Empire*, argues for the outsized impact of pandemics on the overall strength of the Empire. Ray Dalio's *The Changing World Order: Why Nations Succeed and Fail* provided a useful historic perspective in the economic sphere as well as insight into critical differences in culture and ideology between the US and China. Source writings on the plague from Marcus Aurelius and Galen (Rebecca Fleming) were useful for verifying and pulling specific historical details of the consequences of the Antonin plague. Jared Diamond's *Gun, Germs, and Steel* helped frame the overall impact of diseases on history. He points out that, for much of history, disease killed more Soldiers than combat.⁵

The section on pandemic probability is inspired by a podcast interview with Naval Ravikant where he predicts that rapid advancements in biotechnology will facilitate the ability to create dangerous bioweapons at the individual level.⁶ In June of 2019, the Government Accountability Office (GAO) released "Biodefense: The Nation Faces Long-Standing Challenges Related to Defending Against Biological Threats." This, as well as the 2018 *National Biodefense Strategy*, provide an excellent summary of risks posed by biological pathogens to a globalized and interconnected world economy.⁷ Another useful document was the 2018 National Academy of Sciences report *Biodefense in the Age of Synthetic Biology*. This report concludes that "the 21st century is the century of the life sciences" and that "approaches modeled after those taken to

⁵ Jared Diamond, *Guns, Germs, and Steel* (New York: W.W. Norton & Company, 2017), location 3181, Kindle edition.

⁶ Naval Ravikant "End Games (part one)," March 19, 2019, in *The After On*, produced by Rob Reid, podcast, streaming audio, 11:00, accessed August 31, 2020, <https://after-on.com/episodes-31-60/044>.

⁷ Donald J. Trump, *National Biodefense Strategy* (Washington, DC: The White House, 2018), accessed September 16, 2020, <https://www.whitehouse.gov/wp-content/uploads/2018/09/National-Biodefense-Strategy.pdf>.

counter Cold War threats are not sufficient for biological and biologically-enabled chemical weapons in the age of synthetic biology.”⁸ In “Biology’s Brave New World, The Promise and Perils of the Synbio-Revolution,” Laurie points out that the dual use dilemma which hit the physical sciences and chemistry 50 and 100 years ago respectively, has now hit the biological sciences.⁹

In comparing PRC and US Doctrine the author sought to find asymmetries to better ascertain the gaps and opportunities for the US. It also looks for sources which document PRC views on biological warfare. This approach risks confirmation bias, and is an acknowledged risk in the limited space available. Asymmetry is the idea that the best way to defeat a given enemy capability is with something different that does not challenge that strength directly. Robert R. Leonhard, in *The Art of Maneuver*, mentions that US military planners sometimes fall into cognitive symmetry traps. An example of this is the use of tanks to defeat tanks, or artillery to defeat artillery. The best way to defeat a given enemy capability or system, is typically through a different system which is not vulnerable to the other system’s strengths.¹⁰ His observations, while directed at operational and tactical forms of combat, have implications for strategy as well. Clearly, biological warfare offers a potentially significant strategic asymmetric advantage.

The final section, opportunities and challenges, contains a synthesis of observations about the pandemic, historic lessons, technological trends, and suggests a potential strategy. Joshua Ramo’s *Seventh Sense* helped the author frame his observations in terms of the power of emerging networks. The work of Nassim Taleb was important to understanding tail-risk and the

⁸ Senator Kennedy of Massachusetts, speaking on prohibiting genetic discrimination, on June 29, 2000, Amendment No. 3681. 106th Cong., 2nd sess., *Cong. Rec.* 146(85):S6049. Accessed May 21, 2021, <https://www.congress.gov/106/crec/2000/06/29/CREC-2000-06-29-senate.pdf>, in National Academy of Sciences, *Biodefense in the Age of Synthetic Biology* (Washington, DC: National Academy of Sciences, 2018), 126, accessed September 14, 2020, <https://doi.org/10.17226/24890>.

⁹ Laurie Garrett, “Biology’s Brave New World, The Promise and Perils of the Synbio-Revolution,” *Council on Foreign Relations*, Vol. 92 no. 6 (December 2013), accessed September 7, 2020, <https://www.jstor.org/stable/23527010>.

¹⁰ Robert R. Leonhard, *The Art of Maneuver* (Novato, CA: Presidio Press, 1991), 97.

impact of the highly improbable. Several Twitter accounts influenced the author's thinking on pandemics and trends in technology and are worth listing here: futurist Brian Roemmele (@BrianRoemmele), venture capitalists and philosophers Naval Ravikant (@naval), and Balajis Srinivasan (@balajis).

The impact of pandemic disease is generally underestimated. Pandemics have fundamentally affected the course of history, yet, perhaps for this very reason, are easy to overlook. It is said that history is written by the winners. Perhaps this is true, but a more accurate statement is that history is written by the survivors. This approach, therefore, highlights aspects of the historical narrative which have been downplayed due to the inherent survivorship bias of history. It then draws parallels between pandemics as a low-probability/high-impact phenomenon and the low-frequency phenomenon of gray zone conflict; both of which are minor considerations to many US leaders. These arguments then support the idea that the US needs a new cognitive approach to conflict as a whole, especially given the visible consequences of the COVID-19 pandemic.

I. The Changing Character of War

The more we focus our attention in one area to make it clear, of necessity the blurrier other areas become.

—Everett Carl Dolman, *Pure Strategy*

We have military doctrines designed to deal with war. We have diplomatic doctrines designed to deal with the normal to-and-fro of statecraft and diplomacy. We have not developed the kinds of doctrines, and even beyond that, institutional, organizational, or strategic muscle-memory, to be able to deal with the kinds of activities that come above the line of normal diplomacy and statecraft and below the line of war.

—Jake Sullivan, *Center for Strategic & International Studies*

In light of the impact of COVID-19, the historic consequences of pandemics, and advances in biotechnology, it is worth taking another look at the US model of warfare. New methods and technologies for harnessing the destructive power of microbes, combined with the interconnected aspects of a global economy, improve the odds and amplify the consequences of another pandemic, deliberate or accidental. An increasingly consequential gray zone has also become a realm for achieving a broad range of war-like effects outside the domain of physical combat. The US model remains heavily influenced by the Diplomatic, Information, Military, Economic (DIME) framework; a modernist concept which neatly separates different domains, and relies on a quantifiable and capabilities-based approach to friends and foes alike. Although this has been a useful approach in the past, and indeed Joint Publication One (JP 1) says that the “US wages war employing all instruments of national power,” this paradigm assumes warfare is an activity primarily involving the kinetic clash of armed forces.¹¹ However, warfare is increasingly moving into areas and domains which defy and undermine these categories and ways of thinking.

¹¹ US Department of Defense, Joint Staff, Joint Publication (JP) 1-0, *Doctrine for the Armed Forces of the United States* (Washington, DC: Government Printing Office, 2017), I-1c.

What is the appropriate response to \$600 billion in annual property theft, including important military technologies?¹² What is an appropriate way to view the death of 47,000 mostly military-aged Americans annually?¹³ A theft of critical intellectual property has historically been a matter for courts to resolve. US drug policies have been stuck in a bifurcated left/right model with decades of failure. The right says drug use is a personal choice and argues for heavier sentencing, the left sees systemic oppression and advocates for decriminalization.¹⁴ Both views contain kernels of truth, but miss a potentially bigger picture. How many consider that fentanyl might be part of a gray zone strategy inspired by the Opium Wars? Fentanyl has killed far more Americans than Vietnam, and disqualified legions more from military service, yet how many protests has it inspired? These are examples of things which have had war-like impacts on the United States without triggering an overall sense of being “at war.” And, as unlikely as it might seem, the two phenomena are related. Unemployment stemming from the loss of jobs caused by the theft of intellectual property contributes to despair, loss of purpose, and drug use. Clausewitz’ famously stated that “war is simply the continuation of policy (politics) by other means.”¹⁵ Perhaps the acceptance of this theory has led to a theory-induced blindness which obscures that today, economics, information, biotechnology, drugs, manufacturing, networks, laws, treaties, and diplomacy are all continuations of policy (politics) by other means, and threaten to usurp the historically decisive role of armed combat.¹⁶

¹² The National Bureau of Asian Research, Commission on the Theft of American Intellectual Property, *Update to the IP Commission Report* (Washington, DC: NBR, 2017), 9, accessed February 10, 2021, https://www.nbr.org/wp-content/uploads/pdfs/publications/IP_Commission_Report_Update.pdf.

¹³ Michael Lohmuller, Nicole Cook, and Logan Pauley, *Lethal Exchange: Synthetic Drug Networks in the Digital Era* (Washington, DC: The Center for Advanced Defense Studies, 2020), 11, accessed March 19, 2021, https://c4ads.org/s/Lethal_Exchange_Spread.pdf.

¹⁴ Simplification of the issue to make a point.

¹⁵ Clausewitz, 28.

¹⁶ Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 279. His term for describing an inability to see the flaws in a theory once one has used it in one’s thinking.

Although new organizations such as US Cyber Command regularly operate in a contested environment which challenges the conventional definition of warfare, many of the planning, policy, doctrine, and materiel solutions currently being explored frame their approach in terms of large-scale combat operations (LSCO for the US Army) or major combat operations (MCO, the Joint Service term). US conventional military strength, like the Maginot Line in 1939, is robust and historically informed. Multi-Domain Operations (MDO), convergence, and the emphasis on large-scale combat are building a more lethal combat force – which is an essential component of deterrence. Yet this proficiency in the “M” of DIME is a cognitively, organizationally, and politically comfortable field of action for US military officers and policymakers. Is the focus on LSCO and WWII uniforms an attempt to reincarnate, by way of its artifacts, a quantifiable and capabilities-based form of war that conforms to established understanding?

SARS-CoV-2 may also indicate a potential shift in the nature and character of warfare. It has achieved devastating economic destruction and significant loss of life. Surely someone has noticed the potential for the intentional use of such a pathogen? Yet both the pathogen and the gray zone are things which seem to successfully evade consensual understanding. Fentanyl is a drug trafficking issue for the border patrol, a social justice issue for the left, an enforcement issue for the right, and a non-issue for many economists and military professionals. Few consider it to be a national security issue or a modified form of chemical warfare. The term “gray zone” indicates a lack of definition and a blurring of boundaries. It is the kitchen-junk-drawer of things which cannot be well-explained because they do not fit within an existing category. Perhaps this lack of clarity also stems from a mental all-or-nothing approach: if a thing is not “x,” then it must be “y.”

Kuhn argues that paradigms are a set of rules and assumptions which frame the accepted questions and understanding of a given phenomenon.¹⁷ Yet, perhaps counterintuitively, even

¹⁷ Thomas Kuhn, *Structure of Scientific Revolution* (Chicago: University of Chicago Press, 1996), 44.

though a paradigm is a shared set of assumptions, it can exist even if the proponents do not know the full definitions and limits of the paradigm.¹⁸ As theorist Lanir mentions in *Fundamental Surprises*, an event is often surprising not because it was unexpected, but because it revealed an unknown or undefined assumption about the paradigm: “In each case, the surprise was not only about something that the environment caused, but also, and more deeply, about the understanding of the self.”¹⁹

The US concept of warfare contains a set of unwritten rules that assume it is primarily a contest of physical combat. COVID-19, and a consequential gray zone, demonstrate that massive economic damage and significant loss of life can happen outside of physical combat and below the threshold of military response. This threatens to upend the assumptions underlying the current model. If the United States is to maintain its position in a Bretton-Woods system in an environment with increased risk of biological warfare and a growing gray zone outside of the “M,” it is worth considering to what degree these phenomena mark a shift in the nature and character of war, and how the US should respond, adapt, and overcome.

¹⁸ Kuhn, 44.

¹⁹ Zvi Lanier, *Fundamental Surprises* (University of Tel Aviv: Center for Strategic Studies), 28.

II. The Historic Impact of Disease

A pestilence isn't a thing made to man's measure; therefore we tell ourselves that pestilence is a mere bogey of the mind, a bad dream that will pass away. But it doesn't always pass away and, from one bad dream to another, it is men who pass away..."

—Albert Camus, *The Plague*

While besieging the Genoese fortress of Caffa, Mongols catapulted the dead and plague-infected bodies of their comrades into the fortress in what was arguably mankind's first recorded act of biological warfare.²⁰ The year was 1345, and as the residents of Caffa handled and disposed of these catapulted-corpses they also became infected. Soon the plague had spread within and beyond the city walls.²¹ At the time, Caffa - modern day Feodosia, Crimea - was a hub of trade for Genoese merchants and the ships which transited the route between Caffa and Italy likely brought the plague with them.²² It spread throughout Europe and went on to kill around 50 percent of Europe's population in one of the greatest health disasters in history.²³ In Venice, over 70 percent of the population died. In Florence, the number was 60 percent, and the consequences of the plague were numerous and long-lasting: bankruptcy, economic chaos, and more conflict.²⁴ The plague, combined with poor harvests arising from significantly lower temperatures, also led

²⁰ Jack Weatherford, *Genghis Khan and the Making of the Modern World* (New York, NY: Broadway Books, 2004), 243.

²¹ Mark Wheelis, "Biological Warfare at the 1346 Siege of Caffa," *Emerging Infectious Diseases* 8, no. 9 (September 2002): 971, <https://doi.org/10.3201/eid0809.010536>. There is some debate over whether the act of catapulting the bodies over the walls was what spread the plague or whether it spread by other means. A counter-argument is that the fleas which carry the disease do not stay with cold dead bodies as they prefer warm live hosts. From this vantage point it is probably impossible to know for sure the exact vector of infection.

²² Sarah Douglas, "The Black Death and Nation-State Wars of the 14th Century: Environment, Epigenetics, Excess, and Expiation, 1346-1450" in *Epidemics and War*, ed. Rebecca Seaman (Santa Barbara, CA: ABC-CLIO, 2018), 51.

²³ Douglas, 56.

²⁴ *Ibid.*, 56.

to famines. A series of conflicts which started in 1337, known today as the Hundred Years' War, flared across western Europe. The fourteenth century was a truly dark age, and the plague, which was the cause of so much of the mortality, was a primary cause.

Wars, pandemics, and famines, occur repeatedly throughout history with similar sets of consequences. The occurrence of one is often sufficient to create the conditions for any of the other two to appear. For the Mongols, war was what carried the plague from its origin in the Gobi Desert to the canals of Venice.²⁵ In other cases, plagues appear to be the spark of conflict as groups seize on opportunities created by disease-weakened rivals. The Antonin plague, which many believe to have been smallpox brought back upon Verus' return from campaigning in Parthia, affected the Roman Empire primarily from AD 165 to 180.²⁶ However, it was not a single event, but a series of outbreaks that rippled across the empire for many years as non-immune generations came of age.²⁷ Records show a second major plague event in Rome in AD 191, for example.²⁸ Plague devastated the Empire's economy and military. Tribes such as the Vandals took advantage of this weakness and attacked the Empire's borders.²⁹ Marcus [Antoninus] Aurelius auctioned valuables from his palace to raise funds for the Army and compensated for shortages of soldiers with gladiators.³⁰ Eventually, through skilled leadership,

²⁵ Walter Schiedel, *The Great Leveler: Violence and the History of Inequality from the Stone Age to the 21st Century* (Princeton: Princeton University Press, 2017), 293.

²⁶ Rebecca Fleming, "Galen and the Plague," in *Galen's Treatise Περὶ Ἀλμπίας (De Indolentia) in Context: A Tale of Resilience*, ed. Caroline Petit (Leiden, The Netherlands: Brill, 2019), 222, accessed September 13, 2020, <https://www.jstor.org/stable/10.1163/j.ctvrk2wj.12>. The Parthian Empire occupied approximately the region comprising Iran, Iraq, and Kuwait today.

²⁷ Kyle Harper, *The Fate of Rome* (Princeton: Princeton University Press, 2017), 99-100, 111.

²⁸ *Ibid.*, 111.

²⁹ Marcus Aurelius Antoninus, *The Meditations of the Emperor Marcus Aurelius Antoninus*, ed. by James Moore and Michael Silverthorne, trans. by Francis Hutcheson and James Moor (Indianapolis, IN: Liberty Fund Inc, 2008), 9, accessed September 13, 2020, http://files.libertyfund.org/files/2133/Aurelius_1464_LFeBk.pdf.

³⁰ Antoninus, 10.

determination, and luck, he fought off the barbarians and mostly restored the Empire, but it was a close-run affair, and the restoration was relatively short-lived. Less than 100 years later the Cyprian plague broke out in AD 249.³¹ According to observations from the Bishop of Alexandria at the time and from public registers for food handouts, this disease probably killed 60 percent of the population of Alexandria.³² The collapse in the Empire's population caused by these plagues probably played a significant role in the official collapse of the Western Empire usually considered to be AD 476.

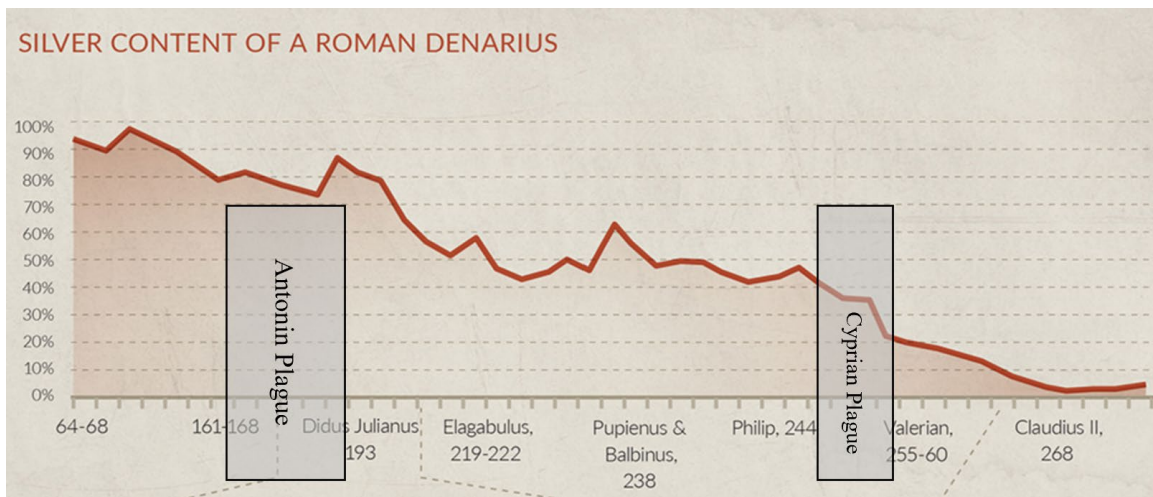


Figure 1. Decline in Silver Content of the Roman Denarius over Time. Jeff Desjardins, “Currency and the Collapse of the Roman Empire,” *Visual Capitalist*, February 19, 2016, accessed May 6, 2021, <https://www.visualcapitalist.com/currency-and-the-collapse-of-the-roman-empire/>. Approximate plague dates added by author.

Economists often reference the decline in the silver content of the Roman Denarius as a proxy for the economic integrity and power of the Empire (see Figure 1). Few sources mention the plagues as a possible causal factor. Yet, when one overlays the approximate dates of the two major plagues a relationship appears likely. Scheidel, in discussing the Antonin Plague, notes that

³¹ Kyle Harper, “Solving the Mystery of an Ancient Roman Plague,” *Atlantic*, November, 2017, accessed October 10, 2020, <https://www.theatlantic.com/science/archive/2017/11/solving-the-mystery-of-an-ancient-roman-plague/543528/>.

³² Scheidel, 334.

“overall price levels roughly doubled within a generation after the outbreak [...] including a surge in coin debasement driven by concurrent and quite possibly related fiscal exigencies.”³³

Smallpox was an undeniable factor in the European colonization of the Americas, just as much as, later on, endemic malaria and yellow fever - brought over from Europe - hindered it.³⁴ Although there is some debate, and much more ink could be devoted to this topic this cross-infection with smallpox was not an intentional tactic of colonization. It was not until the twentieth century that mankind developed an accurate understanding of viruses and bacteria. How would Europeans would know that they had developed a specific and significant immunity to a pathogen that had not spread to the Americas? Europeans were at the crossroads of an infectious disease superhighway, and suffered greatly as a consequence of this for many centuries. This hard-won immunity then gave them an unnoticed advantage over the isolated populations in the Americas which had no immunity.

The lesson here is that the unleashing of a pandemic upon a non-immune population was the most significant factor in the creation of a new power structure in global affairs. Imagine if the immunity profile had been reversed, Europeans had never been exposed to smallpox, and the discovery of the new world ended up importing smallpox to Europe? It is quite possible colonization would never have happened. Estimates vary, but history shows that wherever the Spanish landed in the Americas, massive population declines followed shortly thereafter. In Mexico, it is estimated that smallpox and other diseases caused an 80-95 percent reduction in the population of natives in the sixteenth and seventeenth centuries.³⁵ In Hawaii, “syphilis, gonorrhea, tuberculosis, and influenza arriving with Captain Cook in 1779, followed by a big

³³ Scheidel, 327.

³⁴ Angela Thompson, “Smallpox: Ensuring the Destruction of Armies in Colonial New Spain and Peru, 1518-1625,” in *Epidemics and War* ed. Rebecca Seaman, 130; Jared Diamond, location 3508, Kindle edition.

³⁵ Thompson, 139.

typhoid epidemic in 1804 and numerous ‘minor’ epidemics, reduced Hawaii’s population from around half a million in 1779 to 84,000 in 1853, the year when smallpox finally reached Hawaii and killed around 10,000 of the survivors.”³⁶ Disease has also had a significant and sometimes overlooked impact on the outcome of battles and wars. In Napoleon’s 1812 invasion of Russia, scholars estimate 200,000 soldiers died from typhus, dysentery, and diphtheria, compared to a relatively few 41,000 in combat.³⁷

In the twentieth century alone, estimates place deaths from smallpox and malaria at 300 million apiece.³⁸ If, as Clausewitz says, “war is an act of force to compel our enemy to do our will,” then microbes have been at war with mankind since the beginning, and have been a decisive factor throughout history.³⁹ A survivor of many battles, Clausewitz ultimately died of pandemic cholera in 1831, cutting short his writing of *On War*.

³⁶ Diamond, location 3488.

³⁷ Brian Allen, “The Effects of Infectious Disease on Napoleon's Russian Campaign,” (Thesis, Air Force Air Command and Staff College, Air University, 1998), 34.

³⁸ Colette Flight, “Smallpox: Eradicating the Scourge,” BBC, February 17, 2011, accessed October 12, 2020, https://www.bbc.co.uk/history/british/empire_seapower/smallpox_01.shtml;

Kenneth J. Arrow, Claire Panosian, Hellen Gelband, eds. *Saving Lives, Buying Time: Economics of Malaria Drugs in an Age of Resistance* (Washington, DC: The National Academies Press, 2004), 125, accessed October 12, 2020, https://www.ncbi.nlm.nih.gov/books/NBK215624/pdf/Bookshelf_NBK215624.pdf.

³⁹ Clausewitz, 75.

III. Assessing the Risk of Intentional or Accidental Pandemics

While significant pandemics are rare events, laboratory accidents and natural transmission of diseases from animals to humans are both fairly common. There are essentially three ways that diseases become pandemics. The most common path is zoonosis; the uncontrolled movement of a pathogen from animals to humans generally caused by proximity and a chance mutation. This route has become more common because of the tremendous increase in the number and density of human and livestock populations over the last two hundred years.⁴⁰ The other routes are through accidental or intentional release of a designed or pre-existing pathogen. Dangerous diseases are stored in Bio-Safety Level (BSL) three and four facilities.⁴¹ As human populations and economic and biotechnology capabilities progress, the number of these labs has also increased. They also tend to be located near major population centers. Thus, the probability of another pandemic, accidental or not, is higher than one might think.

The Soviet Union had numerous accidents in its biological weapons program. One of the most significant accidents occurred in 1979, at an Anthrax plant called Compound 19, in Sverdlovsk (Yekaterinburg). A technician left the filter off of the exhaust vent for the area used to dry out the anthrax cultures. The next shift did not see the note from the technician describing the removed filter and activated the fans. These fans blew the Soviet Union's most dangerous form of weaponized Anthrax into the night air in the city of Sverdlovsk for a number of hours before they

⁴⁰ David Quammen, *Spillover, Animal Infections and the Next Human Pandemic* (New York: W.W. Norton & Co, 2012), 496. David describes how from the beginning of mankind until 1804, human population reached 1 billion. From 1804 to 1927 another billion, 3 billion by 1960, and since then each net addition of a billion people has only taken 13 years.

⁴¹ Level three and four facilities are substantially alike. Both types require numerous physical mitigation measures to prevent the mishandling of pathogens. Both types have air tight enclosures specialized containment devices. The biggest difference is that level four facilities require chemical and personal showers on egress, as well as positive pressure protective suits as opposed to the powered respirators in level three facilities. For more information consider this CDC infographic: <https://www.cdc.gov/cpr/infographics/biosafety.htm>, accessed May 5, 2021.

realized their mistake. Over 105 people died from Anthrax infections as a result, most of them workers from the night-shift of an adjacent factory. The event was covered up by the KGB and did not receive coverage in western media reports.⁴²

Ken Alibek reported how his agency, Biopreparat, with help from the KGB and GRU, collected intelligence on global developments in biological weapons research. Their intelligence concluded that China had developed a bioweapons facility in the northeast section of the country when its analysts observed a large fermenting plant and biocontainment lab adjacent to a nuclear testing ground in reconnaissance imagery. In the late 1980s this region had an outbreak of hemorrhagic fever - an area of the world that does not have these diseases naturally. The Soviet analysts concluded this was from a lab accident involving Chinese scientists weaponizing viral diseases.⁴³

For most of recent history, the ability to harness the power of disease in the form of a biological weapon was exclusive to developed nation-states. The most significant use of biological weapons in war was Japan's use of plague, cholera, typhoid, and anthrax against China in WWII.⁴⁴ The Soviets also employed biological weapons – glanders, an equine bacterial disease - against Afghanistan tribes in the 1980s.⁴⁵ Since WWII, the threat of biological warfare has generally been viewed through a similar lens as nuclear weapons; a state-based capability unlikely to be used within a paradigm of deterrence, arms control treaties, technological barriers, and the threat of mutually assured destruction. The last significant use of chemical weapons against US troops was Desert Storm, and it was ineffective. Decades have passed, at war, without

⁴² Ken Alibek, *Biohazard, The Chilling True Story of the Largest Covert Biological Weapons Program in the World – Told from the Inside by the Man Who Ran It* (New York: Random House, 1999), 73-74.

⁴³ Alibek, 273.

⁴⁴ *Ibid.*, 36.

⁴⁵ Glanders is a bacterial disease primarily affecting horses, donkeys, and mules. It can be fatal for humans, but is not common. No naturally occurring cases in humans have been reported since the 1940s; Alibek., 268.

large-scale CBRN (Chemical, Biological, Radiological, Nuclear) events impacting the US military.

However, recent advances in biotechnology are changing this paradigm. Naval Ravikant, technology entrepreneur and founder of AngelList, a new approach for matching venture capital to startup companies, in an interview from the fall of 2019 describes this change:

And the arc of history is giving more and more power to the individual, which is great for individual liberties and freedom, but not so good when it comes to blowing things up. (...) On a long enough time scale, I can take a synthetic biology lab in my room and I can create a weaponized virus that combines the most virulent features of smallpox and the longevity of AIDS and spreads like the flu.⁴⁶

One of the major differences between biotechnology and nuclear technology is that biotechnology has developed in the domain of academia and the private sector, and already has a widely disseminated base of knowledge, materials, and processes.⁴⁷ The means to create cures and prevent disease are quite similar, if not the same, as the processes for creating biological weapons. It is harder to separate the two activities than it is to separate, for example, building a nuclear weapon and operating a nuclear power station.⁴⁸ The costs involved in manipulating biological materials are also rapidly declining in a way similar to the decline in costs for computer processing power: the cost to sequence a human genome has gone from \$100,000 per gene in 2001 to \$1,000 per gene in 2020.⁴⁹

One proximate measure of the increase in biotechnology capability, and therefore potential for misuse or accidental release, is simply the number of BSL-3 and BSL-4 laboratories

⁴⁶ Naval Ravikant “End Games (part one),” 11:00.

⁴⁷ Benjamin Wittes, *Innovation’s Darker Future: Biosecurity, Technologies of Mass Empowerment, and the Constitution* (Washington, DC: Governance Studies at Brookings, 2010), 2-3, accessed September 17, 2020, <https://www.brookings.edu/research/innovations-darker-future-biosecurity-technologies-of-mass-empowerment-and-the-constitution/>.

⁴⁸ *Ibid.*, 5.

⁴⁹ Kris A. Wetterstrand, *The Cost of Sequencing a Human Genome* (Bethesda, MD: National Human Genome Research Institute, August 25, 2020), accessed February 12, 2021, <https://www.genome.gov/about-genomics/fact-sheets/Sequencing-Human-Genome-cost>.

worldwide. In researching this information, the author was unable to find a definitive source for the number of these laboratories worldwide, which is a troubling implication by itself. For the United States, documents from the GAO and the Federation of American Scientists indicate a marked increase in the number of BSL-3 and BSL-4 facilities in the United States. A GAO report from 2013, for example, states that the number of registered BSL-3 and BSL-4 high containment laboratories increased from “1,362 in 2008 to 1,495 in 2010.” However, it also states that this is an incomplete picture of all the high-containment laboratories.⁵⁰ An older report from the GAO shows the number of known BSL-4 labs in the United States grew from two in 1990 to 15 in 2007.⁵¹ The lack of a comprehensive global registry of BSL-3 and BSL-4 labs, is itself an indicator of the degree to which people approach this risk. By comparison, Google searches for the total number of nuclear power plants worldwide returns quite accurate information: there are 440 nuclear powerplants worldwide.⁵²

Other than simply stating the fact that this technology is rapidly maturing and proliferating, what real-world examples are there that lend credence to Ravikant’s and Miller’s predictions? In a Defense Department funded study to demonstrate the threat of synthetic biology, Eckard Wimmer, Distinguished Professor in the Department of Microbiology and Immunology at the Stony Brook University School of Medicine, and his team, created a live polio virus from scratch.⁵³ Prof. Wimmer stated that any of the over 2800 members of the American Society for

⁵⁰ US Government Accountability Office, *High-Containment Laboratories: Assessment of the Nation’s Need is Missing*, GAO-13-466R, by Nancy Kingsbury, Ph.D. (Washington, DC: Government Printing Office, 2013), 6.

⁵¹ US Government Accountability Office, *High-Containment Biosafety Laboratories: Preliminary Observations on the Oversight of the Proliferation of BSL-3 and BSL-4 Laboratories in the United States*, GAO-08-108T (Washington, DC: Government Printing Office, 2007), 1.

⁵² Google Search “number of nuclear reactors worldwide,” September 30, 2020, <http://www.google.com>. This number is corroborated by a report from the Nuclear Energy Institute: <https://www.nei.org/resources/fact-sheets/nuclear-by-the-numbers>, accessed January 6, 2021.

⁵³ Drew Miller, *The Age of Bioengineered Viral Pandemics and Collapse* (Alexandria, VA: Institute for Defense Analysis, 2014), accessed October 2, 2020, <http://www.jstor.com/stable/resrep23620>, 3.

Virology could perform the same feat.⁵⁴ The polio virus is one of the smallest in terms of the length of its RNA code with just 7,741 base pairs.⁵⁵ By comparison, SARS-CoV-2 has about 30,000 base pairs and the common strain of smallpox has about 186,000 base pairs.⁵⁶ If it is possible to recreate a virus with 7,741 base pairs, it is reasonable to estimate that wholesale manipulation and synthesis of different viral strands to create entirely new pathogens is also quite possible. Importantly, Wimmer’s synthetic recreation of the Polio virus was actually performed eighteen years ago, in 2002.

With developments like Wimmer’s well established, the possibility that these weapons might be used either accidentally or purposefully must be significantly higher in the twenty-first century than the twentieth. Another factor contributing to the likelihood of use is the fact that biological weaponry can be deployed in a concealed manner. Many symptoms of diseases overlap, and the difference between an outbreak of a pathogen driven by natural events or by human design can be quite difficult to discern. Covert operations could easily release a biological weapon in a region far removed from the state or region in which it was developed. Biological weapons, because of their potential overlap with naturally occurring diseases, and potential difficulties in determining the original source of infection, make attribution potentially impossible. Developments in this technology may even blur the traditional distinctions between chemical and biological weaponry in ways not yet understood.⁵⁷ A report from the National Academies of Sciences states that synthetic biotechnology may offer the potential to “modulate

⁵⁴ Miller, 3.

⁵⁵ Jennifer Couzin-Frankel, “Poliovirus Baked From Scratch,” *Science*, July 11, 2002, accessed October 2, 2020, <https://www.sciencemag.org/news/2002/07/poliovirus-baked-scratch>.

⁵⁶ R. F. Massung, L. I. Liu, et. al., “Analysis of the Complete Genome of Smallpox Variola Major Virus Strain Bangladesh – 1975,” *Virology* 201, no. 2, (June 1994): 215-240, accessed May 6, 2021, <https://doi.org/10.1006/viro.1994.1288>;

Roujian Lu*, Xiang Zhao et. al., “Genomic Characterisation and Epidemiology of 2019 Novel Coronavirus: Implications for Virus Origins and Receptor Binding,” *TheLancet* (January 30, 2020), accessed May 6, 2021, [https://doi.org/10.1016/S0140-6736\(20\)30251-8](https://doi.org/10.1016/S0140-6736(20)30251-8).

⁵⁷ National Academies of Sciences, 4.

human physiology in novel ways” and this could even challenge the conventional definitions of weaponry itself.⁵⁸ For example, if a syn-bio weapon causes infected humans to act in a specifically different manner, or disrupts a natural balance of the human immune system, it might achieve an adversary’s desired effects without really even meeting the conventional definition of weaponry.

Biological warfare is a natural complement to information warfare. In a world where the capability to develop biological weaponry is more widespread, the indications of an attack overlap with the symptoms of naturally occurring illnesses, in which pathogens might have a delay between infection and illness, and where there could be difficulty in attributing the source of infection, there is a much lower likelihood of retaliation. A skilled information campaign can tilt the odds further in an adversary’s favor. The debate over the origins of SARS-CoV-2 is a perfect example of the difficulty in attribution inherent to the realm of biological phenomenon. The difficulty in figuring this out seems prophetic for any future use of biological weapons. The human mind has a hard time understanding an invisible pathogen. In the US, coming to a consensus about the appropriate response to the virus has been quite difficult, and the disease has laid bare numerous fractures in society and facilitated significant politicization of issues that, in theory, should be non-partisan. Biological warfare is thus a natural companion to information warfare.

Continued advancement in synthetic biology opens the door for the creation of weapons which can target specific genetic profiles.⁵⁹ This added element of precise deployment, which has been lacking in biological weaponry, allows for the use of biological weapons in ways that would have been impossible in the past because of the risk of pandemic and fratricide. Therefore, not only will it be possible to deploy biological weapons in an anonymous manner, it could also be

⁵⁸ National Academies of Sciences, 4.

⁵⁹ Naval Ravikant: “I can even customize it to your genetic code if I wanted to.”

possible to deploy them in a targeted manner with a much smaller risk of pandemic. One might even see novel combinations of bio-weapons and other technologies such as autonomous vehicles. A pathogen constructed to perfectly exploit a unique genomic sequence in an individual might go undetected as a heart attack or bad flu. All of these factors contribute to an increased risk of the use of biological weapons by themselves or in combination with other technologies and methods in the twenty-first century.

In mitigating this threat, the United States will be challenged to implement legal, social, economic, and technical frameworks which strike a reasonable balance between pandemic resistance and economic and constitutional freedom. Much of the world, like the ancient Roman Empire, relies on mobility and density of population to generate high levels of economic growth. Fifty-two percent of the US Gross Domestic Product (GDP) is generated in urban areas and about 80 percent of global GDP is generated in urban areas.⁶⁰ The US military, similarly, relies on mobility and density to accomplish its mission. Much of the west will (and has) experienced this adjustment towards dispersion, more locally organized economies, and less travel, as a harmful economic event. Nassim Taleb argued “[o]ur connected world appears to be more efficient. But when there is a disturbance, the setback is much harder to handle. Not only are we building riskier systems, but also the risks involved in failure are a lot larger.”⁶¹

⁶⁰ Jeff Desjardins, “This Stunning 3D Map Shows U.S. Economic Contribution by City,” Visualcapitalist, accessed May 5, 2021, <https://www.visualcapitalist.com/this-stunning-3d-map-shows-u-s-economic-contribution-by-city/>; McKinsey Global Institute, “Urban World: Mapping the Economic Power of Cities,” March, 2011, 1, accessed November 15, 2020, https://www.mckinsey.com/~/media/mckinsey/featured%20insights/urbanization/urban%20world/mgi_urban_world_mapping_economic_power_of_cities_full_report.ashx.

⁶¹ Drew Miller, quoting Nassim Taleb, 9.

IV. Chinese Concepts of Warfare

The first rule of unrestricted warfare is that there are no rules, with nothing forbidden.

— Col. Qiao Liang and Col. Wang Xiangsui

In *The Hundred Year Marathon*, former Special Assistant for Asian Affairs in the Office of the Secretary of Defense, Michael Pillsbury, points out how a story from *The Romance of the Three Kingdoms* provides an important narrative for understanding Chinese perspectives on rivalry and conflict.⁶² *The Romance of the Three Kingdoms* is one of the most popular works of literature in China and is historical fiction. In the section relevant to the US and China, there are two rivals: Fu Zha the old hegemon, and Gou Jian, the rising challenger.⁶³ Fu Zha manages to take Gou Jian prisoner, and his advisor, Wu Zixu, tells Fu Zha to kill Gou Jian otherwise he will be victorious over him one day. Gou Jian is clever, however, and using influence, is able to get other advisors close to Fu Zha to discredit Wu Zixu - so much so that Fu Zha executes him. Gou Jian, after cleverly obtaining clemency, then serves as Fu Zha's servant for three years in exchange for his freedom and promises to be a cooperative ally to Fu Zha after his sentence expires. Gou Jian performs humiliating and demeaning acts of service to Fu Zha to demonstrate his loyalty. However, shortly after being released at the end of three years, Gou Jian sells Fu Zha poisoned grain to cause a famine, and then invades the kingdom and captures Fu Zha, thus becoming the new hegemon.⁶⁴ This story highlights the idea of concealing one's ambition until

⁶² Luo Guanzhong, *Romance of the Three Kingdoms*, trans. C.H. Brewitt Taylor (ebook), accessed October 8, 2020, http://www.self.gutenberg.org/wplbn0002827913-romance_of_the_three_kingdoms-by_guanzhong_luo.aspx.

⁶³ Michael Pillsbury, *The Hundred Year Marathon* (New York: Henry Holt and Company, 2015), 118.

⁶⁴ *Ibid.*, 118.

the time is right, and employing strategic deception framed by a zero-sum paradigm of competition and the idea that there can only be one hegemon.⁶⁵

Unrestricted Warfare “proposes nonmilitary ways to defeat a stronger nation such as the US through lawfare (that is, using international laws, bodies, and courts to restrict America’s freedom of movement and policy choices), economic warfare, biological and chemical warfare, cyberattacks, and even terrorism.”⁶⁶ It is appropriate to consider whether the ideas in this text, however, are influential and accepted at the highest levels of the CCP. Pillsbury points out that when the news of this study reached the West, “Beijing quickly withdrew all copies from the bookstore.”⁶⁷ However, both of the authors were promoted after it was published.⁶⁸ Wang Xiangsui went on to be a professor at Beihuan University, and Qiao Liang retired as a Major General.⁶⁹ Qiao Liang published another popular book which promoted the idea that China’s international situation resembles the period depicted in *Romance of the Three Kingdoms*.⁷⁰

David Kilcullen, former Chief Strategist in the Office for Counterterrorism at the US State Department and current professor at Arizona State University, suggests that *Unrestricted Warfare* “dramatically broadens the definition of war beyond battlefield dominance.”⁷¹ It makes

⁶⁵ Mr. Pillsbury, on page 119 mentions discussing this story with several scholars in China in 2004 and says that they knew this story well and pointed out books and articles that reference it. Of note, however, the version of the story found in the footnotes of the version available at www.self.gutenberg.org, differs from this version. On page 32, footnotes in the text describe a story in which Gou Jian’s advisor Fan Li instructs a beautiful woman, Xi Shi, to get Fu Zha to fall in love with her. Once she has succeeded in this, she convinces him to dismiss or kill his loyal ministers. After Fu Zha is weakened by this decision, Guo Jian is able to conquer him. This version of the story is also relevant to understanding Chinese perspectives on rivalry. The different versions likely illustrate the difficulty in arriving at a singular understanding of China’s complex and multi-dimensional culture.

⁶⁶ Michael Pillsbury, 116.

⁶⁷ Ibid., 116.

⁶⁸ Ibid., 116.

⁶⁹ David Kilcullen, *The Dragon and the Snakes* (Oxford: Oxford University Press, 2020), 211-212.

⁷⁰ Pillsbury, 117.

⁷¹ Kilcullen, 201.

the argument that the Gulf War and nuclear weapons were the apex of “ultra-lethal weapons” and that future warfare will trend towards “kinder” weaponry since extremely lethal weaponry will not be able to achieve results.⁷² Moreover, it mentions how biological weapons relate to this newer form of warfare. Prior to this section, the authors point out that other countries are unable to compete with the United States in terms of the sheer expense of modern US weaponry such as the F-22. It also mentions that US use of silver iodide powder in Vietnam to induce torrential rains and the use of defoliants, such as Agent Orange, represented ruthless “new-concept” weapons.⁷³

However, the Americans have not been able to get their act together in this area. This is because proposing a new concept of weapons does not require relying on the spring board of new technology, it just demands lucid and incisive thinking. However, this is not a strong point of the Americans, who are slaves to technology in their thinking. The Americans invariably halt their thinking at the boundary where technology has not yet reached. It cannot be denied that man-made earthquakes, tsunamis, weather disasters, or subsonic waves and new biological and chemical weapons all constitute new concept weapons, and they have tremendous differences with what we normally speak of as weapons [...] Speaking in this sense, they are nothing more than non-traditional weapons whose mechanisms have been altered and whose lethal power and destructive capabilities have been magnified several times over [...]. This is to say that there is nothing in the world today that cannot become a weapon, and this requires that our understanding of weapons must have an awareness that breaks through all boundaries.⁷⁴

The authors describe a need to think differently about warfare in order to create a different understanding of the notion of weaponry itself:

A breakthrough in our thinking can open up the domain of the weapons kingdom at one stroke. As we see it, a single man-made stock-market crash, a single computer virus invasion, or a single rumor or scandal that results in a fluctuation in the enemy country’s exchange rates or exposes the leaders of an enemy country on the Internet, all can be included in the ranks of new-concept weapons.⁷⁵

⁷² Qiao Liang and Wang Xiangsui, *Unrestricted Warfare* (Beijing: PLA Literature and Arts Publishing House, 1999), 27.

⁷³ *Ibid.*, 24.

⁷⁴ *Ibid.*, 24-25.

⁷⁵ *Ibid.*, 25.

The idea that something with the relatively mild lethality of SARS-CoV-2 as compared to anthrax or smallpox, could be imagined and employed as a weapon is an idea that attracts controversy. However, considering the economic carnage this virus has wrought in the west, and even acknowledging that some of it was self-imposed, surely someone has noticed the potential of such a pathogen. Numerous businesses across the country are facing bankruptcy, and the US has engaged in a massive amount of stimulus spending.⁷⁶ Of course, as of publication, there is no conclusive evidence to support an assertion that SARS-CoV-2 was developed as a biological weapon, or even developed artificially in the first place. But, the idea of employing a low-lethality biological weapon, which mostly creates economic damage is, arguably, not a considered element in the US approach to warfare. SARS-CoV-2 is a close fit to the kind of “new-concept” and affordable weaponry envisioned by Colonels Qiao, and Wang.

In an edited volume, *China: The Three Warfares*, retired Cambridge Professor Stefan Halper and contributing authors including retired flag officers and national security professionals outline in more detail the PRC’s approach to non-lethal or less-lethal means. The three warfares it describes consist of psychological warfare to “influence and/or disrupt an opponent’s decision-making capability,” media-warfare to affect “long-term influence of perceptions and attitudes,” and legal warfare or “lawfare” which “exploits the legal system to achieve political or commercial objectives.”⁷⁷ Pillsbury concurs when he points out that a high-level defector told him that China spends about \$12 billion per year on information control, messaging, and propaganda, run by the Politburo’s standing committee.⁷⁸ Another idea from *Three Warfares*, critical to an overall understanding of the PRC’s approach, is their “unique view of

⁷⁶ Esther Fung, “Malls File for Bankruptcy or Shut Their Doors as Pandemic Pain Spreads,” *Wall Street Journal*, November 10, 2020, accessed November 10, 2020, <https://www.wsj.com/articles/malls-file-for-bankruptcy-or-shut-their-doors-as-pandemic-pain-spreads-11605013664>.

⁷⁷ Stefan Halper, ed., “Executive Summary,” in *China: The Three Warfares* (Cambridge: University of Cambridge, 2013), prepared for Andy Marshall, Director, Office of Net Assessment, Office of the Secretary of Defense, 12-13.

⁷⁸ Pillsbury, 120.

sovereignty.”⁷⁹ The PRC’s concept of sovereignty is based on a fundamentally different understanding of the world than the Westphalian paradigm of states and which forms a basis for their “rejection of the legal architecture” that has been the basic paradigm of international relations for hundreds of years.⁸⁰ “China conceives of sovereignty as indivisible: ‘if one had an equal, one was not sovereign.’”⁸¹ If this is indeed true, than a powerful PRC does present a challenge to a Westphalian and Bretton-Woods system.

Some recent PRC activity that can be considered in alignment with the ideas of *Three Warfares* and *Unrestricted Warfare*:

1. Militarized artificial islands in Philippines’ maritime Exclusive Economic Zone.
2. Illegal fishing.
3. One-way media.
4. Fentanyl reverse opium war.
5. Information operations to disrupt US pacific alliances.⁸²

Unrestricted Warfare offers an underlying and unifying logic to these actions:

If we acknowledge that the new principles of war are no longer "using armed force to compel the enemy to submit to one's will," but rather are "using all means, including armed force or nonarmed force, military and non-military, and lethal and non-lethal means to compel the enemy to accept one's interests."⁸³

⁷⁹ Halper, 14.

⁸⁰ Ibid., 14.

⁸¹ Ibid., 14.

⁸² Jeremy Page, Carl Lee, Gordon Lubold, “China’s President Pledges No Militarization in Disputed Islands,” *Wall Street Journal*, September 25, 2015, <https://www.wsj.com/articles/china-completes-runway-on-artificial-island-in-south-china-sea-1443184818>;

Hamzah Taoqeer, “South China Sea Dispute: In Light of International Law of the Seas,” *ModernDiplomacy*, August 19, 2020, <https://moderndiplomacy.eu/2020/08/19/south-china-sea-dispute-in-light-of-international-law-of-the-seas/>;

Ian Urbina, “The Deadly Secret of China’s Invisible Armada,” *NBC News*, July 22, 2020, <https://www.nbcnews.com/specials/china-illegal-fishing-fleet/>;

Beina Xu, and Eleanor Albert, *Media Censorship in China* (New York, NY: Council on Foreign Relations, February 17, 2017), <https://www.cfr.org/backgrounder/media-censorship-china>;

Vanda Felbab-Brown, *Fentanyl and Geopolitics* (Washington, DC: Brookings Institute, July, 2020), https://www.brookings.edu/wp-content/uploads/2020/07/8_Felbab-Brown_China_final.pdf;

Jason Morgan, “How Beijing Weaponizes ‘comfort women’ as Propaganda Tool,” *AsiaTimes*, March 24, 2018, <https://asiatimes.com/2018/03/beijing-weaponizes-comfort-women-propaganda-tool/>. All links verified March 23, 2021.

⁸³ Qiao Liang and Wang Xiangsui, 7.

Clausewitz wrote that “war is thus an act of force to compel our enemy to do our will.”⁸⁴ He did not say this act of force had to be borne on a ballistic trajectory and sourced from an expensive piece of advanced technology. Arguably, most of the destruction wrought by SARS-CoV-2 has been not in the fatality rates, but in the restriction of normal economic activity which has cratered the GDP of many countries, increased government borrowing and spending, and led to civil unrest. Perhaps the best evidence of whether something could be considered a weapon or not is not the words that have been spoken about it, but the very real economic and social disintegration it has caused in the relatively open countries of the west. In light of the effects of the COVID-19 pandemic, and the type of thinking about warfare published in PRC strategy documents, US policymakers should consider the implications.

⁸⁴ Clausewitz, 75.

V. US Concepts of Warfare

As we have seen, the Western way of war is really a way of battle – an operational style – rather than a strategic system.

— Lt. Col. Antulio Echevarria

The 2018 *National Defense Strategy* and the 2020 *United States Strategic Approach to the PRC* acknowledge the challenge posed by the PRC’s “expanding use of economic, political, military power to compel acquiescence from nation states” and “reshape the international system.”⁸⁵ In these documents the United States outlines a competitive strategy with two objectives: improve the resiliency of western institutions, alliances, and partnerships, and “compel Beijing to cease or reduce actions harmful to the United States’ vital national interests and those of our partners.”⁸⁶

One example of this has been the implementation of tariffs on Chinese exports and the US-Mexico-Canada (USMCA) trade agreement.⁸⁷ The USMCA requires “that 75 percent of auto content be made in North America.”⁸⁸ This rule attempts to close an export loophole under the old agreement (NAFTA) which allowed countries including China to send products to Canada and Mexico for assembly and then tariff-free export into the US under the North American Free Trade

⁸⁵ Donald J. Trump, *United States Strategic Approach to the People’s Republic of China* (Washington, DC: White House, May, 2020), 1, accessed October 17, 2020, <https://www.whitehouse.gov/wp-content/uploads/2020/05/U.S.-Strategic-Approach-to-The-Peoples-Republic-of-China-Report-5.20.20.pdf>.

⁸⁶ *Ibid.*, 1.

⁸⁷ Lingling Wei, “China to Cut Tariffs on \$75 Billion of U.S. Goods,” *Wall Street Journal*, February 6, 2020, accessed February 6, 2020, <https://www.wsj.com/articles/china-to-cut-tariffs-on-75-billion-of-u-s-goods-11580967540>.

⁸⁸ Office of the United States Trade Representative, *United States-Mexico-Canada Trade Fact Sheet Rebalancing Trade to Support Manufacturing* (Washington, DC: Office of the USTR), accessed October 17, 2020, <https://ustr.gov/trade-agreements/free-trade-agreements/united-states-mexico-canada-agreement/fact-sheets/rebalancing>.

Agreement (NAFTA) umbrella.⁸⁹ These two changes appear to have made the US trade position stronger with respect to the PRC, as well as within North America. On the other hand, these actions have provoked a response from exporters such as the relocation of manufacturing to Mexico.⁹⁰ As a result, the ultimate effectiveness of this specific tactic may not be clear for some time.

The cognitive model of the US military is influenced by the terrain-oriented approach embodied in the borders of the Geographic Combatant Commands (GCC). Strategic Command, Cyber Command, and Special Operations Command do not have borders, but specifically orient on specific threats and adversaries in their domains. Transportation Command focuses on the problems of worldwide logistics. Strategic Command's mission is primarily nuclear deterrence and global strike, although it performs other roles.⁹¹ It is worth considering, given the increasing magnitude of this gray zone conflict, whether a new organization along similar lines as a Unified Command, but integrated with a larger mix of government agencies, might offer a useful approach to better understand and arrange operations in this domain.

China's Belt and Road Initiative (BRI), for example, crosses many Combatant Command boundaries, and operates at a frequency that is hard to hear for the Combatant Commands. Other aspects of the gray zone such as trafficking of fentanyl, overfishing, intellectual property theft, and espionage, involve a broad swath of US agencies. Just as, after the 9/11 attacks, US policy-makers realized that aspects of intelligence were stove-piped into separate agencies, perhaps a

⁸⁹ Melissa Cyrill, "USMCA Trade Pact: What it Means for China, Key Stakeholders," October 16, 2018, *China Briefing*, accessed October 17, 2020, <https://www.china-briefing.com/news/usmca-trade-pact-impact-china-key-stakeholders/>.

⁹⁰ Stefanie Eschenbacher, Anthony Esposito, "Exclusive: Mexico Eager to Lure Firms from Asia Under New Trade Deal," *Reuters*, July 20, 2020, accessed February 9, 2021, <https://www.reuters.com/article/us-mexico-economy-exclusive/exclusive-mexico-eager-to-lure-firms-from-asia-under-new-trade-deal-idUSKCN24L2KB>.

⁹¹ US Strategic Command, "History," January, 2018, accessed February 9, 2021, <https://www.stratcom.mil/About/History/>.

more heterogenous organization could help build a more accurate cognitive picture of this form of conflict. Prior to designing a new organization, however, it would need a guiding strategy.

The United States should consider the merits of a strategy of *reciprocity* as suggested in US Ambassador to China Terry Branstad's editorial from the fall of 2020, and also suggested by Bill Gertz.⁹² Reciprocity might manifest itself in a number of ways, and allows significant flexibility. One example would be requiring Chinese companies to adhere to the same regulations and ownership restrictions while operating in the United States as US companies experience while operating in China. It is not an aggressive concept, but it provides unifying logic for arranging a number of different types of operations. It appeals to a universal human desire for fairness in a relationship between equals. Section seven contains further exploration of this idea.

⁹² Terry Branstad, *Resetting the Relationship Based on Reciprocity* (Washington, DC: US Dept. of State, 2020), 1, accessed March 20, 2021, https://www.state.gov/wp-content/uploads/2020/09/Ambassador-Branstad-Op-Ed_Resetting-the-Relationship-Based-on-Reciprocity.pdf;

Bill Gertz, *Deceiving the Sky* (New York: Encounter Books, 2019), 215.

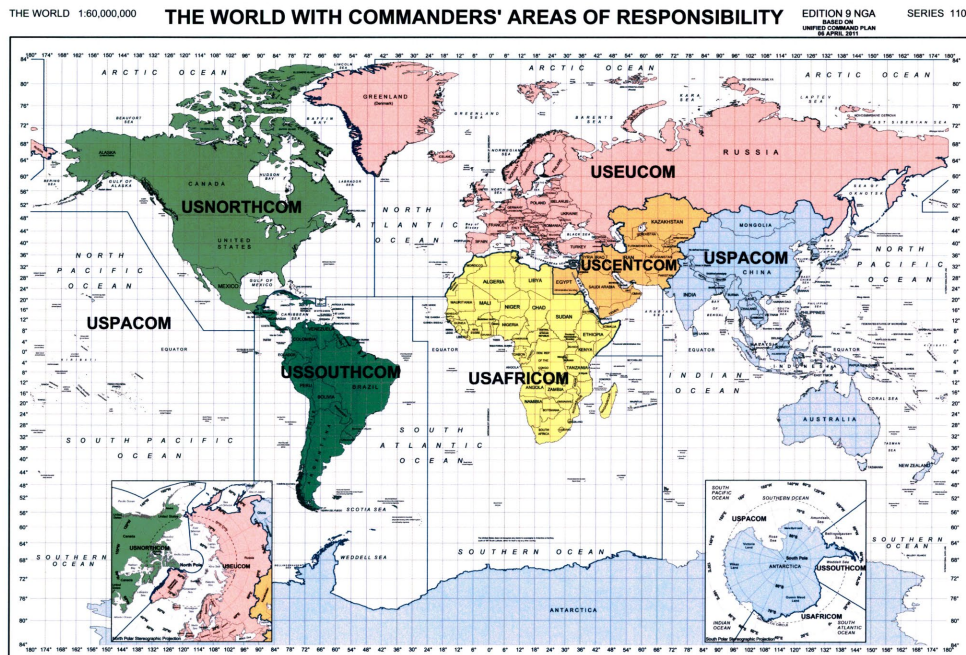


Figure 2. Map of Geographic Combatant Commands.
US Department of Defense, *Unified Command Plan*, accessed May 5, 2021,
<https://archive.defense.gov/ucc>.

VI. Understanding Multi-Domain Operations and LSCO

Nested within the GCC format resides the US Army’s “Multi-Domain Operations 2028” concept which “proposes a series of solutions to solve the problem of layered standoff.”⁹³ The idea is to achieve a greater integration of the domains while enabling the Joint Force to dis-integrate enemy anti-access and area denial systems (A2AD). This idea rests on three core tenets: calibrated force posture, multi-domain formations, and convergence.⁹⁴ The term “calibrated force posture” refers to the special placement of forces with respect to enemy A2AD systems and their ability to close large gaps in distance when necessary. The term “multi-domain formations” essentially refers to formations with a more heterogenous mix of capabilities, and joint functions at the level of brigade or lower.

⁹³ US Department of the Army, Training and Doctrine Command Pamphlet (TP) 525-3-1, *The U.S. Army in Multi-Domain Operations 2028* (Washington, DC: Government Publishing Office, 2018), iii.

⁹⁴ US Army, TP 525-3-1, iii.

The exact form of this is still in development, but one can get an idea of the direction of the concept by looking at the organization of the initial multi-domain task force (MDTF). The MDTF pilot program in 2017 was designed around the 17th Field Artillery brigade and the I2CEWS (Intelligence, Information, Cyber, Electronic Warfare, Space).⁹⁵ The I2CEWS is a new organization created officially in January of 2019 at Fort Lewis, WA.⁹⁶ The battalion-sized unit is organized into four companies which specialize in the aforementioned capabilities. Thus, in its earliest configurations, the MDTF is a unit that mixes long range Army and Joint fires with a new combination of sensing, communications, and electronic and cyberwarfare capabilities. It should also be noted that the 17th Field Artillery Brigade is referred to as America's Premier High Mobility Artillery Rocket System (HIMARS) Brigade.⁹⁷ The HIMARS system is a longer range and more accurate fires platform than traditional artillery systems. This combination of a longer-range weapons system with new sensor and communications capability appears to be the organizational essence of MDO.

Historically, new and unique combinations of warfighting functions allowed militaries to create a force which was greater than the sum of its parts. The integration, and combination of infantry and artillery, armor, and wireless communication, for example, increased armies' lethality and maneuverability. Building on this idea of generating combinations of capabilities to create greater lethality, the MDTF creates a new combination of capabilities across domains and services which arguably have not been integrated or combined in this manner at the level of

⁹⁵ Todd South, "Army to Build at Least Two New Multi-Domain Task Forces," *ArmyTimes*, August 7, 2019, accessed September 6, 2020, <https://www.armytimes.com/news/your-army/2019/08/07/army-to-build-at-least-two-new-multi-domain-task-forces/>.

⁹⁶ Pvt. Caleb Minor, "New Space, Cyber Battalion Activates at JBLM," US Army, January 16, 2019, accessed September 6, 2020, https://www.army.mil/article/216236/new_space_cyber_battalion_activates_at_jblm.

⁹⁷ Capt. Tania Donovan, "17th Field Artillery Brigade Headquarters Returns from Deployment, Uncases Colors," US Army, January 20, 2015, accessed September 6, 2020, https://www.army.mil/article/141391/17th_field_artillery_brigade_headquarters_returns_from_deployment_uncases_colors.

brigades and battalions. Another less elegant, but historically accurate term for this concept might be combined-combined arms.

According to TRADOC Pamphlet 525-3-1, convergence refers to the “rapid and continuous integration of capabilities in all domains, the electro-magnetic spectrum, and information environment that optimizes effects to overmatch the enemy through cross-domain synergy and multiple forms of attack.”⁹⁸ Looking at the composition of the MDTF, one can see how the MDTF, by achieving effects over greater distances and by integrating new domains helps achieve convergence. Arguably, this is driven by advances in technology which are blurring the historic boundaries between services. In battle, the MDTF will, in theory, have a broad range of options across services and domains to apply effects. For any given target, for example, the MDTF might coordinate from Air Force fixed-wing, Army long range precision fires, Navy shipborne missiles, or perhaps through cyberspace or electronic warfare activities. This overlap in capabilities is therefore at the heart of the concept. Another advantage of convergence is that the concept carries a high-degree of flexibility and redundancy in the attack, and increased stand-off. The result of the first field exercise for a MDTF highlights this:

The result was an array of precision strikes on land and at sea, which was coordinated through a network of nodes across all four services and allied nations. The first modern sinking exercise led by the Army used a combination of long-range artillery, air attacks, and shore-based missiles to sink the decommissioned USS Racine.⁹⁹

As technology and processing power continue to improve, the ability to achieve similar effects at great distances across multiple services should increase. Recently, in a test of a new capability, a US Army Paladin howitzer shot down a cruise missile.¹⁰⁰ And while the test

⁹⁸ US Army, TP 525-3-1, iv.

⁹⁹ Todd South, *ArmyTimes*.

¹⁰⁰ Kyle Mizokami, “The Army’s Big, Dumb Guns Aren’t Dumb Anymore (and Now They Can Shoot Down Planes),” *Popular Mechanics*, September 10, 2020, accessed September 10, 2020, <https://www.popularmechanics.com/military/weapons/a33971111/us-army-howitzer-shoots-down-simulated-missile/>.

occurred in a controlled environment, this example illustrates the blurring of boundaries caused by increases in technology and processing power; a weapon which previously only had an offensive strike role now has the potential to be used in an air defense role, and nothing about the weapon itself changed. This example highlights the concept of convergence, new capabilities through advanced technology, and greater integration across domains.

VII. Challenges and Opportunities

How could you wish to become new unless you had first become ashes!

— Frederick Nietzsche, *Thus Spake Zarathustra*

The rise of biotechnology and the gray zone represent an increasingly consequential avenue for the flow of power. This has broad implications for the future role of the US military and the United States. The US concept of war as primarily a physical clash of forces puts it at risk of fundamental surprise as its adversaries and competitors expand their ability to challenge it in ways that avoid a confrontation in this space. Like the Maginot Line in 1939, dominance in physical combat is at risk of becoming non-decisive. After the attacks on Pearl Harbor and 9/11, vivid imagery made the attacks obvious to everyone. Yet biological weapons and the gray zone achieve similar or more significant effects potentially without triggering this broad recognition of attack and a corresponding consensus and unity of purpose. COVID-19 vividly demonstrated how difficult it can be for Americans to agree on the origin of a virus, the utility of wearing masks, and even the fatality rate. An inability to form a consensus about what is happening is a key aspect of the gray zone and potentially biological warfare as well.

These developments require a new way of thinking about power, war, and technology, so as to craft the best strategy possible. Figuring this out requires wrestling with difficult questions such as - what is an effective pandemic response? What kind of pandemic resistant military force is desirable? What is a feasible gray zone strategy? What is the most effective use of military forces in this evolving situation? These tough questions require answers to other hard questions, such as - what is the direction of technology and warfare? What are the key lessons from pandemics? Where are the gaps and opportunities in the current environment?

In 1947, George Kennan, Director of Policy Planning at the State Department, formulated the strategy of containment with respect to the USSR. Kennan wrote that the policy of containment “must be that of a long-term, patient but firm and vigilant containment of Russian

expansive tendencies” and that the US should counter the USSR through the “adroit and vigilant application of counter-force at a series of constantly shifting geographical and political points, corresponding to the shifts and maneuvers of Soviet policy.”¹⁰¹ Overall, containment was a feasible and successful strategy which unified US actions with respect to the USSR. Its biggest flaw, which was also influenced by the twin-superpower structure of the cold war, was that it encouraged a black-and-white view of the world. This led US policymakers to misinterpret events such as the Vietnamese struggle for independence as evidence of the global march of communism.

With respect to the PRC, and considering the complexity and interdependence of the relationship as well as the US’ weaker position relative to 1947, a gray zone strategy of *reciprocity* should be considered. The idea of reciprocity can serve as both a starting point for understanding the PRC’s asymmetric strategies, and as a unifying logic for operating across domains. It also acknowledges that, to a large degree, the gray zone is as much about economic strength and global influence as it is about military power and territory. The United States does not have recent experience with a nation of roughly equal economic strength; the result of China’s meteoric rise over the last few decades. Reciprocity is therefore a mirror for the United States to better understand itself in this new reality and adjust accordingly.

One example of a campaign which might be inspired by a strategy of reciprocity is fishing enforcement. Such an operation would be a direct response to violations of sovereignty with respect to fisheries, which also could strengthen US relationships with allies and partners and bolster the credibility of deterrence.¹⁰² It offers an opportunity for building goodwill with

¹⁰¹ US State Department, *Kennan and Containment* (Washington, DC: US Dept. of State), accessed February 11, 2021, <https://history.state.gov/milestones/1945-1952/kennan>.

¹⁰² *Military.com*, “Coast Guard to Tackle China ‘Illegal’ Fishing in Pacific,” October 24, 2020, accessed February 23, 2021, <https://www.military.com/daily-news/2020/10/24/coast-guard-tackle-china-illegal-fishing-pacific.html>. The current effort could be ramped up with the US Navy, intelligence assets, and a multi-national task force to facilitate enforcement at the national level across the Indo-Pacific.

populations that have historically aligned themselves in opposition to US foreign policy such as environmentalists. Policing illegal fishing through multi-national cooperation enables similar objectives as exercises like Rim of the Pacific while possibly lessening the direct burden on US Naval forces. The United States has much to offer in this effort based on its significant intelligence, and surveillance capabilities, and enabling enforcement through partner nations reduces the risk of escalation. A counter-argument is that the United States Navy has more important things to do than serve as the world's fishing-enforcement-agency. Perhaps this is true, but more important compared to what? How does this approach compare to the current one? It is said that an ounce of prevention is worth a pound of cure, and this is one area where US capabilities enable an effective counter to an important facet of the gray zone.

Other aspects of the PRC's asymmetric methods are more difficult to counter, such as asymmetry of narrative. There is no easy solution to the fact that many forms of US media are banned or significantly limited in the PRC, while the reverse is not true. Significant financial incentives from the PRC compel US companies to support CCP narratives on issues such as Hong Kong and Taiwan. However, the idea of reciprocity offers a starting point for evaluating this problem. The United States should find ways to reciprocally moderate CCP narrative influence in the United States and incentivize, perhaps by offering asylum or other benefits, dissident voices in the PRC. New technologies such as Starlink may also provide a means for disrupting the closed information environment within the PRC.¹⁰³ This issue is made more difficult by the fact that the public square in the US has become a de-facto corporate space owned by technology monopolies. The power of these networks has essentially transferred constitutional authorities over speech from the public to the content-moderators of these technology monopolies. Thus, countering asymmetry of narrative is a complex problem.

¹⁰³ <https://www.starlink.com/>. Starlink expects to offer near global coverage in 2021.

Despite centuries of technological advances, the unfortunate reality is that many pandemic mitigation measures have been forgotten. Copper alloys such as brass were once widely used in door-handles, faucets, and railings.¹⁰⁴ Yet it was only in February of 2021 that the EPA formally acknowledged the usefulness of copper in fighting the coronavirus.¹⁰⁵ Very few structures built today incorporate airborne germ mitigation concepts into their designs. Florence Nightingale advocated in 1859 for designs that increased airflow to mitigate disease, and hospitals later incorporated Nightingale pavilions. Apparently, the Palace of Westminster was built with a state-of-the-art air ventilation system that accounted for a quarter of the building's cost.¹⁰⁶ These design concepts have been mostly forgotten. In a future pandemic it may be possible to keep normal operations in buildings constructed around approved disease-resilient designs and protocols. At this time, and apart from the historic improvements in sanitation made in the nineteenth and twentieth centuries, there is no disease-resistant construction standard like the LEED standard for environmentally friendly construction. Developing and implementing a new logic, or rather a forgotten logic, for physical spaces is an obvious area of improvement.

One trend, as seen in history and in MDO, is increasingly combined arms at lower and lower echelons. As networks and processing power dislocate operators from their systems, so too will new combinations of systems become possible, as well as combinations of arms at lower echelons. Once networks and processing power have finished turning aviation into a low-skilled activity, for example, a medium sized aerial vehicle combined with an artillery system, will make a useful and new form of highly mobile artillery. Does it belong in the Field Artillery Branch or

¹⁰⁴ Gregor Glass, Christopher Rensing, Marc Solioz, "Metallic Copper as an Antimicrobial Surface," *Applied Environmental Microbiology*, accessed October 14, 2020, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3067274/>.

¹⁰⁵ Environmental Protection Agency, *EPA Registers Copper Surfaces for Residual Use Against Coronavirus* (Washington, DC: EPA, 2021), accessed February 23, 2021, <https://www.epa.gov/newsreleases/epa-registers-copper-surfaces-residual-use-against-coronavirus>.

¹⁰⁶ Sarah Zhang, "We're Just Rediscovering a 19th Century Pandemic Strategy," *Atlantic*, February 22, 2021, accessed February 23, 2021, <https://www.theatlantic.com/health/archive/2021/02/bad-air/618106/>.

in the Aviation branch? Likewise, individual jetpacks offer the potential to significantly alter the logic of airborne and air assault operations. To some extent, this is already happening. It may, at some point soon, be possible to create a company with all of the combined arms elements of a BCT and perhaps more firepower, as processing power plus the network makes previously difficult skills common and capable of being combined with other skills in new ways. Separating the operator from the system also provides redundancy and flexibility for operating in a biologically degraded environment.

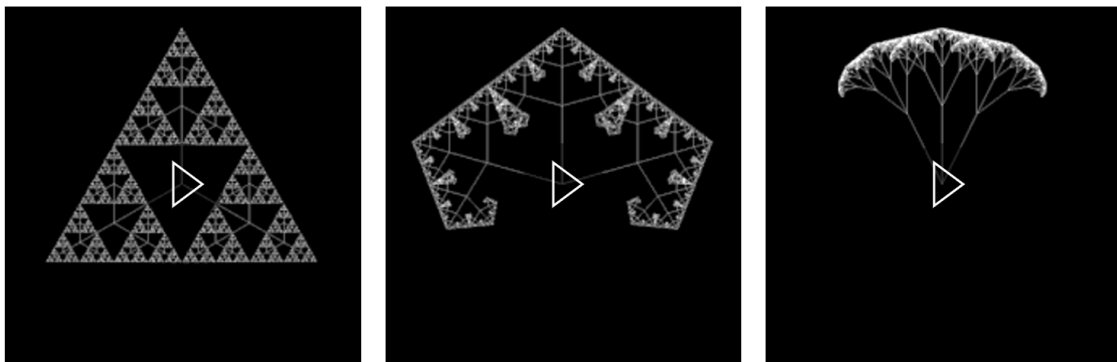


Figure 3. The Sierpiński Triangle. Fractal Explorer, accessed May 6, 2021, <http://www.fractal-explorer.com/sierpinski.html>; Sierpiński Triangle, accessed May 6, 2021, https://en.wikipedia.org/wiki/Sierpinski_triangle.

These images show a structure in which all components are self-similar – a “mathematically generated pattern that is reproducible at any magnification or reduction.” Its ability to morph into something resembling a tree demonstrates the ease of reshaping and reframing something which is made out of self-similar components. Considering this form when looking at changes in military organization leads one to consider a force built from self-similar units which therefore has more redundancy and flexibility.

Apart from MDO, another approach to consider is organizations which emphasize redundancy and flexibility. This idea is where the trend of dislocated operators and systems and increasingly combined arms intersects with pandemic resilience. This design method involves a line of querying which seeks to discover which aspects of the military are most unusual, least-

similar-to, and hardest-to-replicate, than the others. Like the Roman Empire, the military has a dispersed and heterogenous mix of capabilities and relies on density and mobility to accomplish the mission. Basic Combat Training (BCT) and Advanced Individual Training (AIT) occur at one specific set of installations, with operational units usually at separate locations. The Army's two largest forts by population - Fort Bragg and Fort Hood, for example, do not conduct BCT or AIT. A pandemic-resilient and fractal approach might consider integrating and dispersing BCT and AIT across all of the posts using something like an apprenticeship model. Or, considering the trends mentioned earlier in this section, and maybe necessary training can take place virtually while Soldiers are physically located with their new unit, thus creating a mix of the apprentice and centralized models without increasing pandemic vulnerability.

Aircraft carriers are a highly centralized suite of capabilities, are dissimilar to the rest of the surface fleet, require a high density of personnel, and are vulnerable to pandemics. They are also vulnerable to advanced A2AD systems. They are expensive and take a long time to replace. Considering that organizational structures in this design approach should be self-similar, and redundant, a consideration going forward would be building aircraft carriers that are smaller and have fewer planes, lower in cost, but greater in number. Remotely controlled operations might allow for more flying hours with fewer airframes. This coincides with the trend of system/operator dislocation and lower echelons of combined arms. Another approach would be to append, with unmanned systems, a meaningful aviation capability on the rest of the surface fleet. Unmanned aircraft's lesser operating requirements (such as a launcher instead of a runway) facilitates this change.

The United States has offshored significant quantities of its manufacturing capacity in recent decades. This increases its vulnerability to pandemics and conflict. While a full analysis of American manufacturing is beyond the scope of this monograph, a few areas of concern deserve mention. Eighty percent of the active ingredients used in all medicines are made in India and

China.¹⁰⁷ The last plant for making penicillin in the United States closed in 2004.¹⁰⁸ Chinese companies have regularly engaged in a kind of economic warfare whereby they enter a given market, flood it with the lowest priced products to drive competitors out of business, then, when those competitors have gone out of business, dominate the industry and raise prices.¹⁰⁹ It is possible that the full extent of the decline in US based manufacturing will not be widely understood until a situation of true urgency reveals the weak links in this complex system. Nominally, military and other critical equipment is made in the US. However, there is a large set of capabilities – the machines that make the machines, or the machines that make the seals and the belts and the thousands of other minor components, for example – that depend to some extent on overseas manufacturing. The author is not advocating for the United States to become an autarky. However, significant dependence on overseas manufacturing for critical items such as medicines puts US independence at risk, and the risk should be fully understood and mitigated.

Since pandemics are one of the few massive risks to civilization, and even a mildly lethal pathogen like SARS-CoV-2 has significant destructive effects, the United States should implement pandemic-resistant concepts and gray zone strategies like reciprocity. Many of the changes may be expensive, disruptive, and unpopular. No single approach will be decisive. A combination of methods, from new strategies, to new ways of thinking, to organizational and materiel pandemic resilience, to the creation of novel combinations of combined arms, to new organizations, is needed. The changing character and nature of war is challenging the usefulness of dominance in physical combat. It is therefore critical for the United States and its military to

¹⁰⁷ Rosemary Gibson and Janardan Prasad Singh, *ChinaRX* (Guilford, CT: Prometheus Books, 2018), 37.

¹⁰⁸ Gibson, Singh., 75-76.

¹⁰⁹ *Ibid.*, 75-76.

examine these trends and respond accordingly so as not to be fundamentally surprised at some point in the future.

VIII. Appendix: Visualizing Challenges and Opportunities in Overlapping Domains

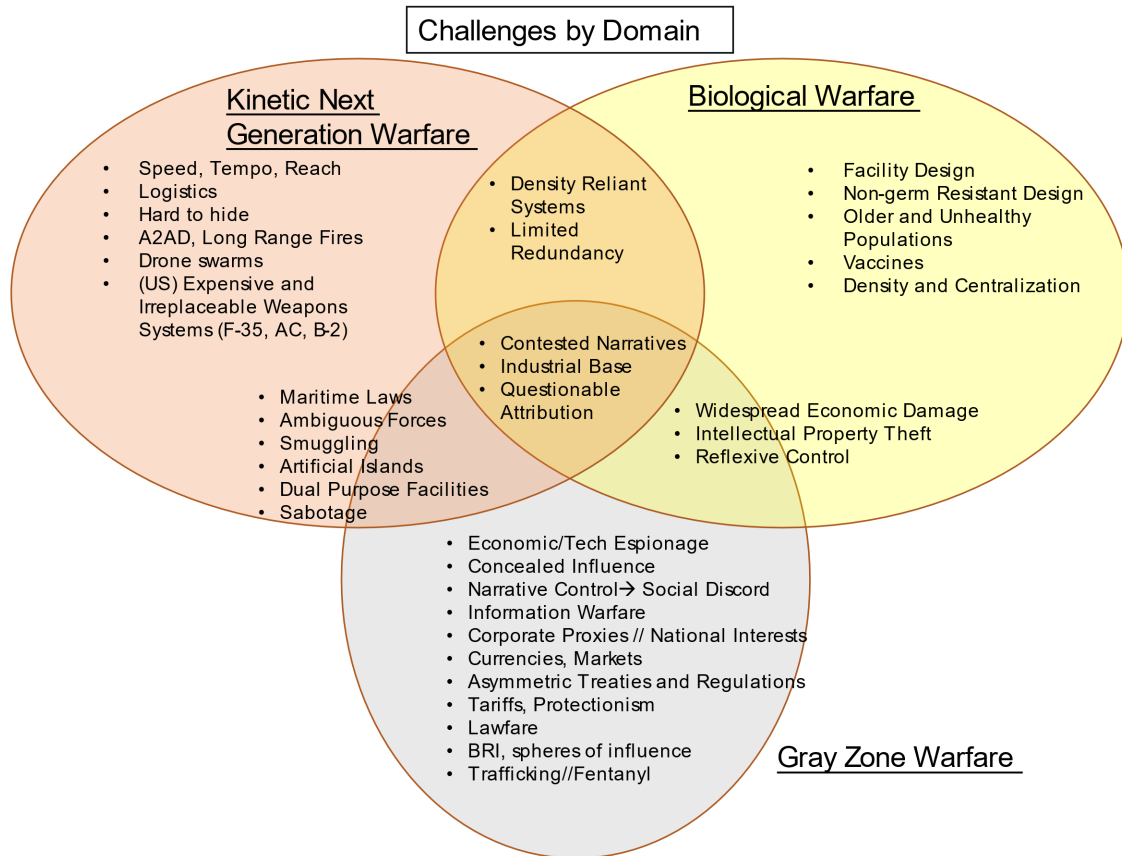


Figure 4. Challenges by Domain. This Venn diagram explores the interaction and overlapping challenges of Kinetic Next Generation Warfare, Biological Warfare, and Gray Zone Warfare. Created by author.

Solutions and Opportunities by Domain

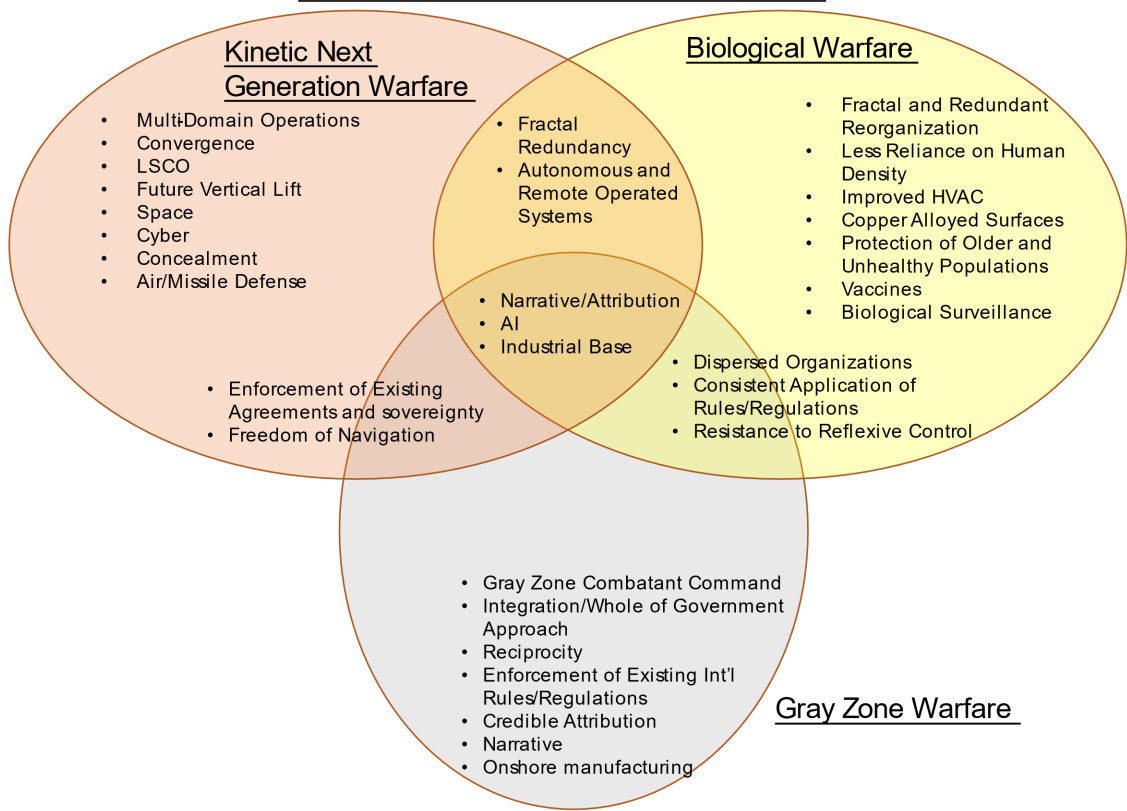


Figure 5. Opportunities by Domain. This Venn diagram explores potential overlapping approaches for solutions to Kinetic Next Generation Warfare, Biological Warfare, and Gray Zone Warfare. Created by author.

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