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~~Avoiding~~ Coping with Surprise in Great Power Conflicts

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CSIS | CENTER FOR STRATEGIC &
INTERNATIONAL STUDIES

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Executive summary

Surprise has always been an element of warfare, but the return of great power competition—and the high-level threat that it poses—gives urgency to thinking about surprise now. Because the future is highly uncertain, and great powers have not fought each other for over 70 years, surprise is highly likely in a future great power conflict. This study, therefore, examines potential surprises in a great power conflict, particularly in a conflict's initial stages when the interaction of adversaries' technologies, prewar plans, and military doctrines first becomes manifest. It is not an attempt to project the future. Rather, it seeks to do the opposite: explore the range of possible future conflicts to see where surprises might lurk.

Why think about surprise now?

Thomas Schelling, in his classic introduction to Roberta Wohlstetter's *Pearl Harbor: Warning and Decisions* (1962), laid out why militaries are susceptible to surprise: "The contingency we have not considered seriously looks strange; what looks strange is thought improbable; what is improbable need not be considered seriously. . . . Rarely has a government been more expectant. We just expected wrong." Schelling was talking about surprise attacks, but his point applies to all kinds of surprise. Militaries have a set of expectations about how conflicts will start, how technologies will function, how battles will be fought, and who will be involved. In developing these expectations, senior military and national security officials prepare the best they can tools such as exercises, wargames, and analysis. However, there remain huge, often unacknowledged, uncertainties. In these uncertainties lies the possibility of surprise.

The United States finds itself in such a situation today. Surprise is always a hazard in war, but three factors make the United States particularly vulnerable today:

- The rise of China and Russia as competing great powers that can challenge the U.S. military in all warfighting domains, especially close to their shores, after a generation of U.S. global military dominance;

- The long peace between great powers that has induced a sense of perpetual security; and

- The changes in warfighting technology that have transformed the conduct of battle since the last great power conflict.

Running through the entire discussion is an extraordinary level of hubris—the overweening pride of Greek tragic heroes from Oedipus to Icarus—in U.S. attitudes and doctrine about conflict. Decades of having overwhelming military capabilities and obtaining easy victories over weak adversaries have given the United States an inflated opinion of how good its military is. Senior officials have repeatedly made claims that the U.S. military is not just the best in the world but the best the world has ever known. As with Greek heroes of legend and

literature, hubris can lead to downfall. In 1806, the then-dominant Prussian army lost a century of military dominance in a single day.

What is surprise?

Surprise, for purposes of this study, is when events occur that so contravene the victim's expectations that opponents gain a major advantage. Surprise is rarely absolute. Historically, victims have had at least some inkling of what was about to happen, but could not come to a decision in time or acted too late to make effective preparations. This study focuses on surprise at the strategic level because surprise there can affect the course and outcome of the conflict, and it is where policymakers can have most influence.

Some surprise is inevitable

Better data collection, more insightful analysis, and improved decisionmaking are always helpful but, in the end, fall short. Some surprise is inevitable. The reasons for this conclusion are many: deception and secrecy, the limits of intelligence, the inherent difficulty in predicting the future, human weakness, the cleverness of adversaries, the skepticism about intelligence warning arising from the legacy of Iraqi weapons of mass destruction (WMD), and the vulnerability of status quo powers to disruptive behavior.

Coloring the entire discussion about anticipating surprise is the "historians' fallacy," the belief that, having identified and analyzed the causes of past mistakes, future mistakes—including surprise—can be avoided. However, this makes excessive use of hindsight. Case studies of the past are useful in refining processes and techniques, but hindsight is not the same as foresight.

It's more than surprise attack

Most literature on surprise focuses on surprise attack. This is understandable since these surprises are highly visible and dramatic. However, the history of warfare shows that there are other kinds of surprise—technological, doctrinal, and political/diplomatic—that are just as important, and the report addresses all of these.

Strategic surprise

Strategic surprise—often called "surprise attack"—is when a conflict occurs at an unexpected time or place. Although strategic surprise is as old as warfare itself—Thucydides, Sun Tzu, Vegetius, and Machiavelli all describe surprise as an element of war—the literature analyzing such attacks is relatively recent. Strategic surprise produces shock that resonates long after the event as victims try to figure out what happened and why.

Several themes emerge from the literature:

- Countries have different risk assessments. These can lead to unexpected decisions to go to war because what appears to be irrational or irresponsible to us may be rational and justified when viewed from the adversary's perspective. Japan's decision to attack

the United States in 1941 is an example. Analysts in the United States viewed a Japanese attack on the United States as beyond unwise, to suicidal, but Japan regarded the conquest of Asia as a matter of regime survival and accepted the risks.

- Surprise attacks often arise from the expectation of a knockout first blow because a new doctrine or technology is thought to create a major "first mover advantage." Examples include mobilization during World War I and strategic bombing in World War II. A contemporary example is cyber weapons, which are thought by some experts to have an offensive advantage.

- Slow reactions by victims generally arise from shortfalls in decisionmaking, not warning. For example, before the Chinese intervention in Korea in 1950, and as it was actually happening, the United States picked up many signals of impending conflict— aerial photographs, prisoner interrogations, reports from Korean civilians, diplomatic ultimatums, Chinese press reports. Nevertheless, General MacArthur and his staff were convinced that such an intervention, although technically possible, was irrational and refused to take action.

Classic examples of strategic surprise include the Japanese attack on Pearl Harbor in 1941, the German attack on the Soviet Union in 1941, the Chinese intervention in Korea in 1950, the Soviet invasion of Czechoslovakia in 1968, and the Arab attack on Israel in 1973.

The greatest vulnerability to strategic surprise today comes from the Russians and the Chinese because of the wide variety of tools available to them. Concerns abound that Russia will launch a surprise attack on the Baltic states of Latvia, Estonia, and Lithuania. These NATO members are particularly vulnerable: militarily weak, geographically exposed, and internally divided by ethnic tensions. Russia frequently conducts nearby "snap" exercises, which could be used as cover for attack preparations. Russia's use of "gray zone" operations could provide pre-invasion softening of the target.

Concerns about China arise from the "Thucydides trap," the proposition that there is a high risk of war between a rising China and a status quo United States. Taiwan and the South China Sea are frequently cited as friction points. Although such a war looks irrational, it would not be unprecedented. China entered the Korean War against the United States in 1950 even though it had recently endured years of civil war and millions of casualties. It took on a nuclear power at a time when it had no nuclear weapons of its own and did this only five years after the United States had vanquished Nazi Germany and Imperial Japan.

Regional powers like North Korea and Iran could also launch surprise attacks, though these would not carry the existential threat of a great power attack (with the partial exception of North Korea's nuclear forces). Such attacks would capitalize on the continuing high level of regional tensions, which have made prospective opponents vulnerable to "de-sensitization." For example, the Iranians continually conduct provocations in the Middle East without launching an actual attack. Someday these provocations could shift to a regional attack. The North Koreans have made an art form of inflammatory political rhetoric so it is discounted by external audiences. As a result, the United States and South Korea might miss a rhetorical shift that portends an actual conflict.

To illustrate potential strategic surprises, the study produced vignettes on a Russian blitz in the Baltic states, a Chinese attack on Taiwan, and a Chinese attack on Vietnam.

Technological surprise

Technological surprise occurs when the performance of new tools of warfare contravenes expectations and produces strategic effects. Technological surprise can occur two ways. First, there are adversary capabilities that are not anticipated or adequately appreciated. Second, there are our own technologies that don't perform as prewar planning and testing had led planners to believe.

In great power conflicts, few technological surprises, in themselves, win wars. Nevertheless, they can provide tactical advantages of such magnitude that they produce strategic effects for a period of time. For example, the superior fighting characteristics of the Japanese Zero fighter in World War II surprised allied air forces and enabled Japan to gain aerial dominance for about a year. The one clear exception is nuclear weapons. These weapons were so powerful that they forced termination of the war.

One kind of surprise has a major impact but cannot be widely employed. Typically, these require large investments of capital and personnel. They are, therefore, deeply shrouded in secrecy. This kind of super weapon is deeply embedded in science fiction, the "Death Star" of Star Wars series being the best known. Historical examples, although rare, include the U.S. atomic weapons program—which produced weapons very slowly—and the British code-breaking effort in World War II—which had to be used carefully to avoid compromise.

Another kind of technological surprise is difficult, if not impossible, to fully conceal, especially once used. Examples include poison gas in World War I, the Soviet T-34 tank, the V-1 and V-2 missiles, and Sputnik. This kind of surprise generally has only a narrow window of effect. Once an adversary sees the technology and understands its origins, the adversary develops countermeasures. The reaction to technological surprise from an adversary is often hyper caution—avoiding contact with the technology if possible—or panic, when a superior technology cannot be avoided.

Just as important as surprise from adversary technology, but virtually absent from the literature, is surprise that occurs when our own weapons do not operate as expected. Militaries enter conflicts assuming that the equipment that they have tested, purchased, and fielded will work. However, history is full of examples where wartime performance fell below peacetime expectations.

The classic example is the failure of U.S. torpedoes in World War II. From the beginning of the conflict, U.S. submarine commanders suspected there was a problem with their torpedoes; they fired perfect shots but nothing happened. Senior officers, who were not present, blamed the problem on lack of crew training and poor shooting. The result was sharp tension between senior officers and their submarine crews. With time, it was discovered that the submarine commanders were correct. The torpedo had multiple defects, but it took years for these to be acknowledged and fixed. The cost in lost opportunities was high.

Other examples include the disappointing performance of air-to-air missiles in Vietnam, of antiaircraft weapons in World War II, and of lighter-than-air vehicles during the interwar period.

Today, cyber attacks constitute a major technological vulnerability. The United States is highly dependent on networks to fight wars. Cyberattacks represent a huge unknown because their wartime effects have never been tested. They could be as destructive as weapons of mass destruction or could provide useful but not war-winning capabilities. Scholars argue both sides. The uncertainty opens space for surprise.

Other new technologies could also produce surprise, for example, weapons in space, autonomous combat vehicles, missile defenses, and hypersonic missiles. Recently developed gene-splicing techniques raise the possibility of new weapons in biological warfare.

Surprise could also arise from long-existing capabilities and missions that have been changed by decades of technological evolution. How these capabilities and missions might operate in future conflicts is highly uncertain because current systems, highly evolved from their last wartime experience, have not been subjected to the kind of stress that another great power might impose. For example, since World War II U.S. submarines have conducted very sophisticated operations in reconnaissance and in stalking adversary submarines. However, U.S. submarines have not fired a shot in anger since 1945 or been attacked by sophisticated antisubmarine defenses such as the Chinese and Russians would possess close to their homelands. Other uncertainties include base vulnerability to long-range precision strike, artillery exchanges using precision munitions, vulnerability of lines of communication, and the ability of aircraft with stealth and electronic warfare protection to penetrate sophisticated air defenses.

To illustrate potential technological surprises, the study produced vignettes on nonacoustic submarine detection, biological enhancements to humans, cyber attack on military cohesion, disruption of satellite ground stations, attacks by swarms of autonomous drones, failure of deep air attack against sophisticated air defenses, and defective air-to-air weapons.

Doctrinal surprise

Doctrinal surprise is the use of known capabilities or technologies in unexpected ways that produces powerful new effects. Doctrinal surprise can also come from the unexpected failure of our own warfighting concepts.

The classic example of an adversary's doctrinal surprise is the German blitzkrieg of World War II. The Wehrmacht combined armored forces with enhanced communications, close air support, and motorized infantry to produce battlefield advances so rapid that their adversaries could not cope and were eventually surrounded and destroyed. Their opponents did not lack the key technologies. The French, for example, had more tanks and better tanks than the Germans. However, the Germans put the technologies together differently and produced a powerful new capability.

Doctrinal surprise goes beyond development of innovative combinations of existing capabilities and emerging technologies. It also includes attacks on "safe" spaces, breaking of taboos, and blurring of the line between war and peace. An example of an attack on safe spaces is the assassination of adversary leadership. Although this has been absent from great power conflict for centuries, it is still seen in regional and civil conflicts. Examples include the 2017 North Korean assassination of Kim Jong Nam, brother of Kim Jong Un, and the 2006 alleged Russian assassination of Alexander Litvinenko, a former Russian intelligence operative. Other examples of attacks on "safe" spaces include loss of sensitive information—the U.S. security apparatus was thoroughly penetrated by the Soviets during the Cold War—and attacks on the homeland—the U.S. Doolittle raid on Japan in 1942 being an example, inducing the Japanese to overreact in response.

Breaking taboos—international agreements, long-standing practice, mutual deterrence—can be a powerful source of surprise because nations get used to these taboos and assume they will continue to restrain the behavior of potential adversaries. An example is the German use of unrestricted submarine warfare in World War I, which broke with a century of maritime tradition but generated an enormous military advantage. However, like many instances of breaking taboos, it engendered international condemnation. Similarly, using suicide as a military tactic—the Japanese kamikazes of World War II and, more recently, ISIS's suicide attacks—surprised adversaries and gained a military advantage as a precision-guided weapon for a weak power even as the tactic horrified most people.

Blurring the line between peace and war occurs when great powers conduct operations in the "gray zone,"—above the level of peacetime commercial rivalry but below the level of direct state-on-state hostilities—because direct confrontations are too risky. Gray zone conflict is incremental, characterized by small steps rather than large actions. Aggressors achieve their goals by gradually encroaching on a victim, rather than by a dramatic single action. Nevertheless, there is often an overt and surprising culminating event, for example, the Russian occupation of Crimea, that follows an escalating gray zone campaign.

Doctrinal surprise can also occur when one's own expectations about how operations will unfold turn out to be wrong. All militaries have doctrine and warfighting concepts that they use to shape their operations. However, many of these doctrines cannot be tested in peacetime so militaries must use other means to estimate effectiveness. Even so, as President Dwight D Eisenhower once observed, "Every war is going to astonish you in the way it occurred and the way it is carried out."

The initial failure of strategic bombing in World War II is one such example. The Army Air Corps believed that heavily armed unescorted bombers could penetrate deep into an enemy's airspace and attack key targets. It built its bomber force around this doctrine. The Eighth Air Force implemented this strategy from August to October 1943, but the strategy failed because of unsustainably high losses. The two raids against the towns of Schweinfurt and Regensburg became infamous because of the 120 bombers lost, about 20 percent of the attacking force. As a result, the Eighth Air Force had to pull back until long-range fighter escorts were available.

Other examples of such doctrinal surprise were the failure of tank destroyers World War II, and misjudging a war's length and intensity by assuming it would end quickly.

Current vulnerabilities are hard to identify because doctrinal surprise can appear almost anywhere. Adversaries might:

- Combine new missile technology with precise targeting attack concepts to neutralize U.S. bases;

- Steal operational secrets and use the information against us;

- Assassinate U.S. leadership or employ nuclear, chemical, or biological weapons; or

- Subvert an ally's political stability before launching an overt attack.

Failure of our own doctrine is similarly hard to forecast. If we knew which doctrines would fail, we would change them. Nevertheless, one can imagine surprise arising when a war is longer or more intense than expected, when a critical weapon fails in actual combat, or when U.S. military leadership or combat forces turn out to be more brittle than expected.

To illustrate potential surprises, the study produced vignettes on a missile attack against the West Coast, an attempt to decapitate U.S. political leadership, attacks on U.S. reinforcement convoys to Europe using compromised information, and gray zone attacks on the Baltic states.

Political/diplomatic surprise

Political or diplomatic surprise is the unexpected realignment of countries or political factions that has a major effect on the balance of power. Diplomatic and political shifts have not been important considerations for the military balance of power since the end of the Cold War because the United States has had overwhelming military capability. This is no longer the case. It needs allies and partners for their basing to support operations far from its shores, for their military forces to fill gaps in U.S. capabilities, and for their political support to enhance the legitimacy of the war effort.

Political and diplomatic shifts are rarely considered in military planning because they fall outside of the military sphere. They are assumptions given to planners by civilian policymakers. But the history of conflict is full of examples where coalitions prove less stable than prewar expectations had envisioned, so these effects cannot be ignored.

As the historical examples show, what countries might do in the stress of gathering war is often not clear, even to the countries themselves, until the moment arrives when they must act one way or the other. Then the soft rhetoric and easy gestures of peace get swept away, and the nakedly self-interested calculations of realist politicians take over.

- In two historical instances (Italy 1914 and France in the Arab-Israeli war of 1967), countries withdrew from preexisting alignments when they had to make the difficult choice about entering hostilities consistent with their peacetime diplomacy.

- In the third (Soviet Union 1939), a country cynically chose the stronger side when war became imminent.

- In the fourth, a weak power (Belgium 1914) found that paper agreements cannot always overcome the military imperatives of its neighbors.

One political surprise that does not appear in the historical record is about countries fracturing domestically at the beginning of wars. In fact, despite the deep divisions in every body politic, there is a "rally around the flag" phenomenon.

A new source of potential surprise is the rise of "lawfare," the use of international law in the conduct of conflict. The concept of "universal jurisdiction" and evolving notions of international law might make U.S. officials vulnerable in the future.

The U.S. need for allied and partner capabilities creates a vulnerability. Because many allies and partners are geographically close to Russia and China, they are much more exposed than the United States itself and might buckle under pressure. To illustrate potential surprises from these vulnerabilities, the study produced vignettes on Pacific allies declaring neutrality in a conflict, Panama declaring the canal neutral in a conflict, and U.S. officials being arrested in Europe as a result of war crime charges.

So, what to do?

A key aim of this study is to help today's policy officials avoid surprise by developing practical policy recommendations. Although this paper argues that surprise is inevitable, and that the United States is particularly vulnerable now, fatalism is unwarranted. The United States can take action to anticipate the possibilities of surprise through better intellectual preparation, to reduce the effects of surprise through resilience, and to counteract the effects of surprise through adaptation.

In developing recommendations in each of these areas—anticipation, resilience, and adaptation—the study followed four basic principles, which might be called "the four no's":

- No detailed planning to compensate for future uncertainty, because the inherent unknowability of the future makes detailed planning illusory;

- No large resource demands, because even a rising DOD budget will have many demands placed on it and resource requirements for exploring hypothetical futures compete poorly in internal budget negotiations;

- No new organizations, because there are already 30 organizations looking at future conflict and one more is unnecessary; and

- No reorganizing the intelligence community yet again because it is still absorbing the post–9/11 reorganization.

Although these look negative, they prevent recommendations from going down easy, but ultimately unproductive, paths.

Anticipation

The purpose of better anticipation is not to accurately forecast the future. As this study has argued, that is hopeless. Neither is the purpose to uncover in the multitude of possible futures the one future that turns out to be right because that will be known only in retrospect. Instead, the purpose is to help policy officials, military and civilian, focus on the right questions, better appreciate the wide variety of possible future events, and thus be less susceptible to surprise. As Thomas Schelling argued: "The danger is in a poverty of expectations—a routine obsession with a few dangers that may be familiar rather than likely. Alliance diplomacy, inter-service bargaining, appropriations hearings, and public discussion all seem to need to focus on a few valid and oversimplified dangers. The planner should think in subtler and more variegated terms to allow for a wider range of contingencies."

There are several fruitful paths to "open the aperture" on possible futures.

- Wargames can explore different futures at relatively low cost. To be effective, they need to be free play, accept adverse results, and be kept private so they can explore sensitive questions.

- Experiments provide a mechanism to test concepts and systems identified as promising in wargames. Because they impose costs, however, senior leadership needs to protect experimentation lest more pressing, near-term demands squeeze it out.

- Exercises are generally not good mechanisms for exploring possible futures because their high cost and use of scarce forces requires that they focus on training. Nevertheless, unexpected events can be injected into exercises, particularly toward the end, in order to accustom forces to being surprised.

- Red teams can provide imaginative perspectives beyond what institutions can provide internally.

- Operational and live-fire testing, which are done routinely on new systems, can identify potential issues for later experimentation.

- Other nations, which have faced similar military problems, can provide useful insights.

Vulnerability to surprise needs to be incorporated into doctrinal publications, which, after a generation of U.S. military dominance, are rife with assumptions about U.S. primacy and military superiority.

Insights also need to be disseminated in order for institutions to broadly appreciate the possibilities of surprise. Professional journals provide a good way to do this since they are widely read and, because they are not official documents, have more latitude to explore alternative futures.

Resilience

Resilience is needed after conflict begins in order to absorb the effects of surprise—whether strategic, technical, doctrinal, or diplomatic/political—and continue to operate effectively. Developing resilience at all levels is crucial. It does no good if the leadership is resolute, but the troops have panicked and run away. Conversely, even steadfast troops will buckle if the leadership has lost heart. Resilience has two aspects: mental and physical.

Marc Bloch, a French veteran of World War I and staff officer in World War II, identified the fundamental challenge with mental resilience when he described what happened to the French army as the blitzkrieg rolled over it in 1940: "They thought that everything was lost, and, therefore, acquiesced in the loss." The French army might have fought on after its initial defeats. It had done so in 1914 in the face of similar setbacks. However, it lacked resilience for a variety of military, political, and cultural reasons and so gave up.

Force-on-force wargames and exercises, which put leaders into demanding and unexpected situations, can develop resilience. There are also mechanisms that might provide a steadying force in crisis situations.

- Reach back capabilities—that is, mechanisms whereby deployed forces can link to organizations back in the United States—are designed to increase resources available to deployed staffs. They might also provide detached and objective analysis in a crisis.

- The senior mentor program, which brought retired senior officers to high-level headquarters to work with current commanders, might be revived. The mentors can offer counsel privately to the commander and possibly provide a steadying influence when the commander is surrounded by a headquarters staff that is reeling from the unexpected.

Finally, senior officials need to stop talking about the unprecedented superiority of the U.S. armed forces. There are other ways to acknowledge the skill and sacrifices of service members without implying that they are unbeatable.

Physical resilience can be enhanced by building a bigger "toolbox" to better cope with whatever surprises occur. This means maintaining a wide range of weapons and units so that if some are incapacitated by countermeasures, or found to be effective in countering an unexpected threat, the commander has a solution at hand. The tradeoff is that, because of cost, these are unlikely to be available in large numbers, but it is easier to build more of something that already exists than to develop a capability from scratch during an emergency. Building a bigger toolbox also means avoiding single points of failure, lest one technological surprise paralyze the entire organization.

Finally, DOD needs flexible mobilization plans to hedge against the possibility of a longer or more intense conflict than it has experienced since Vietnam. This will provide a buffer against the impact of surprise.

Adaptation

Adaptation is the inverse of resilience. Resilience builds internal capacity to absorb surprise and keep operating effectively. Adaptation responds to the source of surprise to counter or mitigate it.

Lessons learned processes, which exist in all of the military services, are one mechanism for doing this. They can identify problems, analyze them centrally, and then distribute insights throughout the organization. In a great power conflict, these processes will need to operate rapidly. Deployable technology exploitation teams can enhance this process by sending experts from many organizations forward to assess technology questions that arise with U.S. or adversary systems. Such teams have the advantage of providing an unfiltered assessment. This might also get around one of the problems with identifying shortfalls in friendly equipment—that the engineers who designed the equipment are often reluctant to acknowledge any faults.

Because there is a natural reluctance to acknowledge failure, flexible decisionmaking is key. The peacetime identification of alternative futures through the efforts described earlier can be valuable. Military officers and policymakers can then focus on the right questions at the beginning of a conflict and take appropriate action. Scholars have also proposed "devil's advocates" and "product evaluation staffs" as ways to open decisionmaking to alternative interpretations.

Once the challenge has been identified and a decision made about how to meet the challenge, the decision must be put into action. Two mechanisms can facilitate this process: rapid acquisition processes and additional congressional authorities.

- Rapid acquisition processes already exist in all the military services and, if used aggressively, will allow quick technological responses to battlefield challenges.

- DOD will also need wartime appropriations and authorities. Congress, despite its many recent inefficiencies, has provided the needed funding and authorities for the wars in Iraq and Afghanistan. Congress will need to continue to show this kind of flexibility and rapid response in dealing with surprise arising in a future conflict.

Chapter 1: Why Think about Surprise Now?

In his classic introduction to Roberta Wohlstetter's *Pearl Harbor: Warning and Decisions* (1962), Thomas Schelling laid out why militaries are susceptible to surprise: "The contingency we have not considered seriously looks strange; what looks strange is thought improbable; what is improbable need not be considered seriously. . . . Rarely has a government been more expectant. We just expected wrong." Schelling was talking about surprise attacks, but his point applies to all kinds of surprise. Militaries have a set of expectations about how conflicts will start, how technologies will function, how battles will be fought, and who will be involved. In developing these expectations, senior military and national security officials prepare the best they can, using exercises, wargames, and analysis. However, there remain huge, but often unacknowledged, uncertainties and with uncertainty lies the possibility of surprise.

The United States finds itself in such a situation today. Surprise is always a hazard in war, but four factors make the United States particularly vulnerable today: the return of great power competition after a generation of absence; the long peace between great powers that has induced a sense of perpetual security; the changes in warfighting technology that have transformed the nature of battle since the last great power conflict; and hubris in U.S attitudes toward conflict arising from decades of having overwhelming military capabilities. This chapter discusses each of these factors in turn.

Return of great power competition: Back to the future

It is now commonplace to observe that great power competition has returned after a generation of absence.[1] The Obama administration identified Russia and China as the greatest national security challenges to the United States. As Secretary of Defense Ash Carter warned, "Two of these [future] challenges [Russia and China] reflect a return to great power competition."[2] The Trump administration's 2018 National Security Strategy has continued this theme: "After being dismissed as a phenomenon of an earlier century, great power

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[1] This study uses "great power" rather than "peer" because, as the later quotations indicate, that is the usage that the national security community has adopted. "Great power" is also more flexible, not making a judgment about whether Russia and China, the current other great powers, have achieved parity with the United States but only that they operate at that level internationally. Sometimes Russia and China are called "near peer" competitors, implying that they have not yet reached the level of the United States in all warfighting domains. While this is true, Russia and China have nevertheless reached a high degree of capability in all of them and matched the United States in some of them, especially near their homelands. Further, "near peer" implies a continuing U.S. military dominance that is unjustified and can induce complacency. The unclassified version of the National Defense Strategy, adopting a unique terminology, uses "long-term strategic competition" and "major powers", but the Sec. Mattis uses "great power" in his public statements.

[2] Secretary of Defense Ash Carter, "Remarks Previewing the FY 2017 Defense Budget," U.S. Department of Defense, February 2, 2016, https://www.defense.gov/News/Speeches/Speech-View/Article/648466/remarks-previewing-the-fy-2017-defense-budget/.

competition has returned."[3] Secretary Mattis similarly warned, "We also look on the prospect of a new era, one governed by today's economic realities and returning once again to a balance of powers. A return to great power competition, marked by a resurgent and more aggressive Russian Federation and a rising, more confident, and assertive China, places the international order under assault."[4]

Great power competition echoes across the think tank and academic community as well.

- Thomas Mahnken, Center for Strategic and Budgetary Assessments: "In recent years it has become apparent that we are living in a world characterized by the reality of *great power competition* and the growing possibility of great power war."[5]

- Colin Dueck, American Enterprise Institute: "The current overall trend during the past couple of years has been toward resurgent nationalism and *great power competition* under increasingly multipolar conditions."[6]

- Dmitri Trenin, Carnegie Moscow Center: "Against the background of mounting tensions in the East and South China Seas and between Beijing and Washington, as well as the arrival of more nationalist leaders in Tokyo and New Delhi, a revisionist, resurgent Russia may not be an outlier, but part of an emerging trend of great-power competition succeeding the post–Cold War period of U.S.-dominated world order."[7]

- Hal Brands and Eric Edelman, School for Advanced International Studies and Center for Strategic and Budgetary Analyses: "The core characteristics of the emerging international era . . . are the gradual but unmistakable erosion of U.S. and Western primacy, the return of sharp *great power competition* across all three key regions of Eurasia and beyond, the revival of global ideological struggle, and the empowerment of the agents of international strife and disorder."[8]

Great power competition is important for two reasons. First, great powers pose a high-level, even existential threat that regional adversaries cannot. Second, U.S. policymakers and the

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[3] President Donald Trump, *National Security Strategy of the United States*, The White House, December 2017, 27, https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905-2.pdf.
[4] Secretary of Defense James Mattis, "Testimony to the Senate Armed Services Committee," 115th Cong., 1st sess., June 13, 2017, https://www.armed-services.senate.gov/imo/media/doc/Mattis_06-13-17.pdf.
[5] Thomas Mahnken, "Statement before the Senate Armed Services Committee on Recommendations for Future National Defense Strategy," 115th Cong., 1st sess., November 30, 2017, https://www.armed-services.senate.gov/hearings/17-11-30-testimony-from-outside-experts-on-recommendations-for-a-future-national-defense-strategy.
[6] Colin Dueck and Ming Wan, "An Era of Great-Power Leaders," *The National Interest*, November 7, 2017, http://nationalinterest.org/feature/era-great-power-leaders-23094.
[7] Dmitri Trenin, *The Ukraine Crisis and the Resumption of Great Power Rivalry* (Moscow: Carnegie Moscow Center, 2014), http://carnegieendowment.org/files/ukraine_great_power_rivalry2014.pdf
[8] Hal Brands and Eric Edelman, *Why Is the World So Unsettled? The End of the Post-Cold War Era and the Crisis of Global Order* (Washington, DC: Center for Strategic and Budgetary Assessments, 2017*)*, 2, http://csbaonline.org/research/publications/why-is-the-world-so-unsettled-the-end-of-the-post-cold-war-era-and-the-cris/publication. There are many more. For example, Sen. John McCain also weighed in about great power competition ("What America Deserves from the National Defense Strategy," *War on the Rocks*, December 21, 2017).

military have no relevant experience. Although some were around during the last years of the Cold War, they were too junior for that experience to be relevant to their current positions.

Russia: Until recently, Russia was viewed with concern but not considered a likely adversary. Although it was increasingly clear that Russia had not integrated with Europe and the international community as hoped at the end of the Cold War, DOD planning scenarios used to size and shape military forces did not include one with an explicit focus on Russia. The 2006 QDR noted: "Russia remains a country in transition. It is unlikely to pose a military threat to the United States or its allies on the same scale or intensity as the Soviet Union during the Cold War. Where possible, the United States will cooperate with Russia on shared interests such as countering the proliferation of weapons of mass destruction, combating terrorism, and countering the trafficking of narcotics. The United States remains concerned about the erosion of democracy in Russia."[9] The 2010 QDR discusses Russia mainly as a treaty partner for nuclear nonproliferation and disarmament.

However, Russian assertiveness, which had been growing since the late 1990s, dramatically accelerated in 2014 with its seizure of the Crimea and invasion of eastern Ukraine. As a result, Russia was suspended from the G-8 in 2014—it had been a member since 1997—and the international community imposed sanctions on Russian leaders in the same year.

Russian actions in Europe were the harbinger of a global resurgence. In October 2015, Russia shocked many observers by directly supporting the Assad regime in Syria and, since then, forging a de facto alliance with Iran. Furthermore, Russia used its cyber capabilities to hack into U.S. computer systems and tamper with the U.S. electoral process. Russia's ongoing comprehensive modernization of its nuclear arsenal, violations of the Intermediate-Range Nuclear Forces (INF) Treaty, and an unclear nuclear doctrine have brought nuclear issues to the forefront to a degree not seen since the days of the Cold War.

Russian military modernization covers ground, air, and naval (particularly submarine) forces as well, although the weakness of its economy will hinder the effort's implementation. A recent CSIS report, *Evaluating Future U.S. Army Force Posture in Europe,* noted:

> The Russian military has made a concerted effort to improve its capabilities since the 2008 Georgia war. . . . As a result of these 'New Look' reforms, Russia changed its command structure to increase combat readiness, undertook efforts to modernize its equipment and improve rapid deployment, and took steps in the direction of transforming from a conscript to a more professional-based army. While these reforms did not bring Russia's military to a level on par with that of that of the United States, they have resulted in real capabilities, as evidenced in both Ukraine and Syria.

Another CSIS report describes the particular steps Russia has taken to sustain its submarine force operations to include "manning by professional contract sailors and officers . . . highly educated commanders . . . and a high risk tolerance in carrying out their assigned missions."

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[9] Department of Defense, *Quadrennial Defense Review 2010,* Washington DC, 2010, 29, https://www.defense.gov/Portals/1/features/defenseReviews/QDR/QDR_as_of_29JAN10_1600.pdf.

As a result, Russian submarines are deploying "at their highest observed levels since the end of the Cold War."[10]

These CSIS reports further describe how Russian military modernization and aggressive behavior have driven the United States to shift its focus in Europe from presence and reassurance of allies to developing credible deterrence against possible Russian aggression. The studies note, "[t]oday, Russia makes no secret that its foreign policy is geared to increasing its global influence and challenging what Moscow sees as U.S. hegemony." These views are not limited to CSIS, as many other think tanks, (for example, Atlantic Council) have published similar views: "Putin has set out to aggressively delegitimize, discredit, and undermine Western policies and institutions as well as the entire post–Cold War norms-based security order. For all intents and purposes, Moscow has declared the West its chief enemy, as explicitly stated in Russia's revised National Security Strategy signed late last year by President Vladimir Putin."[11] Not surprisingly, DOD identified Russia as the first among five global challenges in 2014. The current national security strategy likewise views Russia as a serious challenge, arguing that "Russia seeks to restore its great power status and establish spheres of influence near its borders."[12]

China: China has long been identified as a competitor—Andrew Marshall, long-time head of the Office of Net Assessment, was warning about China in the late 1980s[13]—but until recently that was balanced by the hope that its rise would be cooperative and that economic linkages would moderate military tensions. The 2010 Quadrennial Defense Review (QDR), like previous QDRs, noted China's rise with cautious optimism: "The United States welcomes a strong, prosperous, and successful China that plays a greater global role. The United States welcomes the positive benefits that can accrue from greater cooperation. However, lack of transparency and the nature of China's military development and decision-making processes raise legitimate questions about its future conduct and intentions within Asia and beyond."[14]

Unfortunately, instead of integrating peacefully into the international system, China has become increasingly assertive with actions such as island-building in the South China Sea, declaration of an Air Defense Identification Zone (ADIZ) over contested territory in the East China Sea, and harassment of commercial vessels. China's actions have generated lower-level confrontations with U.S. allies and partners, including ramming of fishing boats, harassment of energy vessels, and aggressive intercepts of reconnaissance aircraft. These actions—combined with territorial claims implied by the infamous "nine dash line"—suggest a commitment to expansive regional claims. Many commentators argue that China is a

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[10] Kathleen H. Hicks et al., *Evaluating Future U.S. Army Force Posture in Europe: Phase II Report* (Washington, DC: Center for Strategic and International Studies, 2016), https://www.csis.org/analysis/evaluating-future-us-army-force-posture-europe-phase-ii-report; Kathleen H. Hicks et al., *Undersea Warfare in Northern Europe* (Washington, DC: Center for Strategic and International Studies, 2016), 2, 9, https://www.csis.org/analysis/undersea-warfare-northern-europe.

[11] Gen. Sir Richard Shirreff and Maciej Olex-Szczytowski, *Arming for Deterrence* (Washington, DC: Atlantic Council, 2016), http://www.atlanticcouncil.org/publications/reports/arming-for-deterrence. This is the think tank version of General Shirreff's novel, *2017 War with* Russia, cited later.

[12] Trump, *National Security Strategy of the United States*, 25

[13] Andrew Krepinevich and Barry Watts, *The Last Warrior* (New York: Basic Books, 2015), 193–94.

[14] Department of Defense, *Quadrennial Defense Review 2010*, 60.

revanchist power seeking to reestablish its historical dominion over Asia.[15] As a result, the 2014 QDR showed increasing concern: "China will continue seeking to counter U.S. strengths using anti-access and area-denial (A2/AD) approaches and by employing new cyber and space control technologies."[16] The 2018 *National Security Strategy* continues this concern: "China seeks to displace the United States in the Indo-Pacific region, expand the reaches of its state driven economic model, and reorder the region in its favor. . . . It is building the most capable and well-funded military in the world, after our own."[17]

Like Russia, China has embarked on a military modernization program but on a much larger scale, given China's stronger economy. Before 2000, China's military was almost solely land-focused and unable to exert influence at a distance from its borders. Its defeat in the 1988 border war with Vietnam and the 1996 transit of the Taiwan Strait by two U.S. carrier battle groups underscored its weakness. In response, China has been building the military muscle to acquire regional hegemony by pursuing advanced symmetric and asymmetric capabilities that challenge U.S. conventional superiority and dominate its neighbors. These capabilities have focused on space, cyber, air, naval, and missile systems that can project power at a distance. Recently, the Chinese announced organizational reforms to make their military operations more effective. As DOD's annual assessment notes: "China's leaders remain focused on developing the capabilities to deter or defeat adversary power projection and counter third-party intervention—including by the United States—during a crisis or conflict. China's officially disclosed military budget grew at an average of 8.5 percent per year in inflation-adjusted terms from 2007 through 2016, and Chinese leaders seem committed to increases in defense spending for the foreseeable future, even as China's economic growth slows."[18]

As a result of China's behavior, some commentators talk of a "Thucydides trap." This refers to the situation in Greece in the fifth century BC when Athens was a rising power and Sparta the reigning hegemon. In considering the outbreak of the Peloponnesus War, Thucydides concluded, "What made war inevitable was the growth of Athenian power and the fear which this caused in Sparta."[19] Graham Allison of Harvard's Kennedy School of Government conducted a broad historical study of what happens when a rising power confronts an established power. He noted that war resulted in 12 of 16 historical instances. Thus, Allison's conclusion is pessimistic: "Based on the current trajectory, war between the United States and China in the decades ahead is not just possible, but much more likely than recognized at the moment."[20]

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[15] For example, Henry Kissinger, *World Order* (London, UK: Penguin Press, 2014), ch. 6 "Toward an Asian Order: Confrontation or Partnership?"

[16] Department of Defense, *Quadrennial Defense Review 2014*, Washington DC, 2014, 6, http://archive.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf.

[17] Trump, *National Security Strategy of the United States*, 25.

[18] Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2017*, Department of Defense, 2017, ii, https://www.defense.gov/Portals/1/Documents/pubs/2017_China_Military_Power_Report.PDF.

[19] Thucydides, *History of the Peloponnesian War,* translated by R. Crawley, Modern Library, New York, 1934, 1:24.

[20] Graham Allison, "The Thucydides Trap: Are the U.S. and China Headed for War?," *The Atlantic*, September 24, 2015, http://www.theatlantic.com/international/archive/2015/09/united-states-china-war-thucydides-trap/406756/. Allison's awe over China's accomplishments has been criticized for not also considering China's

The long peace

It has been over 70 years since great powers have fought each other. This Pax Americana—comparable to the Pax Britannica of the nineteenth century—has produced great benefits for democratic governance and economic prosperity, but it has dulled alertness about threats to peace.

As a result, war itself will be the first surprise. Prolific scholar Richard Betts makes this point in his analysis of surprise attacks: "War involves discontinuity—an aberration or divergence from normal behavior," so it is hard to foresee.[21] Military preparations by an adversary will be detected or escalation in a crisis watched with alarm, but there will be a reluctance to believe that a major war really could happen given its prolonged absence. Further, the suppressive effects of nuclear weapons, the Pinker thesis about long-term trends toward peace, and war's economic irrationality have engendered beliefs that war is obsolete.

- *The nuclear peace:* War has never yet occurred between two nuclear powers because the risks are so enormous. If a conflict were to escalate from conventional weapons, to "tactical" nuclear weapons, to strategic nuclear weapons, devastation and loss of life would reach unprecedented levels. As a result, the belief has arisen that such conflicts will never occur.[22] This is not an unjustified belief. The United States and the Soviet Union conducted an intense 40-year ideological, diplomatic, and military competition that did not result in direct conflict.

  However, wars do occur between great powers, even when armed with powerful weapons. In World War II, for example, all the major powers had chemical weapons, but the powers were deterred from their use on the battlefield, even when facing defeat. Further, nuclear powers have a history of not using nuclear weapons, even when faced with tough fights against determined nonnuclear regional powers. The taboo against their use is great.

- *Pinker thesis:* Stephen Pinker, a psychologist at Harvard, argues that violence in the world has declined both in the long run and in the short run.[23] He attributes the decline to the nation-state monopolies on force (which suppresses and delegitimizes private violence), to commerce (making "other people become more valuable alive than dead"), to increased literacy and communication (promoting empathy), to the increasing role of women (who are less aggressive), and to the rise in rational problem solving. This thesis has been widely debated, and widely criticized, but remains highly influential and has been picked up by national leaders. For example, President Obama

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weaknesses (for example, Arthur Waldron, "There Is No Thucydides Trap," June 18, 2017, SupChina, http://supchina.com/2017/06/12/no-thucydides-trap/. Nevertheless, the possibility of a conflict with China is a widely held concern.

[21] Richard Betts, *Surprise Attack: Lessons for Defense Planning* (Washington, DC: Brookings Institution Press, 1983), 122.

[22] See, for example, Victor Asal and Kyle Beardsley, "Proliferation and International Crisis Behavior," *Journal of Peace Research*, March 1, 2007, and Robert Rauchhaus, "Evaluating the Nuclear Peace Hypothesis," *Journal of Conflict Resolution*, January 27, 2009, among many others. The topic holds great interest for the conflict-resolution community.

[23] Steven Pinker, *The Better Angels of Our Nature* (New York: Viking books, 2011).

often referred to the arc of history bending toward peace: "The trajectory of this planet overall is one toward less violence, more tolerance, less strife, less poverty."[24]

- *War's irrationality:* War causes great human suffering and is often economically catastrophic for the participants. Norman Angell, an English journalist, argued before World War I that the economic consequences from trade disruption and armaments production would make great power war impossible. "[War] belongs to a stage of development out of which we have passed; that the commerce and industry of the people no longer depend upon the expansion of its political frontiers . . . that military power is socially and economically futile and can have no relation to the prosperity of the people exercising it; that in short, war, even when victorious, can no longer achieve those aims for which people strive."[25] Yet war happened. The United States is particularly inclined to this perspective because it tends to view war as either a crime or a crusade. As an example, Eisenhower's memoirs about the Second World War were titled *Crusade in Europe*. Conversely, Marine Gen. Smedley Butler's prewar memoir was titled *War Is a Racket.* That war might be a deliberate political decision looks irrational.

All of these objections have some validity. However, states rarely go to war based solely on rational calculations of gain and loss. Instead, as Thucydides observed 2500 years ago, they are driven by fear, honor, and interest.[26] This led Colin Gray to conclude, "[i]t is orthodox among both liberals and many conservatives to claim that major war between states is obsolescent or obsolete. If history is any guide, this popular view is almost certainly fallacious. . . . War and warfare will always be with us: war is a permanent feature of the human condition."[27]

Jeff Ethel's description about the outbreak of war in the Falklands in 1982 resonates for future conflicts: "During the three weeks following the Argentine landings, each side [UK and Argentina] stood its ground while moving ahead with military preparations, fully expecting the other to back down at any moment. Neither believed that two civilized nations would go to war over an issue so minor, but ended up in that position."[28]

Changes in warfighting

In the 72 years since great powers have fought each other, military technology has changed. Some capabilities did not exist in previous wars—cyber, precision munitions, space, robotics, and information networks, for example. Others existed in the past but have changed radically—submarines, aircraft, fighting vehicles. Many capabilities have not been used since

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[24] Obama quote from Matthew Yglesias, "Interview with President Barack Obama," Vox, January 2015, https://www.vox.com/a/barack-obama-interview-vox-conversation/obama-foreign-policy-transcript. For one critique of Pinker among many, see Frank G. Hoffman, "Foresight into 21st Century Conflict: End of the Greatest Illusion?," Foreign Policy Research Institute, September 2016, https://www.fpri.org/article/2016/09/foresight-21st-century-conflict-end-greatest-illusion/.

[25] Cited in Lawrence Freedman, *The Future of War: A History* (New York: Public Affairs), 42–43.

[26] Thucydides, *History of the Peloponnesian War*, 3:75–76.

[27] Colin Gray, *Another Bloody Century: Future Warfare* (London, UK: Weidenfeld & Nicolson, 2005), 13, 24.

[28] Jeff Ethel and Alfred Price, *Air War South Atlantic* (New York: Scribner, 1984), 227.

the Korean or Vietnam wars while others have not been used since World War II. With this change and lack of combat experience have come the potential for surprise.

Because of its extensive experience with regional conflicts since the end of the Cold War, the United States understands some kinds of military operations well: air campaigns against low- to medium-capability air defenses, close air support in permissive environments, counterinsurgency, missile defense against widely spaced attacks, ground operations against regional powers, deployment of forces in a permissive environment. The experience of regional wars has produced a U.S. military machine that is well-designed and trained for adversaries who, while clever and even determined, cannot match U.S. capabilities.

However, there are significant gaps in knowledge about modern operations against a great power adversary and in an anti-access/area denial (A2/AD) environment that such an adversary could create.

The most visible debate is over aircraft carriers and whether they would be too vulnerable in this kind of threat environment. Similar debates swirl around Army tanks and Air Force short-range fighters. There are many other uncertainties as well. Submarines, for example, conduct extensive peacetime surveillance and reconnaissance operations but have not fought other submarines or surface ships since World War II. Other capabilities, like counter-space systems, have never been used in war at all. These uncertainties are the subject of detailed discussions in the chapters on technological surprise and doctrinal surprise.

The United States finds itself in the situation of the British military at the beginning of the twentieth century. Britain's last great power conflict had been 50 years earlier, during the Crimean War of 1854–1856. In the intervening years, the British fought a nearly continuous series of colonial wars in Sudan, South Africa, India, and Burma. Its army was highly trained and experienced. Thus, the British Army was able to give the Germans a bloody nose at the defensive battle at Mons, Belgium, in September 1914. However, the army lacked the firepower and command experience in controlling large forces that it needed to go on the offensive against another great power and thus failed miserably when it attacked at Ypres a month later. It took several years and an immense cost in blood and treasure before the British developed these capabilities.

The same weaknesses were evident at sea. Peacetime tactical doctrine centralized command and induced cautiousness in lower-level leadership. These weaknesses led to poor performance at the Battle of Jutland in 1916, the only major fleet engagement of the war. Ship captains and lower-echelon commanders failed to act or even report unless directed to do so.[29] Naval historians still marvel at the "amazing neglect" of British commanders who allowed the fleeing German Navy to sail through the British battle column during the night after the battle without reporting its presence to the fleet commander or even opening fire in the absence of orders.[30]

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[29] Gilbert Andrew and Hugh Gordon, *Rules of the Game: Jutland and British Naval Command* (Annapolis, MD: Naval Institute Press, 2000).
[30] V.E. Tarrant, *Jutland: The German Perspective* (Annapolis, MD: Naval Institute Press, 1995), 208.

Like a virus that hides without producing symptoms in normal circumstances, these pathologies may be lurking in the U.S. military only to emerge during the stress of great power war. For example, Tom Ricks criticizes U.S. generalship as lacking accountability. He famously said, "[p]rivates are punished more for losing a rifle than generals are for losing a war."[31] However, Ricks is only half right. Generals are politically accountable, that is, they are removed if they embarrass the political leadership because of comments or actions, which may not be directly relevant to winning or losing the war. Thus, Lt. Gen. Ricardo Sanchez, who led U.S. forces in Iraq from 2003 to 2004, was in line for promotion to general even though the insurgency exploded during his time in command. He was denied promotion only when the Abu Ghraib scandal broke.

Further, as the British found out, these experiences produce conventional generalship. When success is either guaranteed through overwhelming force or hard to measure, then competent implementation of conventional methods is more highly rewarded than unconventional approaches that make the institution uncomfortable without producing obviously better results. Conventional generalship is susceptible to surprise because of its slowness to recognize unexpected events when they are happening or to counter them swiftly when they do happen.

Hubris

The United States is particularly vulnerable to surprise because of its experience of having overpowering conventional military capabilities for the last 25 years. An entire generation has grown up accustomed to the idea that the United States could control events, and that there were severe limits on what opponents could do in response. Regional conflicts have repeatedly confirmed this belief. The United States easily defeated the governments of Iraq (twice), Serbia, Libya, and Afghanistan. It ground ISIS down in a three-year bombing campaign. Its lack of success against insurgencies has been frustrating but not threatening to its global power or to its homeland. As Eliot Cohen has noted, "The United States has grown used to wars with limited risk against minor and isolated rivals."[32]

That has given the United States an inflated opinion of how good its military is. Senior officials and commentators have repeatedly described today's military as "the finest fighting force the world has ever known." [33] This reveals an extraordinary level of hubris—the

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[31] Thomas Ricks, *The Generals: American Military Command from World War II to Today* (London, UK: Penguin Books, 2012).

[32] Eliot Cohen, "How Trump Is Ending the American Era," *The Atlantic*, October 2017, https://www.theatlantic.com/magazine/archive/2017/10/is-trump-ending-the-american-era/537888/.

[33] For example: "[O]ur military [is] the greatest fighting force the world has ever known." Secretary of Defense Ashton Carter, "Remarks to Troops at Kirtland AFB, New Mexico," September 27, 2016, https://www.defense.gov/News/Transcripts/Transcript-View/Article/957408/remarks-by-secretary-carter-to- troops-at-kirtland-afb-new-mexico/; Secretary of Defense Leon Panetta, "Secretary Panetta Video Message for Lesbian, Gay, Bisexual, Transgender Pride Month from the Pentagon," Department of Defense, June 15, 2012, http://archive.defense.gov/transcripts/transcript.aspx?transcriptid; "Remarks at Armed Forces Full Honor Review Farewell Ceremony," Fort Myer, Virginia, January 4, 2017, https://obamawhitehouse.archives.gov/the-press-office/2017/01/04/remarks-president-armed-forces-full-honor-review-farewell-ceremony; President Donald Trump, "Remarks in Meeting with I-85 Bridge First Responders," Washington, DC, April 13, 2017, https://www.whitehouse.gov/the-press-office/2017/04/13/remarks-president-trump-meeting-i-85-bridge-first-responders; Sen. Tammy Duckworth, "Senator Tammy Duckworth on Trump's Trans Military Ban: 'This Man Is Not

overweening pride of Greek tragic heroes from Oedipus to Icarus. This goes beyond just saying that the U.S. military is better than those of other countries today. That's defensible given the broad array of powerful warfighting technologies that the U.S. military can employ, though it's not clear that service member-for-service member the United States is better than, for example, the Israelis, or, for that matter, the Taliban. But in seeing the U.S. military as the best in history, do we really believe that the U.S. armed forces are better than the Spartan hoplites that defeated the Persian Empire, the Roman legions as they conquered an empire, Wellington's Peninsula veterans who stood firm at Waterloo, Napoleon's Grande Armée of 1806 as it crushed Austria-Hungary and Prussia, or the German Wehrmacht at the height of its powers in 1941? And looking beyond Europe, is the U.S. military superior to the Ottoman mamluks, the Zulu impis, the Mongol horsemen, and the Japanese samurai? If so, where's the proof? Hubris deeply affects the U.S. military today.[34]

As Gary Anderson, a Marine combat veteran and study working group member, has pointed out, "[t]hat kind of chest beating breeds complacency. The French king said something very similar before the debacle at Agincourt during the Hundred Years War. Numerous French ministers of war, including the infamous André Maginot, made similar claims in the 1920s and 1930s prior to the humiliating French defeat at the hands of the Germans in 1940."[35]

Greek tragedy reminds us that superpowers, despite their apparently infinite powers, are not destined to rule forever.

As further admonition, the United States should keep in mind the Battle of Jena-Auerstadt, fought in 1806 between the French under Napoleon I and the Prussians. The Prussians had been the military superpower of the previous century, defeating, in turn, Sweden, Austria, France, Russia, and various minor German kingdoms. It fully expected the 1806 campaign against Napoleon to turn out the same way as the previous campaigns. Instead, the French crushed an obsolescent and poorly led Prussian army, and Prussia was forced to accept humiliating peace terms. A century of military domination was wiped out in 24 hours.[36]

> "Two vast and trunkless legs of stone
> Stand in the desert. Near them, on the sand,
> Half sunk, a shattered visage lies, whose frown,
> And wrinkled lip, and sneer of cold command,
> Tell that its sculptor well those passions read
> …
> And on the pedestal these words appear –
> 'My name is Ozymandias, king of kings:
> Look on my works, ye Mighty, and despair!'
> Nothing beside remains. Round the decay
> Of that colossal wreck, boundless and bare
> The lone and level sands stretch far away."
>
> *Ozymandias,* by Percy Bysshe Shelley

Fit to Be Commander-in-Chief," *Glamour Magazine*, July 26, 2017, https://www.glamour.com/story/senator-tammy-duckworth-trump-trans-military-ban=5062; President Barack Obama,

[34] The U.S. foreign policy establishment has been accused of similar hubris, though arising from somewhat different causes. For example, some authors trace to sources long predating the end of the Cold War such as Wilsonian idealism. See, for example, Peter Beinart, *The Icarus Syndrome* (New York: HarperCollins, 2010).

[35] Cited in Thomas E. Ricks, "Here's why Ash Carter should stop saying we have the best military in the world," *Best Defense*, December 15, 2017, http://foreignpolicy.com/2017/12/15/hey-shut-up-about-being-the-best-military-in-the-world-because-we-might-not-be-a-4/.

[36] Thanks to Lt. Col. Gregory A. Thiele for the Jena-Auerstadt reference, "Our Jena-Auerstadt," *Marine Corps Gazette*, November 2016, https://www.mca-marines.org/gazette/2016/11/our-jena-auerst-dt.

Chapter 2: Approaching the Problem

This report conveys the results of a year-long CSIS study that examined potential surprise in a great power conflict, particularly in a conflict's initial stages when the interaction of adversaries' technologies, prewar plans, and military doctrines first becomes manifest. After laying out the study's scope and methodology, this report describes why surprise is inevitable. It then examines the four categories of surprise—strategic, technological, doctrinal, and political/diplomatic— and for each assesses the literature, gives historical examples, identifies current vulnerabilities, and provides vignettes to illustrate how surprise might happen. Finally, the report lays out actions that policymakers can implement now so that forces can be better positioned to handle wartime surprises.

It is also important to state what the project was not. It was not an attempt to project the future. Rather, it sought to do the opposite, assess the range of possible future conflicts to see where surprises might lurk.

What is "surprise"?

We start by considering the fundamental question: what is surprise? The question is not academic. In an age of many voices and commentators, no matter what the phenomenon, there will always be someone who anticipates it. Thus, if the test of surprise is whether something had never been anticipated at all, then there would never be surprise. Someone, somewhere, will have foreseen it.

However, predictions—even if insightful—need to be connected to real-world actions to be effective. The key to avoiding surprise is anticipating threats in a credible way that is broadly recognized by the relevant policymakers and prepared for by institutions. Surprise, then, is when events occur that so contravene the victim's expectations that opponents gain a major advantage.

This definition focuses on the effect on the victim, whether intended by the adversary or not. Most surprise is intended by adversaries, but some arises from the uncertainty inherent in war, for example, when our own technology or doctrine fails to work as expected. Both kinds of surprise need to be considered because both affect the course of a conflict.

Surprise is rarely absolute. In fact, in most of the incidents of surprise described in this report, the victim had at least some inkling of what was about to happen. However, the victim either could not come to a decision in time or acted too late to make effective preparations. In both situations, the adversary gained a major advantage.

Surprise can occur at any level—strategic, operational, or tactical, to use customary military characterizations. This study focuses on the strategic level because surprise there can affect the course and outcome of the conflict, and it is where policymakers can have most

influence. Tactical and operational level effects, while interesting, usually do not have the broad significance that would concern policymakers.

Finally, surprise is not the same as error. A Defense Science Board report on surprise, which had many useful insights cited in this study, drew a distinction between "known surprises," which should have been anticipated and acted upon "because they were clearly in the offing," and "surprising surprises," which could not reasonably be anticipated.[37] This is not a useful distinction. Identifying the causes of surprise using hindsight is always easy, so, to later observers, all surprises should have been anticipated. Much harder is capturing what was known about potential surprise at the time and therefore making a judgment about what a reasonable person might have done given the circumstances and information available. (See "the historian's fallacy" described in Chapter 1.) Rather than trying to assess error, assign blame, and, perhaps, exhibit the same hubris that the study team criticizes, this study notes that these surprises do occur and, in the recommendations, proposes actions to reduce their likelihood.

Why surprise matters

Surprise matters because at the strategic level it can affect the course of a conflict by giving the initiator a powerful advantage on the battlefield. There is also a psychological aspect to surprise, independent of the physical effect, that influences the course of the conflict through demoralization and paralysis. For this reason, surprise is important. It may represent the difference between victory and defeat, the attainment of U.S. national goals, or the loss of its superpower status. Surprise does not always guarantee victory, and in many cases described in this study, the victim had sufficient resources and resilience to recover from surprise and win the conflict. However, being the victim of surprise has a price in blood and treasure that nations would do well to avoid.

Coping with surprise *now*

Current national security literature is replete with speculations about the future of war, but this study is not part of that literature. Instead, this study focuses on avoiding surprise now, or in the near future, not the distant future. Thus, the study's time horizon is about five years, the length of the Pentagon's internal planning cycle. The reasons for a near-term horizon are threefold:

1.   The most important reason is to help policymakers and military officials make decisions about forces and plans today, not in the distant future. Risks exist now and must be faced now.

2.   Thinking about the future of warfare is intellectually exciting but very difficult to do. It attracts many thoughtful and articulate people but, without recognition of its

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[37] Defense Science Board, *2008 Summer Study on Capability Surprise Volume I: Main Report,* Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Washington, DC, 2009, vii, ch. 2, ch.3, http://www.dtic.mil/dtic/tr/fulltext/u2/a513074.pdf. This DSB study does have a definition of surprise (which they call "strategic surprise") that is similar to that used by this study: "an important impact," unexpected because it "challenges the conventional wisdom," and without an easy response.

great uncertainty, can be a tremendous waste of time. There is a cone of accuracy in making forecasts, with greater accuracy for near-term forecasts, at least regarding major trends and threats, and with the range of uncertainty and possible outcomes growing exponentially over time. The uncertainty surrounding 20-year forecasts can be orders of magnitude greater than that for 10-year forecasts.

3. Finally, the exercise gives some insight into how surprise in conflict might affect civilian institutions and how the United States might inflict surprise on its adversaries. Although both go beyond the scope of the current study, they are nevertheless an important additional benefit.

Great power conflicts, conventional conflicts, and first battles

In order to set some boundaries around a sprawling subject, the study focused on great power conflicts because they pose the greatest threat, on conventional conflicts because of the great uncertainty and the different dynamics of nuclear conflicts, and on first battles in a conflict because this is where surprise most often occurs.

Great power conflicts. Surprise can occur in any conflict. Why, then, focus on great power conflicts? The answer is simple: the degree of risk. Great power competitors pose a high level, even existential threat that regional adversaries cannot.

Who, then, is a great power competitor? In the near term, there are two, Russia and China. Only they can compete with the United States in multiple warfighting domains—land, sea, air, space, and cyber—at least close to their shores, endanger fundamental U.S. national security goals, and threaten devastation to the U.S. homeland and way of life. Because great power competitors have these broad capabilities, their opportunities for inflicting surprise are commensurately broad. Whereas the United States may have overwhelming force against regional adversaries, should it desire to employ that force, this is not the case with great power adversaries. Against these adversaries, even bringing all available U.S. force to bear may not be enough.

Adversaries like North Korea or Iran can compete in a more limited manner. Furthermore, they cannot, at least at this writing, pose an existential threat to the United States. North Korea, for example, can compete on land and in cyberspace but its forces in the air, on the sea, and in space are modest or nonexistent. Although it can attack U.S. territory with nuclear weapons, it can only do so with limited numbers and uncertain prospects of penetrating U.S. defenses. (The matter of "existential threat" is, of course, a matter of perspective. North Korea may not be an existential threat to the United States, but it certainly is to South Korea.)

Similarly, Iran can compete with the United States on land, and globally through terrorism by surrogates; however, like North Korea, Iran cannot compete at sea, in the air, or in space nor can it strike U.S. territory with anything beyond symbolic attacks. Also like North Korea, it does pose an existential threat to its neighbors.

Focusing on surprise by great power competitors nevertheless gives insight into regional threats. Many of the vulnerabilities evinced in great power competition are also present in regional conflicts, so the insights of the study can be applied broadly.

Conventional conflicts: The study focused on conventional conflicts because these are the most likely but will also consider the battlefield effects of nuclear weapons. It did not examine surprise in a strategic nuclear exchange because those dynamics are so different from the dynamics of conventional conflict that they require separate treatment. Nevertheless, some of the study's insights will apply to both nuclear conflicts and regional conventional conflicts.

First battles: Colin Gray, the renowned British military historian, analyst, and strategist, has observed, "the initial stages of a conflict are a race between belligerents to correct their mistaken beliefs about what the war would look like."[38] Every conflict has such uncertainties—with technology, doctrine, and diplomacy—and these uncertainties cannot be resolved until militaries actually engage. In addition, surprise attacks generally occur as the first battle.

Militaries always assume that they will win this first battle. However, a classic analysis, *America's First Battles 1776–1965*, found a mixed record for the United States: about half of the first battles were successful and half were failures, but in all there were major surprises. The book notes that America's ability to identify the nature of future conflicts has been "uniformly dismal," and there was some irreducible level of uncertainty no matter how well prepared the United States was. [39]

For these reasons, the study focuses mostly on the initial stages of a conflict. However, surprise can happen at any time, and there are many examples of surprise throughout conflicts.

Using vignettes

To illustrate potential instances of future surprise, this study uses "vignettes." These vignettes are short descriptions (one to two pages), not full scenarios; that is, they lack the context and end-to-end sequence of events that characterize traditional defense planning scenarios. Vignettes are used to illustrate possibilities; they represent plausible futures, not predictions. Also, consistent with the focus of this study, they focus on strategic effects—effects that bear on the course and outcome of the conflict—and look out about five years, not to the distant future. Only a few vignettes represent immediate "existential" challenges. Instead, most portray surprises that could change the course of a conflict, without trying to foresee whether that might lead to eventual adversary victory.

The study tried to "open the aperture" when envisioning possible surprises. In discussing them with the study team and the working group, some surprises appeared unreasonable,

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[38] Gray, *Another Bloody Century: Future Warfare*, 43.
[39] C.E. Heller and W.A. Stofft (eds.), *America's First Battles 1776–1965* (Lawrence, KS: University Press of Kansas, 1986).

prompting the response that "an adversary would never do that." Indeed, the objections often seemed well founded. The course of action in the vignette looked imprudent and highly risky. Yet, the nature of surprise is that it often appears unreasonable. As discussed later, sometimes nations view risk differently or simply make errors in judgment. Thus, the study retained many of these "unreasonable" vignettes.

The vignettes also go beyond the surprise attacks and technological marvels that futurists tend to focus on. While these are important and some were included, the vignettes try to be broader. As the great science fiction writer Frederik Pohl once noted, the purpose of science fiction, and, by extension, all future speculation, is to anticipate the traffic jam, not the car.

The vignettes leverage historical events to imagine analogous future events. For example, just as the Doolittle raid of 1942 surprised the Japanese and induced them to pull forces back from the front lines to protect their homeland, a future cruise missile attack on the West Coast of the United States might surprise the United States and induce it to pull forces back from the Western Pacific. All the vignettes have some historical analogues—in the history of conflict, humans have been very imaginative—but culture and technology have changed, so that will change the specific way that surprise is produced. For example, nations have long tried to discredit their adversaries' leadership, but the internet opens up entirely new mechanisms for accomplishing that age-old goal. (See vignette "The Assassin's Mace.")

Vignettes are the inverse of alternative history, a discipline that has become quite popular in recent years. Alternate history imagines the different paths that actual events might have taken. For example, what would have happened if the Japanese had decided to strike Singapore instead of Pearl Harbor in 1941?[40] Vignettes look at different paths that the *future* might take. Both recognize the contingent nature of human existence, and that the actual course of events is only one path that might have been followed.

Helping policymakers

The participants in this study, from the author through to the working group members, regard scholarship not as an end in itself, but as a means to better national security policy. Thus, the study was designed to offer concrete, policy-relevant recommendations.

The study recognizes that today's policy officials must make decisions about future plans, programs, and capabilities with imperfect and contradictory information. Henry Kissinger observed that policymakers must make decisions before knowing enough to fully justify them. Telling policymakers that historians will make it all clear someday is not helpful. As Margaret Thatcher acidly noted, "The wisdom of hindsight, so useful to historians and indeed to authors of memoirs, is sadly denied to practicing politicians."[41] This project acknowledges that challenge and aims to help today's policymakers avoid surprise by using currently available information and not assuming future omniscience.

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[40] Discussed in Dennis Showalter and Harold Deutsch, *If the Allies Had Fallen: Sixty Alternate Scenarios of World War II* (New York: Skyhorse Publishing, 2012).
[41] Margaret Thatcher, *The Downing Street Years* (New York: Harper Collins, 1993).

Types of surprise: strategic, technological, doctrinal, diplomatic/political

Most literature on surprise focuses on surprise attack. This is not unexpected since these surprises are highly visible, dramatic, and as old as warfare itself. However, the history of warfare also shows that there are other kinds of surprise—technological, doctrinal, and political/diplomatic—that are just as important, and the report addresses all of these.[42]

- *Strategic surprise/surprise attack*, the classic kind of surprise, is when an attack occurs at an unexpected time or place. The classic examples are the Japanese attack on Pearl Harbor in 1941, the German attack on the Soviet Union in 1941, and the Chinese intervention in Korea in 1950. Commonly attributed to "intelligence failures," the causes are actually more complex.

- *Technological surprise* is when the performance of new tools of warfare contravenes expectations. There are two kinds of technological surprise: when adversaries develop unexpectedly effective technology and when U.S. weapons fail when used in combat. The reason for both kinds of surprise is that major wars occur rarely, so it is difficult to forecast accurately the impact of new technologies. Peacetime exercises and experiments can help but, ultimately, nothing can replicate fully the experience of combat. There is always an element of uncertainty.

- *Doctrinal surprise* is when adversaries use known technologies and capabilities in unexpected ways to produce powerful new effects. The classic example is the blitzkrieg, where the Wehrmacht combined armored forces, enhanced communications, close air support, and motorized infantry to produce battlefield advances so rapid that their adversaries could not cope. Doctrinal surprise also occurs when our own doctrine, which was relied on to structure military operations, fails in combat.

- *Diplomatic/political surprise* is the unexpected realignment of countries or major political factions as war breaks out. Although such realignments can happen at any time, in war or peace, this study focused on such surprises at the beginning of a conflict because that is when it is most likely and have the greatest effect.

Not a net assessment

Finally, it is important to note that this is not a net assessment. The study looks at ways that adversaries could inflict surprise on the United States, but these adversaries have many vulnerabilities of their own that the United States could exploit. It is not clear that the United

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[42] Scholars have categorized surprise several other ways that generally are similar to the one used in this report but tend to be narrower. For example, the DSB report, in addition to its distinction of "known surprises" and "surprising surprises," cites three "domains": adaptation of new technology, rapid fielding, and operational innovation. These align with the technological surprise and doctrinal surprise in this report. Handel divides military surprise into "area chosen for the attack, strategy and tactics employed, use of new military doctrines, technological surprise by the use of new weapons systems, surprise in terms of timing," Although he does not include diplomatic surprise, the discussion in the text recognizes the effect that diplomatic surprise has on the military balance of power. Michael Handel, *The Diplomacy Surprise: Hitler, Nixon, Sadat* (Cambridge, MA: Center for International Affairs, Harvard University, 1981),15.

States is more vulnerable than its adversaries. Nevertheless, the United States does have significant vulnerabilities that, if not mitigated, could exact a price in blood and treasure. Identifying and mitigating those vulnerabilities is the purpose of this study.

Chapter 3: The Inevitability of Surprise

Some surprise is inevitable. Better data collection, more insightful analysis, and improved decisionmaking are always helpful, but, in the end, not enough to anticipate everything. The reasons for this conclusion are many, including: deception and secrecy by prospective adversaries, the limits of intelligence, the inherent difficulty in predicting the future, human weakness, the cleverness of enemies, the skepticism arising from distrust of the intelligence community, and the vulnerability of status quo powers to disruptive behavior.

Nevertheless, the conclusion that surprise is inevitable is not a universal opinion. For this reason, it is useful to present the scholarly debate about the inevitability of surprise.

The debate about surprise

Broadly speaking, scholars fall into two competing schools of thought on surprise. The first, "orthodox," school argues that surprise is fundamentally unavoidable.[43] The second, "revisionist," school argues that, with effective reform at all levels of the intelligence process, from collection to analysis to decisionmaking, surprise can be avoided.[44]

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[43] See Richard Betts, "Surprise Despite Warning: Why Sudden Attacks Succeed," *Political Science Quarterly*, Vol. 95, No. 4 (Winter, 1980-1981), 551–72, http://www.jstor.org/stable/2150604; Roberta Wohlstetter, *Pearl Harbor: Warning and Decision* (Stanford, CA: Stanford University Press, 1962); Michael Handel, "The Yom Kippur War and the Inevitability of Surprise," *International Studies Quarterly*, Vol. 21, No. 3 (September 1977), 461–502; Daniel Byman, "Strategic Surprise and the 9/11 Attacks," *Annual Review of Political Science*, Vol. 8:145–170, June 15, 2005, http://www.annualreviews.org/doi/10.1146/annurev.polisci.8.082103.104927; Richard Betts, "Surprise, Scholasticism, and Strategy," *International Studies Quarterly*, Vol. 33, No. 3 (September 1989), 329–43, http://www.jstor.org/stable/2600463; Ephraim Kam, *Surprise Attack: The Victim's Perspective* (Cambridge, UK: Cambridge University Press, 1988); Richard Betts, "Analysis, War, and Decision: Why Intelligence Failures Are Inevitable," *World Politics,* Vol. 31, No. 1 (October 1978), 61–89, http://www.jstor.org/stable/2009967; Amnon Sella, "Barbarossa: Surprise Attack and Communication*," Journal of Contemporary History,* Vol. 13, No. 3 (July 1978), 555–83, http://www.jstor.org/stable/260209; Michael Handel, "Intelligence and the Problem of Strategic Surprise," *Journal of Strategic Studies*, Vol. 7, 1984, Issue 3, 229–81; H.A. DeWeerd, "Strategic Surprise in the Korean War" (Santa Monica, CA: RAND Corporation, 1965), http://www.dtic.mil/dtic/tr/fulltext/u2/612431.pdf.
[44] See Ariel Levite, *Intelligence and Strategic Surprises* (New York: Columbia University Press, 1987); John-Michael Arnold, "Non-State Led Strategic Surprise and U.S. Foreign Policy: A New Variant of an Old Problem," *Yale Journal of International Affairs*, March 1, 2013, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2233016; Brian W. Greene, "Rethinking Strategic Surprise," Defence R&D Canada Centre for Operational Research & Analysis, August 2010, http://www.dtic.mil/docs/citations/ADA533235; Alexander L. George and Jane E. Holl, "The Warning-Response Problem and Missed Opportunities in Preventive Diplomacy" (New York: Carnegie Corporation, 1997), https://www.carnegie.org/media/filer_public/33/6e/336e40fd-5176-42c2-bb9d-afd7b3b6550a/ccny_report_1997_warning.pdf; James Wirtz, "Theory of Surprise," In Richard K. Betts and Thomas G. Mahnken, *Paradoxes of Strategic Intelligence: Essays in Honor of Michael I. Handel* (London, UK: Frank Cass & Co, 2003); Robert Axelrod, "The Rational Timing of Surprise"; Abraham Ben-Zvi, "Hindsight and Foresight: A Conceptual Framework for the Analysis of Surprise Attacks," *World Politics*, Vol. 31, Issue 2 January 1979, 228–46, https://www.cambridge.org/core/journals/world-politics/article/rational-timing-of-surprise/B4EE2AC4163A33546DC6530E6EB5EC19; Abraham Ben-Zvi, "The Dynamics of Surprise: The Defenders Perspective," *Intelligence and National Security*, Vol. 12, 1997, Issue 4, 113–44, https://doi.org/10.1080/02684529708432451; Charles F. Parker and Eric K. Stern, "Bolt from the Blue or Avoidable Failure? Revisiting September 11 and the Origins of Strategic Surprise," *Foreign Policy Analysis*, Vol. 1, Issue 3

The first school—the orthodox school—argues that, while states can take preventive measures to dampen the effects of potential surprises, the factors that prevent victims from effectively predicting and preventing surprise are inherent: the unknowability of the future and the unavoidable limitations of intelligence and policy work. They arise from limitations in human psychology and cognition. For this reason, expansion of collection methods and of the amount of data collected does not fundamentally improve forecasting and the avoidance of surprise.

Richard Betts, a leading proponent of this school, concludes that surprise cannot be avoided by "perfecting norms and procedures for analysis and argumentation" and that the "unresolvable paradoxes and barriers to analytic and decisional accuracy make some incidence of failure inevitable."[45] Similarly, Michael Handel argues that studies done to improve "insight into the causes and pattern of strategic surprise" have only demonstrated that surprise is almost always unavoidable. As an example, he points to Israel's misinterpretations of Egypt's capabilities and intentions prior to the 1973 Yom Kippur War.[46]

Two DOD-sponsored studies recently came to similar conclusions. The Defense Science Board concluded that "**surprise will happen!** [emphasis in the original]"[47] A study for the U.S. Navy by the National Research Council concluded that "Capability surprise is both inevitable and inherently complex. . . . Surprise cannot be completely anticipated."[48]

Within the orthodox school, scholars are divided between those blaming failure of *warning*— inevitable limitations in intelligence work—versus failure in *response*—a lack of adequate attention and decisionmaking by policymakers. Betts, Handel and Dahl argue that problems inherent to intelligence collection and analysis prevent the acquisition of adequate warning. Other scholars such as Daniel Byman and H.A. DeWeerd, and Betts as well, argue that the key failure is the inability of policymakers to adequately respond to intelligence warnings, whether because of domestic interests, under/over estimation of enemy capability and intent, or simply having multiple priorities but limited time.[49]

November 2005, 301–31, http://onlinelibrary.wiley.com/doi/10.1111/j.1743-8594.2005.00014.x/abstract; Colin S. Gray, "Transformation and Strategic Surprise," *Strategic Studies Institute*, April 2005, https://ssi.armywarcollege.edu/pdffiles/PUB602.pdf; Lani Kass and J. Phillip London, "Surprise, Deception, Denial and Warning: Strategic Imperatives," *Orbis*, Vol. 57, Issue 1, Winter 2013, 59–82, https://doi.org/10.1016/j.orbis.2012.10.005; D. McMorrow, "Rare Events," MITRE Corporation, October 2009, https://fas.org/irp/agency/dod/jason/rare.pdf; Or Honig in "Surprise Attacks—Are They Inevitable? Moving Beyond the Orthodox-Revisionist Dichotomy," coined the terms "orthodox" and "revisionist": *Security Studies*, Vol. 17, 2008, Issue 1, 72–106, https://doi.org/10.1080/09636410801894167.

[45] Richard Betts, "Analysis, War, and Decision: Why Intelligence Failures Are Inevitable," *World Politics*, Vol. 31, No. 1 (October 1978), 1, 87, http://www.jstor.org/stable/2009967.

[46] Michael J. Handel, "Intelligence and the Problem of Strategic Surprise," in Richard K. Betts and Thomas G. Mahnken, *Paradoxes of Strategic Intelligence: Essays in Honor of Michael I. Handel* (London, UK: Frank Cass & Co, 2003).

[47] Defense Science Board, *2008 Summer Study on Capability Surprise, Volume I: Main Report,* 7.

[48] National Research Council, *Responding to Capability Surprise: A Strategy for U.S. Naval Forces* (Washington, DC: National Academies Press, 2013), 1,3.

[49] Also, see Amnon Sella, "Barbarossa: Surprise Attack and Communication*," Journal of Contemporary History*, Vol. 13, No. 3 (July 1978), 555–83, http://www.jstor.org/stable/260209, for a detailed description of the policy and bureaucratic struggles within the Kremlin that led to a grossly deficient response to the German invasion of the Soviet Union in 1941, despite repeated warnings of an impending attack.

The second, revisionist, school argues that the factors contributing to the failure to predict and prevent surprise can be overcome with proper reform and better use of intelligence by policymakers. For example, Alexander George and Jane Holl argue that, if national leaders overcome their "policy paralysis" and focus on developing a systematic and practical early warning system combined with a permanent contingency plan, they can prevent strategic surprise.[50] Abraham Ben-Zvi argues that by differentiating between a potential adversary's tactical "actualities" and strategic "possibilities" and evaluating the subsequent intelligence while being mindful of a priori strategic assumptions and biases, intelligence analysts can more successfully identify warnings.[51] Charles Parker and Eric Stern, in their analysis of the September 11 attacks, highlight specific examples of warning, which, if taken seriously, might have reduced the chances of the terrorists' success.[52] The 9/11 commission made a similar argument. It criticized the intelligence community for "not connecting the dots," implying that a better analytic effort could have foreseen the attacks and prevented them.[53] Its solution—reorganization—is a classic in the revisionist school.

Why surprise is inevitable

This study comes down firmly in the orthodox school: good intelligence work and wise government decisionmaking are important, but surprise is ultimately inevitable. There were eight reasons for this conclusion, discussed in detail in the sections that follow:

1. The role of deception and secrecy

2. The limits of intelligence

3. The inherent difficulty of predicting the future

4. Human weakness

5. The enemy's vote

Alexander L. George and Jane E. Holl, *The Warning-Response Problem and Missed Opportunities in Preventive Diplomacy* (New York: Carnegie Corporation, 1997), https://www.carnegie.org/media/filer_public/33/6e/336e40fd-5176-42c2-bb9d-afd7b3b6550a/ccny_report_1997_warning.pdf; Abraham Ben-Zvi, "The Dynamics of Surprise: The Defenders Perspective*," Intelligence and National Security*, Vol. 12, 1997, Issue 4, 113–44, https://doi.org/10.1080/02684529708432451; Lani Kass and J. Phillip London, "Surprise, Deception, Denial and Warning: Strategic Imperatives," *Orbis*, Vol. 57, Issue 1, Winter 2013, 59–82, https://doi.org/10.1016/j.orbis.2012.10.005.

[51] Abraham Ben-Zvi, "Hindsight and Foresight: A Conceptual Framework for the Analysis of Surprise Attacks," *World Politics*, Vol. 31, Issue 2, January 1979, 228–46, https://www.cambridge.org/core/journals/world-politics/article/rational-timing-of-surprise/B4EE2AC4163A33546DC6530E6EB5EC19.

[52] Charles F. Parker and Eric K. Stern, "Bolt from the Blue or Avoidable Failure? Revisiting September 11 and the Origins of Strategic Surprise," *Foreign Policy Analysis*, Vol. 1, Issue 3, November 2005, 301–31, http://onlinelibrary.wiley.com/doi/10.1111/j.1743-8594.2005.00014.x/abstract. A specific example is Director of Central Intelligence George Tenet's report the summer prior to 9/11 warning of the high likelihood of an Al Qaeda attack.

[53] National Commission on Terrorist Attacks Upon the United States, *9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks upon the United States*, 2004, 277, 400, https://9-11commission.gov/.

6. The vulnerability of status quo powers

7. Skepticism about the intelligence community

8. The historian's fallacy

The role of deception and secrecy

The obvious problem in dealing with surprise is that nations actively try to deceive their potential adversaries. In his classic analysis of war, *Patterns of Conflict*, John Boyd points out that most militaries enshrine surprise as a principle of war.[54] Secrecy and deception occur in all four areas: strategic surprise, technological surprise, doctrinal surprise, and diplomatic/political surprise.

In preparing surprise attacks, nations conceal their activities as the Germans did before the Battle of the Bulge when they moved hundreds of thousands of troops to a vulnerable sector without the allies suspecting. Militaries also conduct deception operations. For example, in 1943 the allies created "the man who never was" to deceive the Germans about the planned invasion of Sicily.[55] In 1968, the North Vietnamese kept U.S. attention focused on the remote outpost of Khe Sanh to distract from the planned attack on cities during Tet. One study found that in 93 cases of attempted deception, active deception succeeded in 76 cases (82 percent) and in 11 of the 17 remaining cases, passive deception—concealment — succeeded.[56] Robert Jervis argues that deception is relatively easy: "Intelligence is a game between hiders and finders, with the former usually having the easier job. Intentions, furthermore, often exist in only a few heads and are subject to rapid change. Deception is fairly easy, and the knowledge that it is possible degrades the value of accurate information."[57]

A common mechanism for deception is to use peacetime exercises as cover for surprise attacks. In this way, Egypt used training exercises to cover its military buildup on the Suez Canal prior to its surprise attack on Israel in 1973. Germany used peacetime exercises as cover for its attack on Poland in 1939. In both cases, the victim eventually figured out that the buildup was not a normal peacetime activity, but both lost valuable mobilization time.

Nations also use repeated military incidents to inure the intended victim to potentially threatening military activity. Thomas Schelling noted that failures include both "the alarm that fails to work, but also the alarm that has gone off so often it has been disconnected."[58] This produces "over warning" or "alert fatigue." For example, before North Korea attacked South

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[54] Col. John Boyd, "Patterns of Conflict," edited by Chet Richards and Chuck Spinney, Defense and the National Interest, January 2007, http://www.dnipogo.org/boyd/patterns_ppt.pdf.

[55] Ewen Montagu*, The Man Who Never Was* (Annapolis, MD: Naval Institute Press, 2001). Montagu was the British case office who ran the operation.

[56] Meir Finkel, *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield* (Stanford, CA: Stanford University Press, 2011), 253.

[57] Robert Jervis, *Why Intelligence Fails: Lessons from the Iranian Revolution and the Iraq War* (Ithaca, NY: Cornell University Press, 2010), 2.

[58] Thomas Schelling, foreword to Roberta Wohlstetter, *Pearl Harbor: Warning and Decisions* (Stanford, CA: Stanford University Press, 1962).

Korea in 1950, it instigated hundreds of border incidents. When North Korea finally positioned forces for attack, the South Koreans considered the activity to be more routine incidents. Before Israel preemptively attacked Egypt in 1967, it conducted aircraft exercises over the Mediterranean. These routinely headed towards Egypt, then turned back to Israel. On the designated day, however, they kept going.

With technology, nations keep their most sensitive items secret, with the result that battlefield use causes surprise. Thus, prior to the attack on Pearl Harbor, the United States knew that the Japanese had aerial torpedoes but did not know that the Japanese had developed a method for dropping them in shallow waters such as Pearl Harbor. The United States knew the Japanese had excellent ship-launched torpedoes, but it did not appreciate their excellent fire control or extended range. Most famously, the United States developed the atomic bomb in near total secrecy.

Doctrinal innovations are rarely kept totally secret because so much military activity is visible, but how all elements come together is often unappreciated in peacetime. For example, prior to World War II, the allies could see what the Germans were doing with tanks and aircraft, but the way those capabilities came together on the battlefield was a surprise.

Diplomatic and political realignments are necessarily conducted in secret, such as the Hitler–Stalin nonaggression pact of August 1939. It may be apparent that some alliance partner is unenthusiastic but, as discussed later, countries rarely communicate their intent to defect and, indeed, continue to signal that all is well, until the moment of decision.

The limits of intelligence

Better intelligence is always helpful but not always decisive. Erroneous preconceptions, bad decisionmaking, and battlefield confusion can allow surprise to occur even with extremely accurate intelligence. John Keegan points to the British experience on Crete in 1941 and the U.S. experience at Midway in 1942 as examples of these limitations.[59]

The British had garrisoned Crete after having been thrown off the Greek mainland by a German offensive. They had high-quality troops and command of the seas. Further, code-breaking gave them detailed information about the planned German airborne attack: its location, strength, and timing. Nevertheless, though the British defense did inflict heavy casualties on the Germans, it still failed. German courage, combined with British tactical mistakes, turned the tide, and the British were driven off the island.

Before the Battle of Midway, code-breaking similarly gave the U.S. Navy exact information about the attacker's strength, timing, and location. Indeed, the intelligence forecasts were only off by "five miles, five degrees, and five minutes" as Admiral Nimitz noted.[60] The accurate intelligence, indeed, helped produce a great U.S. victory. Nevertheless, it was a close run thing and dependent on a lot of chance events including: an insightful guess by U.S. dive bombers that allowed them to find the Japanese carriers after getting lost, the fortuitous—

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[59] John Keegan, *Intelligence in War* (New York: Vintage Books, 2002), 144–221

[60] E.B. Potter, "Admiral Nimitz and the Battle of Midway," in Thomas Hone, *The Battle of Midway* (Annapolis, MD: Naval Institute Press, 2013), 224.

though tragic—timing of the U.S. torpedo attacks that pulled Japanese air defenses away from the dive bombers, a bad decision by Admiral Nagumo, the Japanese commander, to rearm aircraft rather than strike with what was available, and the happenstance of delays in Japanese reconnaissance that kept the U.S. carriers hidden for an additional, crucial hour.

The attack on Pearl Harbor in 1941 provides a final example. The United States had broken the Japanese diplomatic code (MAGIC) and therefore had extraordinary insight into Japanese thinking and intentions. Nevertheless, for a variety of reasons—tight controls over access, gaps in information, delays in transmission, confusion about meaning, preconceptions about where an attack might occur—this extraordinary trove of data was not adequate to alert U.S. forces. Gordon Prange, in his encyclopedic history of the attack, pointed to "bountiful human errors of great variety, false assumptions, fallacious views, [and] a vast store of intelligence badly handled."[61]

National technical means now gather more data than ever before but also amplify noise. This phenomenon, first noted by Roberta Wohlstetter, persists. As Eric Dahl commented: "Wohlstetter's view—that an excess of noise had drowned out the pertinent intelligence signals and warnings—has since become conventional wisdom. . . . This problem of signal-to-noise ratio is so fundamental in the intelligence business that today, if one refers to the 'Roberta Wohlstetter problem,' almost everyone knows exactly what you were talking about."[62]

Part of the intelligence problem is that some questions have answers, though those answers may be hard to ascertain, but others don't. Greg Treverton, a longtime observer of the intelligence process, called these "puzzles" and "mysteries." An example of a puzzle was the question whether Iraq had WMD in 2003. There was an answer, although it was hard to find because Saddam was actively trying to conceal it. An example of a mystery was the question whether the Shah of Iran would fall. Intelligence analysts could see the rising popular disturbances and the reaction of the government in 1978 and into 1979, but the question of possible regime collapse was in the future and unknowable.[63] Many potential surprises—especially in technology, doctrine, and diplomacy/politics—fall into the mystery category, and those that are not are often subjects of deception, which makes anticipating surprise extremely difficult.

Finally, there is history. Although the U.S. intelligence community has become increasingly sophisticated, surprises still occur despite all the case studies, lessons learned, congressional inquiries, and internal reviews. The United States was surprised by the entry of the Chinese into the Korean War, by the North Vietnamese offensive during the Tet holiday, by the Egyptian and Syrian attacks on Israel in 1973, by the fall of the Shah in 1979, by the fall of the Berlin wall in 1989, and by the terrorist attacks on September 11, 2001. The Defense Science

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[61] Gordon Prange, *At Dawn We Slept* (New York: Penguin Books, 1981), especially 1 and "The Verdict of History," 725–38

[62] Erik Dahl, *Intelligence and Surprise Attack: Failure and Success from Pearl Harbor to 9/11 and Beyond* (Washington, DC: Georgetown University Press, 2013), 1.

[63] Gregory F. Treverton, "Risks and Riddles," *Smithsonian Magazine*, June 2007, https://www.smithsonianmag.com/history/risks-and-riddles-154744750/.

Board study catalogs 18 surprises since Pearl Harbor.[64] The failure of most other intelligence agencies worldwide to foresee these same events indicates that the cause is not incompetence; the cause is the intractability of the problem.

Napoleon, always good for a pithy aphorism, summed the problem up: "War is composed of nothing but surprises."[65]

The Inherent difficulty of predicting the future

Preparing fully for surprise requires making predictions about the future. However, many commentators have noted the difficulty of the task. Richard Danzig, for example, a former secretary of the Navy and long-time participant in national security decisionmaking, examined future uncertainty in *Driving in the Dark.*[66] He concluded that the defense community is driven to make predictions, but that its need for predictions will always exceed its ability to predict accurately. "Strategic judgments about future environments are often, one might say predictably, wrong." Similarly, Robert Gates argued in his memoir and in testimony that the United States is unable to predict future conflicts. "In the 40 years since Vietnam, our record in predicting where we would be militarily engaged next, even six months out, is perfect: we have never once gotten it right."[67] Although this may be too pessimistic (in the 1990s the United States did foresee a future conflict in Iraq), there is a lot of truth to Secretary Gates' argument. No government forecast foresaw a conflict in Afghanistan (or Vietnam, Korea, Grenada, Panama, Serbia, or Libya).

Although DOD's track record in forecasting the future is poor, others have not fared better. For example, most analysts and even odds-makers failed to foresee Brexit or the results of the 2016 U.S. presidential election. Recent economic research by the Federal Reserve is similarly discouraging. Despite plentiful data and continuous calibration, economic forecasts are still highly unreliable even over two-year horizons, with increasing uncertainty for longer-range forecasts. The study concluded, "[l]onger-horizon forecasts do not have predictive power. . . . The future is uncertain."[68] This empirical and anecdotal evidence has engendered considerable skepticism about forecasting accuracy.

As St. Paul observed, we see through a glass darkly. [69] Two thousand years of history have not improved the viewing.

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[64] Defense Science Board, *Capability Surprise, Volume 2: Supporting Papers*, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Washington, DC, 2010, 15–18.
[65] Napoleon Bonaparte, *Maxim*s, cited in Robert D. Heinl, *Dictionary of Military and Naval Quotations* (Annapolis, MD: U.S. Naval Institute, 1966), 317.
[66] Richard Danzig*, Driving in the Dark: Ten Propositions about Prediction and National Security* (Washington, DC: Center for the New American Security, October 2011), https://s3.amazonaws.com/files.cnas.org/documents/CNAS_Prediction_Danzig.pdf?mtime=20160906081652.
[67] Robert M. Gates*, Duty: Memoirs of a Secretary at War* (New York: Alfred A. Knopf, 2014), 590.
[68] David Reifschneider and Peter Tulip, "Gauging the Uncertainty of the Economic Outlook Using Historical Forecasting Errors: The Federal Reserve's Approach*, Finance and Economics Discussion Series 2017-2020,"* (Washington, DC: Board of Governors of the Federal Reserve System, 2017), https://doi.org/10.17016/FEDS.2017.020.
[69] *First Letter of Paul to the Corinthians*, 13:12.

Human weakness

Daniel Kahneman and fellow behavioral economists have famously shown how susceptible human beings are to mental shortcuts and how these shortcuts can disrupt clear and objective thinking. For example, human beings:

- Focus on the information available and often do not consider what other information might be important (termed by Kahneman as "what you see is all there is");

- Look for information that confirms their existing views and explain away information that tends to contradict them (called "confirmation bias);

- Overestimate their ability to control events and discount the effect of randomness;

- Focus on normality and averages to the exclusion of ranges, which obscures the discontinuities that surprise entails; and

- Try to make sense of the world by building narratives based on the information available therefore closing off alternative explanations.

Philip Tetlock, head of the Good Judgment Project at the University of Pennsylvania, took the analysis a step further regarding expert judgment. After conducting extensive quantitative research on the prediction ability of recognized experts, he concluded that experts do little better in predicting the future than dart-throwing monkeys.[70] Indeed, this is unfair to the monkeys because the most attention-grabbing and visible expert forecasts are the least accurate. Events tend to muddle along rather than take dramatic turns. Thus, news program talking heads have the worst track record. This failure occurred for many of the same reasons that Kahneman identified. More encouraging, Tetlock later identified attributes that produced better, though still imperfect, forecasting.[71]

These human frailties—overconfidence, unwillingness to reconsider viewpoints, and comfort with continuity—leave decisionmakers and their supporting staffs vulnerable to surprise.

The enemy's vote

An old military saying holds that the enemy gets a vote. Along this line, Herman Kahn, the famous (or infamous) nuclear strategist of the 1960s and 1970s, observed that there is always someone on the other side whose job it is to outsmart you, "and sometimes that person does his job." Kahn made this observation to personalize and make specific the notion that adversaries are not gray shapes with vague powers but specific people who are often highly trained and extremely good at their jobs. He pointed to Japanese Adm. Takijiro Ohnishi who coordinated the planning for the Pearl Harbor attack. Ohnishi had graduated at the top of his

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[70] Philip E. Tetlock, *Expert Political Judgment: How Good Is It? How Can We Know?* (Princeton, NJ: Princeton University Press, 2006).

[71] Philip Tetlock and Dan Gardner, *Superforecasting: The Art and Science of Prediction* (New York: Crown, 2015). In this follow-on book, Tetlock examines the traits of people who had the best track records as forecasters in his competitions, that is, the "superforecasters."

class at the Japanese Naval Academy and had served for many years in the Japanese naval air arm, developing it from an embryonic force to a powerful instrument. He had Capt. Minoru Genda working for him, one of the Japanese Navy's foremost advocates of naval air power. They knew their business, as they proved during the opening stages of World War II.[72]

Vulnerability of status quo powers

Status quo powers like the United States are naturally more vulnerable to surprise because they are deeply invested in the rules of an international system and have constructed warfighting techniques to fit that system. As a result, "asymmetric" techniques—"the application of dissimilar strategies, tactics, capabilities, and methods to circumvent or negate an opponent's strengths while exploiting his weaknesses"[73]—often catch status quo powers by surprise.

Skepticism about the intelligence community

In the background of any future discussion about potential surprise will be a lingering skepticism about intelligence warnings as a result of the failure to foresee the attacks of 9/11, the errors assessing WMD in Iraq, and, more recently, accusations of political favoritism.

- The failure to predict the attacks of 9/11 is well known. Whether the intelligence community should have "connected the dots" is still disputed. Nevertheless, the community did fail to identify and prevent a major attack.

- The inaccurate assessment of Iraqi WMD in 2002–2003 is also well known. Indicators from Iraq supported the view that Iraq possessed some WMD. The director of the CIA, George Tenet, famously said, "It's a slamdunk."[74] In the end, the judgments of the intelligence community were entirely wrong, leading to a long war and bitter political recriminations.

- Recently, politics has intruded overtly into the intelligence discussion with President Trump criticizing the community for its past failures and expressing doubt about the validity of its findings that the Russians interfered with the presidential election.

The point is not whether the skepticism is warranted. The point is that it will exist. As a result, the intelligence community will find it difficult in the future to convince policymakers that a threat is imminent without some visible action by the adversary. Inferences, necessarily ambiguous, from human sources, overhead imagery, and signals intercepts may not be enough. This political skepticism will induce delay in implementing countermeasures, making the United States vulnerable to surprise.

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[72] Herman Kahn, *On Thermonuclear War* (Princeton, NJ: Princeton University Press, 1960), 412–13.
[73] U.S. Department of Defense, *DOD Dictionary of Military and Associated Terms*, August 2017, http://www.dtic.mil/doctrine/new_pubs/dictionary.pdf.
[74] Bob Woodward, *Plan of Attack* (New York: Simon and Schuster, 2004), 249.

The historian's fallacy

The historian's fallacy induces present experts to overestimate their ability to learn from the past and avoid future mistakes. This arises because much of the literature about anticipating future conflicts is, by necessity, historical. Historians have the advantage of knowing how events turned out and are therefore susceptible to the belief that such outcomes were foreseeable if observers just "connected the dots." However, historians can see which "dots" were relevant, which were irrelevant, and how to connect the relevant "dots." Further, even if historians can accurately diagnose a problem, that does not mean that fixes are possible. Some problems—cognitive biases, for example—are artifacts of the human condition and unfixable.

This study's author cautioned against the historian's fallacy in a piece commemorating the 100th anniversary of the Battle of the Somme. In retrospect, the system of trenches that arose on the western front seems inevitable given the development of the machine gun and technical advances in artillery. However, the pre-1914 experience in warfare indicated that maneuver campaigns were most likely. The article's conclusion is worth noting here:

> [The experience of the Western Front] reminds us how unclear the future really is. Historians will no doubt look back on the present day and explain how it was obvious events would turn out as they did and how current decision-makers, military and civilian, were blind not to have seen how changes in the world would affect unfolding events. These future historians will have the advantage of seeing how things came out and knowing which parts of history were relevant and which were dead ends. We don't have that advantage. Yes, it is worth trying to see where present trends are headed. Yes, it is also worthwhile trying to imagine future conflicts and their nature. But we ought to be humble, recognize the limits of foresight, and be ready to adapt to the inevitable surprises that occur.[75]

Colin Gray provides a definitive conclusion here: "Surprise is not merely possible, or even probable, it is certain."[76]

Known and unknown

A theme that runs through the analysis of surprise is the existence of "known unknowns" and "unknown unknowns," to use Secretary of Defense Donald Rumsfeld's categorization of the challenge that policymakers face.[77]

"Known unknowns" are those uncertainties that have been identified in the national security literature and recognized by military institutions but for which there are no clear answers available in peacetime.

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[75] Mark Cancian, "Slaughter on the Somme: The Limits of Foresight," *War on the Rocks*, July 1, 2016, http://warontherocks.com/2016/07/slaughter-on-the-somme-the-limits-of-foresight-on-the-road-to-the-great-war/.
[76] Gray, *Another Bloody Century,* 25.
[77] Donald Rumsfeld, *Known and Unknown*, *A Memoir* (New York: Sentinel, 2011).

Aircraft carrier survivability is a prominent example. Since World War II, carriers have operated in sanctuary, and no enemy has damaged one, despite extensive carrier operations in conflict zones. However, in the face of long-range precision strike munitions that constitute anti-access/area denial environments in great power conflicts, carriers would be vulnerable. Some argue that this vulnerability makes carriers less useful in high-end conflicts and that the Navy should shift to other platforms. Others argue that carriers have sufficient defensive mechanisms, on board and in its escorts, to survive and operate effectively in all environments. This question is impossible to resolve in peacetime because the answer depends on adversary technologies and doctrines, which are not fully revealed, and on U.S. capabilities that can only be partially tested in peacetime.[78]

The key point is to have identified it as a question and to develop alternative concepts. Organizations, prompted by the question, can then watch for indicators about an answer, during both peacetime and the initial stages of a conflict, and react quickly, without having to develop questions or alternatives in the heat of a conflict. In the case of carrier vulnerability, the Navy has developed the concept of distributed lethality, whereby many combatants, using long-range munitions and networked sensors, could provide an alternative architecture for naval combat.[79] In professional journals, navalists debate the measure—countermeasure dynamic of carrier vulnerability and are actively striving for an answer.

Gathering these known unknowns is an important step. Few policymakers likely appreciate what we know and don't know about the nature of future conflicts. Just listing and describing known unknowns identifies what to watch and where hedges may be needed. It thus reduces the effects of surprise. It also reduces the phenomenon of what strategist Frank Hoffman called "pink flamingos," challenges that are brightly evident but which are ignored because inconvenient.[80] Further, such a listing drives planners to think about alternative operational concepts in case the original concept turns out to be infeasible.

More difficult are the "unknown unknowns," uncertainties not identified, or not sufficiently understood, in peacetime. Popularized as "black swans" by Nassim Taleb, these are unexpected events that have a major impact.[81] Because they are unexpected, they fundamentally disrupt the assumptions on which plans and operations are based. Identifying and hedging against these events can, therefore, produce great benefits. Just acknowledging their likely existence can give military and civilian policymakers some resilience against their effects.

However, they are difficult to anticipate—surprise is, by definition, unanticipated. It takes an act of imagination to see unknown unknowns, but, with effort and focus, some insights are

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[78] For extended discussion of this debate, see Mark Cancian, "What Does the Future Hold for US Navy Aircraft Carriers," *World Politics Review*, February 10, 2016, https://www.worldpoliticsreview.com/articles/17908/what-does-the-future-hold-for-the-u-s-navy-s-aircraft-carriers.

[79] VAdm. Thomas Rowden, RAdm. Peter Gumataotao, and RAdm. Peter Fanta, "Distributed Lethality," *Proceedings*, January 2015, https://www.usni.org/magazines/proceedings/2015-01/distributed-lethality.

[80] Frank Hoffman, "Black Swans and Pink Flamingoes: Five Principles for Force Design," *War on the Rocks*, August 19, 2015, https://warontherocks.com/2015/08/black-swans-and-pink-flamingos-five-principles-for-force-design/.

[81] Nassim Nicholas Taleb, *The Black Swan: The Impact of the Highly Improbable* (New York: Random House, 2010).

possible. This report identifies many unknown unknowns and, in the final chapter, recommends processes whereby more could be identified. Such discussions can move unknown unknowns to the known unknown category, not a complete resolution but a reduction in the severity of surprise.

Known and unknown is this study's alternative to the Defense Science Board categorization of known surprises and surprising surprises. The two approaches are similar. The difference, as described earlier, is that this study does not attempt to make judgments about what policymakers should have anticipated.

Chapter 4: Strategic Surprise

Strategic surprise—often called "surprise attack"—occurs when a conflict occurs at an unexpected time or place. This kind of surprise is the most commonly analyzed in the literature. Surprise can occur at all levels of warfare—strategic, operational, tactical—but surprise at the strategic level is what concerns policymakers and is the focus here. The section presents the existing literature on this form of surprise, then assesses the areas where the United States may be currently vulnerable to strategic surprise.

Shock produces a rich literature but uncertain progress

Surprise attack is as old as warfare itself. The Bible, for example, describes how David surprised the Amalekites by attacking at night while they were feasting. The Carthaginians secretly crossed the Alps from Spain into Italy and ambushed the Romans at Lake Trasimene. George Washington famously crossed the Delaware River on Christmas Eve, 1776, and surprised the Hessians at Trenton.[82] Thucydides, Sun Tzu, Vegetius, Machiavelli, and Clausewitz all describe surprise as an element of war.

The literature analyzing surprise attack, however, is relatively recent but plentiful. Surprise attacks produce shock that resonates long after the event as victims try to figure out what happened. Three patterns emerge. First, the literature on surprise attacks tends to come in short bursts following what is considered to be a consequential "strategic surprise." For instance, the surprise attack debate reached a peak in the early 1950s after Pearl Harbor, Operation Barbarossa, and the Chinese entry into the Korean War. There was another burst of literature in the 1970–1980s following the Yom Kippur War, and, most recently, after 9/11 and the subsequent surge in terrorist attacks.

Second, each boom of surprise attack literature begins with case-study approaches and is followed by more theoretical work. Thus, the vast majority of literature is at least partially case-study based, with the exception of literature such as Wirtz's "Theory of Surprise," Handel's "Intelligence and the Problem of Strategic Surprise," and Gray's "Transformation and Strategic Surprise."

Third, earlier works tend to be from the more pessimistic orthodox camp. Examples include scholars such as Wohlstetter, Betts, Gray, and Handel. Recent work tends to follow the more optimistic revisionist camp. Examples include Parker and Stern, and Kass and London. This relative optimism arises from expectations that big data and better sensors will be able to roll back the Clausewitzian fog of war.

Several themes emerge from the literature: countries have different risk assessments, which leads to unexpected decisions to go to war; surprise attacks often arise from an expectation

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[82] 1 Samuel 14–18; Livy, *The War with Hannibal* (London, UK: Penguin Books,1965).

of a knockout first blow; and slow reactions by victims generally arise from shortfalls in decisionmaking, not warning.

Different risk assessments

An adversary's assessment of risk and benefit may be different from our own. What appears to be irrational or irresponsible to us may be rational and justified when viewed from the adversary's perspective. This is a subset of a broader literature on mirror imaging and the difficulty in understanding decisionmaking across cultures and political systems. Mirror imaging attributes our own values and perspectives to an adversary. Betts described mirror imaging as when the defender "assume[s] his adversary will see the same alternatives and constraints in the situation, or the same linkages between facts, that he does." He notes that it "may flow from wishful thinking or unrecognized differences in culture or perceptions" and noted that most policymakers are susceptible to it.[83] Robert Jervis noted that "judging others' intentions is notoriously difficult."[84] These considerations drive a logic that aggression and surprise attack may be rational. Rational does not mean good. It just means that when viewed from a particular perspective with a particular set of values, the action appears attractive, or, at least, more attractive than the alternatives.

Japan's decision to attack the United States in 1941 is an example of this asymmetry. It seemed to military analysts in the United States that for Japan to attack was not just unwise but suicidal. The United States had twice the population and perhaps five times the economy.[85] Yet, as Graham Allison notes, "we misread risks that General Tojo was willing to accept. He regarded the conquest of Asia, not as the culmination of an ambition but as a matter of regime survival. It was a life and death matter to them."[86] Admiral Yamamoto, who planned and led the raid, was literally a gambler. He enjoyed betting on games of chance in his leisure, which indicated his willingness to take the chance of an attack that might not succeed. Indeed, the Japanese only gave the attack on Pearl Harbor a 50 percent chance of success but considered the risk worth taking.

Further, the Japanese had a reasonable strategy build on this initial surprise attack. The concept was that the Pearl Harbor attack would badly damage the American fleet, so the Japanese would be able to conquer the resource territories that it desired. It would then fortify the perimeter of its newly conquered Empire and wear down the inevitable U.S. counterattack. When the United States tired, accelerated perhaps by an active isolationist movement, a negotiated settlement would codify Japanese conquests. The plan failed because the Japanese acquired what they called "victory disease" and pushed their conquests too far, while the Americans proved to be much more resilient and determined

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[83] Betts, *Surprise Attack: Lessons for Defense Planning*, 122.
[84] Richard Jervis, "Perceiving and Coping with Threat," in Robert Jervis, Richard Lebow, and Janice Stein, *Psychology and Deterrence* (Baltimore, MD: Johns Hopkins University Press, 1989), 14.
[85] John Ellis, *World War II: A Statistical Survey* (United Kingdom: Factsonfile, 1983), 273; Alan S. Milward, *War, Economy, and Society 1939–1945* (Berkeley: University of California Press,1979), 63, 85.
[86] Graham Allison, *Destined for War: Can America and China Escape Thucydides's Trap?* (New York: Houghton Mifflin Harcourt, 2017).

than expected. In the end, the judgment of American military analysts was correct: the Japanese attack was catastrophic for Japan. Nevertheless, it happened.[87]

Expectation of a knock out first blow

British strategist Lawrence Freeman argues that states launch surprise attacks as a way to achieve a quick victory without the pain and suffering associated with long, drawn-out conflicts. States often believe that some new technologies give advantages to the offense and can then be used to launch a knockout blow. Examples of this belief include railroad-facilitated mobilization during World War I and airpower in World War II. A contemporary example is cyber weapons, thought by some experts to provide an offensive advantage. However, history generally shows that initial surprise does not deliver a quick victory. Freedman cites Operation Barbarossa, Pearl Harbor, the North Korean invasion of South Korea, the Argentine invasion of the Falklands, and Iraq's 1990 invasion of Kuwait as examples where a state found success in the initial surprise attack, but that success did not lead to ultimate victory.[88]

Knockout blows do occasionally occur in regional conflicts when adversaries lack the territorial depth or the resources to absorb a first blow and bounce back. Examples are few, but their existence is probably what encourages states to believe that such knockout blows are possible. For example, the Israelis destroyed the Egyptian and Syrian air forces in the opening hours of the 1967 war and, if not decisive, the strike gave them a huge advantage. Russia seized Crimea from Ukraine in what was, in effect, a surprise attack in March 2014. However, this operation was a limited land grab and not an attempt to conquer the entire Ukraine.

Shortfalls in decisionmaking, not warning

In his seminal work on surprise attack, Richard Betts argued that "the primary problem in major strategic surprises is not intelligence warning but political disbelief." He points out that there are always some indicators and warning (to use the intelligence community's terms) that something will happen. Troop movements are spotted, reserve mobilization becomes apparent, reconnaissance increases, political rhetoric sharpens, spies acquire military plans. Preparations for major attacks cannot be fully hidden. Even in an era of long-range strike, great powers need to reposition platforms for attacks. Further, most military forces are customarily in garrison doing routine maintenance and training. Only a small number are deployed for actual operations. Thus, a country seeking to bring its combat power to bear in a surprise attack would need to take many, highly visible actions.[89]

The problem, Betts argues, is not believing the signals received. The reasons are several, with considerable overlap to the issues described earlier regarding the inevitability of surprise:

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[87] There was also a minor element of technological surprise, not discussed here. Pearl Harbor was regarded as too shallow for aerial drop torpedoes, but the Japanese devised a way to keep their torpedoes from running too deep.
[88] Freedman, *The Future of War: A History*, 278–79.
[89] For an analysis of how this would apply to a future war in Korea, see Mark Cancian, "The Korean War 2.0? The Signs to Watch," *Breaking Defense*, August 15, 2017, https://breakingdefense.com/2017/08/korean-war-2-0-the-signs-to-watch/.

attack seems irrational, war involves a major discontinuity from long experience, other explanations are available for an adversary's buildup.

The classic example here is Stalin's failure to react to the many warnings he received about a German attack in June 1941. Historians have documented 84 specific warnings, some of which were very high quality. They included reports from spies about imminent hostilities, observation of German troop movements, increases in German reconnaissance overflights, and reports from deserters. Nevertheless, Stalin refused to believe any of them. In fact, Stalin disciplined people who warned of German threats, sending them to the gulags or even having them shot.[90]

The same dynamic applies in other surprise attacks. Before the Chinese intervention in Korea in 1950, and as it was actually happening, the United States picked up many signals of impending conflict—aerial reconnaissance, prisoner interrogations, reports from Korean civilians, diplomatic ultimatums, Chinese press reports. Nevertheless, MacArthur and his staff were convinced that such an intervention, although technically possible, was irrational. On October 15, 1950, at a time when thousands of Chinese were already in Korea, General MacArthur said, "[i]n spite of their continued interest in some blatant public statements, [China has] decided against further expensive investment in support of a lost cause." As a result, U.S. and South Korean forces were totally surprised, and badly defeated, when they finally ran into the Chinese army.[91]

The Soviet invasion of Czechoslovakia in 1968 and the Arab attack on Israel in 1973 show the same dynamic: signals were received, clear in retrospect, but just not believed at the time.

Erik Dahl builds on Betts's analysis. He argues: "Strategic-level intelligence and warning are surprisingly easy to acquire and are often readily available before major attacks. But they are unlikely to be acted upon by decision-makers, and in any case are too general to be useful in preventing attacks. Tactical-level intelligence is much harder to acquire, but when available is much more likely to be useful and actionable."[92] He argues that policymakers often request strategic assessments, but these lack the immediacy and specificity to compel critical decisions about peace and war. Only when very specific and incontrovertible warnings become available will policymakers act. For example, in 1941 the Soviets knew that the Germans would attack eventually but were uncertain about when; in 1941 the United States knew that the Japanese would attack soon but were unsure about where; in 1940 the British and French knew that the Germans were going to attack but were unsure about how. Yet all were surprised when the attack actually came. Strategic warning was not helpful in preventing surprise.[93]

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[90] Richard Overy, *Russia's War* (London, UK: Penguin Books, 1998), 94–97; Robert Conquest, *Stalin: Breaker of Nations* (New York: Viking Press, 1991), 234–35.

[91] Billy C Mossman, *Ebb and Flow: November 1950–July 1951* (Washington, DC: Center of Military History, U.S. Army, 1990), 19–20.

[92] Erik Dahl, *Intelligence and Surprise Attack: Failure and Success from Pearl Harbor to 9/11 and Beyond* (Washington, DC: Georgetown University Press, 2013), 22.

[93] Betts, *Surprise Attack: Lessons for Defense Planning*, 122.

Further, the twin fears of causing unnecessary civilian alarm and possibly provoking the kind of attack that they are seeking to prevent inhibit policymakers from taking action. Thus, for example, the Israeli leadership was receiving warnings prior to the 1973 war but was reluctant to order alerts or mobilization. Both actions could induce the Egyptians and Syrians to prepare for war if they were not already doing so and would disrupt the Israeli economy because mobilization took so many workers away from their jobs.

Indeed, without specific, tactical information, policymakers frequently cannot act even if they wanted to. For example, before the 9/11 attacks, there were general warnings that terrorists were planning something big. But such warnings were not specific enough to take action and became part of the general threat background. Before policymakers could take effective action, they needed information about the nature of the attack, the location, and the timing.

Areas of current vulnerability

The greatest U.S. vulnerability to strategic surprise comes from Russia and China because of the wide variety of tools available to them. North Korea and Iran could launch surprise attacks also, though these would not carry the existential threat of a great power attack. Even North Korea's nuclear forces, while concerning, currently lack the capacity to create an existential threat.

Russia

Russia's penchant for aggression is well recognized. In recent years, Russia has attacked Georgia, seized Crimea, and supported separatist elements in eastern Ukraine. There is considerable history undergirding this aggression including the centuries-long conquests that built the small Duchy of Muscovy into an immense empire stretching from Europe to the Pacific, Soviet expansion before and after World War II, and a historical fear of invasion that drives it to establish buffers on its border.

> Vignette: Russian blitz in the Baltic states
>
> Russia launches surprise attack on Baltics after electoral setback to ethnic Russians. The attack swiftly overruns Estonia and Latvia. Russia then offers to withdraw in exchange for peace terms that include Baltic states' withdrawal from NATO.

Concerns abound that Russia will launch a surprise attack on the Baltic states of Latvia, Estonia, and Lithuania. These NATO members are particularly vulnerable: militarily weak, geographically exposed, and internally divided by ethnic tensions. This scenario has, in fact, made its way into recent fiction. Gen. Sir Richard Shirreff, who served as NATO's deputy supreme allied commander in Europe until 2014, wrote a novel, *2017 War with Russia*, based on his concerns about a Russian attack on the Baltics.[94] In the novel, Russian President Vladimir Putin orchestrates several events to weaken NATO's resolve and create a justification for sending forces into the Baltics. These events include using the

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[94] Richard Shirreff, *2017 War with Russia* (London, UK: Coronet Books, 2016). The main point of the novel is about Britain's military unpreparedness for future conflict. The novel follows what is apparently a British tradition of retired generals warning about military unpreparedness. Gen. Sir John Hackett made similar warnings in novel form during the 1980s: *The Third World War: The Untold Story* (London, UK: Sedgwick and Jackson,1982).

war in Syria to push refugees into Turkey to cause a crisis throughout Europe, blaming Ukraine for a rocket attack on a school conducted by Russian forces, and inciting violence during demonstrations in Latvia. He then conducts a lightning strike to capture the countries before NATO can react.

The weakness is not fictional. RAND's extensive wargaming of a Baltic invasion concluded, "the outcome was, bluntly, a disaster for NATO. Russian forces . . . were at the gates of or actually entering Riga, Tallinn, or both between 36 and 60 hours after the start of hostilities."[95] Assessments continue to be grim. A recent U.S. Army report noted a wide variety of shortfalls in reinforcing units—"underequipped, undermanned, inadequately organized"—stemming from the fact that these units would be infantry that lack the heavy firepower needed to confront Russian armor.[96]

China

Graham Allison, as noted earlier, devotes an entire book to the "Thucydides Trap," the proposition that there is a high risk of war between a rising China and a status quo United States. He notes that China entered the Korean War against the United States in 1950 even though it had recently endured years of civil war and millions of casualties. It took on a nuclear power at a time when it had no nuclear weapons of its own and did this only five years after the United States had vanquished Nazi Germany and Imperial Japan.[97]

Further, China's doctrine for conventional strike appears to "stress the importance of surprise."[98] The long-range precision weaponry that the PLA has built up gives it "distinct

> **Vignette: China invades Taiwan**
>
> China launches surprise attack on Taiwan to forestall a possible declaration of independence. PLA forces establish A2/AD bubble around island but do not attack U.S. forces in Pacific. Most U.S. allies call for negotiations and declare neutrality. U.S. decides not to launch counteroffensive in such unfavorable circumstances.

> **Vignette: China attacks Vietnam**
>
> The Chinese escalate their actions in the South China Sea, moving an oil rig and fishing vessels into a disputed area. When the Vietnamese resist, China conducts strikes against Vietnamese air and naval bases. The United States has few good options for helping the Vietnamese, and its position in the South China Sea deteriorates.

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[95] David A. Shlapak and Michael W. Johnson, "Reinforcing Deterrence on NATO's Eastern Flank: Wargaming the Defense of the Baltics" (Arlington, VA: RAND Corporation, 2016), http://www.rand.org/pubs/research_reports/RR1253.html.

[96] Wesley Morgan, "U.S. Army Unprepared to Deal with Russia In Europe," *Politico*, September 2, 2017, http://www.politico.com/story/2017/09/02/army-study-173rd-airborne-brigade-europe-russia-242273.

[97] Allison, *Destined for War: Can America and China Escape Thucydides Trap?*

[98] Roy Kamphausen, David Lai, and Travis Tanner (eds.), *Assessing the People's Liberation Army in the Hu Jintao Era* (Carlisle Barracks, PA: U.S. Army War College Press, 2014), 315 http://ssi.armywarcollege.edu/pdffiles/pub1201.pdf; Michael Chase and Arthur Chan, *China's Evolving Approach to "Integrated Strategic Deterrence"* (Berkeley, CA: RAND Corporation, 2016), 38, https://www.rand.org/pubs/research_reports/RR1366.html.

first-mover advantages" because strikes against an unprepared opponent will have much greater effects than against a prepared opponent.[99]

Regional adversaries and desensitization to threats

The long years of peace and a continuing high level of international tensions have made the United States vulnerable to "desensitization" by prospective opponents, especially regional opponents who tend to be less restrained than nuclear-armed great powers. That is, the United States and its allies are accustomed to and discount aggressive actions by potential adversaries. Aircraft and ships harass each other, exercises show off military capabilities, missile launches demonstrate long-range strike capabilities, all without ending in actual conflict. The United States and its allies thus see aggressive actions as political and diplomatic signals, not as military threats. However, in the run-up to a surprise attack, a potential adversary could use these tensions as a way to desensitize the United States and its allies to an increasing threat. For example, Iranian small boats have repeatedly threatened U.S. ships in the Persian Gulf but have always backed off. Some day they might not back off.

This desensitization also applies to political rhetoric, particularly to that of the North Koreans who have made an art form of inflammatory statements. A few examples include: "I will surely and definitely tame the mentally deranged U.S. dotard with fire"; "In the case of our super-mighty preemptive strike being launched, it will completely and immediately wipe out not only U.S. imperialists' invasion forces in South Korea and its surrounding areas but the U.S. mainland and reduce them to ashes."[100] Decades of such rhetoric have signified a continuing state of tension but no actual military action and have inured the United States and its allies to any more ominous significance.

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[99] Thomas Shugart and Javier Gonzalez, *First Strike: China's Missile Threat to U.S. Bases in Asia* (Washington, DC: Center for a New American Security, 2017), 1–3, https://s3.amazonaws.com/files.cnas.org/documents/CNASReport-FirstStrike-Final.pdf.
[100] Phil McCausland, "Kim Jon Un Calls President Trump 'Dotard' and 'Frightened Dog,'" NBC News, September 22, 2017, https://www.nbcnews.com/news/world/north-korea-s-kim-jong-un-calls-president-trump-frightened-n803631; "N.K. threatens to fire four missiles toward Guam," Yonhap News Agency, August 10, 2017, http://english.yonhapnews.co.kr/news/2017/08/10/0200000000AEN20170810000600315.html

Chapter 5: Technological Surprise

Technological surprise occurs when the performance of new tools of warfare contravenes expectations and produces strategic effects. This form of surprise is a favorite of military futurists and science fiction writers given the often-fantastic nature of potential future capabilities. There are two ways that technological surprise can occur. First, there are adversary capabilities that are not anticipated or adequately appreciated. Second, there are our own technologies that don't perform as prewar planning and testing had led planners to believe. This chapter explores these two pathways, along with areas of current U.S. vulnerability.

Surprise from an adversary's technology

As with other kinds of surprise, technological surprise is not absolute, that is, scientists in the victim's society will have anticipated the technology. The key point is that the technology was not sufficiently understood and acted upon by opposing nations and their forces in the field.

In great power conflicts, few technological surprises, in themselves, win wars. They may be decisive in conflicts that pit a great power against a regional power, but great powers have the depth and breadth necessary to weather the unexpected. Nevertheless, technological surprises can provide tactical advantages that may be of such magnitude that they produce strategic effects. For example, the Japanese Zero fighter in World War II surprised allied air forces and enabled Japan to gain aerial dominance for about a year but did not bring ultimate victory. (See detailed discussion later in this chapter.) The one clear exception is nuclear weapons. These weapons were so powerful that they forced termination of the war.[101]

Surprise from technology evolution, not revolution

Technological surprise is sometimes attributed to technological "revolutions" but surprise stemming from technological evolution is far more common. Herman Kahn had an insightful thought experiment in this regard. Writing in 1962, he looked at military technology after World War II and imagined what a war with the Soviet Union would have looked like at five-year intervals (1951, 1956, 1961). He examined the weapons available and speculated what their battlefield effects might have been. He then applied this methodology to forecast future conflicts (1965, 1969, 1973). What became evident was how evolving technologies—especially aviation, nuclear weapons, and command-and-control—altered the nature of a conflict. The apparent abruptness of change was an artifact of the five-year interval between

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[101] This formulation is not intended to ignore the debate about exactly what finally convinced the Japanese to surrender. Without question, the Soviet invasion of Manchuria had an important effect on the Japanese leadership. But if Japan had not surrendered in August 1945, the continued use of atomic weapons would ultimately have forced a surrender.

conflicts and of the rapid pace of technological evolution during this period.[102] All evolving technologies, therefore, create a vulnerability to surprise.

Handel's Categorization of Technological Surprise

Michael Handel describes two types of technological surprise: type one, a single system that has major impact but cannot be widely employed; and type two, a large number of systems developed and widely employed.[103]

Type one surprises abound in fiction. Probably the best-known example in popular culture is the Death Star of the *Star Wars* movie series. The Death Star (for those who have somehow lived through last 35 years without encountering it) was an orbiting battle station the size of a small planet. Its primary weapon was a superlaser that could destroy entire planets and purportedly contained 1 million crewmembers. Constructed in secret, its existence was dramatically revealed when the superlaser destroyed the planet Alderaan. The trope was so compelling that the Star Wars series used it twice, once in the original Star Wars movie (*A New Hope*) and a second time in *Return of the Jedi.*[104]

The trope of the super weapon was deeply embedded in science fiction before Star Wars. H.G. Wells, for example, hypothesized weapons of mass destruction (*The Shape of Things to Come*). Jules Vern hypothesized super weapons as aircraft (*Robur the Conqueror*), high-speed vehicles (*Master of the World*), and submarines (Nautilus in *20,000 Leagues under the Sea*). But the trope goes back even further. One could argue that the Trojan horse of Homer's *Odyssey* represents a type one surprise. It took extensive effort to build, had never been seen before, was constructed in secret, and provided a major battlefield advantage when employed.

Type one surprise is not confined to fiction, however. Historical examples, although rare, include the U.S. atomic weapons program and the British code-breaking effort in World War II, code-named Ultra.

- *U.S. nuclear weapons program:* Initial interest in uranium research began in 1939 when Albert Einstein and Leo Szilard wrote to President Roosevelt to alert him that German researchers were already researching military uses for uranium and to urge that the allies should do the same. When the United States entered the war, the Manhattan Project was officially established in 1942 to develop and field an atomic bomb. Headquartered at Oak Ridge, Tennessee, the project eventually employed over 130,000 people at 30 sites in the United States and cost roughly $30 billion in FY 2018 dollars. The project involved producing the needed fissile material—enriching uranium ore and separating plutonium—and fabricating the electro-mechanical parts for a bomb. After a successful test on July 16, 1945, the weapon was used the following month on Hiroshima and Nagasaki, Japan. Secrecy was an absolute requirement to avoid alerting adversaries about the discoveries that the project was making and not

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[102] Kahn, *On Thermonuclear War*, 417–523.
[103] Handel, "Intelligence and the Problem of Strategic Surprise," 229–81.
[104] Star Wars, http://www.starwars.com/databank/death-star; Death Star, http://starwars.wikia.com/wiki/Death_Star.

induce them to start their own programs. According to the U.S. Department of Energy, "Secrecy in the Manhattan Project was so complete that many people working for the organization did not know what they were working on until they heard about the bombing of Hiroshima on the radio."[105]

- *Ultra:* During World War II, the German military used Enigma devices to encrypt sensitive messages. The machine was extremely complex, with huge numbers of possible encryption pathways. Believing their messages to be undecipherable, the Germans continued to use the devices until the end of the war. However, the British, aided by some early Polish work, assembled a massive effort at Bletchley Park to break the Enigma code. The work included not just thousands of personnel but the first real computers as well. As a result, British analysts were able to decrypt 90,000 Enigma messages from 1942 to the end of the war. Yet, according to F.W. Winterbotham, who wrote the first major analysis of the codebreaking program, even when German intelligence analysts realized that the British knew the exact locations of German U-boats, "they did not accept the fact that [the allies] had broken Enigma." Sir Harry Hinsley, another historian of codebreaking, argued that, although the Allies would have eventually won the war without Ultra, the existence of Ultra shortened the length of the conflict. The secrecy was so complete that little information about Ultra was public until Winterbotham's publication of *The Ultra Secret* in 1974.[106]

These examples reveal several characteristics of type one surprise. The first is that they require major investments of capital and personnel and are therefore intended to have a major impact on the battlefield. Because of the high investment, militaries often go to extreme lengths to protect the projects' secrecy. Access is tightly controlled with very few people knowing the full scope of the project. Type one surprises are also easier to conceal due to their unitary nature, which does not require wide distribution. As a result of both the high secrecy and unitary nature, type one surprises are often completely unexpected by adversaries.

Type two surprises arise from widely employed technologies. Some are new systems developed from technologies never used in war before while others are modifications of existing systems to create radically new capabilities. These latter are generally "known unknowns." These technologies have often been discussed, sometimes at length, in professional circles, but there is no definitive answer about their effectiveness until they are actually employed in a great power conflict.

Type two surprises are impossible to fully conceal once used. Thus, a type two surprise generally has only a narrow window of effect. Once an adversary sees the technology and understands its origins, the adversary develops countermeasures. Sometimes these

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[105] Vincent C. Jones, *Manhattan: The Army and the Atomic Bomb* (Washington, DC: Center for Military History, U.S. Army, 1985), https://history.army.mil/html/books/011/11-10/CMH_Pub_11-10.pdf; U.S. Department of Energy, "The Manhattan Project: Making the Atomic bomb," January 1999, 19, https://www.osti.gov/accomplishments/documents/fullText/ACC0001.pdf.

[106] F.W. Winterbotham, *The Ultra Secret* (New York: Harper and Row, 1974), 85; Sir Harry Hinsley, "The Influence of ULTRA in the Second World War," Security Group Seminar, Lecture at Babbage Lecture Theatre, October 19, 1993, http://www.cdpa.co.uk/UoP/HoC/Lectures/HoC_08e.PDF.

countermeasures are tactical, as with the British response to the V1 cruise missile and the U.S. response to the Japanese Long Lance torpedo. Sometimes these countermeasures are technical, such as masks to protect against poison gas. Frequently, adversaries develop their own comparable technology.

Betts had these kinds of technological surprises in mind when he argued that most technological surprises have small effects on the overall military balance: "[S]trickly technical surprises are frequent. Most are minor or they are recognized and hedged against with new countermeasures. They are part of the natural ebb and flow of defense modernization and procurement." Betts further argued, "Purely technical surprises usually arise because the victim's short-term ignorance."[107] Freedman also cautions against placing too much weight behind technological advances and their ability to decisively shape conflict. Instead, he argues that war is plagued by inherent uncertainty and that technological advances rarely do much to ensure immediate victories.

A few examples serve to illustrate this dynamic:

- *Poison gas in World War I*: The Germans first used poison gas, chlorine, in a major way on April 22, 1915, during the second battle of Ypres. (There had been smaller, unnoticed usages earlier.) The attack was a complete surprise to allied troops. The resulting casualties and panic among the survivors opened a four-mile gap in the French front. As this use was an experiment, the Germans were not prepared to fully exploit the advantage and only achieved a local, tactical success. Within days, the allies had developed crude gas masks and, in short order, designed fully effective anti-gas protective measures. This made gas attacks much less effective. In fact, countermeasures became so good that gas caused fewer deaths, though more injuries, than high explosives.[108] Within six months, the allies produced their own poison gases so the Germans were forced to develop their own countermeasures and suffer the restrictions that operating under gas conditions imposed.

- *Japanese A6M Zero fighter:* The Japanese Zero was known to the U.S. military before the war but only after meeting it in combat did U.S. aviators appreciate its long range and high maneuverability. This gave the Japanese a significant advantage in aerial combat and alarmed allied pilots. The Zero allowed Japan to gain aerial dominance for about a year. However, with experience and the capture of an intact Zero during the Aleutian Island campaign, the Zero's weaknesses—poor diving ability and weak protection—became apparent. Refined fighter tactics (for example, the Thatch weave maneuver) and the fielding of improved U.S. aircraft such as the F6F Hellcat and the F4U Corsair eventually gave U.S. aviators dominance over the Zero.[109]

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[107] Richard Betts, "Surprise Despite Warning: Why Sudden Attacks Succeed," *Political Science Quarterly*, Vol. 95, No. 4 (Winter, 1980-1981), 111–13.

[108] James Kendall, *Breathe Freely! The Truth about Poison Gas* (New York: Appleton Century Company, 1938), 46–54

[109] Jacob Neufeld, William T. Y'Blood, and Mary Lee Jefferson, *Pearl to V-J Day World War II in the Pacific*, Air Force History and Museum Program, 2000, 76, https://media.defense.gov/2010/Sep/28/2001329789/-1/-1/0/AFD-100928-060.pdf.

- *Soviet T-34 tank:* The Germans first encountered Soviet T-34 tanks in July 1941, just a month after the opening of Operation Barbarossa. With a powerful gun, well-designed armor, and mechanical reliability, the T-34 was superior to German panzers. The Germans were stunned that the backward Slavs could develop such a weapon. Gen. Heinz Guderian, commander of one of the panzer groups, lamented, "Up to this time we had enjoyed tank superiority, but from now on the situation was reversed. The prospect of rapid, decisive victories was fading in consequence."[110] However, Soviet ill-preparedness, with inexperienced commanders and poorly trained tank crews, limited the T-34's impact on the battlefield. The Germans responded by upgrading their tank fleet with heavier guns, retiring lighter tanks, and developing the heavy Panther and Tiger tanks. German antitank crews learned to destroy the T-34 by exploiting its poor visibility and weak transmission. Nevertheless, the T-34, upgraded continuously during the war, remained an effective weapon. [111]

- *V-1 and V-2 missile attacks:* The allies had inklings about the German V-1 (cruise missile) and V-2 (ballistic missile) programs from various intelligence sources but dismissed such weapons as technologically infeasible. The allies did conduct air attacks on the Peenemunde development center in August 1943 and on other suspicious sites later as a precautionary measure. These attacks slowed, but did not halt, the programs. When the V-1 attacks began, the British were initially surprised but quickly set up defensive barriers consisting of fighters, antiaircraft guns, and balloons, so that ultimately only 25 percent of V-1 rockets reached their intended targets. The V-2 proved to be much more difficult to counter because of its ballistic trajectory and faster speed. Air attacks on fixed launchers were successful, but the Allies were not aware that the both the V-1 and V-2 could be launched from mobile platforms, so attacks were not stopped entirely. A British disinformation campaign fooled the Germans into firing rockets short of London but that did not stop the attacks. Fortunately for the British, the V-1 and V-2 effects, while damaging, did not reach a scale where they could change the outcome of the war.[112]

- *Sputnik:* Sputnik was a peacetime technological surprise, so it does not quite fit with the wartime examples here. However, it does give an important insight into how the United States thinks about technology competition. During the 1940s and 1950s, the United States had led the Soviet Union in nearly all technological areas. The United States, for example, had developed nuclear weapons first as well as jet fighters, radar, and a wide variety of other warfighting technologies. The Soviet Union appeared to win World War II through brute force and its willingness to accept high casualties. Therefore, the United States did not expect that a supposedly backward Soviet Union could pull ahead in a key warfighting technology. But the Soviet Union did exactly that on October 4, 1957, when it launched Sputnik One, the world's first man-made

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[110] Heinz Guderian, *Panzer Leader* (London, UK: Michael Joseph, 1952), 237–38.
[111] Christopher Foss, *World War II Tanks and Fighting Vehicles* (New York: Arco Publishing, 1981), 110–14.
[112] John Keegan, *The Second World War* (London, UK: Penguin Books, 2005), 258–94.

satellite, after the United States had repeatedly failed in its attempts to launch its own satellites. The result was not just surprise, but near panic. [113]

Some technologies can begin as a type one surprise before morphing into a type two surprise. For example, the U.S. development of stealth technology, particularly the F-117 and B-2 programs, began as a type one concealed technology. The United States developed the F-117 in the late 1970s and 1980s as part of an extensive research effort on low observable technologies. The B-2 effort began at roughly the same time, but developmental difficulties delayed operational usage until the late 1990s. Both were developed in great secrecy, although vague reports had leaked out. The F-117's existence was officially disclosed in 1988, and the aircraft flew combat missions in Panama in 1989. The B-2 was first displayed in 1988 and used in combat in the air war against Serbia in 1999.

Occasionally, the advantage of a type two surprise can be maintained for an extended period even after it is no longer a surprise. For example, the United States has been able to use stealth effectively for a long time because countermeasures are so difficult even though the technology is now widely understood. Similarly, the Germans were able to use the V-2 rocket for over a year because there was no defense and attempts to destroy the rockets before launch had only partial success.

Reactions to technological surprise

The first reaction is adaptation—tactical/doctrinal, then technological—since those on the battlefield have little choice. When that is not possible, forces will occasionally withdraw until more favorable circumstances develop. Thus, the German U-boat fleet pulled out of the mid-Atlantic in June 1943 after heavy losses in May. They returned in the fall when new German weapons became available. At the extreme, there is anger and a touch of panic. Here a U.S. tank commander in World War II describes facing superior German tanks: "To see 25 or even many more of our rounds fired and ricochet off the enemy attackers. To be finally hit, once, and we climbed from a burning, blackened, and now useless pile of scrap iron . . . cost us not just tanks and skilled men but the heart ache and sense of defeat that I and other men have felt."[114]

Surprise from failure in our own technology: "a stab in the back"

Just as important as surprise from adversary technology, but virtually absent from the literature, is surprise that occurs when our own weapons do not operate as expected. Militaries enter conflicts assuming the equipment that they have tested, purchased, and fielded will work. However, history is full of examples where wartime performance fell below peacetime expectations. This kind of surprise is extremely difficult to foresee, a classic "unknown unknown," because the technologies are generally thought to be understood; otherwise they would not have been fielded.

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[113] "The Legacy of Sputnik," Editorial, *New York Times*, October 4, 2007, 28, http://www.nytimes.com/2007/10/04/opinion/04thur3.html.
[114] Cited in David E. Johnson, *Fast Tanks and Heavy Bombers* (Ithaca, NY: Cornell University Press, 2003), 188.

Described below are some examples of this phenomenon. The theme that runs through all of the examples is that peacetime testing, even when it is done conscientiously, cannot fully replicate wartime conditions. There is always an element of uncertainty and, hence, a vulnerability to surprise.

- *World War II torpedo defects:* From the beginning of the conflict, U.S. submarine commanders suspected that there was a problem with their torpedoes; they fired perfect shots but nothing happened. Seniors officers, who were not present, blamed the problem on a lack of crew training and poor shooting. The result was a sharp tension between commanders and their subordinates. In the U.S. military, this is probably the best known of all technological surprises because it had such a devastating impact on U.S. submarine performance.

  With time, it was discovered that the main U.S. torpedo (Mark XIV) had three, possibly four, flaws: it ran deeper than set, so it frequently ran under the target; the magnetic detonator exploded prematurely so that targets were shaken but not damaged; the backup contact detonator was faulty, crushing rather than detonating the warhead; and the torpedo likely had a tendency to circle back on the submarine. It took nearly two years of war to overcome the skepticism of senior commanders and of the engineers who developed the weapons. Eventually, tests demonstrated the problems, and the torpedoes were fixed, but U.S. submarines had lost a lot of time, a lot of targets, and a lot of lives in the process. The circling defect was never demonstrated conclusively, but several submarines experienced it and survived. The *USS Tang*, one of the top scoring U.S. submarines of World War II, experienced it and did not survive, and several unknown losses are thought to have resulted from this defect. Other nations—Germany, United Kingdom, Japan—had similar problems with their torpedoes but fixed them more quickly.

  How could these defects have occurred? In retrospect, it is clear that prewar testing had been too limited. Targets and torpedoes were expensive, so they were rarely expended. Further, the existing torpedo production facility had, in effect, a monopoly, which it protected against competition and criticism. Finally, the magnetic detonator was so secret that analyses and testing were restricted, lest the capabilities be revealed. Clay Blair, chronicler of the submarine war, concluded acidly: "The torpedo scandal of the US submarine force in World War II is one of the worst in the history of any kind of warfare."[115]

- *Air-to-air missiles in Vietnam*: In the 1950s and into the 1960s, the United States developed missiles for air-to-air warfare. Missiles were guided by either infrared seekers (AIM-9 Sidewinder) or radar seekers (AIM-7 Sparrow), attained much longer ranges than guns, and did not require perfect aircraft alignment on the target. However, during the air war over North Vietnam, these missiles proved to be a disappointment. As Thomas Mencken notes: "Prior to the war, the Defense Department expected [the AIM-7 Sparrow] to have a 70% probability of kill. In fact . . .

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[115] Clay Blair, *Silent Victory: The US Submarine War against Japan* (New York: JP Lippincott Co., 1975), 384–88.

only 8% of Sparrow launches resulted in hits. The missiles often failed to function properly due to their complexity and a large amount of sensitive equipment. In addition, pilots were poorly trained and often launched missiles out of parameters. The AIM-9 did little better with only a 15% of launches resulting in kills. Prewar testing had predicted 60%. The missile proved to be easily spoofed."[116] In response, both the Navy and the Air Force put guns back on aircraft in order to have a reliable air-to-air weapon. Guns had been removed on the assumption that missiles had made them unnecessary.

- *Antiaircraft weapons in World War II*: Although not a U.S. phenomenon, this example nevertheless captures important dynamics about expectations and prewar testing. During the 1930s, the Germans developed the 88mm antiaircraft gun. It turned out to be one of the most successful weapons of World War II, being employed effectively as an antitank weapon, a tank gun, and an artillery piece, but, ironically, it did poorly in its intended role as an antiaircraft weapon. Based on prewar tests, the Germans believed that the gun would shoot down one enemy aircraft for every four rounds fired. In fact, during wartime, the gun shot down one aircraft for every 5,000 rounds fired. Testing had been off by a factor of 1,000. How could this happen? It emerged that the prewar tests had been conducted by organizations that regarded the test, not as an assessment of the weapon but as an evaluation of their own performance. Therefore, they used specially trained and selected crews, later derided as the equivalent of Olympic athletes with Ph.D.s in physics. Test parameters were similarly doctored with single targets flying at predetermined altitudes during daylight. Wartime conditions were entirely different. Crews were hastily assembled, often using conscripted teenagers. Aircraft appeared at night, at high altitudes, and in large formations. Most important of all, wartime targets shot back.[117]

- *Lighter-than-air vehicles*: Some new and exciting technologies, for which proponents have high expectations, never really work. One example is lighter-than-air vehicles. With their ability to carry heavy loads and stay aloft nearly indefinitely, they were thought in the 1920s and 1930s to revolutionize warfare. Both Jules Verne and H.G. Wells used such vehicles as central elements of their speculative fiction. However, these vehicles turned out to be much less robust than thought. Flagship examples of this technology—the *Hindenburg* (Germany), *Akron* and *Macon* (U.S.), *R101* (UK)—all crashed. During the Second World War lighter-than-air vehicles had a useful, but very modest, role mostly by the allies in antisubmarine warfare surveillance.

Effect of surprise when technology fails

When friendly weapons do not operate as expected, the effects are focused inward: suspicion and resentment by the troops and blame by those higher up. As Capt. Edward L Beach, a World War II submarine officer, wrote after the war:

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[116] Thomas Mahnken, *Technology in the American Way of War since 1945* (New York: Columbia University Press, 2008), 94–95.
[117] Kahn, *On Thermonuclear War*, 329–30.

Anguished uncertainties, self-doubts, lack of confidence . . . were attendant upon the total reversal of all prewar training results. Nothing can be more demoralizing to men who risk their lives in combat than to be forced to use weapons which they know, from experience, are not dependable and for which they have no substitute. . . . Most inexcusable, those in ultimate authority refused to accept the continually renewed evidence that there was something wrong. All unsuccessful attacks, without exception, were blamed on the skippers, their fire control parties, and their torpedo overhaul personnel. Our technical experts had produced a perfect weapon which, by the mechanical marvel of its design, could only function correctly and could never fail to function correctly. If our torpedoes did not function as designed, the fault could only be that they were not being used correctly, for there was no way that a perfectly designed torpedo like ours could fail to work. Any other explanations were merely self-serving excuses.[118]

As a result of this thinking, senior officers relieved several submarine captains for poor shooting when, in retrospect, the problem seems to have been faulty torpedoes.

This dynamic was not limited to the U.S. Navy. When lightly armored and lightly armed U.S. Army tanks met the more powerful German tanks at Kasserine Pass in North Africa, they were chewed to pieces. The U.S. Army's immediate reaction was that the equipment was fine—well-designed and appropriate for the mission. ("The finest tanks in the world," said General Patton.) The problem was "green" troops and poor leadership. The troops did need experience, and the leadership did need improvement, but the tanks were grossly inadequate. It was late 1944 before the United States fielded a tank that could engage German tanks on even close to equal footing (the M4 Sherman with a high-velocity 76mm gun, though even that is considered, in retrospect, to have been inferior to the German Mark IV, V, and VI tanks).[119]

Areas of current vulnerability

There are current vulnerabilities in all three areas of technological surprise: type one, from capital intensive and highly secret adversary investments; type two, from superior performance of adversary technologies; and finally, from underperformance of our own technologies. Nevertheless, they are extremely difficult to foresee. Type one surprises are kept highly secret, type two surprises often aren't appreciated until actual combat, and our own technological failures are classic unknown unknowns.

Hubris amplifies theses vulnerabilities. The U.S. military is so accustomed to having across-the-board technology superiority, that it is vulnerable to surprise when adversaries have comparable or superior technologies. The United States would do well to remember the experience of the Royal Navy at the battle of Jutland in 1916. Britain had ruled the waves for two centuries. At the Battle of Jutland, it found that its upstart opponent, the German Navy,

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[118] Edward L. Beach, "Culpable Negligence: a Submarine Commander Tells Why We Almost Lost the Pacific War," *American Heritage*, December 1980, p. 41-54, http://www.americanheritage.com/content/200-years-under-sea-3%E2%80%9Cculpable-negligence%E2%80%9D
[119] Johnson, ch. 14, "Armored Bludgeon", p.189-201

had tougher ships and more accurate gunnery. British naval surprise was evident in Adm. Sir David Beatty's comment when ship after ship blew up under German fire: "There seems to be something wrong with our bloody ships today."[120]

Type one vulnerabilities

It is unlikely (but not impossible—surprise!) that China or Russia have built a Death Star or some equivalent of the Manhattan Project. However, it is likely that they have undertaken major technological projects that the United States either doesn't see or doesn't fully appreciate, but that have the potential to change the course of a conflict. Guessing what these might be is highly speculative because potential adversaries keep such technologies in deep secrecy.

> Vignette: Nonacoustic sensors
>
> Russia's long effort to develop effective nonacoustic submarine sensors pays off. In a naval conflict, U.S. and UK navies suffer unexplained submarines losses, causing them to pull all submarines back into safer waters.

One known area where such capabilities might exist is in cyberspace, the wildcard of new technologies. It has received an immense amount of attention because nearly all civilian and military communication depends on computers and global networks. For this reason, cyber has been declared a separate domain for military competition along with ground, sea, air, and space. The Defense Science Board cited it as the top U.S. vulnerability to surprise.[121] One observer summarized the vulnerability thus: "The layered technology risk combined with the multiple vulnerability vectors this brings in to every part of our war fighting capability is simply gobsmacking."[122]

> Vignette: "Assassin's Mace"— asymmetric cyber attack
>
> Using hacked personal data from the 2010 breach of the U.S. Office of Personnel Management, the Chinese conduct an "assassin's mace" cyber attack on U.S. military cohesion. Lost bank accounts, false rumors, and fake videos alarm and distract military personnel at all levels just before a Chinese attack on Taiwan.

In the commercial world, cyberattacks have increased in sophistication. Some hackers demand ransom while others publish information that is embarrassing (the hack of Sony Pictures, for example). In 2016, cyberattacks were believed to cost global businesses some $450 billion.[123] Despite the high cost and several notably severe attacks, a cyberattack has yet to destroy a corporation. Similarly, in the national security domain, publicly disclosed intrusions have not yet caused human casualties or destroyed military equipment with the

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[120] Gilbert Andrew and Hugh Gordon, *Rules of the Game: Jutland and British Naval Command* (Annapolis, MD: Naval Institute press, 2000). The book is an extended argument that the Royal Navy had become complacent in its century of dominance since Trafalgar.

[121] Defense Science Board, *2008 Summer Study on Capability Surprise, Volume I: Main Report,* 10–15.

[122] Commander Salamander, "Nice network you have there. Shame if something happened to it," U.S. Naval Institute blog, https://blog.usni.org/posts/2017/11/22/nice-network-you-have-there-shame-if-something-happened-to-it.

[123] Loyds, "Counting the cost," July 10, 2017, https://www.lloyds.com/news-and-insight/risk-insight/library/technology/countingthecost.

notable exception of the Stuxnet virus that destroyed centrifuges in Iran. All potential U.S. adversaries are known to have cyber warfighting tools, but their highly secret nature makes it hard to know their exact potential. Further, although adversaries attack U.S. networks every day, they are likely holding their most powerful "day one" cyber weapons for major conflict. Therefore, huge uncertainty exists about whether cyber could be as destructive as weapons of mass destruction or whether it would provide useful, but not war-winning, supporting capabilities. Scholars argue both sides.[124] The uncertainty opens space for surprise.

Other type one surprises are possible. For example, production of new biological weapons is coming within the capability of even moderate-sized states through gene-splicing technology. A new technique, CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats), has revolutionized gene editing— removing parts of a genome that are

> Vignette: Biological enhancements
>
> Chinese scientists develop drugs for special forces personnel that allow the soldiers to operate for extended periods and at high-energy levels without sleep or rest but at the cost of severe health reactions. They use this capability to attack U.S. airfields in the Western Pacific—extremely demanding wartime missions.

undesirable and replacing them with parts that are desirable. When used to build resistance to disease or to correct underlying genetic conditions, the technology holds great promise. However, a rogue state or nonstate group could use the technique to construct powerful biological weapons. Conventional wisdom has viewed biological agents as poor military weapons because of their delayed action, dispersed effects, and challenging delivery, but they might be attractive to states or nonstate groups with little compunction about civilian casualties.

Another possibility would be space-based weapons—lasers that would blind or jammers that would interfere with data links. With so many military capabilities for reconnaissance, communications, early warning, and geolocation dependent on space, the denial of these capabilities could give an adversary a great advantage. This was the Defense Science Board's second identified vulnerability to surprise.

Type two vulnerabilities

Proponents of new technologies and associated warfighting concepts argue that their views represent a modern analog to the carrier-versus-battleship debates of the interwar period. The insurgent aviation technology and its accompanying warfighting concepts started modestly in the early 1920s. By the 1930s, the relentless march of technology pointed to a definitive answer, that is, that aircraft would eventually dominate unprotected warships. In

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[124] For a view of high concern, see, for example, Fred Kaplan, *Dark Territory: The Secret History of Cyber War* (New York: Simon and Schuster, 2016), or Peter Singer, "The 2018 State of the Digital Union: The Seven Deadly Sins of Cyber Security We Must Face," *War on the Rocks*, January 30, 2018, https://warontherocks.com/2018/01/2018-state-digital-union-seven-deadly-sins-cyber-security-must-face/. For a view of moderate concern, see James A. Lewis, "The Truth about a Cyber Pearl Harbor," CNN, August 29, 2016, http://www.cnn.com/2017/08/29/opinions/truth-about-cyber-pearl-harbor-lewis/index.html.

1941, wartime experience—at Taranto harbor, at Pearl Harbor, and off Singapore—showed that the moment had arrived. The insurgents had been right.

Proponents of existing technologies and warfighting concepts argue that novelty is not itself a virtue and that new technologies may require a long gestation or may fail completely. For example, the heavy bomber eventually had a large impact on the course of the Second World War and subsequent military history, but it took many years during the war for this weapon and its concept of employment to be refined to the point where it was effective. Early usages (as described in the chapter on doctrinal surprise) were disappointing.

Below is an illustrative list of new capabilities with a description of the uncertainty and the potential for surprise. The list is not comprehensive but gives a sense of the scope of the challenge.

- *Contested operations in space:* Space has been a sanctuary since human beings began using it in the 1950s. As noted earlier, space assets perform many vital military functions including warning, communications, reconnaissance, and geolocation. The United States, China, and Russia have developed antisatellite capabilities that could degrade these functions in future conflicts in ways not fully understood.[125]

> Vignette: U.S military satellites neutralized
>
> Chinese hackers gain access to U.S. satellite ground terminals through phishing attacks and plant malware in the orbital station-keeping instructions for several satellite constellations. When conflict breaks out, the malware is activated, causing many satellites to de-orbit and be lost. U.S. headquarters take others offline to ensure security.

- *Autonomous combat vehicles*: Autonomous combat vehicles, in the sense of missiles with precision guidance, are with us now. Loitering and long-endurance vehicles that can recognize targets on their own are clearly within current capabilities. If combined with weapons release authority, such vehicles could become independent actors on the battlefield.[126]

> Vignette: Pearl Harbor 2.0—Drone-style
>
> Swarms of autonomous drones with artificial intelligence, launched covertly from container ships, attack U.S. bases on Hawaii, Okinawa, and Guam. Ships, aircraft, and command centers are destroyed or neutralized.

- *Missile defense:* Missile defenses have been tested in regional conflicts: by the United States against Iraqi SCUDs in 1991 and 2003, by Israel against Palestinian rocket attacks, and by the Saudis against Yemeni rebel rocket attacks. However, these

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[125] Todd Harrison, Zack Cooper, Kaitlyn Johnson, and Thomas G. Roberts, *Escalation and Deterrence in the Second Space Age* (Washington, DC: Center for Strategic and International Studies, 2017), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/171109_Harrison_EscalationDeterrenceSecondSpaceAge.pdf.
[126] M.L. Cummings, *Artificial Intelligence and the Future of Warfare* (London, UK: Chatham House, 2017), https://www.chathamhouse.org/sites/files/chathamhouse/publications/research/2017-01-26-artificial-intelligence-future-warfare-cummings-final.pdf.

systems have not been used against the advanced weapons that a great power could field, with warhead maneuvering and decoys, or against an adversary capable of large salvos designed to overwhelm defenses by sheer weight of fire. Peacetime tests might be encouraging, but no definitive answer is possible without the challenges of actual combat.[127]

- *Hypersonics:* The United States, the Chinese, and the Russians have experimented with hypersonic weapons, which allow very-high-speed, long-range strikes for which few defenses exist. Such weapons would give the possessing country a large first-mover advantage because attacks might be conducted so rapidly that even an alerted defense could not defend effectively.

In addition to new technologies, there are long existing capabilities and missions that have been changed by new technologies. How these capabilities and missions might operate in conflict is highly uncertain because it has been decades since they have been subjected to the kind of stress that another great power might impose. Many of these uncertainties are analogous to the previously discussed carrier vulnerability question, that is, they have been identified and discussed in the national security community, but no definitive answer is possible in peacetime. And with uncertainty comes the possibility of surprise.

- *Submarine operations against sophisticated antisubmarine defenses:* Since World War II, U.S. submarines have conducted very sophisticated operations in reconnaissance and in stalking adversary submarines.[128] However, U.S. submarines have not fired a shot in anger since 1945 nor have they been attacked by sophisticated antisubmarine defenses such as the Chinese and Russians would possess in waters close to their homelands.[129]

- *Base vulnerability to long-range precision strike:* U.S. overseas bases have been sanctuaries since 1945, experiencing only nuisance hit-and-run attacks. However, U.S. bases in the Western Pacific are within range of Chinese long-range strike systems as are U.S. bases in Europe to Russian systems. These strikes have the ability to shut down base operations, at least temporarily if not permanently. Whether base defenses would be adequate and how the United States might continue to operate under degraded conditions is unclear.[130]

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[127] Thomas Karako, Ian Williams, and Wes Rumbaugh, *Missile Defense 2020: Next Steps for Defending the Homeland* (Washington, DC: Center for Strategic and International Studies, 2017), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/170406_Karako_MissileDefense2020_Web.pdf; Thomas Karako et al., *Missile Defense and Defeat: Considerations for the New Policy Review* (Washington, DC: Center for Strategic and International Studies, 2017), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/170228_Karako_MissileDefenseDefeat_Web.pdf.

[128] Sherry Sontag and Christopher, *Blind Man's Bluff: The Untold Story of American Submarine Espionage* (New York: Perseus Books, 1998), especially 140–58.

[129] Bryan Clark, *The Emerging Era in Undersea Warfare* (Washington, DC: Center for Strategic and Budgetary Assessments), http://csbaonline.org/research/publications/undersea-warfare/publication; Kathleen H. Hicks, Andrew Metrick, Lisa Sawyer Samp, and Kathleen Weinberger, *Undersea Warfare in Northern Europe* (Washington, DC: Center for Strategic and International Studies, 2016), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/160721_Hicks_UnderseaWarfare_Web.pdf.

[130] Shugart and Gonzalez, *First Strike: China's Missile Threat to U.S. Bases in Asia*.

- *Artillery exchanges using precision munitions:* Historically, artillery has often fought other artillery (called "counter-battery fire"), but the natural dispersion of the projectile trajectories and the uncertainty of target location required firing large numbers of shells to achieve even small effects. The guided artillery projectiles and accurate target location now available allow a single round to do what dozens or hundreds did previously. This may change the dynamic of fire support into one of mutual vulnerability of the hunter and hunted.[131]

- *Vulnerability of lines of communication to interdiction:* United States has had completely protected lines of communication since the Second World War. Even when fighting on land was intense, such as in Korea and in Vietnam, the sea and air lines of communication were free of interference. In a great power conflict, this will no longer be the case. Both Russia and China have the ability to attack U.S. transport aircraft and cargo ships with submarines, long-range missiles, and aircraft, threatening once secure lines of communication, and forcing a twenty-first-century version of World War II's Battle of the Atlantic.[132]

- *Ability of aircraft with stealth and electronic warfare protection to penetrate sophisticated air defenses:* The United States has built a powerful fleet of stealth aircraft, including the B-2 bomber, F-22 fighter, and F-35 multirole fighter and is

> Vignette: Stealth strike fails—Schweinfurt-Regensburg in the twenty-first century
>
> In a conflict over the Baltics, NATO decides to strike Kaliningrad because fires from the enclave are impeding NATO reinforcements. The strike consists of stealth aircraft with electromagnetic support but suffers heavy losses when the Russians are still able to use their advanced air defenses effectively.

developing a next-generation stealth bomber (B-21). The assumption is that these aircraft, properly supported with electronic warfare systems either on the aircraft or in supporting aircraft, can penetrate even the most sophisticated air defenses. However, the air defenses that stealth aircraft have fought against up until now have not had the capability that a great power air defense would have.[133]

[131] Carlo Kopp, "Artillery in the Digital Age," *DefenceToday*, October 2010, https://www.ausairpower.net/SP/DT-Guided-Artillery-Oct-2010.pdf; Shawn Woodford, "The Russian Artillery Strike That Spooked the U.S. Army," Dupuy Institute, March 29, 2017, http://www.dupuyinstitute.org/blog/2017/03/29/the-russian-artillery-strike-that-spooked-the-u-s-army/.

[132] For a discussion of how this environment has changed in the Pacific, see Michael Green, Kathleen Hicks, and Mark Cancian, *Asia Pacific Rebalance 2025* (Washington, DC: Center for Strategic and International Studies, January 19, 2016), 164–66, https://www.csis.org/analysis/asia-pacific-rebalance-2025.

[133] David Axe and Noah Shachtman, *"Operation Chimichanga" Tests Pentagon's Stealth Strike Force* (Washington, DC: Brookings Institution, 2012), https://www.brookings.edu/opinions/operation-chimichanga-tests-pentagons-stealth-strike-force/.

Technology Failure

Finally, there is surprise that arises when our own technologies do not work as expected. The U.S. military is particularly dependent on technology as it has progressively substituted capital for labor and sought to reduce the exposure of service members to enemy fire. On the whole, this

> Vignette: Technological stab in the back
>
> A bad batch of chips is used in the manufacture of the Advanced Medium-Range Air-to-Air Missile, or AMRAAM (AIM-123D). This renders most of the U.S. long-range air-to-air missiles ineffective, allowing the Chinese to effectively strike military targets on Guam. However, service material commands and the manufacturer discount reports of failures, blaming inexperienced pilots for launching out of parameters.

effort has been successful with the United States establishing dominance over its recent adversaries and reducing the number of casualties. The flipside of this technological advantage is that the United States has become particularly vulnerable because of what Thomas Mahnken called, "The technological optimism that has historically animated U.S. defense planning. . . . [even though] the realities of technological development and acquisition frequently belie optimistic predictions."[134]

Technological failures are extremely hard to predict because, if we knew where the defects were, we would fix them. Further, because all systems have been tested in peacetime, there is a confidence about their performance that does not allow the possibility of surprise failures. Nevertheless, potential failures likely exist. As Williamson Murray notes, "capabilities create dependencies, and dependencies create vulnerabilities." And he might have added, vulnerabilities create the possibility for surprise.[135]

Two examples illustrate this vulnerability.

- *Global Positioning System (GPS):* The system works perfectly in peacetime, and is tested every day through nearly ubiquitous civilian and military use. The wartime vulnerability of the system to attack on the satellite constellation and to local jamming is well known. However, it has been a generation since the U.S. military has operated without precise navigation, and its ability to shift quickly to backup systems and procedures is likely poor. Although the military still teaches navigation with map and compass, those skills are thin. Backup navigation systems like Loran have been deactivated as redundant. Alternative navigation methods like inertial systems exist but are thinly spread and are less robust.

- *Cooperative Engagement Capability (CEC):* To increase the number of shooters and sensors, the Navy has been expanding the use of networks in naval warfare. At the heart of the counter-air mission is the Cooperative Engagement Capability (CEC). This technology enables a remote sensor, like an E-2D Hawkeye, to provide targeting information and terminal guidance to a missile launched from a distant AEGIS destroyer. This complex piece of naval warfare is highly dependent on datalinks to

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[134] Mahnken, *Technology in the American Way of War since 1945*, 2.
[135] Williamson Murray, *America and the Future of War: The past as Prologue* (Stanford, CA: Hoover Institution Press, 2017), 177.

move information between platforms and ultimately to the munition. CEC is constantly being upgraded in order to refine and expand its capabilities. It is conceivable that a future upgrade, rushed into service to meet an immediate threat, might have unforeseen flaws. Or that there was a long-standing bug, not discovered by regular peacetime operations. Or that a piece of malware was inserted. Any of these could cause CEC, a vital capability for defending the fleet from mass cruise missile attacks, to fail in combat. While this may seem like an unlikely scenario, there are historical precedents for vital systems failing when first employed in combat—air-to-air missiles, as previously described, for example.

Chapter 6: Doctrinal Surprise

Doctrinal surprise is the use of known capabilities or technologies in unexpected ways that produce powerful new effects. Some experts (Betts, Handel, Finkel) combine doctrinal and technological surprise because the two so frequently occur together—new technologies and new concepts of their employment. This study makes a distinction in order to provide more nuance to the discussion. Technological surprise arises from a single weapon or platform whereas doctrinal surprise arises from putting together in new ways several different technologies, some of which may be new but some of which may be long known. Doctrinal surprise can also come from the unexpected failure of one's own warfighting concepts.

"Doctrine" is used here in a generic sense, that is, a military's concept for employing people and weapons in a conflict. Doctrine has very formal connotations—manuals, schools, and formal processes— that apply only to large militaries that have establishments for education and research. That is not the way doctrine is used for this study. Any entity, no matter how small or informal, can have a doctrine in the generic sense that this study uses it.

The typical reaction to doctrinal surprise is, we didn't realize that could be done. Marc Bloch, a university professor who fought in the First World War and was recalled to service in the second, captured the disorienting effect of doctrinal surprise when he lamented: "From beginning to end of the campaign, the Germans showed this embarrassing skill of appearing where they ought not to have appeared. They did not, in fact, play the game."[136] Bloch was talking about the blitzkrieg and how the German tempo of operations was faster than the French could deal with. However, the latter part of his observation captures the general problem of doctrinal surprise, that is, the adversary was not doing what was expected.

Many paths to doctrinal surprise

There is a considerable academic literature about how militaries develop new doctrines and capabilities.[137] Broadly speaking, nations with large, tradition-bound, and bureaucratic militaries are likely to be slow to adopt doctrinal changes that cut against established patterns of behavior and organizational culture. For example, both the United States and Great Britain experimented with tanks before World War II but did not build their first tank divisions until 1940. It was the rebuilding German Army, which had fewer institutional restraints after having been shattered in World War I, that built multiple tank units before the war and was successfully able to implement blitzkrieg.

Writing in the 1980s, Richard Betts contended that doctrinal surprises were rare. They required technological changes coupled with a "revolution in operational strategy." The

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[136] Marc Bloch, *Strange Defeat: A Statement of Evidence Written in 1940* (New York: W. W. Norton & Company, 1968), 47.

[137] Barry Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca, NY: Cornell University Press, 1986); Stephen Rosen, *Winning the Next War*: *Innovation and the Modern Military* (Ithaca, NY: Cornell University Press, 1991).

examples below demonstrate, however, that when doctrinal surprise does occur, it can be very powerful because of the psychological as well as physical effects.

In examining the many ways that doctrinal surprise can occur, this study has developed five categories: adversaries develop innovative combinations of existing capabilities and emerging technologies; attacks on "safe spaces"; breaking taboos; blurring the line between peace and war; and our own doctrinal failure. These are described below, with historical examples for illustration.

Development of Innovative combinations of existing capabilities and emerging technologies

The classic example is the German blitzkrieg of World War II. The Wehrmacht combined armored forces, with enhanced communications, close air support, and motorized infantry, to produce battlefield advances so rapid that their adversaries could not cope and were eventually surrounded and destroyed. The French and British did not lack the key technologies; the French and British had the same technologies. Indeed, the French had more tanks and better tanks (SOMUA and Char B) than the Germans.[138] However, the Germans put the technologies together differently and produced a powerful new capability.

This was a surprise that was not a secret. The process had occurred openly, with extensive discussion in the German military professional journals. Much of this literature was translated into foreign languages and thus was accessible, read, and discussed in other countries.

What made it surprising was that the pieces had come together just before the war began. German forces in the Spanish Civil War (1936–1939), which were closely watched by other militaries, did not yet exhibit these doctrinal advances. When the new warfighting concepts produced extraordinary battlefield success in 1939 and 1940, many German generals were as astonished as Germany's victims. These generals had experienced the trench warfare of the First World War, and many still had that structure in their heads. Indeed, the first German war plan for an attack on France was an infantry-heavy concept that resembled the Schlieffen plan. It was only when this plan was compromised, and Hitler intervened personally to support the ideas of some visionary officers, particularly General Manstein, that the revolutionary plan was adopted.[139]

A more recent example is the insurgent's widespread use of improvised explosive devices (IEDs) in Iraq. During the long insurgency in Iraq, U.S. forces faced an adversary that could not stand up to them in a conventional firefight and, instead, employed the techniques of asymmetric warfare. One such technique was the use of IEDs, which combined the existing technology of bombs, homemade or scrounged from abandoned Iraqi Army depots, with

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[138] The SOMUA, the French medium tank, was armed with a 47 mm gun; the Char B, the French heavy tank, was armed with both a 75 mm gun and a 47 mm gun. Both were far superior to the German Mark I (machine guns only), II (20 mm gun), and III (37mm gun) tanks that comprised nearly all of the German armored inventory at this time. See Karl-Frieser, *The Blitzkrieg Legend: The 1940 Campaign in the Wes*t (Annapolis, MD: Naval Institute Press, 2005).

[139] Alister Horne, *To Lose a Battle* (London, UK: Penguin, 2007); Erich Von Manstein, *Lost Victories*, translated by Anthony Powell, ch. 5, "The Operational Plan Controversy," 94–126. Manstein describes how many elements of the German staff fought against innovative use of the tank forces and how he was exiled to an infantry corps despite having devised the blitzkrieg plan that was eventually adopted.

improvised triggering devices such as cell phones, wires, contact plates, or antidisturbance devices. By late 2003, IEDs were responsible for the majority of U.S. and coalition deaths. Attacks soared to 24,000 in 2007, becoming increasingly sophisticated. Surprise was total. Mines had been encountered in previous conflicts, used in established ways by conventional forces. They had also been seen in insurgencies. In Vietnam, for example, booby-traps were common but an adjunct to operations by guerrilla forces. In Iraq, these devices became the primary method of resistance.[140]

Attacks on "safe" spaces

Attacks on supposedly safe areas achieve surprise by the nature of their target. This section describes three kinds of such attacks: assassination of adversary leadership, information compromise, and direct attacks on an adversary's homeland. Though not a comprehensive treatment, these three groups illustrate the concept.

Assassination of adversary leadership

Assassination of adversary leadership has been absent from great power conflict for centuries. U.S. policy, for example, explicitly prohibits assassination (Executive Order 12333).

However, assassination of leaders in insurgencies and in regional conflicts is common. For example, in January 1966, members of the Nigerian military assassinated the Nigerian prime minister and 21 other political and military officials in the first phase of their coup attempt.[141] In April 1994, a plane carrying the presidents of Rwanda and Burundi, as well as six other high-ranking members of the Rwandan government, was shot down by a surface-to-air missile. All died in the attack, which was suspected to have been conducted by rogue elements of the Hutu establishment, in order to create a vacuum that would enable the planned genocide of the Rwandan Tutsi.[142] The United States tried to eliminate Saddam Hussein during both the 1991 and 2003 conflicts, calling him a "high-value target." Drone attacks on terrorists have routinely targeted leaders. The Israelis have been relentless in hunting down and killing terrorists.

Further, some regimes do not feel constrained by the existing rules of international order. The examples below show how assassination has been used by such regimes in the last several decades. The list includes only state-sponsored assassinations. Though hardly comprehensive, the list is long to make the point that this is not a rare event but more common than might be expected.

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[140] Andrew Smith, "Improvised Explosive Devices in Iraq, 2003–09: A Case of Operational Surprise and Institutional Response," Strategic Studies Institute, April 2011, https://ssi.armywarcollege.edu/pubs/download.cfm?q=1064.

[141] Central Intelligence Agency, "Current Intelligence Country Handbook: Nigeria," June 1966, https://www.cia.gov/library/readingroom/docs/CIA-RDP79T00826A003200140001-5.pdf; Eghosa Osaghae, "Government and Politics," In *Nigeria: a country study*, Ed. Helen Chapin Metz, Department of the Army, 1991, http://www.marines.mil/Portals/59/Publications/Nigeria%20Study_3.pdf.

[142] U.S. Department of State, "SPOT Intelligence Report: Rwanda/Burundi: Turmoil in Rwanda," April 7, 1994, https://nsarchive2.gwu.edu//NSAEBB/NSAEBB119/Rw4.pdf.

- *2017 North Korean assassination of Kim Jong-nam:* Kim Jong-nam, the brother of Kim Jong-un, was assassinated in the Kuala Lumpur Airport by two women using VX nerve agent. The reason for the assassination was not clear since Kim Jong-nam had not challenged Kim Jong-un, but Kim Jong-un apparently was taking no chances.[143]

- *2006 Alleged Russian assassination of Alexander Litvinenko:* Former Russian intelligence operative Alexander Litvinenko was surreptitiously poisoned with polonium-210, in one of the first uses of a radiological weapon, and died on November 23, 2006. British authorities charge that Russian nationals Andrei Lugovoi and Dmitry Kovtun were responsible for administering the poison in Litvinenko's tea.[144]

- *1993 Iraqi attempted assassination of George H.W. Bush:* The day before the former president's visit, Kuwaiti security officials arrested 17 people suspected of attempting to assassinate him. The CIA and the Department of Justice concluded that the Iraqi government was likely behind the attempted assassination.[145]

- *1979 Iranian assassination of Shahriar Shafiq:* Members of an Iranian death squad, sent by the Revolutionary government to eliminate members of the Shah's family, assassinated Shahriar Shafiq, the former Shah's nephew, to prevent him from becoming the nucleus of a government in exile.[146]

- *1968 Blue House Raid in South Korea:* North Korea trained and deployed 31 commandos to assassinate South Korean President Park Chung-hee. The highly trained and motivated commandos attacked the presidential residence ("Blue House") but were driven off and the survivors eventually hunted down and killed.[147] This was not an isolated incident. The North Koreans tried to kill the South Korean president with a bomb in Rangoon in 1983. The president survived but 21 officials, including the foreign minister, did not.

- *1940 Soviet Union's assassination of Leon Trotsky:* Leon Trotsky, one of the founding members of the Soviet Union, had clashed with Stalin and fled to Mexico. He was assassinated there by Ramon Mercader, a Soviet agent.[148]

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[143] Risyiana Muthia and Joshua Berlinger, "Father of accused in Kim Jong Nam's murder: 'My daughter was being used,'" CNN, October 1, 2017, http://www.cnn.com/2017/09/30/asia/malaysia-kim-jong-nam-trial-siti-aisyah/index.html.
[144] The Litvinenko Inquiry, *Report into the death of Alexander Litvinenko*, January 2016, http://webarchive.nationalarchives.gov.uk/20160613090753/https://www.litvinenkoinquiry.org/files/Litvinenko-Inquiry-Report-web-version.pdf.
[145] U.S. Department of Justice, "The FBI Laboratory: An Investigation into Laboratory Practices and Alleged Misconduct in Explosives-Related and Other Cases," Office of the Inspector General, April 1997, https://fas.org/irp/agency/doj/oig/fbilab1/05bush2.htm.
[146] Human Rights & Democracy for Iran, "Case of Shahriar Shafiq," accessed on December 18, 2017, https://www.iranrights.org/memorial/story/-7088/shahriar-shafiq.
[147] Adam Rawnsley, "North Korea's Special Operations Assassins," *War Is Boring*, May 26, 2016, http://warisboring.com/north-koreas-special-operations-assassins/.
[148] Robert Conquest, *The Great Terror: A Reassessment* (Oxford, UK: Oxford University Press, 1990), 412–18.

Information compromise

Nations have secrets, and their adversaries are always trying to discover those secrets in order to gain advantage. The historical record is replete with examples of victims of information compromise who continue to act as if no breach had occurred or was even possible, even when presented with clear contravening evidence.

- *Allied codebreaking during World War II:* The breaking of the Enigma code was described earlier. The key point here is that, although the Germans periodically upgraded the Enigma machines, thereby temporarily frustrating decrypters, they never figured out that their codes had been compromised.

  The United States played the leading role in deciphering Japanese messages. Codenamed MAGIC, this program first broke diplomatic traffic (PURPLE), followed by naval traffic (JN-25). Decrypting PURPLE gave warning about the attack on Pearl Harbor, though without enough detail to enable specific preparations.[149] Decrypting JN-25 gave the U.S. Navy crucial intelligence that facilitated the victory at Midway.[150]

- *Penetration of U.S. national security establishment by spies:* It is clear in retrospect that the U.S. national security establishment was thoroughly penetrated by Soviet spies during the Cold War. Even before the Cold War began, the Soviet Union had established an integrated network of spies that reached all the way up to the assistant secretary of the treasury, Henry Dexter White, and members of the Manhattan project, including David Greenglass, Julius Rosenberg, and Theodore Hall. According to the former head of the CIA counterintelligence program Paul Redmond, "Spies have been discovered in every agency involved in U.S. national security—as well as in every branch of the armed services except the Coast Guard."[151]

  During the Cold War, Aldrich Ames (CIA clandestine service) and Robert Hanssen (FBI counterintelligence) revealed the identities of U.S. spies; Edward Lee Howard (CIA) gave the Soviets classified information after being fired for theft, drug, and alcohol abuse; Ron Pelton (National Security Agency) revealed information about underwater surveillance programs; and John Walker (Navy) provided information about U.S. cryptologic communication systems. There were many others. Decrypted information from the Venona code-breaking project has shown how extensive the Soviet penetration was.[152]

  This danger did not go away with the Cold War. Russian and Chinese intelligence agencies aggressively probe U.S. security institutions. For example, in 2016, an

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[149] David Kahn, *The Codebreakers: The Story of Secret Writing* (New York: The Macmillan Company, 1973).
[150] Stephen P. Zammit, "Behind the Victory: Midway and JN25," Centre for Strategic Cyberspace and Security Science, 2012, http://www.cscss.org/featured/midway/Feature_Briefing-CSCSS_005_Midway_JN25.pdf.
[151] Paul Redmond, "America Pays the Price of Openness," *Wall Street Journal*, June 23, 2000, https://www.wsj.com/articles/SB961714855328129933.
[152] Michael J. Sulick, *American Spies: Espionage against the United States from the Cold War to the Present* (Washington, DC: Georgetown University Press, October 2013); Michael J. Sulick, *Spying in America: Espionage from the Revolutionary War to the Dawn of the Cold War* (Washington, DC: Georgetown University Press, January 2014).

unknown group calling itself The Shadow Brokers, possibly from Russia though it is not clear, broke into the most secure areas of the National Security Agency's information systems and stole many of its most valuable internet decryption cracking tools. The loss might not have been discovered except that the hackers both bragged about their achievement and sold the tools on the dark web.[153]

Direct attacks on an adversary's homeland

The first attacks against the homeland cause surprise because nations overestimate their ability to defend their home territory and overpromise to their populations. This is particularly acute for the United States with its wide geographic buffer against adversaries. However, this pathology is not limited to the United States. A classic example is the Doolittle raid on Japan in 1942. The United States, after its many defeats of early 1942, looked for a way to strike back. U.S. Army and Navy planners came up with the concept of launching Army medium bombers from aircraft carriers. Thus, the *USS Hornet,* after approaching Japan on a little-used northern route, launched 16 B-25s on April 18, 1942. The aircraft bombed targets around Tokyo and in several industrial cities. The physical effects were small. Each aircraft carried only four bombs and accuracy at that point in the war was poor. However, the psychological effects were great. Both the Japanese leadership and population were stunned that the "defeated" opponent could strike the supposedly invulnerable homeland. In response, the Japanese pulled air defense units back to the homeland to guard against a repeat of this attack. They conducted massive ground sweeps in eastern China, where they assumed the attack had come from, and launched the ill-fated attack on Midway to deal a final blow against their enemy. Conversely, the attack boosted U.S. morale during a time of nearly continuous defeats. Despite the significance attributed to the raid by both sides, it was a "one-off" event. The United States was unable to attack the Japanese homeland again for another two years.

The irony is that the Japanese civil population, like all populations, proved to be much more resilient than the government had thought. Like the British and the Germans, the Japanese continued to live and work even under the terrible bombing of late 1944 and 1945. With time, the population becomes accustomed to a new normal. Pin-prick attacks like the Doolittle raid don't matter.

But in the initial stages of the conflict, when attacks are a surprise and without precedent, they can be paralyzing. Gen. Charles A. Horner, air component commander during the 1990–1991 Persian Gulf war, noted the effect of SCUD attacks: "I have never seen anything like the terror that was induced on the civilian populace of Tel Aviv and Riyadh from the SCUD bombing."[154] These attacks caused terror even though they inflicted essentially no civilian damage. Attacks that inflicted severe casualties would likely have paralyzed these

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[153] Scott Shane, Nicole Perlroth, and David E. Sanger, "Security Breach and Spilled Secrets Have Shaken the NSA to Its Core," *New York Times*, November 14, 2017, https://www.nytimes.com/2017/11/12/us/nsa-shadow-brokers; Adam Goldman, "Ex-CIA offices suspected of compromising Chinese informants is arrested," *New York Times*, January 16, 2018.
[154] Cited in Defense Science Board, *Capability Surprise, Volume 2: Supporting Papers*, 149.

societies, even though the Israelis, particularly, had learned to live with a certain level of violence from terrorism.

Breaking taboos

Taboos arise from a variety of causes including international agreements, long-standing practice, and mutual deterrence. Because combatants get accustomed to these taboos, breaking them can create considerable surprise. However, the breaking of taboos often incurs severe diplomatic and political penalties. The examples below come from all three of these causes: one from mutual deterrence and international agreements (use of weapons of mass destruction), one from long-standing practice and international agreements (unrestricted submarine warfare), and one from long-standing practice (suicide as a military tactic).

Use of weapons of mass destruction (WMD): WMD use—nuclear, chemical, and biological weapons—has been nearly entirely suppressed by international treaties against their use in the case of chemical and biological weapons and by mutual deterrence in the case of nuclear arms. Indeed, even as Nazi Germany and Imperial Japan were suffering terrible military and civilian casualties and facing utter defeat, they did not use these weapons against other military powers, though both the Germans and the Japanese did use these weapons against civilians.

Nevertheless, the prohibition has not been completely effective. There have been limited usages of chemical weapons in regional conflicts, for example, in the Yemeni civil war in the 1960s, against the Kurds in Halabjah in 1988, and in the Syrian Civil War. The Iran-Iraq War of 1980–1988 saw tens of thousands of deaths attributed to chemical weapons. Many regimes clearly believe that the weapons have value, especially if they think they can get away with their use.

Unlike chemical and biological weapons, nuclear weapons are clearly a declared element of several nations' military arsenals. The number of countries possessing such weapons has grown steadily from the original one (the United States) in 1945 to nine today (including Israel, which has not formally declared its possession). All these countries are modernizing their nuclear forces. Many adversaries appear to be planning to use nuclear weapons as an offset to U.S. conventional superiority. North Korea has clearly developed nuclear weapons for such a purpose. RAND recently conducted several "nuclear games" that envisioned early employment of nuclear weapons by the North Korean regime to get the United States to "back off" and stop prosecuting a conventional conflict that North Korea has no chance of surviving, much less winning.[155]

Further, as Andrew Krepinevich and Jacob Cohn have argued, the barrier to use may be dropping: "as conventional weapons have become increasingly precise and capable of achieving strategic effects, and as nuclear weapons design has enabled the fielding of more discriminate weapons, the clear distinction that had existed between conventional and

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[155] David Ochmanek et al., *U.S. Military Capabilities and Forces for a Dangerous World* (Santa Monica, CA: RAND, 2017), 55, https://www.rand.org/pubs/research_reports/RR1782.html.

nuclear weapons has become progressively blurred. This could make sustaining the 71-year-old tradition of nonuse of nuclear weapons more difficult."[156]

Unrestricted submarine warfare: During World War I, submarines were not themselves a surprise. Both sides had had access to the new technology for a decade. The surprise was in their employment. Long-standing international practice and formal agreements required that warships give merchant vessels warning before they were attacked. Although these practices had been designed for surface ships, they were applied to submarines also, thus greatly reducing their effectiveness against merchant shipping. However, in February 1917, with its military position worsening and the allied blockade tightening, Germany began unrestricted submarine warfare in direct contravention of long-standing norms. British shipping losses skyrocketed, and there was concern that the British Islands would starve. However, Germany's maritime success from breaking existing taboos came at a high price: U.S. entry into the war on the allied side. Over time, the combination of reinforcements from the United States and new technologies, like the depth charge, moderated shipping losses although they remained high for the remainder of the war.[157]

Suicide as a military tactic: War involves risk to life, and many combatants are killed as a result of operations. In the Western tradition, however, there is always some hope of personal survival. Even in "last stands," there is often the possibility of ultimate relief. However, some non-Western traditions have used suicide missions extensively. Militarily, these act as the precision-guided munition of a weaker power. Suicide missions do not require any new technology, just dedicated adherents. However, the taboo in the West against suicide is strong, so the use of suicide missions continually causes surprise.

The Japanese kamikazes of World War II are well known. Their employment was a huge surprise to the United States. Navy Admiral Nimitz went so far as to say they were the one thing that had not been anticipated in prewar gaming.[158] However, their employment was entirely rational, if non-Western. Japan had started the war with a highly skilled cadre of aviators. The grinding attrition of the long Pacific air war gradually eliminated this cadre, and Japan had not built the large training pipeline needed to produce sufficient replacements. At the Battle of the Philippine Sea in 1944 the inexperienced Japanese aviators had been massacred. After that, Japan had aircraft but not pilots. The solution was to turn aircraft into, essentially, cruise missiles, using minimally trained pilots.

Suicide attacks were again employed on a large scale during the Tamil rebellion in Sri Lanka by the insurgent group, Liberation Tigers of Tamil Elam, more commonly referred to as the Tamil Tigers. The Tamil Tigers have the dubious distinction of having invented the suicide vest, later used extensively by Islamic suicide bombers, and of killing the first head of state in a suicide attack (Rajiv Gandhi, prime minister of India, in 1991).

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[156]Andrew F. Krepinevich and Jacob Cohn, *Rethinking Armageddon: Scenario Planning in the Second Nuclear Age* (Washington, DC: Center for Strategic and Budgetary Assessments, 2016), 7.
[157] Edwyn A. Gray, *The Killing Time: The German U-Boat 1914–1918* (New York: Charles Scribner's Sons, 1972).
[158] Pat Harrigan, Pat Harrigan, Matthew G. Kirschenbaum, and James F. Dunnigan, *Zones of Control: Perspectives on Wargaming* (Cambridge, MA: MIT Press, 2016), 179.

More recently, ISIS has used suicide attacks extensively, the way a regular army might use artillery, hurling suicide bombers on foot or in vehicles one after another at enemy positions to weaken them. Suicide bombings often occurred in the space between peace and war because targets were frequently civilians or civilian activities.

Blurring the line between war and peace

The 400-year Westphalian structure of nation-states and expectations about their sovereignty produces a clear boundary between peace and war, and the United States has built a military enterprise that fits this structure. Yet, to avoid direct confrontations, great powers have moved into a "gray zone" of conflict. "Gray zone" conflict is inconsistent with this Westphalian structure, operating above the level of diplomatic rivalry with intrusions into other countries' internal affairs and conflict through surrogates, but below the level of direct state-on-state hostilities.

Gray zone conflict is incremental by its nature, characterized by small steps rather than large actions. Aggressors achieve their goals by gradually encroaching on a victim, rather than by a dramatic single event. Thus, it is not amenable to surprise in the same way as other kinds of conflicts. Nevertheless, there is often a culminating point where the cumulative effects of the increments become apparent. At that moment, the victim may fully and suddenly appreciate what has been happening gradually. That is the moment of surprise.

Recent examples of gray zone conflict include the Russian takeover of the Crimea through infiltration of special forces and agitation of sympathetic local populations; Russian intervention in Ukraine using similar tactics but also employing regular forces under various disguises; Chinese island-building activities in the South China Sea; and Chinese global commercial expansion that has military attributes.

Although gray zone conflict is sometimes thought to be a recent phenomenon, it is an extension of the proxy warfare that great powers have used against each other throughout history. This provided a way to engage each other and pursue interests without the risks of direct conflict. Cold War examples include Soviet support of North Vietnam and U.S. support of Afghan insurgents. However, the phenomenon is part of the art of warfare and goes far back in time. The British supported guerrillas in Spain (where the word "guerrilla" comes from) and France supported Native American tribes against Great Britain in the eighteenth century. Sun Tzu discusses it, as does Marcus Aurelius.

When our own doctrine fails: best laid plans that go astray

As with technology, surprise can occur when one's own expectations about how operations will unfold turn out to be wrong. All militaries have doctrine and warfighting concepts that they use to shape their operations. Developing this doctrine requires forecasting the complex

> "It ain't what you don't know that kills you, it's what you know for sure that ain't true."—Mark Twain

interaction of organizations, human beings, and technologies under conditions of unprecedented stress. Militaries believe their doctrines will be successful, or they would not

be employing them. However, many of these doctrines cannot be tested in peacetime—how would an air force test strategic bombing? The interval between wars is, fortunately, long, so militaries must observe other conflicts and extrapolate these experiences to its own situation, conduct experiments, build intellectual constructs, and then act on those. Here, as elsewhere, with uncertainty there is vulnerability to surprise. As President Dwight D. Eisenhower once observed, "Every war is going to astonish you in the way it occurred and in the way it is carried out."[159]

Nevertheless, doctrinal failure is extremely difficult to identify and correct because an institution's first instinct is to cling to doctrine and instead criticize the operators. "The doctrine is sound, but next time it should be applied better," as one analyst of first battles observed about military responses to initial failure. Often it takes repeated failures for the institution to acknowledge that the problem is the doctrine itself and not faulty implementation.[160]

Three examples show different aspects of surprise arising from doctrinal failure. The first, strategic bombing, illustrates the common problem that concepts developed in peacetime may not work under wartime conditions. The second, tank destroyers in World War II, shows how some solutions to a warfighting challenge may fail in practice. The third, misjudging war's length and intensity illustrates how optimistic peacetime planning may be undermined by the grim realities of war.

Initial failure of strategic bombing in World War II

From its inception in the 1920s through today, the subject of strategic bombing has engendered great emotion. The purpose here is not to take sides in the controversy but to note the doctrinal surprise that U.S. Army Air Forces suffered during the initial stages of the strategic bombing campaign in Europe.

The concept for strategic bombing was that large numbers of heavily armed bombers, flying close together, could protect themselves without fighter cover and penetrate deep into an enemy's airspace. The bombers would then attack vital enemy economic and transportation nodes, thereby bringing about a decisive result without having to defeat the enemy ground forces. The concept was more than just a battlefield technique. For the Army air forces, it was the key to long-sought organizational independence.

To implement this concept, the United States developed the B-17 and B-24 bombers (and, later, the B-29), each with around 10 heavy machine guns with the exact number varying by type and model. A group of 72 bombers flying together would, therefore, mount approximately 720 heavy machine guns for defense against enemy fighter attack. The concept was put to the test on August 17, 1943, with a raid against the towns of Schweinfurt and Regensburg, deep inside Germany. Sixty of the 376 attacking bombers were shot down, 16 percent, a loss rate that was unsustainable. The extent of the losses stunned air campaign

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[159] Dwight D. Eisenhower, "News Conference of March 23, 1955," https://www.dwightdeisenhower.com/195/War-Defense.
[160] John Shy, "First Battles in Retrospect," in Heller and Stofft, *America's First Battles 1776–1965*, 333.

planners. Nevertheless, the Eighth Air Force, which oversaw the bombing campaign, kept up the deep attacks for two more months with high losses. Finally, an attack against the same cities in October produced similar catastrophic losses and forced a reevaluation. As David Johnson notes in his history of interwar innovation, "The [Air Force] doctrine of daylight bombing without fighter escort was bankrupt."[161] The Eighth Air Force had to pull back and attack easier targets until long-range fighter escorts, the P-51 and P-47, became available in early 1944.[162]

Failure of tank destroyers in World War II

After observing the sweeping German armored attacks of 1939 to 1941, the U.S. Army developed tank destroyers and a school of doctrine as a means to counter these attacks. Tank destroyers were antitank weapons mounted on a mobile chassis. The idea was that they would move quickly to threatened areas and set up an antitank screen. It was not an unreasonable idea. The Germans had had great success with heavy antitank guns (the infamous "88") in the Western Desert in 1941–1942. The U.S. Army reasoned that a mobile gun would be even better. The units were called "tank destroyers" rather than "mobile antitank units" to emphasize their active role. Indeed, the branch's motto was "seek, strike, destroy."

The concept did not work under combat conditions. The most common U.S. tank destroyer, the M-10, had an open turret top, leaving it vulnerable to artillery and small arms fire. The gun was too small to deal with the frontal armor of German tank, but the tank destroyer armor was too thin to allow it to maneuver around to the sides of German tanks as U.S. tanks did when they were outgunned. The units failed miserably at the battle of Kasserine Pass in February 1943. Even in early 1943, before serious combat against the Germans began, General Devers, chief of the armored force, had concluded: "The separate tank destroyer arm is not a practical concept on the battlefield." General Patton also pronounced tank destroyers unsuccessful. Tanks, with their heavier armor, were more useful than the lighter, less protected tank destroyers. Thus, many tank destroyer units were broken up, converted to self-propelled artillery, or used in other roles. Yet it took over a year to unwind the planned buildup of the tank destroyer arm.[163]

Misjudging wars' length and intensity

The assumption that wars will be short has been a classic error when militaries and politicians think about future conflict. This assumption arises from both overconfidence in one's own capabilities and the desire to reduce the cost of peacetime preparations. Sometimes great power wars are indeed short (the German-French war of 1870, for example), but frequently

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[161] Johnson, *Fast Tanks and Heavy Bombers*, 209.

[162] Richard Overy, *The Air War 1939–1945* (New York: Stein and Day, 1980), 75.

[163] Martin Blumenson, *Kasserine Pass* (Boston, MA: Houghton Mifflin, 1967); Kent Greenfield, Robert Palmer, and Bell Wiley, *The Organization of Ground Combat Troops*, Historical Division, Department of the Army, 1947, 230, 425–27. The Germans also built tank destroyers (Sturmgeschütz), but of a very different design, fully enclosed and with heavy armor, essentially tanks without a turret. These were much more successful than the U.S. version.

these wars are long because the two sides are relatively well matched, and the stakes are high.

In World War I the refrain, "home before the leaves fall," has become infamous for capturing the optimism and hubris of the time. In the American Civil War both sides expected the conflict to be short. Each side recruited armies for only about 90 days, figuring that the war would be decided swiftly. More recently, the wars in Iraq and Afghanistan have persisted far longer than the United States expected. In each conflict, there was a moment when the leadership finally recognized the need for a long struggle. For Great Britain in World War I, it was in the need to institute conscription, rather than rely on volunteers. For the United States in the Civil War, it was in enlisting soldiers for three years, rather than just a few months. For the United States in Iraq, it was in deciding to expand the size of the force and conduct a surge in 2006.

Joshua Rovner, a writer on strategy and intelligence, made this point about a potential conflict with China:

> When Americans today think of protracted wars, they think of the painful counter-insurgencies against non-state armed groups in Vietnam, Afghanistan, in Iraq. Conventional wars against regular forces, by contrast, have been astonishingly short, with historically low casualties. But the chance of a prolonged conventional war has not disappeared. A conflict against China, for instance, could follow the Peloponnesian pattern. . . . Strategists in both countries hope for rapid victories at low costs, with cyber attacks and other information operations crippling the other side's ability to coordinate an effective defense. [But] both sides will view the outcome as crucial, even existential, or they would not have taken the risk of war against a nuclear armed great power in the first place. US leaders may view the war as a final test of the postwar liberal order that they spent so much blood and treasure building. The Chinese Communist Party will feel intense pressure to avoid capitulation, especially if the war involves deeply nationalist issues like the status of Taiwan.[164]

The intensity of wars is also often underestimated. The 1982 Falklands War provides some insight into the intensity of a conflict between two well-equipped modern powers. The British had more capable forces, but they were projecting power 8,000 miles from their homeland and could not bring all of their capabilities to bear. The Argentineans had never fought an air or naval war but maintained relatively capable air forces and were fighting from their home bases. The war was not particularly long, lasting only 73 days, but the scale of losses shocked both sides. The Argentineans conducted continuous air attacks against the British fleet, losing 102 aircraft, about 40 percent of their original inventory. However, they sank six British ships, damaged eight others, and would have inflicted even greater damage if

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[164] Joshua Rovner, "Thucydides and the Long War Problem," *War on the Rocks*, December 4, 2017.

their bombs had been fused correctly. The Argentineans also lost several warships, including one of their largest, the cruiser *General Belgrano*.[165]

Areas of current vulnerability

Since doctrinal surprise can appear almost anywhere, one cannot say that some areas are vulnerable while others are safe. However, using the five areas of doctrinal surprise identified—innovative combinations of existing capabilities and emerging technologies, attacks on "safe" areas, breaking taboos, blurring the line between peace and war, and failure of one's own doctrine—we can explore where surprise might occur in the future.

A key point goes back to the original definition of surprise; it is the effect on the victim that matters. Some actions, like WMD use, might be intended as surprises; others, like suicide missions, are surprises because they are outside of expected or even logical pathways; yet others, like wars of unexpected long duration and high intensity, arise from circumstances and may be a surprise to both sides.

Adversaries develop innovative combinations of existing capabilities and emerging technologies

Since these are innovative, they are, by their nature, difficult to forecast. One example might be a Chinese long-range missile strike on U.S. bases in the Pacific. The attack would combine new missile technology with precise targeting and innovative attack concepts. The Chinese have been practicing for such an eventuality.[166]

> Vignette: Cruise missile strike on the U.S. homeland
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> Chinese cruise missiles launched from a submarine strike on U.S. military facilities on the West Coast. Damage is light, but air defense and missile-defense units are pulled back to the continental United States from the Western Pacific in order to prevent another such attack. Western states demand that National Guard units be retained at home for protection.

Another example might be the effective application of Russian firepower, both kinetic and nonkinetic. This would combine the excellent, and numerous, Russian artillery with powerful electronic warfare capabilities. They would target both NATO artillery units and command-and-control centers. At the same time, NATO counter-battery fire might be rendered ineffective because of radiofrequency jamming to disrupt target acquisition and GPS spoofing to defeat guidance systems.

Attacks on "safe" areas.

Such attacks could take many forms but three areas illustrate some possibilities. First, the continental United States has not been seriously attacked by a foreign state for 200 years, the last experience being British invasions during the War of 1812 (the attacks on 9/11 being from

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[165] Ethel and Price, *Air War South Atlantic,* especially appendices 4, 8, 9, and 10. Ethel and Price interviewed military personnel, especially pilots, from both the British and Argentine militaries, and were able to assemble an authoritative analysis of losses, as opposed to the claimed losses sometimes cited in the literature.
[166] Shugart and Gonzalez, *First Strike: China's Missile Threat to U.S. Bases in Asia*, 8–10.

a nonstate terrorist group). This sense of invulnerability has been particularly strong since the end of the Cold War where the United States has repeatedly attacked adversaries' homelands but adversaries have been unable, or deterred from, attacking the U.S. homeland. It is widely recognized that this might not continue in a future great power conflict.

Second, U.S. leadership has been inviolate in war since John Wilkes Booth assassinated President Lincoln. Nevertheless, this also could change. Adversaries would no doubt point to the U.S. targeting of insurgent ("terrorist") leadership as an equivalent activity. Although the United States regards this campaign as a military operation akin to long-range artillery fire, the distinction is not persuasive to many in the international community.[167]

> Vignette: Decapitation of U.S. leadership
>
> In response to a perceived loss of legitimacy by U.S. moves on Taiwan, the Chinese attempt to decapitate U.S. political leadership through assassinations prior to an invasion of Taiwan.

Third, the U.S. political and military establishment understands that information can be compromised and that adversaries are constantly trying to discover U.S. secrets. However, the United States does not always act as if it believed this. It has been so long since actual military operations were affected by compromised information that such a possibility has dropped out of consideration, given all of the other factors to consider. Yet, the United States should remember both what the allies did to Germany and Japan through broken codes in the Second World War and how thoroughly the Soviets penetrated the U.S. national security establishment during the Cold War. In future great power conflicts, therefore, the United States must be aware of the possibility that its innermost secrets have been compromised as they have been in the past.

> Vignette: Espionage enables attack on U.S. sealift
>
> In a European conflict, the Russians use information stolen through espionage to locate U.S. reinforcement convoys to Europe and target ships with critical military cargos. Loss of U.S. equipment delays NATO response many weeks, allowing Russia to solidify gains and offer an armistice.

Blurring the line between peace and war

Because direct conflict between great powers is so dangerous, great powers may continue or even expand gray zone activity as the primary method of competition. As noted earlier, status quo powers like the United States are vulnerable to surprise in this area because of

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[167] For two examples among many, see Philip Alston, "Report of the Special Rapporteur on Extrajudicial, Summary or Arbitrary Executions," United Nations, A/HRC/14/24/Add.6, May 28, 2010, http://www2.ohchr.org/english/bodies/hrcouncil/docs/14session/A.HRC.14.24.Add6.pdf; Uri Friedman, "Targeted Killings: A Short History: How America Came to Embrace Assassination," *Foreign Policy,* August 13, 2012, http://foreignpolicy.com/2012/08/13/targeted-killings-a-short-history/.

their deep investment in an existing international system and the Westphalian concept of inviolate borders.

> Vignette: Hybrid attack on NATO
>
> Russia manufactures incidents and incites unrest in the Baltic states and eastern Europe, then invades under cover of a humanitarian operation. NATO refuses to intervene in a "domestic" dispute.

The risk is that incremental aggressions produce little response until an aggressor takes a major unexpected action, by which time it may be too late to respond effectively.

Breaking taboos: Nuclear, chemical, biological warfare

Because of prohibitions and long-standing taboos against use of these weapons, their employment would be inherently surprising. The prohibitions may continue, but two important factors have changed that may make use more attractive to some nations in the future.

First, the United States no longer possesses chemical or biological weapons and therefore cannot threaten retaliation in kind. It can threaten retaliation by conventional or nuclear forces, but these may be, respectively, not enough and too much. Second, rogue nations like North Korea and Syria and nonstate actors like ISIS have shown a willingness to use these weapons despite international condemnation. These arms are particularly appealing to such actors because of the potential for highly asymmetric effects.

Second, there is possibility for such attacks to go largely unnoticed initially since the effects are often masked and always denied. In that case, a kind of "gray area" usage, there would be no initial surprise but a period of tension culminating in the realization that these prohibited weapons had in fact been used. This scenario bears some resemblance to the ongoing use of chemical weapons in the Syrian Civil War. The possibility of "plausible deniability" might make use of these weapons more attractive.

Notwithstanding the possibility of nuclear usage, previous CSIS studies have found it difficult for the national security community to think seriously about how these weapons might figure into a future conflict, especially on battlefields when combined with conventional capabilities. Nearly all of the literature during the Cold War focused on strategic nuclear exchanges. That continues today. The *Washington Post*, for example, had a scenario for nuclear war with North Korea that skipped a conventional phase and went directly to a nuclear exchange. Andrew Krepinevich and Jacob Cohn of the Center for Strategic and Budgetary Assessments had an excellent set of scenarios—for Iran, Russia, North Korea, and China—exploring how a nuclear conflict might begin, but the scenarios stopped as the conflict was beginning and focused on the nuclear decisionmaking. They noted: "Prudence dictates that scenarios be developed that examine how best to address the situation where deterrence fails and priority shifts to terminating such a conflict as promptly as possible." [168]

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[168] Jeffrey Lewis, "This is how a nuclear war with North Korea would unfold," *Washington Post*, December 8, 2017; Krepinevich and Cohn, *Rethinking Armageddon: Scenario Planning in the Second Nuclear Age*, 122.

Part of the hesitation to consider "war termination" is that it presumes that there is a nuclear war, and just that presumption spooks many researchers.

Nuclear scenarios from Center for Strategic and Budgetary Assessments:

Iran—Iranian proxies attack Israel, Bahrain, and Yemen. Israel retaliates against Iranian oil facilities. Both sides, fearing a decapitating strike, put their nuclear forces on high alert.

Russia—Ethnic Russian unrest in Latvia, initially peaceful, turns violent. Russia intervenes as a "humanitarian mission." NATO reinforces Latvia. Russia engages NATO forces and puts dual capable nuclear forces on alert. NATO responds.

China—Faced with declining economic growth, weak demographics, and ecological degradation, China becomes increasingly nationalistic and decides to greatly increase its nuclear forces to offset U.S. and Russian nuclear and conventional military advantages.

North Korea—Facing economic collapse, North Korea launches a nuclear strike against Japanese cities and demands easing of sanctions.

In a previous CSIS project, *Alternative Defense Strategies in a Cost Constrained Environment*,[169] the study team was unable to generate a serious discussion among working group members about the nuclear element in scenarios involving conventional conflicts with North Korea or Russia. The uncertainties were too great for anyone to feel comfortable making a forecast. Nuclear capabilities possessed by future adversaries are what Frank Hoffman (a working group member of this study) called "pink flamingoes," "a predictable event that is ignored due to cognitive biases of a senior leader or a group of leaders trapped by powerful institutional forces. These are the cases which are 'known knowns,' often brightly lit, but remaining studiously ignored by policymakers."[170]

The United States has never been very comfortable about planning for a nuclear battlefield. It made some efforts in the 1950s with the New Look and the Army's (unsuccessful) "Pentomic" divisions, but military planners abandoned those structures in the early 1960s when DOD's strategy moved to "flexible response." During the Cold War, the superpowers maintained thousands of tactical nuclear weapons, but the United States assumed that wars would begin with a conventional phase, even if eventually the war went nuclear. Thus, Cold War exercises were conducted as conventional conflicts up until the very end when the very precise nuclear release procedures were practiced. At that point, exercises ended because no one could foresee how events on a nuclear battlefield would unfold. [171]

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[169] Mark Cancian and Clark Murdock, *Alternative Defense Strategies in a Cost Constrained Environment,* (Washington, DC: Center for Strategic and International Studies, 2016), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/160104_Cancian_AlternativeDefenseStrategies_WebRev.pdf.
[170] Hoffman, "Black Swans and Pink Flamingoes: Five Principles for Force Design," *War on the Rocks*, August 19, 2015, https://warontherocks.com/2015/08/black-swans-and-pink-flamingos-five-principles-for-force-design/.
[171] To be fair, this reticence about nuclear warfighting may have had a lot to do with allied concerns. As Brian Lynn notes: "Western European public, political, and military opinion believed such weapons would do more damage than the Soviet invasion, and they opposed any inclusion of NBC [nuclear, biological, chemical] into exercises." Brian Linn, *The Echo of Battle: The Army's Way of War* (Cambridge, MA: Harvard University Press, 2007), 217.

Familiarity with nuclear battlefield operations has declined from even that relatively low point as the services have largely denuclearized since the end of the Cold War. As Thomas Mahnken observed, "To a remarkable extent, nuclear weapons, which were so central to the US armed forces during the Cold War, have become marginal to the services that once embraced them so enthusiastically."[172]

Failure of one's own doctrine

These potential failures are difficult to identify beforehand. After all, if the military knew that particular doctrines were unfounded, the doctrine would be replaced. What can be done ahead of time is to identify the key assumptions behind warfighting doctrine so that, in conflict, they can be examined critically for possible revision.

U.S. military doctrine is not necessarily faulty. Doctrine writers have worked hard on it, using recent conflicts, wargaming, and peacetime exercises to develop sensible ways of engaging an adversary. However, for all the reasons noted in this report, the future is highly uncertain, particularly in a conflict with great power adversaries, and some doctrines just won't work.

Faulty doctrine and the resulting surprise might occur on land, with the vulnerability of large and sophisticated headquarters to precision attack; it might occur at sea, where ships are more vulnerable than had been anticipated; it might occur in the air where the low vulnerability of U.S. aircraft could come to an end.

Surprise could arise, not from a more challenging environment, but from a different environment. For example, Steve Biddle and Ivan Oelrich have argued because of limits to sustainable long-range reconnaissance in A2/AD environments, the long-range, standoff exchanges that many experts expect may not occur. Instead, there may be more of a midrange fight, and blockades may become more attractive.[173] August Cole, a working group member, hypothesized that a future conflict with Russia might not involve the massed tank forces that had been imagined because of difficulties in getting NATO heavy forces to the front. Access through the Baltic and through the corridor made reinforcement of the Baltic states slow and tenuous. Instead, it might be an infantry fight with precision weapons from artillery and antitank missiles.[174]

A different area of surprise might be with the intensity of conflict and the level of attrition. In regional wars, great powers like the United States can generally control the tempo of operations and manage attrition. In great power conflicts, that will not be possible. Yet, U.S. military forces and their supporting acquisition, training, and logistics organizations are configured for short, limited conflicts. This is not surprising or unreasonable, since the United States has fought limited conflicts since the end of the Vietnam War. However, great power conflicts could unfold very differently and last much longer than a few months. Attrition of people and equipment in such a conflict would be much higher than the United States has experienced in regional conflicts. For example, typical loss rates of ground equipment in past

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[172] Mahnken, *Technology in the American Way of War since 1945*, 221.
[173] Steve Biddle and Ivan Oelrich, "Future Warfare in the Western Pacific," *International Security*, Vol. 41, No. 1 (summer 2016), 7–48.
[174] Interview with August Cole, January 8, 2015.

great power conflicts was about 1 percent per day. At that rate, and allowing for the use of war reserves, the Army's 15 armored brigade combat teams would be ground down to two after about 10 months. The same dynamic applies to ships, aircraft, and ammunition across all the services. Industry, configured for peacetime efficiency, will be able to replace only a fraction of these losses.[175]

Related to hubris is the possibility that U.S. forces and leadership might be more fragile than expected. U.S. combat forces have done well in the many regional wars of the last 30 years, and there is reason for confidence that they will exhibit the same level of steadiness and fortitude that they have exhibited in these regional wars. The same cannot necessarily be said of the vast support and headquarters apparatus, which has not been subjected to high levels of danger. Except for the Marine Corps, the services give non-infantry personnel very little combat training. This creates a vulnerability and the potential for surprise. Stories from the blitzkrieg era show what happens when these elements face unexpected danger for which they've not been prepared: They shatter, flee, and cause a chain reaction of disintegration.[176] The story of Private Jessica Lynch's unit is instructive. During the initial stages of the 2003 invasion of Iraq, elements of the 507th Maintenance Company took a wrong turn and ended up in enemy territory. Its members were unfamiliar with even the most basic combat skills and could not defend themselves.[177]

Leadership might also be fragile. U.S. military leaders are extremely well educated and well trained. They have risen in a system of progressively increasing responsibilities and a ruthless up-or-out meritocracy. The popular image sees all military leaders as all successful, with only a few exceptions. However, the senior leadership's warfighting skills have been criticized for not producing better results in Iraq and Afghanistan, and, in many warfighting areas, leaders have not been subjected to the stress of combat at all. Tom Ricks, in his widely read critique of Army generalship, *The Generals*, criticizes "a tolerance of below-average performance" and a system with "an incentive structure that rewards inaction."[178]

The U.S. experience with senior military leaders at the beginning of World War II should be a warning. General Marshall, chief of staff of the Army, relieved many senior officers who proved unable to make the transition from peacetime to wartime. The Navy had to do the same, especially with its submarine commanders. Submarine commanders were a particular problem because in peacetime they had been trained to focus on safety and had been admonished for doing anything risky that might endanger the boat. In wartime, the Navy needed exactly the opposite, aggressive commanders who were willing to risk the boat and its crew in order to take the fight to the enemy.

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[175] For a detailed discussion of the dynamics of attrition and possible responses, see Mark Cancian, "Long Wars and Industrial Mobilization: It Won't Be World War II Again," *War On The Rocks*, August 2017, https://warontherocks.com/2017/08/long-wars-and-industrial-mobilization-it-wont-be-world-war-ii-again/.
[176] For a powerful description of a well-trained army disintegrating, see Walter Lord, *The Miracle of Dunkirk* (New York: Open Road, 1982), especially ch. 1 and 2.
[177] See, for example, Gregory Fontenot, E.J. Degen, and David Tohn, *On Point: The United States Army in Operation Iraqi Freedom* (Annapolis, MD: U.S. Naval Institute Press, 2005), 411–14.
[178] Ricks, *The Generals: American Military Command from World War II to Today,* esp. 447–55.

The point is that doctrine will fail in unexpected ways, and the effect will be . . . surprising.

Chapter 7: Political/Diplomatic Surprise

Political or diplomatic surprise is defined as the unexpected realignment of countries or political factions that has a major effect on the balance of power.[179] Scholars point out that unexpected realignments can happen at any time, in war or peace, but this study focused on realignments during a conflict because that is when they have immediate military effect, and especially at the beginning of a conflict because that is when they are most common.[180]

Diplomatic and political shifts have not been important considerations for the military balance of power since the end of the Cold War because the United States has had overwhelming military capability compared with actual and likely opponents. The issue, instead, has been the ability and willingness of the United States to employ that power. Although the United States has led coalitions in all of its recent conflicts, and these coalitions have been helpful both in establishing political legitimacy and in reducing the burden on U.S. forces, the existence of such a coalition has not been fundamental to success or failure.

It was different in the past. During the Cold War, uncertainty about the alignment of countries had a major effect on estimates about the balance of forces. For NATO, France's participation was a major uncertainty after France had left the NATO military command in 1966. For the Warsaw Pact, the political unreliability of some members, such as the Poles and the Czechs, was a major uncertainty. Congressman Les Aspin, a long-time observer of the military balance both while in Congress and, later, as secretary of defense, used to sum up the analysis about the European military balance as a question of who showed up and when mobilization began. Thus, political alignments were fundamental to understanding the military balance and, hence, the outcome of a potential conflict.[181]

Unexpected realignments have occurred in recent regional conflicts. France refused to participate in the 2003 invasion of Iraq, Turkey refused at the last minute to allow U.S. forces access, and Spain left the coalition in 2005 after terrorist attacks in Madrid. These raise the possibility that such realignments would occur in great power conflicts, and, indeed, could be more common because the stakes are so much higher.

Such realignments will be more important in the future. As during the Cold War, the United States, powerful though it is, needs allies and coalition partners in a great power conflict. Some allies and partners provide military capabilities (Vietnam, France), others provide basing (Philippines), many provide both (UK, Japan, Germany). The sudden realignment of such

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[179] Michael Handel, "Surprise and Change in International Politics," *International Security,* Vol. 4, No. 4 (Spring, 1980), 57–85, http://www.jstor.org/stable/2626668.

[180] Examples of diplomatic surprise during peacetime include the 1935 German rearmament, the Sadat peace initiative, and the U.S.-China rapprochement. These are also important but beyond the scope of this study. Handel discusses both kinds in *The Diplomacy Surprise: Hitler, Nixon, Sadat*, Center for International Affairs, Harvard University, 1981.

[181] John M. Collins, *US-Soviet Military Balance: Concepts and Capabilities 1960–19*80 (New York: McGraw Hill, 1980), 299–302, 316.

allies and partners would change the military balance and could affect the outcome of a conflict.

Political and diplomatic shifts are rarely considered in military planning because they fall outside of the military sphere. They are assumptions given to planners by civilian policymakers. But the history of conflict is full of examples where coalitions prove much less stable than prewar expectations had envisioned, so these effects cannot be ignored.

Diplomacy—Beware the realists

Surprises in the diplomatic and political realm arise from the nakedly self-interested calculations of realist politicians. The "realist school" of international relations believes that a state's behavior is driven by a desire for security and power, that idealism plays a relatively little part, and that a state's domestic structure has little relevance to its international behavior. John Mearsheimer, the leading offensive realist, argues that alliances are only temporary "marriages of convenience" and that "states operating in a self-help world almost always act according to their own self-interest and do not subordinate their interests to the interests of other states."[182] One is reminded of the line from the *Godfather* as Michael Corleone discusses a mafia hit: "It's not personal. It's strictly business."[183]

In observing realist views on alliance realignment, this study does not argue that other schools of international relations are invalid. Most countries do not realign their alliances during conflicts, and, therefore, there is space for other schools to provide explanations about the behavior of nation-states. Nevertheless, realism does explain the realignments that do occur, and these can have large consequences in conflicts.

The historical record shows that alliance strength is highly uncertain before conflict begins. In two historical instances described below (Italy 1914 and Israel 1967), nations withdrew from preexisting alignments when they had to make the difficult choice about entering hostilities consistent with their peacetime diplomacy. In the third (Soviet Union 1939), a country cynically chose the stronger side when war became imminent. In the fourth, a weak power (Belgium 1914) found that paper agreements cannot always overcome the military imperatives of its neighbors.

Italy 1914

Italy had joined the triple alliance with Germany and Austria-Hungary in 1882 in order to safeguard its African colonies. However, by 1914, though still a member of the alliance, Italy was less concerned about its colonies and was reluctant to go to war with France and Britain. As the major powers declared war on each other during the first week of August, Italy declared its neutrality, thus denying Austria-Hungary's navy an easy exit to the Mediterranean, eliminating French worries about its border with Italy, and relieving British concerns about its

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[182] John Mearsheimer, *The Tragedy of Great Power Politics* (New York: Norton & Company, 2001), 33.
[183] *The Godfather*, directed by Francis Ford Coppola, Paramount Pictures, 1972; Mario Puzo, *The Godfather* (New York: G.P. Putnam's Sons, 1969).

naval base at Malta and its control of the Mediterranean.[184] In 1915, Italy entered the war on the other side, enticed by promises of territorial gain.[185]

Israel 1967

In the 1950s and into the 1960s France was Israel's major supporter and provider of armaments. For example, Israel's air force consisted almost entirely of French aircraft: Mirages, Mysteres, Ouragans, Vautours.[186] The United States did not take up the role of major weapons supplier until after the 1967 war. France, under Charles de Gaulle, armed Israel as a way of showing French independence from both the United States and the Soviet Union. Further, France, with Great Britain, had joined with Israel in attacking Egypt in 1956 and retained some of those military linkages. However, in the spring of 1967, when tensions increased between Israel and its Arab neighbors, particularly Nasser's Egypt, French diplomacy shifted. Abba Eban, the Israeli foreign minister, reminded de Gaulle of his guarantees, under which Israel had accepted Egyptian reoccupation of the Sinai Peninsula. De Gaulle responded, "That was 1957. This is 1967." He was not going to jeopardize his relationships with the Arab world. So on the eve of an existential war, Israel's main ally defected to the other side.[187]

Soviet Union 1939

During 1938 and 1939, Britain and France tried to forge an agreement with the Soviet Union to restrain Nazi Germany. The attractiveness of such an arrangement was obvious. The three countries had been allied in World War I, and the fundamental cause, the need to balance a powerful Germany, had returned. Further, Nazi Germany was a bitter ideological foe of the Soviet Union, blaming communism for Germany's economic woes and desiring "living space" to the east to settle a growing German population. In the summer of 1939, France and Britain sent delegations to the Soviet Union to try to work out terms of an alliance. However, Stalin had become convinced that the Western countries were too weak and hesitant to be reliable partners. Behind the scenes, he negotiated an agreement with his mortal enemy, Nazi Germany, which offered him territorial expansion. On August 23, 1939, the Soviet Union and Nazi Germany publicly announced the now infamous Molotov-Ribbentrop Pact, shocking the world. The invasion of Poland began just 10 days later. Under the pact's secret provisions, the Soviet Union occupied the Baltic states and parts of Romania and Poland.[188]

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[184] Paul G. Halpern, *The Naval War in the Mediterranean 1914–1918* (Annapolis, MD: Naval Institute Press, 1987), 12–26, 84–93.

[185] William L. Langer, *The Diplomacy of Diplomacy* (New York: Alfred A Knopf, 1968), 10, 593; Mitchell B. Garrett and James L. Godfrey, *Europe Since 1815* (New York: Appleton-Century-Crofts, 1947), 507.

[186] Nadav Safran, *From War to War: The Arab-Israeli Confrontation, 1948–1967* (New York: Pegasus, 1969), 443.

[187] Michael B. Oren, *Six Days of the War: June 1967 in the Making of the Modern Middle East* (Oxford, UK: Oxford University Press, 2002), 100–101; Abba Eban, *My Country: The Story of Modern Israel* (Jerusalem, IL: Weidenfeld and Nicolson, 1972), 209–10.

[188] Richard Overy, *Russia's War: Blood upon the Snow* (New York: Penguin Putnam, 1997), 54–99. Handel, *The Diplomacy Surprise: Hitler, Nixon, Sadat*, 97–176. Handel points out that this is not the first time that Germany and the Soviet Union had surprised the Western allies by making an agreement. In 1922 these two pariah states made an agreement with the Treaty of Rapallo.

Germany invades Belgium in 1914

The modern world looks back at the 1914 German invasion of neutral Belgium through the lens of World War II when Germany invaded not just Belgium but other neutral countries such as Norway, Denmark, and Yugoslavia. It is hard, therefore, to capture the sense of shock that arose from the 1914 violation of neutrality at the outset of World War I. Belgium had been created in 1830, and its neutrality had been guaranteed by all the major powers, including Germany. Belgium did not participate in the system of alliances that arose before 1914 and adamantly refused to allow any joint military planning with France. Germany's Schlieffen plan, however, required the German Army to march through Belgium in order to attack France from a less expected direction and to avoid the fortifications on the French-German border. Germany delivered an ultimatum to Belgium on August 2, 1914, demanding that it allow German forces to march through the country. Belgium refused and was therefore drawn into a war it did not expect. The German occupation was also extremely brutal, calculating that terror would subdue the population and ensure unimpeded transit through Belgium to meet the strict timetables of the Schlieffen plan. Germany did this even understanding that there would be a huge international backlash, particularly in Great Britain, which felt responsible for Belgium's safety.[189]

Politics

Whereas diplomatic surprise occurs in nations' external relations, political surprise occurs in its internal relations.

The dog that did not bark

In reviewing the literature, the study team expected to find instances of domestic political fractures at the beginning of a war. After all, war puts a great stress on society, and in every political body there are elements deeply alienated from the government. One would expect that these would lead to an immediate antiwar movement, particularly in democratic countries where the open expression of political opinions is allowed. However, that's not what history reveals; in fact, just the opposite occurs: war engenders a "rally round the flag" sentiment rather than opposition to the inevitable sacrifices. John Mueller, a scholar who closely follows public opinion during conflict, documented this phenomenon in the United States, showing that presidents have strong public support during the initial stages of a conflict.[190] The support declines over time. Then antiwar movements develop and become powerful, but this is a gradual development and not a surprise.[191]

This phenomenon is not specific to the United States but appears to be widespread. There is a particularly powerful example with the French during the crisis of August 1914. The French

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[189] Barbara Tuchman, *The Guns of August* (New York: Macmillan Company, 1962), 98–111.

[190] John Mueller, "The Iraq Syndrome," *Foreign Affairs*, November/December 2005, https://www.foreignaffairs.com/articles/north-korea/2005-10-01/iraq-syndrome. See also John Mueller, *War, Presidents and Public Opinion* (New York: Wiley, 1973).

[191] Public opinion polls about support for the Korean, Vietnam, and Iraq wars show the same decline for each over time. See Mark Cancian, "Winning Hearts and Minds at Home," *Naval Institute Proceedings*, September 2010, https://www.usni.org/magazines/proceedings/2010-09/winning-hearts-and-minds-home.

police kept a list, Carnet B, of potential disruptors who were to be arrested upon mobilization. After much discussion, the government decided not to conduct the arrests in the interest of national unity. It turned out to be a foresighted decision. Of the 2,500 names on the list, 80 percent ultimately volunteered for military service.[192]

Lawfare—a new domain of conflict

Although domestic politics may not be a source of surprise, international law may be. Many authors have noted that the Westphalian concept of state sovereignty is being attacked, not just from the bottom through nonstate actors, but from the top through emerging global legal structures. Although the United States has held off from ratifying many of these international agreements because of its global interests and the need to maintain military flexibility, the concepts are nevertheless widely supported. Some examples include the International Criminal Court and treaties against the use of land mines and cluster munitions. As a result, international law has arisen as a new domain of conflict, called lawfare. Charles Dunlap, retired Air Force lawyer and prolific writer on military/legal issues, defined lawfare as "the use of law as a weapon of war." He noted, for example, that "the enemy in Iraq and Afghanistan is fighting back by mounting a massive—and increasingly effective—lawfare campaign."[193] Similarly, Professor William Eckhardt observes: "Knowing that our society so respects the rule of law that it demands compliance with it, our enemies carefully attack our military plans as illegal and immoral and our execution of those plans as contrary to the law of war. Our vulnerability here is what philosopher of war Carl von Clausewitz would term our "center of gravity."[194]

For example, politicians and activists are much more willing to call certain conflicts "illegal", not just unwise. Oona Hathaway, a highly regarded legal scholar in this area, observed that the Iraq war "is now widely regarded as an illegal war". She and Sen. Cory Booker argued that keeping US troops in Syria after the defeat of ISIS was "a blatantly illegal action."[195]

A key element of lawfare is the notion of "universal jurisdiction," which allows states or international organizations to claim criminal jurisdiction over an accused person regardless of where the alleged crime was committed, and regardless of the accused's nationality or country of residence. In theory, universal jurisdiction allows any court in the world to arrest any inhabitant of the world for alleged crimes committed anywhere in the world if there is an applicable domestic statute. Although universal jurisdiction is a long-standing legal concept, courts and activists have become more aggressive in its application.

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[192] Tuchman, *The Guns of August*, 87.

[193] Charles Dunlap, *Law and Military Interventions: Preserving Humanitarian Values in 21st Century Conflicts*, Kennedy School of Government, November 29, 2001). http://people.duke.edu/~pfeaver/dunlap.pdf.; Charles J. Dunlap, Jr. "Lawfare: A Decisive Element of 21st-Century Conflicts?"
Joint Forces Quarterly, issue 54, 3dquarter 2009, 34-39

[194] William George Eckhardt, "Lawyering for Uncle Sam When He Draws His Sword," *Chicago Journal of International Law* 431 (2003), 4

[195] Oona Hathaway, "What the Chilcot report teaches us about national security lawyering", *Just Security*, July 11, 2016, https://www.justsecurity.org/31946/chilcot-report-teaches-national-security-lawyering/; Oona Hathaway and Sen. Cary A. Booker, "A Syria Plan That Breaks the Law ", *New York Times,* January 23, 2018

"Lawfare" is not an all-powerful weapon. Many countries have flouted international conventions with impunity. Thus, China ignores an international court's ruling against it in boundary disputes in the South China Sea. Syria uses chemical weapons and attacks medical personnel. North Korea conducts massive fraud abroad to finance its weapons programs. The United States has refused to acknowledge restrictions on weapons like cluster munitions or nuclear weapons. Nevertheless, the strong activist community has moved norms far from where they were in even the recent past.

Areas of current vulnerability

In great power conflicts, the United States needs allies and partners for basing to support operations far from its shores, for military forces to fill gaps in U.S. capabilities, and for political support to enhance the legitimacy of the war effort. This dependency creates a vulnerability.

Because many allies and partners are geographically close to Russia and China, they are more vulnerable to coercion and direct pressure than the United States. As the historical examples show, what countries might do in the stress of imminent war is often not clear, even to the countries themselves, until the moment arrives when they must act one way or the other.

> **Vignette: US alliances in East Asia collapse**
>
> In retaliation for increasingly tight sanctions, North Korea launches conventional missiles at Japan. As the United States and Japan consider responses, South Korea, the Philippines, Thailand, and New Zealand declare their neutrality.

Some allies have shown themselves vulnerable to inducements or coercion. Recently, the Philippines have reacted favorably to Chinese economic inducements although recent U.S. counters may have been successful in reestablishing the relationship. During the Cold War, New Zealand essentially withdrew from its alliance with the United States, impelled by a domestic peace and antinuclear movement and by Soviet intimidation about being damaged in a U.S.– Soviet conflict.

> **Vignette: Panama declares canal neutral**
>
> In a U.S.-China conflict, Panama, fearing that it would be drawn into a war that did not concern it and, perhaps, influenced by Chinese economic pressure, declares the canal neutral, closed to all warships and military cargo. When the United States threatens military action, Panama threatens to sabotage the canal. The United States backs off and endeavors to work around the resulting reinforcement and logistic delays.

These diplomatic realignments also appear in fictional works. In *Ghost Fleet*, Japan declares its neutrality in a conflict between the United States on the one hand and Russia and China on the other. The book also hypothesizes a secret deal between China and Russia, reminiscent of the Nazi–Soviet nonaggression pact.[196] In *2017 War with Russia,* Russian

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[196] P.W. Singer and August Cole, *Ghost Fleet: a Novel of the Next War* (New York: First Mariner Books, 2015).

economic pressure causes several NATO members to waiver in their support of collective defense.

A very different vulnerability is to "lawfare." The United States is uniquely vulnerable because it has global responsibilities and conducts a wide variety of military operations. Foreign courts and jurisdictions, applying the concepts of international war crimes and universal jurisdiction, could take action against U.S. citizens in a way that the United States could not cut off at the national or international level. This is particularly true in conflicts that European elites oppose.

The vulnerability is not theoretical. In 2003 judges in several European countries, including Belgium, threatened legal action against then-Secretary of Defense Donald Rumsfeld. Belgium, for example, has a law giving it jurisdiction to try war crimes, genocide, and other crimes against humanity wherever they are committed. Rumsfeld threatened to pull U.S. forces out of Belgium, and the Europeans backed off.[197]

However, lawfare concepts have gained strength from 2003, and such legal actions might have a different outcome in the future. Indeed, the chief prosecutor of the International Criminal Court is seeking authority to investigate war crimes in Afghanistan, including some allegedly committed by Americans. Although final action on the prosecutor's request is unclear, activist NGOs applaud such actions and will encourage them in the future.[198]

> Vignette: Senior U.S. military commanders arrested for allegedly war crimes
>
> During a series of skirmishes on the Korean DMZ, the U.S. use of cluster munitions becomes controversial. Several prominent NGOs claim that it constitutes a "war crime," and the International Criminal Court (ICC) secretly investigates. Several senior U.S. officials, including the commander of PACOM, are arrested at a European airport when the ICC indictment is revealed. The U.S. effort to enlist international support collapses.

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[197] "US Threatens NATO Boycott Over Belgium War Crimes Law," *The Guardian*, June 13, 2003, https://www.theguardian.com/world/2003/jun/13/nato.warcrimes.

[198] Rick Gladstone and Marlise Simons, "Prosecutors Move in Afghan War Inquiry May Mean Clash with U.S.," *New York Times*, November 20, 2017, https://www.nytimes.com/2017/11/20/world/asia/international-criminal-court-afghanistan-united-states.html.

Chapter 8: What to Do? Preparing for and Managing Surprise

As this paper has argued, surprise is inevitable, and the United States is particularly vulnerable now. Nevertheless, fatalism is unwarranted. The United States can take action to anticipate the possibilities of surprise through better intellectual preparation, to reduce the impact of surprise through resilience, and to counteract the effects of surprise through adaptation.

U.S. policymakers and military officers are aware of these dangers. They are striving to peer into the future and prepare by using insights from analysis, peacetime exercises, experiments, and recent combat experience. By one count, there are 30 organizations in DOD and its associated agencies doing work on the future of conflict.[199] The Army, for example, has a "Deep Futures" project, looking out to 2030–2050. The Navy has the Institute for Future Warfare Studies at the Naval War College. The Air Force has its Center for Strategy and Technology. The Marine Corps has its Futures Directorate. The Obama administration's Third Offset (an effort to develop advanced technology weapons for great power conflict), Strategic Capabilities Office (an organization designed to create new capabilities by modifying existing systems), and Defense Innovation Unit Experimental (an organization designed to link DOD with civilian high technology industry) were ways to cope technologically. These are all worthy efforts. Nevertheless, it is the nature of surprise that it is hard to foresee, and there are severe limitations on our ability to forecast the future. Even prudent preparations cannot fully protect against surprise since wartime circumstances will always differ from peacetime expectations.

Coping with potential surprise is not just a matter of physical preparation—weapons, forces, research, basing—which are important but not sufficient. In 1940 the allies (French, British, Belgian, Netherlands) were superior to the German Army in most respects but were beaten in six weeks. In 1941–1942, the United States and its allies had naval forces equivalent to the Japanese, but the Japanese ran wild for eight months, inflicting defeat after defeat on the allies. In 1950–1951, the UN forces were superior to the Chinese forces in every warfighting metric except the number of troops, but the Chinese rolled them back half the length of the Korean Peninsula. In each case, battlefield success came not from overwhelming military capabilities, but from strategic, doctrinal, and technological surprise and the debilitating effects that surprise had on opponents. Thus, the recommendations here focus on moral and intellectual elements as well as physical.

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[199] Sam Tangredi, "We Want Your Input–From the U.S. Naval War College's Institute for Future Warfare Studies," Center for International Maritime Security, October 31, 2017, http://cimsec.org/want-input-u-s-naval-war-colleges-institute-future-warfare-studies/34554.

General principles

In developing recommendations for policymakers, the study followed four basic principles, which might be called "the four no's": no detailed planning, no large resource demands, no new organizations, and no reorganizing the intelligence community yet again. Although these look negative, they prevent recommendations from going down easy, but ultimately unproductive, paths.

No detailed, long-term planning

The inclination of many large organizations, particularly the military, is to devise detailed plans and checklists to deal with future uncertainty. At the tactical level, "battle drills" make a lot of sense because troops must take action quickly and under extreme stress. At higher levels it becomes problematic. Many are familiar with Von Moltke's precept that no plan survives contact with the enemy. The problem is that planners are often reluctant to let go of their plans and, as this study has argued, the great uncertainty of the future makes detailed planning impossible. Finkel, for example, describes how in World War II Britain and France both tried to use meticulous planning to handle the unexpected events of war, and both failed.[200]

In the past, the U.S. military has similarly tried to compensate for uncertainty by planning in more detail and increasing control. As Heller and Stofft conclude, "The [U.S.] professional response to the chronic American weakness in command-and-control was to plan more thoroughly, leaving as little to chance as possible. But thorough planning, with its natural de-emphasis of unexpected situations (beyond the scope of contingency plans), led to rigidity and, often, heavy losses."[201] The issue of detailed planning arose again in the 1990s with the Army's concept of "synchronization" whereby all the disparate elements of power would be integrated. However, the concept was harshly criticized for being excessively controlling, "command push" rather than "reconnaissance pull."[202]

No large resource demands

Increased resources can help deal with surprise. Expanding intelligence, wargaming, and exercises can better anticipate the range of possible futures; developing new weapons can hedge against what adversaries might do; enhancing science and technology programs can anticipate adversary advances and facilitate U.S. countermeasures; building additional forces can provide depth to absorb the effects of surprise. All these enhancements are worthwhile, and they have the additional benefit of coping with a wide variety of other demands and

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[200] Finkel, *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield*, ch. 10 "The Slow British Recovery from the German Armored and Antitank Tactics," and Chapter 12 "The French Failure to Recover from the Surprise of the German Blitzkrieg."

[201] John Shy, "First Battles in Retrospect," in Heller and Stofft, *America's First Battles 1776–1965,* 330.

[202] See, among many criticisms, Maj. John Schmitt, "Out of Synch with Maneuver Warfare," *Marine Corps Gazette*, August 1994, and Maj. Kenneth F. McKenzie, "They Shoot Synchronizers, Don't They?," *Marine Corps Gazette*, August 1994.

contingencies. They should not be dismissed out of hand, and hedging against surprise is one reason to support a robust defense effort.

However, as intellectually satisfying as expensive recommendations might be, they are of limited use to policymakers who must operate in an environment of limited resources. Decisions about the level of the defense budget will be driven by the nation's general sense of threat and security rather than the need to hedge against future surprise.

As this report is being written, the Trump administration has just published its National Security Strategy and National Defense Strategy. The recent two-year budget deal, if fully implemented, will provide a large defense budget increase and build a buffer against the effects of surprise. Nevertheless, the budget restrictions of the Budget Control Act have not been eliminated, the congressional elections of 2018 may shift the balance of power in the Congress, and long-term deficit projections indicate that all discretionary federal spending—including defense—will be squeezed as interest payments increase and entitlements expand. Competition for resources will continue to be intense. Typically, near-term demands compete more successfully than hypothetical future demands. Therefore, this study focused on recommendations that would make relatively modest demands on resources while still having important effects for coping with potential surprise.

No new organizations

Studies that identify a new problem often recommend a new organization. The Defense Science Board recommended establishing a "Capability, Assessment, Warning and Response Office to provide DOD senior leadership with timely assessment and warning of potentially high risk adversary capabilities."[203] The previously cited Navy study on "capability surprise" recommended the creation of a "surprise mitigation office on the staff of the Office of the Chief of Naval Operations (OPNAV).[204]

These recommendations may have come to fruition. The reorganization of the acquisition structure includes a new Strategic Intelligence Analysis Cell under the under secretary of defense (research and engineering). This cell "will focus on understanding the enemies' capabilities and vulnerabilities, conducting analysis on our own U.S. capabilities, tracking technology trends across the globe and assessing potential/emerging threats and/or future opportunities that warrant action, that marriage investment."[205] These responsibilities look very much like what the two studies had recommended and sound like they would provide insights about vulnerabilities to future surprise. DOD should see how this new cell performs before creating any new organizations or assigning responsibilities for anticipating surprise to existing organizations.

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[203] Defense Science Board, *Capability Surprise, Volume 2: Supporting Papers*, 60–62.
[204] National Research Council, *Responding to Capability Surprise: A Strategy for U.S. Naval Forces*, 29.
[205] Department of Defense, Report to Congress Restructuring the Department of Defense Acquisition, Technology and Logistics Organization and Chief Management Officer Organization, August 2017, 4.

No reorganizing the intelligence community

Reorganizations are disruptive, expensive, and liable to unforeseen secondary effects. The national intelligence community underwent a major reorganization after the 9/11 attacks, and that reorganization still needs time to settle in. This does not mean that the intelligence community should be exempt from further improvements or change. The community has a strong tradition of lessons learned and should continue to conduct candid self-analysis.

Anticipation

This report has argued that perfect foresight is impossible, and even good foresight is likely unachievable because the future is too uncertain. As Cohen and Gooch warn in their survey of "military misfortunes," "The task of predicting the future is a wholly unreasonable one." Expecting institutions to exert such foresight as a way of avoiding future "misfortunes" (to use Cohen and Gooch's term) is unreasonable and a shirking of responsible governance.[206] The purpose of prewar preparation, then, is not to predict the future but to broaden horizons to reduce the impact of whatever unexpected events occur and, above all, to accustom decisionmakers to the notion that surprise will happen. As Thomas Schelling argued: "The danger is in a poverty of expectations—a routine obsession with a few dangers that may be familiar rather than likely. Alliance diplomacy, inter-service bargaining, appropriations hearings, and public discussion all seem to need to focus on a few valid and oversimplified dangers. The planner should think in subtler and more variegated terms to allow for a wider range of contingencies."[207]

Ernest May, in his sweeping analysis of intelligence by different countries before the two world wars, concluded that the key to better wartime outcomes was not accuracy in making estimates—that was very difficult—but asking the right questions because these would focus policymaking on the right issues.[208] Therefore, building on the foundation provided by this study's analysis of vulnerabilities and on the vignettes illustrating how these vulnerabilities might be exploited by adversaries, here are the big questions that prewar thinking should consider:

- Under what conditions might an adversary launch a conventional surprise attack against the United States?

- Are there technologies that adversaries might have developed or modified that the United States is not currently anticipating?

- Are there technologies that the United States is depending on that may fail in a great power conflict?

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[206] Eliot A. Cohen and John Gooch, *Military Misfortunes: An Anatomy of Failure in War* (New York: Free Press, 1990), 207.
[207] Thomas Schelling, foreword to Roberta Wohlstetter, *Pearl Harbor: Warning and Decisions* (Stanford, CA: Stanford University Press, 1962).
[208] Ernest May, *Knowing One's Enemies: Intelligence Assessments before the Two World Wars* (Princeton, N.J: Princeton University Press, 1984), 504–08.

- Are there new or unexpected warfighting approaches that adversaries might employ?

- Are there warfighting approaches that the United States plans to employ that may not be viable?

- Are there diplomatic or political alignments that might change when hostilities begin?

To gain insight into these questions, this study recommends a variety of actions: wargames, experiments, exercises, red teams, operational testing, and learning from other nations. Insights gained then need to be disseminated to the entire national security community and incorporated into doctrinal publications.

Wargames

DOD recently highlighted wargaming as a way to cope intellectually with an uncertain future.[209] This is an excellent mechanism for expanding intellectual horizons and considering different futures at relatively low cost. Experience from the past can help shape wargaming experience to be most effective in anticipating, mitigating, and adapting to surprise.

Norman Friedman and many others have pointed to the Naval War College's wargames in the 1920s and 1930s as successful mechanisms for anticipating future wartime challenges in the Pacific. The wargames showed likely early defeats (loss of the Philippines), the need for advanced bases, the large demands for amphibious forces to recapture lost territory, and the importance of mobile logistics. As previously noted, Admiral Nimitz famously claimed that the Naval War College wargames had anticipated everything in the Pacific campaign except kamikazes. While that expansive claim has been disputed (the games did not, for example, anticipate the Battle of the Atlantic), the statement does indicate his attitude toward the usefulness of the wargames.[210]

Several characteristics of these wargames allowed them to have real effect. First, there were a lot of them. That allowed the wargames to explore different scenarios and to explore the scenarios multiple times. The institution could "waste" games on lower-priority scenarios. As one strategist put it, "You must spend time hunting for surprises. If you have limited time, it is difficult to avoid coming up with the obvious."[211]

The games were connected directly to planning organizations. This allowed the games to focus on critical uncertainties and to feed the insights directly to people who could actually use them. When a reorganization had the War College report instead to the educational establishment, this linkage was lost, and the wargames became much less influential.

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[209] Robert Work, *Wargaming and Innovation*, U.S. Department of Defense, February 9, 2015, https://news.usni.org/2015/03/18/document-memo-to-pentagon-leadership-on-wargaming.

[210] See, for example, Frank G. Hoffman, "War Plan Orange: Lessons for the Future," *Strategic Review*, Summer 2000. Hoffman argues that War Plan Orange—the war plan against Japan and that was shaped by the Naval War College games—lacked duality of fronts, consideration of allies, both offensive and defense submarine campaigns, convoys, and nuclear warfare (which alone was excusable).

[211] Kees van der Heijden, cited in Krepinevich and Cohn, *Rethinking Armageddon: Scenario Planning in the Second Nuclear Age*, 43.

The games allowed free play, so unexpected events could happen. Although most players followed conventional approaches, occasionally some maverick would pursue a different course that opened up the horizons of discussion. Free play is a helpful but not sufficient condition because members of institutions tend to view problems in similar ways, hence the value of "red teams," which are discussed in depth later.

The games were kept private. That allowed them to raise sensitive questions that, if known publicly, might affect budgets and policies before their full implications were fully understood. In the 1930s, this related primarily to the difficulty in defending the Philippines. A contemporary example would be the ability to defend Taiwan. If adverse wargame results got out, then proponents or opponents of current policy could use the results in ongoing political and budget battles. The resulting controversies would make candid games difficult.[212]

The question of Taiwan raises the uncomfortable issue of political and diplomatic alignments. Since these fall outside a strictly military realm, the inclination is to accept current policy as a fixed value and explore operational issues from there. This also avoids potentially embarrassing questions when allies and partners discover these alternative assumptions regarding their role and policies. But Cohen and Gooch argue that these political and diplomatic alternatives must be explored: "When military organizations look at future war, they must think as hard and realistically about the political military conditions under which it will occur as about the tactics each side will adopt. . . . The alternative, too often preferred by civilian policy analysts as well as military officers, is a dangerously misleading and sterile operational study, uninformed by political considerations."[213]

Another insight is the need to accept the possibility of high losses and attrition. Losses are inevitable in war but acknowledging them in peacetime is often hard. Finally, a contemporary concern is the need to think about adversaries' possible use of WMD. As discussed earlier, such use is hard to imagine because of the taboos and legal restrictions. Nevertheless, the use cannot be ruled out, because other countries may have different judgments about risk and advantage. In the past, there was a cadre of experts willing "to think about the unthinkable." That expertise should be reestablished despite being uncomfortable.

Experiments

Every wargame must make assumptions about how various functions will work in the real world. However, when these functions, or the technology underlying them, are new, the assumption may or may not be valid. Thus, the next step for concepts developed in a wargame is an experiment. An experiment has real people and equipment execute a concept to see whether the concept actually works. The value for avoiding surprise is that experiments can illuminate where there are unexpected vulnerabilities (or opportunities, but that is a matter for a different study).

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[212] Discussion with Norman Friedman, November 7, 2017, relating findings of a forthcoming book about Naval War College wargaming.
[213] Cohen and Gooch, *Military Misfortunes: An Anatomy of Failure in War*, 239.

The success of an experiment depends on being clear about what is being tested: the equipment and concepts, not the participating personnel and units. There is no "pass or fail" for the personnel. The pre–World War II German antiaircraft tests, described earlier, are an object lesson: it is easy for experiment designers and participants to skew the outcome if they feel responsible for producing a good result. Indeed, the key to successful experiments is allowing failure and living with the notion that some promising technologies and concepts just don't work well in the real world. As a theoretical proposition, that's easy. However, enthusiastic advocates, who believe in the technology or concept, and the desire to justify the cost and effort of an experiment, often push for positive results. That must be resisted, perhaps by having an independent, or at least separate, organization actually run the experiment.

Unfortunately, experimentation is often regarded as a luxury. Because it is more expensive than a wargame, involving as it does real people and equipment, it requires a fiscal commitment. However, it does not provide the unit training value of exercises, which are also expensive. Experiments also take unit time, a precious commodity in wartime, which is why experiments have declined in recent years. For example, Navy experimentation declined by 70 percent in the mid-2000s.[214] With the demise of Joint Forces Command, there is no high-level proponent tasked with a focus on experimentation. Senior leadership, therefore, needs to protect experimentation because, if they don't, it will not compete well in budget processes, and a useful tool for anticipating potential surprises will be diminished.

Fortunately, organizations exist to conduct experimentation and prototyping: the Army Technology Maturation Initiative and Expeditionary Warfare Experiment, the Navy Office of Rapid Prototyping and Eric Experimentation, the Marine Corps Warfighting Laboratory, the Air Force Strategic Development Planning and Experimentation Office, the DOD Strategic Capabilities Office, and the new office in USD(R&E), Emerging Capabilities and Prototyping. The *2018 National Defense Strategy* notes the need to "foster a culture of experimentation." Whether this will translate into increased activity on the ground remains to be seen.[215]

Exercises

Exercises would seem to be an excellent complement to experiments for exploring new concepts. Exercises, after all, look like experiments but on a larger scale and with regular units. They would be a natural next step to exploring concepts surfaced in wargames and explored in experiments. It turns out, however, that exercises are not very good mechanisms for developing insights about future conflict because there are too many restrictions in terms of geography, forces, and timeline.

The problem is that exercises are rare and expensive. They happen in a narrow time window, using forces that are expensive to operate and that have many other commitments. Therefore, exercises must be efficient in involving all forces and covering many training

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[214] National Research Council, *Responding to Capability Surprise: A Strategy for U.S. Naval Forces*, 123–24
[215] U.S. Department of Defense, *2018 National Defense Strategy*, 7. For a description of DOD's experimentation and prototyping programs, see George M. Dougherty, "Promoting Disruptive Military Innovation: Best Practices for DOD Experimentation and Prototyping Programs," *Defense Acquisition Review Journal*, January 2018, Vol. 25 No. 1, 2–29.

objectives. This engenders a lack of realism. For example, in actual conflict, some forces never get used. They are too far away, don't get called in time, are kept in reserve, or just don't engage effectively. However, in an exercise, all the forces need to have something to do all the time, or the limited and expensive opportunity that the exercise represents will be wasted. The Navy study on surprise notes, "Most exercises are related to upcoming operational commitments. . . . There is little free play, and exercises are typically scripted with little deviation allowed."[216]

An infamous example of this tension between exploring concepts and conducting training was the 2002 Millennium Challenge exercise (MC02).[217] Costing $250 million, MC02 brought live field exercises and computer simulation together to assess how the United States might conduct "rapid decisive operations," a cutting-edge concept at the time, against a determined adversary in the Persian Gulf (clearly Iran, but not specifically identified).[218] Controversy arose when retired Marine Corps Lt. Gen. Paul Van Riper, who served as commander of the red force, used unconventional tactics to "sink" some U.S. ships. These ships were reactivated by the exercise controllers in order to keep the game moving and to allow the live elements of the exercise—the amphibious operation and airborne operation— to take place. General Van Riper complained that important lessons of his simulated victory were not adequately acknowledged across the military.[219]

The exercise controllers had a different perspective. They had certain events that needed to be executed if the many commands involved were to get the training that they needed. Further, the live portions of the exercise—an amphibious landing at Camp Lejeune and airborne drop at Fort Bragg—had to occur at a particular time on a particular day. In the exercise concept, these operations were happening in the Persian Gulf as part of the operations there, even though they were actually being conducted halfway around the world. Global communications allowed this kind of simulation. It briefed well. However, both of these live operations were inflexible and expensive. The supporting amphibious ships and strategic airlift aircraft had tight schedules and were dedicated to the exercise just for the scheduled time. Further, the training areas at the military bases had only been reserved for that particular time window, and other, non-exercise units had reserved the areas outside that window. This all made sense to a peacetime military trying to juggle multiple demands as efficiently and effectively as possible. However, it induced tremendous inflexibility into the exercise. The game controllers could not accommodate Van Riper's actions without wasting training opportunities that had been planned for years.

The high cost of the exercise, the hype about its importance, and the controversy about alleged duplicity and cover-up left a bad taste in everyone's mouth and, as a result, made military planners wary about large exercises and free play in general and especially their use

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[216] National Research Council, *Responding to Capability Surprise: A Strategy for U.S. Naval Forces*, 120.
[217] For a full discussion, see Michael Zenko, "Millennium Challenge: The Real Story of a Corrupted Military Exercise and Its Legacy," *War on the Rocks*, November 5, 2015, https://warontherocks.com/2015/11/millennium-challenge-the-real-story-of-a-corrupted-military-exercise-and-its-legacy/.
[218] United States Joint Forces Command, "Millennium Challenge 02," https://web.archive.org/web/20070928005405/http://www.jfcom.mil/about/experiments/mc02.htm.
[219] Thom Shanker, "Iran Encounter Grimly Echoes '02 War Game," *New York Times*, January 12, 2008, http://www.nytimes.com/2008/01/12/washington/12navy.html.

in exploring new warfighting concepts. MC02 demonstrated that exercises are much better for working out tactics, techniques, and procedures (TTPs) for effectively conducting operations than for developing new warfighting concepts and uncovering the potential sources of surprise that such concepts might reveal.

Nevertheless, when designed appropriately, exercises can provide some insight into possible mechanisms of surprise. One way to do this is to make some exercises small, focused on a particular question, and structured for free play. They need to be small, so they can be "wasted" on events that are believed to be unlikely or implausible. They need to be focused, so they do not become large and rare events with multiple purposes and inflexible structures like MC02. They need to be free play because scripted play is written by the exercise controllers and will reflect the expectations and biases of the overarching institution. As one Navy captain lamented, "When was the last time we had an unconstrained exercise, (where) you go with an unalerted sub, and an unalerted surface ship, you're given a mission, you can fire as many torpedoes as you have, you have to win. We don't do that. Same thing goes for air defense exercises that is unconstrained and unalerted—we don't do it. . . . Same thing goes for air defense exercise that is unconstrained and unalerted—we don't do it."[220]

Even large, scripted exercises can have some value in anticipating surprise by incorporating "nonstandard events." To be effective, such injections need to be kept secret beforehand. Surprise from "nonstandard events" will be controversial because they are outside what is considered "reasonable" and therefore contravene existing expectations. One approach would be to inject these "implausible surprises" at the end of an exercise so participants get experience with surprise without the exercise designers having to reshape the entire event. The services have mechanisms to do this in their force-on-force exercises—Army Combat Training Centers, Navy Top Gun, Air Force Red Flag, Marine Corps Combined Arms Exercises at 29 Palms—and high-level staff exercises like the Marine Corps' Marine Air-Ground Task Force (MAGTF) Staff Training Program and the Army's Mission Command Training Program.

Despite the difficulties, training under degraded conditions needs to be done, particularly simulating a cyber attack that renders certain weapons or links ineffective. As one naval observer noted, "Our extreme reliance on communications networks and the inherent vulnerability that poses are well recognized throughout the Navy and the joint defense community in general. However, discussions about mitigating it seem near universally to focus on how to make our networks perfectly failsafe, rather than how to improve our combat doctrine's resiliency by reducing its dependence on communications."[221] It makes sense to do our utmost to protect networks. However, it is also prudent to develop ways to operate if networks are degraded or even cut. This is particularly important for a younger generation that is so accustomed to operating in networks that they will have difficulty transitioning to an environment where they must operate without networks or with only rudimentary networks.

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[220] Attributed to Navy Capt. Gerry Roncolato in Sydney Freedberg, "U.S. Navy is not ready for major war: Ex-skippers, Bob Work," *Breaking Defense*, December 5, 2017.
[221] Lt. Cdr. Colin Roberts, "In the Long Calm Lee of Midway," *Proceedings*, January 2018, 20.

Learning to operate with degraded networks is particularly important because of the asymmetric conditions the U.S. forces might face. As Robert Holcolmb, a working group member and long-time tester, observed, "An enemy who would deny us the advantages [of GPS and a network] will have prepared his own forces beforehand, knowing what was coming. He would have all the initiative, not us. By the time we figured out how to fight under those conditions, we would have a very rough time trying to wrest the initiative away from him." Although there are workarounds to GPS and networks, as people who grew in an earlier era understand, these workarounds need preparation and training. For example, service members need to have a physical map and know how to use a compass if GPS goes down. That can't be quickly improvised. Further, such preparations in training are needed to counteract the inevitable shock and disorientation that would accompany the loss of networks and the customary ways of conducting business.[222]

Red Teams

Williamson Murray, like many others, has pointed out that "Bureaucratic organizations are incapable of providing imaginative, out-of-the-box assessments that challenge basic assumptions because by their very nature they aim at consensus rather than confrontation and argument."[223] Indeed, senior officials frequently complain about the inability of the bureaucracy to produce innovative solutions. Former Secretary of Defense Gates complained about "the hidebound and unresponsive bureaucratic structure . . . wed to their old plans, programs, and thinking and refus[ing] to change their ways regardless of circumstances.[224] Former Secretary Rumsfeld similarly complained, "Innovation was stifled not by ill intent but by institutional inertia . . . and gridlock."[225]

Red teams are a popular response to these frustrations because they can provide a way around organizational limitations. Red teams are groups outside the primary decisionmaking process. Their purpose is to "deliver some new finding or insight that otherwise could not have been self-generated within the walls of the targeted institution."[226] They are another way to uncover and explore potentially unexpected actions by adversaries. This exploration can move vulnerabilities from "unknown unknowns" to "known unknowns," so that when conflict comes the leadership can be watching to see how the question is resolved and then take appropriate action.

Good red teams are staffed with creative thinkers with reputations for challenging established assumptions. There are two types of red teams: "emulative teams" that try to

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[222] For an imagined description of the disintegration and disorientation of a digital society that loses its network, see Madeline Ashby, "A Stopped Clock," in *War Stories from the Future*, the Atlantic Council Art of Future Warfare Project, 2015. A short personal story is relevant here. The author was once talking to a young research assistant and the subject of losing the global network arose. The young researcher said, the world as we know it would end. The (old) author responded, the world as you know it would end, but not the world as I know it because I know what the world looked like without the network. The potential shock of surprise is evident, but transition of expectations and acquisition of compensating skills is not an inconsequential matter.
[223] Williamson Murray, *America and the Future of War: The past as Prologue* (Stanford, CA: Hoover Institution Press, 2017), 134.
[224] Gates, *Duty: Memoirs of a Secretary at War*, 126.
[225] Rumsfeld, *Known and Unknown, A Memoir,* 333.
[226] Micah Zenko, *Red Team: How to Succeed by Thinking Like the Enemy* (New York: Basic Books, 2015).

replicate what a potential adversary would do given the adversary's culture and inclinations, and "clever teams" that take the most effective actions possible, irrespective of what an adversary might actually do. Both approaches are probably needed. "Emulative teams" are more realistic but may not capture adversary actions that are "out of character." "Clever teams" could capture a broader range of possible actions.

The purpose of using red teams is not to prove that the institution's approach is wrong. The conventional approach is likely right. After all, it is the product of extensive research, testing, and experience. The purpose is to open the aperture to other possibilities and thereby reduce vulnerability to surprise. Even if the institution does little to prepare for the surprises identified, just having surfaced the possibility of alternative futures has value in shaping the thinking of the institution's leaders.

Red teams are also not magical. Their perspectives still come out of the same society, and often from the same professional community, as the institution's members and therefore share many of the same assumptions. That often limits how much of a different perspective they provide.

Operational and live fire testing

The United States has an extensive operational testing activity, arising from disappointing field performance of some systems in the 1980s. Operational testing, conducted by the services and overseen by an independent organization, the Directorate of Operational Test and Evaluation (DOT&E), has been successful in reducing the gap between intended performance and actual performance. However, there are limitations to the operational testing regime that create vulnerabilities to surprise.

First, testing is done on a system's officially established characteristics, called Key Performance Parameters (KPPs), which are set by the service or agency developing the system. This is appropriate. The operational test is widely regarded by program managers and their organizations as a system's "final exam," which it can pass or fail. Broader testing would be viewed as unfair. However, the operational testing that is conducted does uncover potential weaknesses, which might be worth exploring. Further, testing against a different set of threats or with different operating concepts might establish system opportunities and limits that would be useful to war fighters. Thus, testing outside of established KPPs would be valuable, though it would need to be considered an experiment, not an operational test, and would likely be done by a different organization.

This broader experimentation needs to be done. As one expert observed, "We spend tens of billions of dollars on the development and production of sophisticated systems but seem unwilling to devote a small fraction of that total to realistic testing of how they actually work in high-end engagements."[227] This requires investments in targets and threat simulators. Although no amount of experimentation will uncover all possible surprises and system

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[227] Private email to author from testing official.

limitations, it can uncover some of them and, more importantly, make the point that even systems that passed their operational tests still have vulnerabilities when facing a real enemy.

The second problem is that system limitations are not always appreciated in the field. Although DOT&E annually publishes the results of its testing program, and now provides these results directly to the combatant commanders and their staffs, appreciation of weapons limitations and constraints may not have reached the unit level.[228]

Learning from other nations

Other nations, both great powers and regional powers, think hard about future conflicts and develop concepts just as the United States does. However, they are generally regarded as having little that the United States can learn from, with some exceptions—for example, Israelis in air defense suppression and the UK for special operations. In part, this is understandable since the United States has unmatched resources and global responsibilities. In part, it is a reflection of hubris, the notion that because the United States has unparalleled resources and recent combat experience, there is little to be learned from the experiences or insights of other nations' militaries. This hubris creates vulnerability. Fortunately, this is easy to change. The United States has a global set of military attachés who work with and observe the militaries of other nations. They provide a mechanism for seeing what the United States might learn from other militaries. What is needed is to take other militaries seriously. Secretary Mattis, in his rollout of the National Defense Strategy, pledged that, "The department will do more than just listen to other nations ideas. We will be willing to be persuaded by them. Not all good ideas come from the country with the most aircraft carriers."[229]

Incorporation into doctrinal publications

All doctrine publications need to incorporate a sense of the unexpected. This process has begun. The new *National Defense Strategy* focuses on great power conflict, envisioning powerful adversaries capable of establishing challenging A2AD environments. Nevertheless, there remains a strong tone of U.S. primacy and military superiority in joint planning doctrine. The *Joint Operating Environment 2035*, for example, envisions major conflicts occurring, "When the United States [emphasis added] decides it must punish an aggressor..."—implying that the United States will control events.[230] It is not enough to put in a few words deep in the text acknowledging that the unexpected might occur. Such cautions get obscured when the overriding thrust of the document is how the United States will control the course of

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[228] Director, Operational Test and Evaluation, *FY 2016 Annual Report*, December 2016, http://www.dote.osd.mil/annual-report/index.html.

[229] Mattis, *National Defense Strategy Roll out Speech*.

[230] *Joint Operating Environment 2035: The Joint Force in a Contested and Disordered World*, Joint Staff, July 14, 2016, https://publicintelligence.net/jcs-joe-2035/, 46; Another example of this assumption of primacy is the Time Phased Force Deployment Data (known as the "TPFDD"). This massive data base coordinates the efficient movement of massive amounts of gear and troops overseas in major operations. It matches units to be moved with a specific every ship or cargo aircraft at a particular time and at a particular place. It has been extremely successful in every recent operation, giving the U.S. its global military reach. However, it assumes that the U.S dominates the international commons and that an adversary cannot disrupt this complex logistics flow. See *JP 3-35, Deployment and Redeployment Operations*, https://fas.org/irp/doddir/dod/jp3_35.pdf

events. The sense needs to be incorporated throughout.[231] As discussed in the section on resilience, the fact that surprise might occur, and that U.S. forces might be at a disadvantage as a result, does not imply defeatism or fatalism. It does imply that adversaries might be as clever as we are, and that preparation is needed. Doctrinal publications need to impart that sense.

Dissemination of insights

Insights derived from wargames, experiments, and exercises need to be disseminated in a candid manner so that results are understood. Because of the sensitive nature of these discussions, such dissemination should occur outside of formal channels to provide institutions with some distance from controversial ideas. Fortunately, the military has a long tradition of self-analysis and debate in military journals. This needs to be encouraged and protected. That is easier said than done when uncomfortable arguments arise that contravene an institution's doctrine and could have immediate effects on budgets and policy.

The Navy and Marine Corps have a particularly effective structure for doing this because their institutions for advocacy and professional education are separate. The Navy has the Navy League to argue for naval interests, and it has the Naval Institute, which is forbidden from lobbying, to handle professional education. The Marine Corps has a similar arrangement with the Marine Corps League and the Marine Corps Association. As a result, there was less vulnerability to having the near-term needs of the service for budgets and programs interfere with its discussion on professional matters.

Senior officials, military and civilian, must resist the temptation to clamp down on dissenting opinions that upset established doctrine. In the 1930s, the French military required all professional publications to receive official permission before being disseminated. This eliminated discussion of alternative futures and made it impossible for the French military to change doctrine when their original doctrines proved faulty.[232]

Resilience

Resilience is needed after conflict begins in order to cope with the inevitable surprises that occur. Then the need is not anticipation because answers to pre-conflict questions will be apparent. Instead, the need is to absorb the effects of surprise of whatever kind—strategic, technical, doctrinal, diplomatic/political—and continue to operate effectively. Developing resilience at all levels is crucial. It does no good if the leadership is resolute, but the troops have panicked and run away. Conversely, even steadfast troops will buckle if the leadership has lost heart.

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[231] The Joint Planning document (*Joint Publication 5-0 Joint Planning*) has the right sentiment, "Placing absolute faith in predetermined and closely sequenced plans is unlikely to prove successful against an agile opponent. A commander should maintain a balance between proactive planning and timely adaptation to unforeseen events as the OE [operational environment] changes and other relevant actors, including the adversary and competitors, adapt." However, this thought is buried in a section on assessment. The overall descriptions of planning barely mention a dynamic adversary and instead describe planning as a bureaucratic activity conducted in a static environment.

[232] Finkel, *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield*, 219–20.

The model here is the strategic nuclear enterprise. This is one area where the United States military has always assumed that conflict might begin with a surprise attack, the proverbial "bolt out of the blue," however unlikely, and hedged against that threat. As a result, the United States has built elaborate processes and systems to ensure that such surprise will fail to deliver a decisive blow. It has fielded redundant command-and-control systems, redundant weapons platforms (the triad of bombers, ICBMs, and ballistic missile submarines), and redundant warning systems. It has hardened U.S. systems to reduce the effects of an attack. Therefore, ICBMs are in concrete silos, submarines hide in the open ocean, and, during the most dangerous days of the Cold War, bombers sat on high alert. Further, all the personnel involved are trained to accept the notion that war could begin at any moment, that there might not be a lengthy preparation period, and that they must be able to function even when the unexpected occurs.

Mental resilience

This last point brings out the importance of mental resilience. Analyses tend to focus on the physical, that is, having equipment and forces that can absorb the effects of surprise and still have the capacity to continue to function. Mental resilience is just as important. Marc Bloch identified the fundamental problem here when he described what happened to the French army in 1940 as the blitzkrieg rolled over it: "They thought that everything was lost, and, therefore, acquiesced in the loss." The French army might have fought on after its initial defeats. It had done so in 1914 in the face of similar setbacks. However, it lacked resilience for a variety of military, political, and cultural reasons, so the army gave up.

This need for mental resilience applies to all levels but especially to senior military and civilian leaders. These leaders are assumed to be mentally resilient as a product of their training over many years. Military officers go through a long preparation process including successive levels of command and an extensive military education system. Senior civilian decisionmakers are generally highly experienced and well educated in civilian universities. Nevertheless, the inevitable occurrence of surprise in some dimension—strategic, technological, doctrinal, political/diplomatic—will disorient them if their training did not prepare them for it.

Marc Bloch provides insights into how mental rigidity can defeat the best-trained officers, and, by extension, civilian officials. "Unconsciously officers got into the habit of expecting that everything would happen as the manuals said it would. When the [enemy] refused to play the game according to staff college rules, they found themselves as much at sea as the public speaker who is faced by questions to which he is not been taught the answers."[233]

Finkel makes a strong argument for "flexibility," that is, a mental attitude that is open to alternatives. He notes the rapid reaction of the Germans when they faced allied technical surprises in the air war, such as chaff, which blinded their early warning radars. He also cites the 1973 Israeli development of countermeasures to Egyptian and Syrian surface-to-air missiles, which had not been used extensively before in the Middle East and were more

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[233] Bloch, *Strange Defeat: A Statement of Evidence Written in 1940*, 48, 106.

effective than expected. In contrast, he notes the slow decisionmaking of the French in 1940 and the British in the early war years.

To make leaders more resilient, it is imperative to incorporate these concepts—the inevitability of some surprise, and the need for anticipation, resilience, and adaptation—into the education system for both military officers and civilian defense officials. A small group of planners or a red team can identify vulnerability to surprise, describe possible instances of surprise, and recommend actions to cope with surprise. However, they can inform only a small group and, even with effective reporting, only some of the senior leadership. They cannot make the whole institution, at all levels, aware of vulnerabilities and potential responses. Only the education system can do that. Therefore, these concepts need to be woven into classes, simulations, and exercises in all the national security educational institutions.

This also gets at the key concern that Cohen and Gooch raise, that misfortunes (and surprises) are *organizational* phenomenon. Although histories and analyses often focus on commanders, modern warfare involves vast organizations, far beyond a single person's control. Coping with surprise, then, requires educating an entire institution, not just select commanders.[234] This organizational education would change the fabric of military institutions, creating the needed flexibility and resilience.

One element of a solution is to construct situations in peacetime training where officers face the unexpected. Force-on-force wargames and exercises, described in the earlier section on anticipation, can develop resilience in leaders as well as help them anticipate different possible futures. To do this, games might sometimes pit U.S. forces against extremely powerful adversary forces, or put U.S. forces in situations where they are unlikely to win or even to survive, "gamed to failure," to make the point that U.S. forces will incur losses, even heavy losses, in great power conflicts. To stress players, wargames might introduce unexpected technologies by adversaries or realign political relationships just prior to hostilities or reduce the effectiveness of some U.S. capabilities.

As noted earlier, there is tension between training and education. Because individuals and forces go through high-level training so infrequently, there is an inclination to use standard scenarios in order to enhance the training value for coordinating complex maneuver and fires in a multidomain battle. Game designers will need to figure out ways to do both, perhaps by having different classes of wargames or creating games that can be run more frequently with less "drag" on units.

Another approach is to build up the intellectual resources available to commanders and senior officials in order to provide an outside, perhaps dispassionate, source of advice that is less affected by the local crisis of the moment. These resources might also act to steady staffs and commanders when they experience the shock of surprise.

- Reach-back capabilities are one way to do this. "Reach back" refers to mechanisms whereby deployed forces can link to resources back in the United States. These

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[234] Cohen and Gooch, *Military Misfortunes: An Anatomy of Failure in War*, 231–33.

already exist extensively for particular specialties, for example, intelligence. Intelligence units overseas can instantaneously consult with intelligence resources in the United States and tap into resources, perspectives, and capabilities that don't exist forward. The value in a surprise situation is that forces and commanders can access a broader array of information and thus better understand what is going on.[235]

- DOD might revive the senior mentor program. The senior mentor program brought retired senior officers to high-level headquarters to work directly with current senior commanders. This gave current commanders a confidant at hand who was outside of the chain of command and allowed them to tap into the vast experience that these retired officers possessed. The program was shut down by Secretary Gates in 2010 over concerns about conflicts of interest because many retired officers had corporate connections.[236] However, the department should revive the program since so much of the effect of surprise occurs in the mind of the commander. Senior mentors might provide a steadying influence when commanders are surrounded by a headquarters staff that is reeling from the unexpected. Senior mentors might also have some things in their personal experience that are not in the current commander's experience. The mentors can provide counsel privately without the threat of interfering with the commander's or staff's prerogatives. Senior mentors, because they come from the same institutions and backgrounds, are likely to be more credible and easier for commander to engage with than red teams, which, to be effective, come from different cultures.

Finally, senior officials need to stop talking about the unprecedented superiority of the U.S. armed forces. Overblown rhetoric feeds the overconfidence already present in U.S. military culture as result of easy victories over much weaker opponents. Overconfidence amplifies the shock of surprise and, as Marc Bloch warned, makes leaders susceptible to disillusionment and discouragement. There are ways to acknowledge the skills and sacrifices of service members without implying that they are unbeatable. Fortunately, Secretary Mattis has spoken out on the subject and set the appropriate tone: "It's good to remind ourselves that Americans have no God-given right to victory on the battlefield."[237] Senior military officers, as they have begun thinking about war with a great power, have made the same point. Gen. Mark Milley, Army chief of staff, talks frequently about this new environment: "It's going to be intensely lethal, the likes of which the United States Army, the United States

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[235] Robert Holcombe, a working group member with experience in reach back, expressed some reservations here. In his experience, it took a long time to get people in the rear to understand the problems of the forward units and, with Iraq, the difference in time zones meant that many issues arose in the middle of the night when the rear was not available. The problems were solvable, the first by rotating personnel forward periodically so they understood circumstances first hand, the second by maintaining a watch schedule. He concluded: "Reach back can work, but it requires a very specific set of circumstances and considerable effort on the part of the rear team."
[236] Office of the Secretary of Defense, "Department of Defense Memorandum on Senior Mentors," Department of Defense, April 1, 2010, https://www.acq.osd.mil/dpap/dars/docs/SeniorMentorPolicy.pdf. "It is imperative that the experts we hire be subject to certain ethics laws and regulations that apply to Federal employees to avoid any perception of impropriety. The policy requires DoD to hire all senior mentors as HQEs [Highly Qualified Experts] under section 9903, title 5, United States Code."
[237] Secretary of Defense Jim Mattis, "Remarks to the Air Force Association 2017 Air, Space and Cyber Conference," Department of Defense, September 20, 2017, https://www.defense.gov/News/Speeches/Speech-View/Article/1318960/air-force-association-2017-air-space-and-cyber-conference/.

military, has not experienced . . . since World War II."[238] Adm. John Richardson, chief of naval operations, commented recently: "If you're a commander and you're not a little nervous about . . . going into combat against a competent and advanced enemy, you are not thinking hard enough."[239] This thinking needs to permeate the institutions and drive out the sense of superiority and primacy that has taken hold over the last generation.

Physical resilience

Meir Finkel recommends mass to provide a buffer against the effects of surprise. Mass would also provide a valuable political benefit by buying time for senior officials to make more deliberate decisions. However, as noted earlier, while this is worth pursuing, it will be difficult to push into a defense budget that is already overcommitted.

Another approach would be for DOD to build a bigger toolbox to better cope with whatever surprises occur. Coping with surprise effectively requires being able to grab the appropriate tool out of the military toolbox—weapons, munitions, organizations—to handle the unexpected circumstances. The greater the uncertainty, and the greater the vulnerability to surprise, the deeper the toolbox needs to be. Finkel calls this "the principle of diversity," maintaining "a wide range of weapons and units so that if some are incapacitated by countermeasures, the commander can still devise a solution with the remaining resources." His example is the Israeli response to antiaircraft missiles using a variety of capabilities at hand. His counterexample is the Israeli overemphasis on tank warfare prior to the 1973 Yom Kippur war. After the 1967 war, when Israeli tank forces had almost single-handedly produced a great ground victory, Israel had greatly expanded its tank units at the expense of supporting units such as infantry, artillery, and engineers. It was thus hampered in efforts to counter Egyptian and Syrian antitank missiles when they were first encountered in 1973.[240]

Building a bigger toolbox argues for a procurement and force-building strategy that has lots of different kinds of organizations and systems available rather than building a few in large numbers—that is, building horizontally rather than vertically. This increases the chances that the required capability will be available in a surprise situation. Even if the capability is not available in the numbers desired, at least some capability will be available, and it is easier to build more than to develop something from scratch during an emergency.

There is a down side. By giving up some economies of scale, this is less efficient than fielding large numbers of a standard organization or system. Further, the forces and equipment will be sub-optimized for the threats that are actually anticipated. Nevertheless, in conditions of great uncertainty, as the United States is facing now, this tradeoff is acceptable.

An example is the up-armored HMMWV (up-armored Humvee). The Army bought about 400 in the late 1990s to equip military police units. This occurred in response to the experience of dealing with hostile civilians in the Balkans where lethal force was not appropriate but threats

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[238] Sydney J. Freedberg Jr., "Army short $40B on modernization versus China, Russia: CSA Milley," October 3, 2016.

[239] Sydney J. Freedberg Jr., "Navy in Midst of High-End War 'Renaissance': Vice Adm. Rowden," *Breaking Defense*, January 9, 2018.

[240] Finkel, *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield*, 82, 150–64.

to unprotected vehicles were too high. The Army, therefore, developed a HMMWV (light truck) with extra armor. In 2003, when the insurgency in Iraq began using improvised explosive devices (IEDs) extensively, the Army realized that its standard, (unarmored) HMMWVs were too vulnerable. So, it sent to Iraq all the up-armored Humvees in inventory. When these were successful in reducing casualties, the Army had the design, suppliers, training pipeline, and maintenance system available to quickly expand the inventory and eventually equip all of its units.

Building a bigger toolbox also means avoiding single points of failure. Single points of failure occur when there is only one system that can perform a certain task. If that one system develops a problem, or an adversary has developed an effective counter, then military forces are unable to execute this task, even imperfectly. Several single points of failure are apparent today. One is the F-35 Joint Strike Fighter, which, while offering powerful warfighting capabilities, will comprise almost the entire U.S. tactical aircraft inventory in the future. If something goes wrong with that system, then the U.S. tactical aviation inventory, which has cost hundreds of billions of dollars and is a central element in U.S. warfighting doctrine, will be degraded. Another is the reliance on GPS-guided munitions. These have been spectacularly successful in regional conflicts, but U.S. reliance on them creates a vulnerability when used against adversaries possessing countermeasures.[241]

The Navy study on surprise had a similar approach. It recommended design margins on equipment such as power and space to provide room to incorporate responses to the unexpected. It also recommended that the Navy consider building "more less-expensive, single-mission ships to increase fleet resilience and absorb the impact of an unanticipated threat at sea."[242] It also recommended consideration of a high-low mix that has been part of Navy shipbuilding plans off and on for the last several decades. This goes against DOD direction to emphasize capability rather than capacity but is consistent with recent Navy desires to increase fleet size in order to reduce the tempo of operations on individual ships.[243]

Flexible mobilization plans

DOD should also think more creatively about industrial mobilization and the expansion of forces to hedge against the possibility of a longer or more intense conflict than it has experienced since Vietnam. This will provide another kind of buffer against the impact of surprise.

To replace high attrition, DOD will need to find ways to ease bottlenecks in defense industry, look abroad for suppliers, and use older, obsolescent equipment in imaginative ways. To

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[241] An additional benefit of having a large toolbox is that it complicates adversary planning. Adversaries need to devise more complicated plans to deal with the U.S. forces with a variety of capabilities and backup systems, especially since planners tend to make worst-case assessments. A single adversary technology may not be able to neutralize a U.S. capability.

[242] National Research Council, *Responding to Capability Surprise: A Strategy for U.S. Naval Forces*, 73.

[243] For a detailed discussion of the capability versus capacity tradeoff, see Mark Cancian, *U.S. Military Forces in FY-2018: The Uncertain Buildup* (Washington, DC: CSIS, October 2017), especially 27–32, https://www.csis.org/analysis/us-military-forces-fy-2018.

replace personnel losses and expand forces, DOD will need to think creatively about manpower, perhaps substituting civilians, contractors, and allies for military personnel who take too long to train. This will be very uncomfortable because it departs from the model of exquisitely trained personnel and high-quality equipment that the military has become accustomed to fighting its wars with.

Adaptation

Adaptation refers to actions undertaken once conflict has begun, and surprise has occurred. It is the flipside of resilience. Resilience builds capacity to absorb surprise and keep operating effectively. Adaptation responds to the source of surprise to counter or mitigate it.

There is a vast literature on innovation, arising from the recognition of uncertainty, surprise, and inevitable error. Michael Howard summed the problem up: "In these circumstances when everybody starts wrong, the advantage goes to the side that can most quickly adjust itself to the new and unfamiliar environment and learn from its mistakes. [The goal is to develop] the capacity to get it right quickly when the moment arrives."[244]

John Boyd's observation-orientation-decision-action cycle ("OODA loop") is a useful construct to apply here. Observation means seeing what has happened. Orientation means fitting what has happened into a broader context to understand its meaning. Institutions must then make a clear decision and then turn that decision into action. To adapt effectively to surprise, institutions, like individuals, must go through this cycle quickly and effectively. If any element breaks down, then the institution will not be able to adapt.[245]

Boyd emphasizes the importance of speed. He devised the model based on his experience as a fighter pilot when he noticed that effective fighter pilots did not necessarily have the best aircraft but could transition from one maneuver to another more quickly than an opponent. He expanded this insight to warfare in general.

Observation and orientation

Adaptation begins with identification of a problem or opportunity. Often a unit or individual will have an insight or solution to the problem, but that does the institution little good if the insight remains isolated. There are several processes by which the U.S. military currently works to observe and orient on problems and opportunities.

Lessons learned processes: All of the services have mechanisms for capturing, analyzing, and disseminating lessons learned in the field. The Army has a particularly elaborate program operated by the Center for Army Lessons Learned (CALL). The center gathers data, primarily from unit reports but also from forward-deployed liaison officers. Teams at CALL analyze the collected data and develop best practices at the tactical, operational, and strategic levels. Finally, the dissemination division publishes CALL's reports, which includes shipping, as they describe it, "thousands of books a month in direct response to soldier requests for

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[244] Michael Howard, "Military Science in the Age of Peace," *RUSI Journal*, 119 (March 1974), 9.
[245] John Boyd, *Patterns of Conflict*, edited by Chet Richards and Chuck Spinney, Defense and the National Interest, January 2007, http://www.dnipogo.org/boyd/patterns_ppt.pdf.

publications from the CALL websites, phone calls, emails, or walk-in traffic to CALL's publications room at Fort Leavenworth, KS."[246]

In a great power conflict, lessons learned processes will need to operate rapidly to identify surprises and suggest remedies. Some surprises will, of course, be evident immediately to all levels of the military establishment. A surprise attack, for example, will not need a lessons-learned process. (At least initially. Eventually, victims of surprise attack generally conduct a system-wide "postmortem" to prevent the surprise from happening again.) Similarly, most political and diplomatic surprises will be evident. However, many technological and doctrinal surprises will not be immediately evident to all levels of the institution. The U.S. experience with torpedoes in World War II comes to mind where it took an unconscionably long time to identify the problem. In a future conflict, the United States will not be able to wait two years to get one of its main weapons working properly.

This will not be easy. Finkel distinguishes between "real time learning" and learning lessons from the past. He notes: "An important factor in recovering from technological and doctrinal surprise is the ability to derive lessons while the surprise is taking place, that is, devising immediate solutions and circulating them throughout the [organization]."[247] This is different from the usual cycle of lessons learned where units generally input their observations at the end of a deployment, and the military bureaucracy churns through possible responses. The system will need to operate much more quickly. Further, the system will need to be credible so it can push the institution into taking action. During the recent wars, lessons-learned organizations were sometimes regarded as long-term, historical processes, staffed by reservists and contractors, rather than real-time sources for action.

Fortunately, there are precedents in all the services for "liaison teams" to go forward into combat zones to gather data and make observations. These teams provide both rapid reporting and direct reporting. In addition, military intelligence staffs, civil affairs units, and operational assessment cells have separate reporting channels that can disseminate real-time observations and lessons learned.

Deployable technology exploitation teams: A variation of the lessons-learned process is the creation of deployable technology exploitation teams. The concept is that experts would move forward when technology issues arise, whether with U.S. technologies or with adversary technologies, to examine the systems in place and to make a rapid diagnosis. This would avoid the lengthy process of sending equipment back to the United States. The U.S. military has used such teams in the past, so it is not a new concept. For example, during the 1991 and 2003 conflicts with Iraq, WMD teams went forward to deal with the threat of these weapons. The Joint IED Defeat Organization, discussed later, formed such teams during the Iraq and Afghanistan wars.

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[246] Center for Army Lessons Learned, http://usacac.army.mil/organizations/mccoe/call, especially *Executing Knowledge Management in Support of Mission Command: A Primer for Senior Leaders*, Center for Army Lessons Learned, November 2017, http://usacac.army.mil/sites/default/files/publications/18-02.

[247] Finkel, *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield*, ch. 5 "The mechanism for lesson learning and rapid dissemination," 111−21.

In addition to providing a rapid response, an advantage of such teams is they can provide an unfiltered assessment, that is, an assessment that is not reviewed and modified by the different levels in the chain of command, some of which will have a stake in the outcome of the analysis. One of the problems with identifying defects in the World War II torpedoes was that the engineers who developed the weapon were unwilling to consider the possibility that their product was faulty.

Such teams do not need to be active in peacetime, but organizations with the required expertise both inside and outside the government need to be aware of the possible demand and be ready to respond. One could imagine, for example, teams coming out of the Navy's Aviation Systems Command, augmented by personnel from the Center for Naval Analyses,[248] the Institute for Defense Analyses, MITRE, and even from industry, going forward to examine adversary ordinance that fell into friendly hands.

Decision

The assumption in the previous discussion is that once a problem has been clearly identified, then policymakers will make the appropriate decision. As this study has noted, however, there is often a reluctance or more even an outright refusal to acknowledge failure. Note how long it took for the French to react to the German blitzkrieg, or, more recently, the Bush administration to recognize that it faced an insurgency in Iraq. In more recent history, former Secretary of Defense Robert Gates describes how he had to intervene personally to get better-protected vehicles (Mine Resistant Ambush Protected, or MRAPs) into the field, bypassing DOD's "hidebound and unresponsive bureaucratic structure" and "the department's inexplicable peacetime mindset in wartime."[249]

Actions recommended under anticipation and resilience can facilitate this decisionmaking process: dissemination of wargaming results so that the possibility of surprise is recognized; discussion in the professional journals so alternative courses of action can be identified; and education of military officers and policy officials so they operate effectively even when surprised. These actions act to move vulnerabilities from the "unknown unknown" category to the "known unknown" category. The case of carrier vulnerability, discussed earlier, is relevant here. Although the question cannot be resolved in peacetime, it has been identified and thoroughly discussed. As a result, naval officers and policymakers will be watching what happens at the beginning of a conflict and will be able to adjust the use of carriers depending on the level of their vulnerability.

Scholars have also proposed ways to improve the decisionmaking process. A version of the red team, for example, would have a "devil's advocate" for each decision. That person's role would be to challenge the conventional wisdom and to reduce the possibility of "groupthink," whereby groups of like-minded individuals quickly coalesce around a particular solution without considering the full set of possibilities. Whereas a red team would be outside of the decisionmaking process, the devil's advocate would be inside, perhaps a staff section that has opposed the bureaucratic consensus on an issue. The intelligence community has

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[248] The Center for Naval Analyses is a subsidiary of the CNA Corporation.
[249] Gates, *Duty: Memoirs of a Secretary at War*, 126.

considered incorporating such a viewpoint in order to prevent a repeat of major surprises like the overthrow of the Shah in 1979 and the Arab attack on Israel in 1973. However, such a role is institutionally challenging because the person or organization taking on the responsibility is at risk of damaging career prospects, even if the position rotated depending on the issue.

Robert Jervis proposes a version of the devil's advocate in a "product evaluation staff." The staff's job would be to independently evaluate the organization's analysis products, looking for weak arguments and overlooked possibilities.[250] Jervis made the recommendation in the context of the intelligence community, but the concept could be applied broadly. To avoid creating new bureaucracy, this responsibility should be assigned to an existing staff organization.

Action

Once a challenge has been identified and a decision made about how to meet that challenge, the decision must be put into action. Two mechanisms can be established in peacetime to facilitate this process: rapid acquisition processes and on-call congressional authorities.

Rapid acquisition processes: DOD's acquisition system is slow. There are good reasons for that methodical pace when acquiring multibillion-dollar systems and putting so much of the public's money at risk. However, to cope with surprise, DOD will need to move quickly. The time from identification of a problem to fielding an effective response needs to be weeks or months, not years.

Fortunately, many authorities already exist, and DOD's experience in the past 10 years has developed some mechanisms for rapid acquisition.[251] The Army, for example, has the Rapid Capabilities Office, which allows for the quicker acquisition of capabilities in response to unforeseen challenges; the Rapid Reaction Technology Office, which enables solutions outside the normal two-year budget process; and the Rapid Innovation Fund, which works with small businesses to add technological solutions into the acquisition process.[252] Other services have established similar offices.

In addition, Congress has provided DOD and the services with authorities to conduct rapid acquisition in support of designated military operations. These range from waiving certain

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[250] Jervis, *Why Intelligence Fails: Lessons from the Iranian Revolution and the Iraq War*, 186–87.

[251] Andrew Hunter, "The US Needs More Weapons That Can Be Quickly and Easily Modified," *Defense One,* April 25, 2016, http://www.defenseone.com/ideas/2016/04/us-needs-more-weapons-can-be-quickly-and-easily-modified/127787/.

[252] Andrew Hunter and Rhys McCormick, *The Army Modernization Imperative: A New Big Five for the Twenty-First Century* (Washington, DC: Center for Strategic and International Studies, 2017), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/170530_Hunter_ArmyModernization_Web.pdf; Andrew Hunter and Ryan A. Crotty, *Keeping the Technological Edge: Leveraging Outside Innovation to Sustain the Department of Defense's Technological Advantage* (Washington, DC: Center for Strategic and International Studies, 2015), https://csis-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/150925_Hunter_KeepingTechnologicalEdge_Web.pdf.

contract provisions, narrowing or eliminating the need for competition, increasing the threshold for simplified small acquisitions, and streamlining testing.[253]

In a surprise situation, DOD will need to use these offices and authorities quickly. The response to IEDs in Iraq provides both encouragement and concern. DOD enhanced its truck fleet several times to cope with the increasing threat, first applying improvised "Mad Max" armor, then building up-armored versions of its truck fleet (up-armored HMMWVs, for example), then buying specifically designed vehicles, the Mine Resistant/Armored Protected, or MRAPs. However, the responses took a long time, MRAPs not arriving in theater in large numbers until 2010, long after the threat had materialized.

DOD also stood up a specially tasked organization to counter the threat, the Joint IED Defeat Organization. The recognition of the threat occurred in the early phases of the conflict. In October 2003, CENTCOM commander Gen. John Abizaid called for a "Manhattan-like project" for the IED threat. DOD's initial response was the creation of an "Army IED task force," which later morphed into the "Joint IED Defeat Task Force," which in turn grew into the Joint IED Defeat Organization with a staff of 3,100 and an annual budget of more than $4 billion. It pursued three lines of operation: defeating the device through armor, jamming, and other devices; attacking the network that produced and implanted IEDs; and training the troops to deal with the threat. So, although recognition by senior officials was quick, it took over 2-1/2 years to develop a national response to the threat, a timeline that will need to be shortened in any conflict with a great power adversary, which will have far better capabilities than insurgent forces.[254]

Congressional authorities When a conflict occurs, DOD will likely be operating under peacetime authorities and appropriations. Congress will need to shift quickly to wartime appropriations and authorities. "Wartime appropriations" means providing the increased level of resources needed to fight a war since peacetime budgets do not contain resources for a high wartime level of operations. "Wartime authorities" means the ability to increase purchases, call up reservists, prioritize defense needs in dual-use industries, and, based on lessons learned from contact teams, perhaps buying new kinds of equipment and modifying existing equipment.

Fortunately, Congress has reacted quickly when wartime demands required, even as it has not been a model of smooth and deliberate operations in other areas. After 9/11, for example, it immediately provided extra resources and has continued to provide whatever level of resources is needed to conduct wartime operations. The wars in Iraq and Afghanistan may have been controversial, but the Congress has provided essentially whatever funding the military requested. This was a change from the experience at the end of the Vietnam War where Congress cut funding as a way to choke off wartime operations. Further, Congress has provided a wide range of authorities that DOD has asked for. Some examples include provision of transportation and logistics support to coalition forces, training and equipping of

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[253] Moshe Schwartz, *Acquisition Reform in the FY 2016–FY 2018 National Defense Authorization Act* (Washington, DC: Congressional Research Service, January 4, 2018).
[254] Robert Sadowski *Joint Improvised Explosive Device Defeat Organization: Anomaly or Future Roadmap* (Carlyle, PA: U.S. Army War College, March 25, 2008), http://www.dtic.mil/get-tr-doc/pdf?AD=ADA47972821.

coalition forces, and rapid construction of contingency bases. Congress will need to continue to show this kind of flexibility and rapid response in dealing with surprise arising in a future conflict.

Appendix: Vignettes

Strategic Surprise	
1	Russian blitz in the Baltic states
2	China invades Taiwan
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5	Biological enhancements to special operations soldiers
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Strategic Surprise

Vignette #1: Russian Blitz in the Baltics

History: The Soviet Union invades Afghanistan in December 1979 after a coup by internal communist rivals deposes the Afghan communist leadership preferred by Moscow; Germany attacks Yugoslavia in April 1941, after a military coup installs a pro-Allied government hostile to the Axis powers.

The Future? A political crisis erupts in Latvia after a highly contentious parliamentary election. The Harmony Center, a leftist party popular with Latvia's large Russian-speaking population and that has close ties to Russian leaders, wins the single-largest number of seats but falls short of an absolute majority. Latvia's center and center-right political parties, however, cannot agree on terms to form a government. The impasse attracts little interest at first, but this changes as reports surface that Moscow is trying to influence the government formation process. Latvia quickly becomes a fulcrum for the broader tensions between Russia and the West. Alarmed that Russia may be trying to gain a trojan horse inside NATO and the EU, Western leaders exert pressure on the Latvian center/right parties to form a government and block Harmony from taking power. When this happens, Moscow accuses the West of orchestrating a coup d'état and permitting their Baltic allies to permanently relegate their Russian minorities to second-class status. Clashes break out in Riga during demonstrations staged by Harmony supporters. These are met with counter-demonstrations by Latvian ultranationalists. Similar demonstrations erupt in Estonia.

Angry and humiliated at the outcome in Latvia, the Kremlin recalls its ambassadors from Riga and Tallinn, halts cross-border trade, and orders large-scale snap exercises in the Western Military District involving more than 100,000 troops. Armored forces concentrate near the Baltic States' borders while the Baltic and Northern Fleets conduct drills at sea. As with past Russian snap exercises, U.S. and NATO intelligence agencies warn with mixed confidence that Moscow could use the drills as cover for an attack. U.S. and NATO military commanders also warn—as they have many times before—that, if deterrence fails, their forces in the Baltics are inadequate and would be rapidly overrun. Wary of provoking Moscow, U.S. and NATO leaders decide against reinforcing the Baltics or deploying forces elsewhere on the continent. Their caution appears to be rewarded as Moscow's anger seems to subside after several weeks. Rhetoric from Russian state media softens, and Russia lifts some cross-border trade restrictions. The snap exercises wind down as most of the units start returning to their garrisons, and only a few motorized infantry units are left conducting field exercises.

One night, elite Russian Spetsnaz units slip across the heavily forested Estonian and Latvian borders near Pskov and seize border crossings. Several reinforced Russian motorized infantry regiments that were conducting night maneuvers nearby suddenly turn and silently dart across the border. In two columns, the Russian forces drive headlong through the darkness for Riga and Tallinn, navigating with night vision goggles. Within an hour of its forces crossing the border, Russia launches cyber-attacks to disrupt Latvia and Estonia's telecommunications networks and power grids. Russian Tu-95 Bear bombers circling over the St. Petersburg region fire Kh-55 cruise missiles at the few Latvian and Estonian arms depots, assembly

points, and command and control facilities not collocated with NATO enhanced Forward Presence (eFP) units. The Russian Ministry of Defense announces that Latvian and Estonian airspace is closed while it conducts humanitarian operations in Latvia and Estonia. Russian air defense systems light up across the region. Having encountered only sporadic resistance, the Russian columns reach the outskirts of Tallinn and Riga by late morning where they are met by elite airborne infantry (VDV) and Spetsnaz ferried in by rotary and fixed-wing aircraft throughout the night and into the morning.

Confining its operations to Estonian and Latvian territory, Russia does not take offensive actions against other NATO members, including Lithuania, and seeks to bypass and isolate NATO forces in the region. The NATO eFP battlegroups are paralyzed. Not only do most units lack clear orders from their capitals on whether they can take the field against the Russians, most lack the equipment and ammunition to do so. The NATO battlegroup in Latvia, for example, comprising a hodgepodge of 1,000 Canadian, Albanian, Italian, Slovenian, and Spanish troops, cannot coordinate a response, and essentially becomes a hostage. The Latvian and Estonian units that share their bases with the NATO forces are reluctant to take action without NATO support and hunker down. As Russian forces contain the NATO forces in their bases from a distance, these units become a liability as NATO leaders debate whether to invoke Article 5. Moscow offers to repatriate each country's military personnel and equipment so long as they do not attack Russian forces as they leave. The assumption that the United States would react before NATO does proves false. For domestic political and practical military reasons, Washington does not want to enter a potentially catastrophic war in Eastern Europe while most of its European allies sit on the fence.

As Russian forces prepare to move into the capital cities on the second day of the invasion, the Latvian and Estonian governments declare Riga and Tallinn open cities to spare civilians and prevent damage to the historic cities. Leaders flee into exile. Russian follow-on forces begin pouring over the borders to extend control over the rest of the countries, encountering only light resistance from half-mobilized reserve units and sporadic partisan activity. To avoid a general war, the Kremlin issues its demands to the West, offering an olive branch that would allow Estonia and Latvia to remain independent, but on Russia's terms. Russia offers to withdraw its armed forces if—

1. Latvia and Estonia both agree to dissolve their governments and hold new parliamentary elections within three months. The elections must be held under Organization for Security and Cooperation in Europe (OSCE) supervision and free from foreign interference;

2. The United States and EU will guarantee the full rights of Russian-speakers and ethnic Russians on equal terms with the other citizens of the Baltic States;

3. Certain government powers in Latvia and Estonia will be devolved to regional and local governments to achieve greater political autonomy for predominately Russian-speaking areas;

4. NATO will withdraw all military forces from Estonia, Latvia, *and Lithuania*. A small joint EU and OSCE force will be permitted to observe Russia's borders with Latvia and Estonia.

5. After new elections, Estonia and Latvia will withdraw from the Washington Treaty and within one year sever all ties to NATO. Both may remain in the EU.

6. Within one year, Latvia and Estonia will enact constitutional amendments pledging themselves to permanent neutrality, prohibiting both their entry into any military alliances and the establishment of foreign military bases within their territories.

Authors Note: Russia's political objectives in this vignette are limited to attaining greater political rights for Russian minorities and forcing Estonia and Latvia out of NATO. In order to avert a potentially disastrous conflict with NATO, Russia seeks to present NATO with a fait accompli *by taking the capitals quickly and then issuing demands for its withdrawal tailored in a manner that some NATO members would view as tolerable compared to the costs of retaking the Baltics by force. At the operational level, Russia limits the scope of the conflict to Latvia and Estonia and tries to give NATO members no further motivation for intervening by minimizing NATO casualties.*

Russia attacks with a relatively small, light, and mobile entry force, a scenario that is quite different than the attack methodologies often debated today in the West. Since 2014, scenarios for a Russian attack in the Baltics have generally vacillated between two extremes: either Russia would conduct a large-scale combined arms attack spearheaded on the ground by heavy armored formations or a Crimea-style hybrid operation involving "little green men." The former seems to be too much force, the latter too little. Latvia and Estonia each only have a handful of lightly armed infantry battalions, most not kept at high readiness, and some special operations forces. The force mix for a Russian invasion might more closely resemble what Germany used to overrun the Low Countries and Denmark in World War II: robust motorized infantry and airborne troops backed by air power, which quickly overwhelm their far smaller and lightly equipped opponents. For Russia, such a force could be built up discreetly, would be able to take objectives rapidly, and would still possess sufficient firepower to overpower whatever resistance it might encounter.

Vignette #2: China Invades Taiwan

History: Germany invades Poland in September 1939 to recover "German" territory lost in the Versailles treaty.

The Future? Relations between China and Taiwan experience a flare-up as Taiwanese elections approach. Taiwan's growing diplomatic isolation, combined with an economic slowdown in the region, prods the pro-independence movement toward a more hardline stance, and it gains a significant lead in the polls. The changed political environment even leads the Kuomintang, once firm advocates of unification, to waver in its support for the One-China Principle. While Washington and Beijing publicly call for a peaceful resolution, the Chinese political and military leadership conclude that it is only a matter of time before Taiwan attempts to break away—whether after this election or the next. Mindful that a pro-

independence electoral victory would put the Republic of China (ROC) and U.S. forces on heightened alert, making an already-risky invasion attempt more difficult, China decides to strike before the election to achieve surprise and deliver a quick knockout blow. China is also determined to keep the United States out of the war by overrunning Taiwan as rapidly as possible while making any U.S. effort to intervene extremely costly for Washington. As the People's Liberation Army (PLA) begins preparations, U.S. and ROC intelligence warn of the heightened military activity across the Strait. It is unclear, however, whether the PLA is planning to conduct a postelection show of force or an actual attack and whether any of this hinges on the new government declaring independence.

At dawn four days before the election, China opens the invasion with an enormous air and missile bombardment of ROC airbases, naval bases, and air defenses. Waves of PLA Air Force (PLAAF) ground attack aircraft with precision-guided munitions destroy ROC aircraft on the ground and warships in port. Chinese short-range ballistic missiles and cruise missiles continuously pummel ROC airbases, cratering runways to disrupt air operations and dispersing antivehicle mines to disrupt repairs and movement. At mid-morning, the PLA's amphibious landings begin at several locations, with the main landing near Hsinchu, on the northwest coast of the island. The PLA aims to land 14 frontline divisions within the first week and rapidly overrun major parts of eastern Taiwan. Small teams of Chinese Special Operations Forces, some of which infiltrated ahead of the attacks and others sleeper cells that were activated, stir chaos across the island with sabotage operations and ambushes, which delay the arrival of some larger ROC Army units at the beachheads.

Furious at China's blatant aggression, the U.S. president is strongly inclined to come to Taiwan's aid. As the National Security Council gathers for an emergency meeting several hours after the invasion begins, the president and his political advisers are stunned by the military options brought forward by the Pentagon. While the Department of Defense and outside analysts had warned for years about China's military modernization and its strengthening anti-access/area-denial capabilities (A2/AD), the crisis crystalizes the impact of these new strategic realities. PACOM reports that Chinese forces are establishing a thicket of A2/AD capabilities through the Pacific to disrupt the ability of U.S. forces to assist Taipei. The PLA Navy (PLAN), for instance, is surging its entire SSN fleet into the East China Sea and Philippine Sea to screen the invasion against U.S. naval forces. U.S. carrier strike groups arriving from Japan or the United States will have to run a gauntlet of submarines, mines, aircraft, long-range antiship ballistic missiles, and cruise missiles—all before arriving within range to aid the beleaguered ROC forces. Neutralizing China's multilayered air defense systems, based on the mainland but extending over Taiwan, could require strikes against the mainland. While Tokyo is willing to allow U.S. forces to use its bases on Okinawa (but not on mainland Japan), most would be vulnerable to Chinese ballistic and cruise missiles until more missile defense assets and Aegis destroyers arrive from the United States.

The Joint Chiefs and PACOM express confidence that, with time, China's A2/AD barriers could be grounded down and the invasion thrown back. However, doing so will require a massive commitment of naval and air power, and it will take several weeks to build up the forces needed in the Pacific. It is unclear whether the ROC can hold out that long. U.S. forward-deployed forces—air forces on Guam, Okinawa, and Japan, the USS *Ronald Reagan*

carrier strike group at Yokosuka, and ships transiting to and from the Middle East—could be sent into the fight immediately, but their limited numbers might lead to high losses. SSNs could be employed in the Strait against China's amphibious and resupply shipping, but the boats would face considerable risks from even the PLAN's modest antisubmarine warfare capabilities due to the Strait's shallow waters and the confined operating space.

Faced with the prospect of tens of thousands of U.S. casualties, large losses of scarce ships and aircraft, the lack of willing allies, and possible nuclear escalation, the United States is forced to confine its actions to sanctions and diplomatic protests.

Vignette #3: China Attacks Vietnam

History: China attacks Vietnam in 1979 in retaliation for Vietnamese intervention in Cambodia and alignment with the Soviet Union.

The Future? The longstanding tensions between China and Vietnam over their competing territorial claims in the South China Sea erupt into a series of maritime standoffs around the Spratly Islands and the Parcel Islands. Throughout the crisis, Washington strongly encourages Hanoi to stand firm against Beijing's territorial claims in the South China Sea. As tensions run high, China attempts to move an oil rig into disputed waters near the Parcel Islands and escorts it with a small fleet of fishing vessels and coast guard cutters to deter any actions by Vietnam and other claimants. The Vietnamese Coast Guard, however, responds in force to contest the movement and results in a series of violent clashes. The Vietnamese successfully rout the Chinese fleet, but at least nine Chinese fishermen drown, three dozen are arrested, and four fishing vessels are disabled and seized by Vietnam. The entire incident is filmed by Vietnam, which releases the video. It quickly goes viral online, deeply humiliating Beijing and earning Hanoi praise from Washington, Tokyo, Taipei, and others.

Beijing decides that the status quo in the South China Sea is intolerable and that military action is necessary to punish its smaller neighbor for its intransigence. The Chinese leadership debates a variety of responses. Ultimately, it decides against a limited military action targeting Vietnam's military presence in the South China Sea, believing this would simply invite more tit-for-tat confrontations. Instead, Beijing plans a decisive attack to cripple Hanoi's ability to hold onto its positions in the South China Sea and to demonstrate China's growing military strength.

While tensions appear to dissipate after the clashes around the Parcels, three weeks later China launches a large-scale surprise attack on Vietnamese air and naval bases up and down the Indochina Peninsula. Vietnam is caught entirely unprepared for an attack on its homeland. Hanoi had anticipated a limited Chinese response in the South China Sea, an assessment supported by intelligence provided by the Americans, as many Chinese naval and air forces were observed redeploying from the Taiwan Strait to bases in southern China.

China opens its attack by pummeling Vietnamese air defenses and largely defenseless fighter bases in northern Vietnam with barrages of land-attack cruise missiles and ballistic missiles fired by PLA Rocket Force units in southern China and Hainan. Waves of PLA Air Force (PLAAF) Xian H-6 and Xian JH-7 bombers, joined by escort fighters, strike Vietnamese air and

naval bases along the coast with air-launched cruise missiles and precision-guided munitions. Without hardened aircraft shelters and parked almost wing-to-wing, most of Vietnam's frontline fighter aircraft are destroyed on the ground. The Vietnam People's Navy is similarly gutted by heavy losses including 3 *Kilo*-class submarines, 10 modern frigates and corvettes, and numerous smaller patrol boats and support vessels. Perhaps the biggest surprise is China's operational reach. Using its small tanker fleet, PLAAF aircraft conduct several airstrikes against Vietnam's naval base at Phu Quoc in the Gulf of Thailand, about a thousand miles from the main Chinese bases. Crippled by the attack, Hanoi urgently requests that the United States come to its defense. Washington, however, while condemning China's aggression, declines to get directly involved in the conflict, offering military equipment and supplies instead. Over the next several weeks, Vietnam's military presence in the Spratly and Parcel Islands is systematically dismantled by Chinese airstrikes and naval infantry landings.

Author's note: There is a strong precedent for such an attack. In 1979, Chinese Vice-premier Deng Xiaoping visited the United States for the first time and told American president Jimmy Carter: "The little child [Vietnam] is getting naughty, it's time he gets spanked." On February 15, Deng Xiaoping announced that China planned to conduct a limited attack on Vietnam. The reason cited was to support China's ally, the Khmer Rouge of Cambodia, in addition to ending the mistreatment of Vietnam's ethnic Chinese minority and the Vietnamese occupation of the Spratly Islands, which were claimed by China. To prevent Soviet intervention on Vietnam's behalf, Deng warned Moscow the next day that China was prepared for a full-scale war against the Soviet Union. The war lasted for about one month and caused tens of thousands of casualties. However, Vietnam proved to be a tougher adversary than China had expected.

Today, instead of allying with the Soviet Union against China, Vietnam is allying with the United States but with the same intention of countering Chinese influence. Chinese military capabilities are far greater than those possessed in 1979.

Technological Surprise

Vignette #4: "Assassin's Mace"—Asymmetric Cyber Attack

History: Prior to invasion in 1950, the Chinese Communists denounce Tibet as a "feudal serfdom" and a "hell on earth" and spread propaganda about the abuses and wealth of the ruling elites in order to undermine resistance. In Hungary in 1956, after crushing the anticommunist revolt, the communist government publishes an extensive series of "white books" describing incidents of violence against Communist Party in order to undermine the resistance's legitimacy.

The future? [translated from the Mandarin] "<Comrade General Secretary, your patience these last three years has been rewarded. Our gift is finally ready.>"

"<Good. Deliver it to our friends. And then we can truly begin.>"

One week later: "Mr. Secretary, they've finally made a move."

"Thank you." The U.S. secretary of defense had wondered this past week when the other shoe would drop. Finally, it had, though the U.S. military would be unable to respond effectively for a while.

The scope and detail of the attack, not to mention its sheer audacity, had earned the grudging respect of the secretary. Years of worry about a possible Chinese "Assassin's Mace"—a silver bullet superweapon capable of disabling key parts of the American military—turned out to be focused on the wrong thing.

The cyber attacks varied. Sailors stationed at the 7th Fleet's homeport in Japan awoke one day to find their financial accounts, and those of their dependents, empty. Checking, savings, retirement funds: simply gone. The Marines based on Okinawa were under virtual siege by the populace, whose simmering resentment at their presence had boiled over after a YouTube video posted under the account of a Marine stationed there had gone viral. The video featured a dozen Marines drunkenly gang-raping two teenaged Okinawan girls. The video was vivid, the girls' cries heart-wrenching, the cheers of Marines sickening. *And all of it fake.* The National Security Agency's initial analysis of the video had uncovered digital fingerprints showing that it was a computer-assisted lie, and could prove that the Marine's account under which it had been posted was hacked. But the damage had been done.

There was the commanding officer of Edwards Air Force Base whose Internet browser history had been posted on the squadron's Facebook page. His command turned on him as a pervert; his weak protestations that he had not visited most of the posted links could not counter his admission that he had, in fact, trafficked some of them. *Lies mixed with the truth.* Soldiers at Fort Sill were at each other's throats thanks to a series of text messages that allegedly unearthed an adultery ring on base.

The variations elsewhere were endless. Marines suddenly owed hundreds of thousands of dollars on credit lines they had never opened; sailors received death threats on their Twitter feeds; spouses and female service members had private pictures of themselves plastered across the Internet; older servicemembers received notifications about cancerous conditions discovered in their latest physical.

Leadership was not exempt. Under the hashtag #PACOMMUSTGO a dozen women allegedly described harassment by the commander of Pacific command. Editorial writers demanded that, under the administration's "zero tolerance" policy, he step aside while Congress held hearings.

There was not an American service member or dependent whose life had not been digitally turned upside down. In response, the secretary had declared "an operational pause," directing units to stand down until things were sorted out.

Then, China had made its move, flooding the South China Sea with its conventional forces, enforcing a sea and air identification zone there, and blockading Taiwan. But the secretary could only respond weakly with a few air patrols and diversions of ships already at sea. Word was coming in through back channels that the Taiwanese government, suddenly stripped of its most ardent defender, was already considering capitulation.

Author's note: In this vignette an adversary uses the personally identifiable information gleaned from the 2015 hack of the Office of Personnel Management (OPM) and potentially from other hacks, yet unknown. OPM holds the official records for millions of government personnel, including members of the military. The level of detail and amount of sensitive information in these records would allow an adversary to disrupt a servicemember's medical and financial records, email, social media accounts, and personal electronic devices. Col. John Boyd once said that the best way to destroy the cohesion of an organization was by spreading mistrust and discord. A cyber attack as described in this vignette would do just that. The attack would not prevent a U.S. military response because eventually enough of the disruption would be settled out. However, it would slow a response and that might be all an adversary needed.

China has been relentless in attacking U.S. networks and, apparently, has had some success. Aside from OPM, other American government agencies have also been breached and thus shown vulnerabilities. Cyber intrusions into Britain's National Institute of Health, for example, demonstrated how personal medical information is vulnerable on a massive scale.

Vignette #5: Biological Enhancements to Special Operations Soldiers

History: During World War II, the German military distributed a medication called Pervitin to its troops. The tablets, made with a methamphetamine compound, kept pilots awake for extended operations and could lead to feelings of euphoria. The drugs were used for decades but were ultimately banned due to negative side effects like dizziness, hallucination, depression, and even heart failure.

The Future? In its long-term competition with the United States, China looks to a variety of areas to gain a competitive edge. One area of interest is bio-enhancement. The Chinese use the advantage of their authoritarian system to waive any notions of informed consent and conduct experiments on human beings. The Chinese explore gene-splicing techniques in an effort to develop humans with enhanced physical characteristics, but such research would take decades to come to fruition as a genetically altered child would need to mature to military age. The Chinese also explore various drugs to enhance combat performance. Given the controversial and politicized nature of these bio-enhancement efforts, the programs are highly classified and not much is known to the outside world.

Chinese scientists succeed in developing a performance-enhancing drug, a new blend of amphetamine and dopaminergic compounds, that improves endurance, reaction time, and muscle strength. The drug accomplishes this by overriding the body's limits on core temperature levels to access reserve energy. While the immediate effect is powerful, the extremely high physical activity leads to muscle breakdown and nervous system dysfunction, eventually resulting in paralysis or death. American military researchers were generally aware of the drug's effects but rejected the whole class due to the high death rate of animal test subjects.

Energized by the drug, two teams of Chinese commandos conduct simultaneous raids on U.S. bases in Japan: the Yokosuka Naval Base and the Kadena Air Base. At Yokosuka a Chinese submarine stops just outside of the Tokyo Bay. The commandos unload and,

unaffected by the cold waters due to heightened core temperatures from the drugs, use swimmer delivery vehicles to approach the base undetected. The troops lay charges on several ships and at the gates of certain dry docks. The explosions cause extensive damage that will take years to repair. A similar scene unfolds at Kadena as the commandos emerge onto the beach with a surprising level of stamina and power, catching the American troops off guard. The Chinese soldiers, seemingly tireless and unusually agile, overtake the base's security and damage several airborne early warning and signal intelligence aircraft. Some of the soldiers disable control mechanisms for the base's extensive tank farm. Burning fuel floods the area, destroying much of the base fuel system. Part of the munitions storage area explodes, destroying dozens of scarce air-to-air and air-to-ground missiles.

After several hours, the intense firefight suddenly ends. The Chinese commandos who were not shot down are discovered dead or paralyzed, having collapsed to the ground or floated to the surface of the water. Autopsies performed on the bodies in the following days reveal the high levels of amphetamine-like substances in the soldiers' blood. The mission, though ultimately suicidal in nature, proved highly effective at accomplishing Beijing's goal of disabling key U.S. military targets in the Pacific Ocean.

Author's Note: The use of performance-enhancing drugs, and particularly amphetamines, has precedents beyond the use of Pervitin in WWII. During the 1993 Battle of Mogadishu, Somali militants chewed a plant called khat, which releases an amphetamine-like stimulant that is said to cause excitement, mild euphoria, and hyperactivity. Chewing khat increased the endurance of Somali militants, forcing American troops to work around the jittery fighters by operating at night after the effects of khat had worn off. Even today, U.S. pilots use "Go-Pills" before particularly long or fatiguing missions. The pills contain dextroamphetamine, which keeps the pilots awake and more alert, though has been a source of controversy as some suggest the drug has adverse side effects. In authoritarian regimes, unburdened by the requirements of informed consent, researchers might find ways to enhance human performance, even at a high cost to the individual. The Soviet and East German athletic regimes were notorious during the Cold War for giving performance-enhancing drugs to athletes, often without their knowledge and causing severe long-term effects.

Vignette #6: U.S. Military Satellites Neutralized

History: In 1914, at the beginning of World War I, Great Britain cuts Germany's undersea telegraph cables to its overseas possessions and stations. This isolates them and makes coordination of military operations outside Europe difficult.

The Future? As part of China's ongoing cyber warfare effort, PLA hackers conduct cyber reconnaissance of U.S. military satellite infrastructure to better understand U.S. operations and discover weaknesses that might be useful in the event of a conflict. After a period of trial-and-error, the hackers successfully employ targeted spear phishing attacks against several Air Force personnel in the 50th Space Wing at Air Force Space Command, Schriever Air Force Base, Colorado (AFSPC). Using compromised personal and work accounts, the hackers establish a foothold in the AFSPC's unclassified network and gradually move laterally to unclassified contractor maintenance terminals that are sometimes connected to the Air

Force Satellite Control Network (AFSCN). The AFSCN controls multiple telemetry, tracking, and commanding (TT&C) ground stations, remote tracking stations (RTS), and satellite operation control centers the Air Force uses to operate, command, and maintain most DoD satellites and some civilian satellites.

Over several months, the PLA hackers bury into the TT&C ground station network at Schriever AFB. They take over several user terminals in the satellite operations center. A combination of spoofing user terminals and automation allows the transmissions to go unnoticed by Air Force operators on the night shift. For several hours, the hijacked terminals are used to transmit malicious code to three dozen DoD communications satellites as they make routine contact with ground station. The malicious commands appear to be standard orbital station-keeping instructions. The code is set to execute upon receipt of a batch of go instructions. The terminal spoofs, however, eventually trip red flags in the network. Evidence of the intrusion is uncovered, and the hackers quickly lose access. Following the breach, network security at TT&C stations is improved. Sloppy or perhaps wishful analysis of the attack by CYBERCOM and the National Security Agency (NSA), however, discounts the possibility that the hackers had affected satellite operations. Hopeful their implants are still accessible, PLA hackers use their knowledge of the network to regain limited access to the AFSCN network through vulnerabilities at Remote Tracking Stations (RTS) in Hawaii and New Hampshire, and then they wait.

When a conflict erupts between China and the United States over Taiwan, the hackers activate their implants. The compromised RTSs transmit the execute orders to the infected DoD satellites passing overhead. Air Force operators at Schriever AFB do not realize what is happening until it is too late. In all, 25 of 33 infected DoD communications satellites begin de-orbiting. Although the RTSs regain control of some satellites, all the fuel is gone, so there is nothing to be done but watch them slowly descend from orbit and burn up. While a significant blow, the losses themselves are not totally crippling. However, stunned at the extent the Chinese have penetrated its ground stations and satellites, DoD overreacts and sharply curtails ground station communication with its satellites to conduct extensive security checks. Entire constellations of DoD and commercial satellites provide only limited service for weeks. Without assured satellite communications, U.S. forces in the Pacific are forced onto the defensive.

Vignette #7: Pearl Harbor 2.0—Drone Style

History: In 1941 Japan develops a shallow running air-dropped torpedo allowing it to attack ships at anchor. In 1967, the Israeli Air Force carries out a preemptive attack on Arab air bases, destroying most of the Egyptian and Syrian air forces on the ground.

Future? Tensions between the United States and China reach a breaking point after a series of U.S. freedom-of-navigation operations during which Chinese patrol boats are pushed aside and one badly damaged. Chinese media paint the United States as the aggressor, trying to return China to the subservient position it occupied in the twentieth century.

Senior members of the PLA plan a strike that will neutralize U.S. power in the Pacific without involving other countries or causing many casualties. They know that the missile defenses recently installed around U.S. bases make a missile attack uncertain.

Despite the crisis, global commerce continues unabated. As a sign of this, the container ships COSCO Africa, COSCO Osaka, and COSCO Kobe—all owned by a Chinese national corporation—prepare to depart Shanghai on their regularly scheduled voyages to ports in Japan and on the U.S. West Coast. Laden with hundreds of containers, the ships are no different from any of the thousands of other large cargo ships plying the world's ocean. Curiously, their crews are swapped out at the last minute in Shanghai, replaced by serious-looking men with a military air. Furthermore, the 20 containers on the top level are replaced by a special set of 20 containers. They are the product of the PLA Air Force's most secret project, codenamed Xiongnu by a junior officer with a wicked sense of humor and a love of history. (Xiongnu—horse-mounted archers from the west).

The ships leave on a staggered schedule, COSCO Africa first, then COSCO Kobe a week later, then COSCO Osaka two days after that. Oddly, their automatic identification system (AIS) global tracking beacons show them still in Shanghai. Lost amid the churn of global trade, the ships sail on, invisible to the wider world. Soon the ships reach their targets, the islands of Okinawa, Guam, and Oahu. Three hours before midnight local time and with a brief series of commands, the fruits of Xiongnu are revealed.

The tops of 20 containers flip open. Ten of these each contain two relatively large drones that fully unfold once flung into the air. These 20 aircraft carry a large explosive to destroy buildings and satellite antennas. The other 10 contain 50 small drones each for a total of 500 small, yet deadly aircraft. Each carries a small shaped charge designed to destroy aircraft wings, engines, and vital avionics.

Thirty minutes after launch, the drones reach their targets. The bases are caught totally unaware. The large drones attack satellite dishes, repair facilities, and command centers. The smaller drones attack individual aircraft and ships. Guided by the onboard artificial intelligence, the drones hit the most sensitive parts of each. Thus, few U.S. aircraft are actually destroyed, but the damage requires that most be sent back to depots in the continental United States for repairs that will take years because of the limited capacity of those facilities. Similarly, no ships sink but all are rendered combat ineffective when drones destroy above-deck weapons and sensors. Finally, headquarters lose much of their capacity to communicate with their forces.

No other countries have been attacked, and few casualties have been inflicted. Nevertheless, a large part of PACOM's combat power has been neutralized. Shortly thereafter, the second phase of the Chinese plan is set into motion…

Author's Note: While this may read like science fiction, the underlying technology for such a strike is available today. Using commercial shipping, quite plausible given China's position in the global marketplace, would be especially hard to detect beforehand. Lastly, existing air defense systems are wholly unprepared to deal with a very large number of very small targets.

Vignette #8: NATO Submarines Located and Attacked through Nonacoustic Submarine Sensors

History: Allied antisubmarine warfare advances during World War II, such as airborne surface-search radar, radio direction finding, and maturation of sonar, give their forces dominance over German submarines.

The Future? After decades of highly secret work, Russia makes several breakthroughs in nonacoustic submarine detection that allow it to detect submarine wakes using synthetic aperture radars (SAR) aboard aircraft and satellites. The capability is based on detecting the small hydrodynamic disturbances created on the surface of the ocean by submerged submarines. While this had long been recognized in naval circles as a potential detection method, its development was hampered by technological limitations in detecting such minute changes on the surface and limits on data processing. Russia is able to overcome these challenges with the development of ultra-wideband SAR systems and high-end off-the-shelf microprocessors that allow it to rapidly process data onboard its antisubmarine aircraft in near-real time. The Russian Navy's Tu-142MZ ASW aircraft provide the ideal platform for marrying the technologies to its existing antisubmarine warfare capabilities and undersea acoustic detection networks.

Shortly after a large-scale conventional conflict erupts between NATO and Russia in Eastern Europe, the United States loses two *Los Angeles*-class SSNs in separate incidents. The first submarine is destroyed by a Russian Tu-142MZ aircraft as the submarine is approaching its patrol area in the Barents Sea, off Murmansk. Several days later, the second submarine is lost in the Norwegian Sea to a suspected attack by a new Russian ASW frigate (Project 23420) from the Northern Fleet, perhaps vectored by ASW aircraft.

While troubled by the losses, the Defense Intelligence Agency and the Office of Naval Intelligence initially attribute both to the relatively noisy acoustic signature of the *Los Angeles*-class boats and improvements in Russia's acoustic detection sensors, which are thought to have allowed the boats to be tracked and destroyed. Navy officials stress that both were older vessels scheduled for retirement but kept in service to maintain the size of the Navy's SSN fleet amid rising tensions with Russia and China. As a precaution, the Navy limits the remaining *Los Angeles*-class SSNs to patrols south of the Greenland-Iceland-UK barrier but retains high confidence in the stealth performance of the *Virginia*-class SSNs.

A week later, the UK submarine *Triumph* disappears off Iceland. This alarms the Royal Navy, which does not know what happened, but the U.S. Navy rationalizes that this was one of the older *Trafalgar*-class submarines and therefore like the *Los Angeles*-class losses.

Two weeks after the *Los Angeles*-class losses, a *Virginia*-class submarine is lost in the Barents Sea and a second is heavily damaged while operating near the Sea of Okhotsk in the Pacific. Both attacks are attributed to Russian Tu-142 aircraft. The losses of the *Virginia*-class boats stun the Navy. The U.S. intelligence community theorizes that Russia is employing a previously unknown nonacoustic detection capability. Worried that its limited SSN fleet could suffer further losses, EUCOM orders all U.S. SSNs in the North Atlantic withdrawn closer to the U.S. eastern seaboard. The withdrawal causes a severe disruption to U.S. and NATO naval

operations in the North Atlantic and in the Baltic and allows greater freedom of action for Russian SSNs, which increase attacks on trans-Atlantic convoys.

Author's note: Russia, and the Soviet Union before it, has long pursued technologies that would allow detection and subsequent tracking of adversary submarines without a traditional sonar—that is, "nonacoustic." Active sonars give away the hunter's location and passive sonars have limited range. Both must be in the water. Nonacoustic technologies, if effective, would transform the ASW mission and submarine operations because they would degrade or outright remove a submarine's defining characteristic, stealth. Shortly after the end of the Cold War, there was considerable debate regarding the maturity of the Soviet R&D activities and claims of operational efficacy in this area. Although there is much skepticism about how much success the Russians have had, if any, the possibility cannot be dismissed out of hand.

Vignette #9: Stealth Strike Fails—Schweinfurt-Regensburg for the Twenty-first Century

History: In the summer of 1943, the U.S. Eighth Air Force conducted a series of daylight long-range bomber raids against heavily protected targets deep within Germany. These raids implemented air forces doctrine that massed formations of heavily armed bombers would be able to defend themselves from interceptor aircraft, successfully penetrate enemy airspace, and attack key targets. The raids, while achieving some of their objectives, resulted in high aircraft losses. In the last raid, against Schweinfurt-Regensburg, over 20 percent of the total force is lost. This was unsustainable and implementation of the doctrine was delayed until long-range fighters became available.

The Future? NATO and Russia are engaged in conflict over the Baltic states. Russian ground forces seize portions of the region under the pretext of protecting ethnic Russians and interdict the Suwalki Gap, the land bridge between Belarus and the Russian enclave of Kaliningrad, with long-range fires out of Kaliningrad. This makes NATO reinforcement of the Baltic states difficult.

Anticipating a NATO response, Russia bolsters its advanced military capabilities in this region. It now has three S-400 regiments in Kaliningrad with a fourth based in western Belarus. These powerful air defense assets are supported by advanced fighter aircraft, a Nebo radar system with claimed counter-stealth capabilities, and long-range strike systems including the Iskander-M ballistic missile and the 9M729 cruise missile (NATO designation: SSC-8 Screwdriver).

To support a series of ground operations designed to open the Suwalki gap, EUCOM/Supreme Headquarters Allied Powers Europe (SHAPE) need to neutralize Russian air defense capabilities and degrade its long-range strike complex. At the top of this priority list is the destruction of the Nebo radar as well as the various radars and command systems supporting the three S-400 regiments in the immediate theater region. To do this, the air component commander draws up a strike package that heavily uses the perceived U.S. trump card, stealth aircraft.

The attack plan calls for four B-2 Spirit bombers equipped with advanced, powered glide munitions to hunt and destroy the Nebo radar system and the 91N6E "Big Bird" acquisition radars. The bombers are supported by 36 F-35s outfitted for "Wild Weasel" missions against battery-level fire control radars and command and control systems. The strike package also includes 12 F-22s to suppress any Russian interceptor aircraft. Two hours before the strike crosses the point of no departure, the United States conducts a large-scale cruise missile strike against known Russian airbases to hinder their air operations. Lastly, the air raid is paired with a second cruise missile salvo targeting a range of fixed targets across Kaliningrad. This second cruise missile wave is intended as a distraction from the main thrust of the operation, the air raid.

At first, the operation goes as planned. The F-22s and cruise missiles successfully suppress Russian interceptor aircraft, and the RC-135s supporting the operation locate and vector the B-2s onto their targets. However, the operation begins to go awry as the F-35s get within 50 miles of their targets. Across the formation, radar warning receivers blare with launch warnings. The sensor components of the S-400 complex perform exactly as designed and the Russian air defense commander choose his tactics wisely favoring a denser salvo of active interceptors albeit at a shorter range than employing the long-range capabilities of his air defense complex. Some of the F-35s launch their weapons at extreme ranges, but most break for home. For several F-35s, it is too late. The F-35s suffer the worst losses in a U.S. air raid since the Vietnam War with eight aircraft destroyed outright and four more suffering heavy combat damage.

The B-2s fare better. They complete the primary objective of their mission. They destroy the advanced Nebo radar complex and render mission kills against two of the battalion-level acquisition radars. However, a clever Russian commander achieves a partial lock against three B-2s. Two of these aircraft escape with noncritical damage. The third, the *Spirit of Kitty Hawk*, is not so lucky. Heavily damaged, the air crew makes an emergency landing at the Gdansk Lech Walesa Airport. Shortly after B-2's landing, the airport is hit with a barrage of Iskander ballistic missiles destroying the aircraft on the ground.

The result of the strike is 15 percent attrition of the small (20 aircraft), yet vital B-2 fleet. More seriously, the F-35s suffer 33 percent attrition. The Russian air defense complex remains operable and the Suwalki Gap is still under fire.

Author's Note: This reflects a future where Russian air defense systems meet or exceed their design specifications and U.S. systems underperform. The vignette sidesteps inclusion of robust electronic warfare capabilities on both sides because they are highly classified and hard to predict. These capabilities would cut both ways—NATO would use them to degrade Russian radars while Russia would use them to degrade targeting. The U.S. Air Force might be reluctant to risk scarce B-2s in such an attack, but NATO and EUCOM would be pushing hard for some action.

Vignette #10: A Technological Stab in the Back—Bad Chips in Air-to-air Missiles

History: During World War II, the U.S. submarine force was severely hampered by defective torpedoes that failed to perform as designed. Going into the Vietnam War, the U.S. Air Force

and Navy had embraced air-to-air missiles in the form of the radar-guided AIM-7 Sparrow and infrared-guided AIM-9 Sidewinder. Neither system works as well as expected. Both system failures—torpedo and missile— are compounded by the lack of a backup system because the primary was believed to be so effective.

The Future? The United States and China finally come to blows in the Western Pacific. The initial stage of the conflict sees China cripple Kadena Air Base on Okinawa. U.S. installations across Japan also come under attack. The bases all receive varying degrees of damage, though none are damaged as heavily as Kadena. Some good news for the United States is that the *Reagan* strike group and the *Bonhomme Richard* amphibious ready group are at sea and escape the opening phase of the conflict unscathed.

The Chinese pay a heavy price at sea. The *Liaoning* strike group comes under attack from two *Virginia*-class submarines patrolling the East China Sea. The carrier is sunk along with one of the Type 052D air warfare destroyers. Two Type 54A frigates are damaged. The United States also launches a massive cruise missile raid on the North Fleet's headquarters at Qingdao. This strikes cripples not only the base but several vessels tied up pierside.

Realizing that they need to reclaim the initiative, Chinese leadership decides to attack Anderson Air Base in Guam. Given U.S. advances in missile defense, the DF-26 intermediate-range ballistic missiles (IRBMs) are no longer the potent weapon that once earned them the moniker of "Guam Express." Instead, the PLA Air Force draws up plans for a mass air raid. The fleet of 50 H-6K bombers carries 300 of the potent, long-range CJ-10 air-launched cruise missiles. The bombers are protected by the first 12 operational J-20 stealth fighters and another 20 J-11Ds. This escort formation is the largest that China can support with its tanking fleet. The formation of 82 aircraft is the largest single air raid conducted since the end of the Vietnam War.

PACOM is not unaware to the threat. Satellite reconnaissance has detected the massing of the H-6 fleet at various bases in eastern China. In response, the *Carl Vinson* strike group, newly arrived in the Western Pacific, takes up a screening position in the Philippine Sea. Carrier Air Wing 2, embarked aboard the *Vinson*, is the most modern wing in the Navy with 30 F-35Cs, 24 F-18E/Fs, 5 E-2Ds, and 6 EA-18Gs with the newly operational Next Generation Jammer. The Air Force is also taking the threat seriously. It has deployed 4 E-3 Sentries, 18 F-22s, and 36 F-35As to Anderson. The Air Force has also moved a dozen aerial tankers to the base to support long-range air combat missions.

These aircraft are all equipped with the latest AIM-120D AMRAAMs and AIM-9X Sidewinders. The F-22s each carry 6 AMRAAMs and 2 Sidewinders. The F-35s carry 4 advanced medium-range air-to-air missiles (AMRAAMs) but their 2 Sidewinders are carried externally, diminishing their stealth characteristics. The Super Hornets are held in reserve. Their lack of stealth is believed to be a key weakness in the upcoming battle. All told, the United States is prepared to put 66 JSFs and 18 Raptors into the sky—carrying 372 advanced long-range antiaircraft missiles—against 50 lumbering bombers and their 32 escorts.

In U.S. ready rooms, morale is high. Carrier Air Wing Two is commanded by a descendant of Admiral Joseph Clark, commander of Task Force 58.1 during the infamous Great Marianas

Turkey Shoot, when Navy aircraft shot down hundreds of attacking Japanese aircraft. The night before the attack he compares this famed victory for U.S. carrier aviation to the coming engagement. At first, things go according to plan. PACOM assets are able to detect the oncoming bombers as they fly over the Ryukyu Islands. The J-20s and J-11s attempt to intercept the U.S. fighters but cannot act before the U.S. formation unleashes a well-coordinated volley of AMRAAMs. The training of the U.S. force is obvious. Each of the H-6 bombers is targeted with two AMRAAMs, launched from over 100 miles away. The U.S. commanders are confident of victory.

However, the missiles fail. Only 10 bombers are destroyed, as the majority of the AMRAAMs do not successfully acquire their targets. Unbeknownst to the pilots and the entire U.S. military, half of the AIM-120Ds purchased from 2016 until 2021 have a fault with the microprocessor that controls terminal engagement, a fault that has escaped notice in testing. This affects over 1,500 of the most advanced missiles in the U.S. inventory.

The F-22 squadron commander immediately tries to close the range to use the shorter-range AIM-9X Sidewinder. However, the squadron has only 36 Sidewinders to work with and must tussle with the bomber's escorts. Immediately launching the remainder of their AMRAAMs at the escorts, the combination of better training and the long-awaited helmet-mounted cueing system helps the F-22s wipe out most of the Chinese fighters. However, a third of the F-22s are lost in dogfights with the J-20s. Working together, the F-35s and F-22s are able to destroy another 15 H-6Ks. Despite their efforts, the Chinese aircraft salvo 150 cruise missiles against Anderson. Their targets? The island's missile defense installations. Shortly after these are degraded, 25 DF-26s arrive to cripple the base. U.S. power in the Pacific receives another hammer blow, and pilots lose confidence in their equipment.

When field commands later report the problem, service material commands and the manufacturer discount reports of failures, blaming inexperienced pilots for launching out of parameters.

Author's Note: There is always a chance that technology will not perform in conflict. The effects of such` failure can be especially pernicious when an entire operating concept is built around a weapon's capability, in this case beyond-visual-range air-to-air missiles. The superiority of U.S. Air Force and Navy is predicated on sensor fusion, stealth, and long-range weapons. Without these weapons, the advantage goes away. Operational testing can reveal weaknesses in the initial weapons production and follow-on testing of manufacturing lots might pick up a defect. However, there is no test like combat, and there is a long history of defects in weapons being hidden until first contact with the enemy.

Doctrinal Surprise

Vignette #11: Cruise Missile Strike on the U.S. Homeland

History: On April 18, 1942, U.S. aircraft, launched from an aircraft carrier that has approached Japan on a little-used northern route, bomb targets around Tokyo and in several industrial

cities. The physical effects are small, but the psychological effects are great, causing the Japanese to pull air defense units back to guard the homeland.

The future? Conflict breaks out between the United States and China, arising from disputes in the South China Sea and the Taiwan Strait. China, employing its modernized air and naval capabilities, sets up an anti-access/area-denial bubble around its homeland. Nevertheless, it takes heavy losses from U.S. and allied attacks. U.S. submarines devastate Chinese ships that venture too far from shore, the artificial islands constructed in the South China Sea are bombed back into submerged reefs, and missiles hit coastal port facilities.

China decides to take the war to its enemy. The PLAN sneaks a specially selected and trained submarine across the Pacific, avoiding detection by sailing a little-used southern route. The submarine launches a barrage of cruise missiles at ships in San Diego harbor and at several bases in the area—Miramar, Point Loma, Coronado, North Island, Navy Base San Diego. Several ships are hit; ship defenses, activated but at low readiness, limit the damage but cannot completely prevent it. The damage ashore—several hangers and headquarters buildings struck—is not serious.

But the psychological damage is immense. Because the U.S. homeland lacks any cruise missile defenses, the California governor and congressional delegation demand that forces be pulled back to the West Coast to protect against further missile strikes of any kind. As a result, two Terminal High-Altitude Air Defense (THAAD) batteries and two Patriot battalions are redeployed from the western Pacific to the U.S. West Coast. All the West Coast governors insist on keeping half of their National Guard forces in the state for territorial defense. In effect, U.S. warfighting forces are severely reduced without the Chinese actually having engaged them in combat.

Author's note: Many analysts have noted China's growing long-range strike capabilities and the resulting vulnerability of U.S. mega-bases in Guam and Okinawa. In response, the United States has begun beefing up base defenses there. However, the United States implicitly regards its homeland as a sanctuary, as it has been for 200 years since the War of 1812. Except for a thin defense against ICBMs, the homeland is defended at a distance by forward-deployed forces. Nevertheless, the Chinese have the capability to attack the U.S. homeland with conventional weapons using submarines and cruise missiles.

Vignette #12: Decapitation of U.S. Leadership

History: In January 1968, North Korea attempts to decapitate the South Korean leadership by dispatching a team of 31 highly trained commandos to infiltrate across the DMZ, slip into Seoul, and storm the Blue House to assassinate South Korean president Park Chung-hee. The raid is ultimately thwarted by police who stop the team at a checkpoint approximately 800 meters from the Blue House.

The Future? Amid rising tensions over Taiwan, the White House announces it would station a small contingent of U.S. forces to Taiwan on a rotational basis by the next year to serve a military liaison and advisory function. Experts note that they also act as a tripwire against a Chinese attack. Moreover, unnamed U.S. officials are quoted in the media suggesting that the

White House might be willing to consider recognition of Taiwanese independence down the road as a way of resolving the decades-long uncertainty about Taiwan's status. Beijing views the stationing of U.S. troops and threats about recognizing Taiwanese independence as crossing a red line that threatens its domestic standing with rival factions in the Chinese Communist Party and the military. Faced with the loss of legitimacy and fearing overthrow as a result, Beijing embarks on a plan to decapitate the U.S. leadership to order to create a short window to impose a *fait accompli* on the Taiwan question.

Forty Chinese commandos, organized into six teams, infiltrate the United States among the 3 million Chinese tourists that visit annually. The commandos make their way to small weapons caches prepositioned by the Chinese intelligence services. These caches consist of sniper rifles, semi-automatic rifles, pistols, ammunition, and tactical gear, all commercially available in the United States and acquired through unwitting intermediaries. The teams communicate with handlers about their targets and coordinate movements and attack timings using encrypted commercial messaging apps on their cell phones. The primary target is the president of the United States, with the secondary goal to remove as many other senior U.S. political and military leaders as possible. After several weeks of waiting for an opportunity, the primary team finds an advantageous position overlooking a large outdoor campaign rally in Phoenix, Arizona. While on stage, the president is struck by a salvo of sniper fire and dies shortly thereafter.

Immediately upon the president's assassination, the other commando teams are signaled to attack their targets. The team tasked with killing the vice president storms the grounds of the U.S. Naval Observatory but is stopped by the Secret Service. Another team kills the secretary of state while he is leaving dinner at a popular restaurant in Georgetown. Two teams infiltrate the lightly guarded perimeter at Joint Base Myer-Henderson Hall in Arlington, Virginia, and assault Officers Row where many of the Pentagon's senior military leaders reside. The chairman of the Joint Chiefs of Staff, the chief of staff of the Army, and several other senior officers are killed and two other members of the Joint Chiefs are wounded. The last team attacks a congressional fundraiser in downtown Washington, slightly wounding the speaker of the House while killing or injuring more than a dozen Members of Congress. Most of the commandos are killed amid intense firefights with law enforcement during the night. Several are captured alive but severely wounded. Dozens of law enforcement officers and civilians are killed in the gun battles. The vice president and the secretary of defense, who is overseas, are left in charge of the U.S. response.

U.S. media reports that the attackers all appear to be Chinese nationals, stunning the country. Commentators and politicians demand action. Beijing publicly denounces the attacks and claims it has intelligence the attackers were Taiwanese ultranationalists trying to provoke a war. Meanwhile, it quietly deploys its forces in and around the Taiwan Strait. As successor U.S. leadership is sworn in and begins to take up the levers of power, the People's Liberation Army launches a massive long-planned surprise attack on Taiwan, destroying most of the ROC's aircraft, warships, and command and control systems in the opening hours. Most of the island's communications links with the outside world are severed or jammed. Scattered intelligence and media reports indicate that PLA paratroopers have landed near ROC bases in Tainan and that amphibious landings are underway near Taipei. China claims the threats by

the United States forced it to make a preventative attack on Taiwan to avert a more disastrous confrontation with the United States, which it claims was planning to use the terrorist attacks as a pretext for recognizing Taipei's independence. Several days pass before the U.S. intelligence community and FBI can confirm the attackers were Chinese military operatives, by which point the PLA controls most of Taiwan.

Vignette #13: Espionage Enables Attacks on U.S. Military Sealift

History: Amid the wider U.S. campaign against Japanese merchant shipping in World War II, American submarine attacks throughout 1944 inflict serious losses on Japanese military convoys such as the Take Ichi convoy and Convoy Hi-71 that attempt to move Imperial Japanese Army reinforcements to the Philippines, New Guinea, and Saipan. U.S. submarines, often guided by signals intelligence, interdict these convoys and inflict massive losses that cripple the fighting strength of several Japanese divisions before they ever reached the combat zone.

The Future? After a protracted political crisis between Russia and NATO in the Baltic States, Russian forces invade and occupy the Baltic States. As NATO mobilizes and deploys its forces in response, the United States immediately begins a massive and well-rehearsed operation to reinforce Europe from the continental United States. In all, the United States plans to move over 30 combat and support brigades to Western and Central Europe in a two-month period to drive Russian forces out of the Baltics. Nearly all of the heavy equipment for these forces is slated to travel by sea.

Moscow, however, plans to employ a large portion of its attack submarine fleet for a short and precise interdiction campaign against the initial wave of U.S. military shipping. Unlike historical submarine campaigns aimed broadly at a nation's merchant shipping, Russia's plan hinges on its ability to find and sink a few specific ships that are loaded with heavy equipment in a brief period before the United States can react effectively. Moscow's primary targets are the 42 roll-on/roll-off ships operated by the U.S. Military Sealift Command and in the Ready Reserve Force, as well as the 18 U.S.-flagged privately owned roll-on/roll-off vessels in the Maritime Security Program (MSP). Moscow hopes that by disrupting the reinforcement of Europe and destroying much frontline U.S. equipment while en route, it can significantly delay—if not avert—the anticipated U.S. and NATO counteroffensive. Such a delay might buy Moscow critical time to exploit the political divisions in NATO while also allowing its own forces time to fully mobilize and transform the Baltics into a defensive hornets' nest that Western leaders may balk at retaking by force.

Russian military intelligence places a heavy emphasis on tracking these vessels prior to the conflict. Aided by several agents within U.S. military headquarters, the Russians have little difficulty infiltrating the computer networks of major U.S. port and rail facilities on the eastern seaboard, allowing them to track shipments, departure times, and planned travel routes. To better ensure that the ships can be located at sea, Russian agents exploit the lax security around docks and railyards to slip small off-the-shelf GPS trackers beneath military vehicles and onto cargo containers before they are loaded. Several MSP ships have already been

surreptitiously wired with satellite trackers accomplished during stays in Eastern European ports while moving cargo for U.S. rotational units.

Ten days after Russia's attack on the Baltics, the first three U.S. ships bound for Europe depart from the Port of Beaumont laden with the equipment of the 2nd Armored Brigade Combat Team, 1st Infantry Division. Over the next week, more than 20 ships carrying U.S. military cargoes depart major ports in Texas, Georgia, South Carolina, and Maryland. Most of the ships sail in small groups or independently. The vessels adopt low electronic emissions profiles and travel at relatively high speeds in the hopes of evading attack but are not organized into convoys or escorted.

While the United States does have contingency plans to organize a convoy system in the North Atlantic, convoys are not immediately put into place for many of the same reasons that the Navy was slow to initiate convoys in World War II. First, the threat was believed to be low. While acknowledging that Russian submarines would pose some danger to shipping and lines of communication in the North Atlantic, U.S. planning assumed that sea interdiction remained a low priority for Russia and that shipping losses would be small. Second, the crisis atmosphere generates intense pressure from the White House and European allies for U.S. forces to arrive as fast as possible and organizing convoys is viewed as an unnecessary delay. Third, few Pentagon leaders are willing to push back against the Navy's strong preference that its scarce antisubmarine assets be used to protect carrier strike groups and to conduct offensive antisubmarine patrols rather than convoy defense.

A dozen Yasen and Kilo-class attack submarines from the Northern Fleet, dispatched before hostilities began, are vectored to their targets by the compromised sailing data. Within a week, seven U.S. roll-on/roll-off vessels and five container ships are sunk. Over the following two weeks, 10 more U.S. vessels are lost. By the third week, however, Russian successes diminish. The number of available submarines dwindles as the diesel-powered Kilo-class vessels must begin their long journey back to Murmansk for replenishment. The number of targets also diminishes as most of the pre-tracked ships are either sunk or manage to evade the submarines.

The precision submarine campaign against its military shipping catches the United States by surprise. The equipment losses are staggering, including most of the equipment for three armored brigade combat teams (ABCTs), or a third of the Army's active-duty armor force, as well as for two Combat Aviation Brigades, one Fires Brigade, and three Sustainment Brigades. Although 60,000 U.S. soldiers have already arrived in Germany and Poland by airlift, they have little heavy equipment. While the equipment losses can be replaced by drawing from global prepositioned stocks, war reserves, and stripping National Guard units, the equipment still needs to run the gauntlet to Europe. U.S. ships are held back at ports until convoys can be organized and antisubmarine assets shifted. Meanwhile, NATO members refuse to move against Russia until U.S. forces are fully deployed. In the end, NATO's timetable for a quick counteroffensive is stymied. Russia proposes an in-place cease-fire, which several NATO members suggest the alliance seriously consider.

Authors Note: The events in this vignette have precedents beyond the submarine campaign against Japan. During World War II, the United States did not begin convoying until six

months after Pearl Harbor, believing that ships could avoid U-boats and that convoys were an unnecessary diversion of naval strength. (The British Admiralty made the same mistakes against the German U-boats in both world wars.) The United States Navy also believed that German U-boats would be held close to Europe and would not deploy all the way to U.S. shores. The resulting terrible losses in merchant shipping forced the U.S. Navy to begin convoying operations.

This vignette assumes a shift in Russian naval doctrine that prioritizes the use of its attack submarine force for a limited sea interdiction campaign instead of operations against U.S./NATO naval strike forces. While protecting its SSBN bastions in the far north would probably remain the Russian Navy's highest priority, this shift toward interdiction could be driven by several factors. First, Russia could recognize that in the opening stages of a conflict it must find a way to leverage its naval strengths to even the odds for its land forces that would otherwise be left facing superior U.S. and NATO ground forces (a reversal from the Cold War) if reinforcement were allowed to occur unimpeded. Second, Russia could have greater confidence in the ability of its air- and land-based A2/AD capabilities to hold NATO naval strike forces at bay, at least initially, while its attack submarines are employed elsewhere. Finally, the deep penetration of the U.S. security establishment during the Cold War, described in the main text of this report and still a threat under the Russian Federation, might give Russia critical information about U.S. force movements.

Vignette #14: Hybrid Attack on NATO

History: Through the 1930s and climaxing in 1938 Hitler incites pro-German elements in Austria to facilitate unification with Germany ("Anschluss"). In 1938 he similarly incites the Sudeten Germans in Czechoslovakia to do the same, prior to a concessionary agreement and, later, occupation.

The future? In June 2019 *Wikileaks* releases documents showing that elected officials in Helsinki had taken large sums of money from Russian oligarchs for campaign funding. Finland's pro-NATO government falls, and the pending agreement to coordinate military activities with NATO is immediately shelved. Later that same month, the liquefied natural gas facility at Szczecin, Poland, is severely damaged in an explosion. A dozen workers are killed, and an equal number wounded. An underwater vehicle is detected and traced briefly back into German waters after the incident. Later investigations hypothesize that a mini-submarine or an unmanned underwater vehicle probably delivered some kind of mine to the side of the gas processing facility. A Polish vessel transiting the Kiel Canal has an engine badly damaged and blocks the passage for several days. Right after the ship is towed out of the canal, another Polish vessel has a similar failure in the same area. No explanation is found.

When Poland asks Germany to explain the underwater vehicle that it had detected, Germany disavows all knowledge. Polish websites are inundated with suggestions that German business interests are behind efforts to discredit Polish commercial firms and that Germany is upset at poor Polish ship maintenance. While this emergency is being discussed, on July 19, internet links using undersea cables connecting Sweden to the south are intermittently blocked, and some traffic is rerouted. Some of the information gets through, but to

erroneous addresses or in altered form, and Swedish business companies complain of a billion euro loss.

In July, Sweden's air defense system begins to erroneously display large numbers of aircraft entering its airspace. Conversely, numerous flights of Russian aircraft fly through Finnish airspace at will, yet Finnish defensive systems never detect anything. Estonia, home of the NATO Cooperative Cyber Defence Centre of Excellence, has its government computer files destroyed by a virus apparently present when the system was created. Backup systems eventually restore many government functions, but some files, including pension benefit information, appear permanently damaged and will take months to reconstruct.

A prominent Russian emigre who lived in Estonia, and who frequently spoke in favor of Moscow's positions on social media, is found hanged in a park on July 28 with an inflammatory anti-Moscow placard attached to his corpse. Russia demands an apology for the crime and asks for permission to dispatch its own investigation team, which is denied by Tallinn. President Putin issues a harsh statement about Estonian arrogance to his government-controlled TV stations, places travel prohibitions on Estonian travelers, and orders a military exercise along the common border. Russian aircraft fly over Estonia's airspace, and two Russian corvettes sail through Estonia's waters.

On August 1, the Estonian government requests an emergency North Atlantic Council meeting to discuss rising security concerns and potential Russian involvement. The request is rebuffed by Greece, Hungary, and Bulgaria as premature. Although the Council does not meet, the Military Committee does meet, but several nations do not attend, and no consensus for action emerges. At the request of Germany, a scheduled naval exercise in the region is canceled to avoid "provocation." When the Military Committee attempts to begin planning some cyber security responses, Turkey insists NATO not get involved in a "domestic" issue.

Three days later, a Russian tanker leaving Primorsk is moderately damaged when it strikes some kind of underwater debris. Russia claims it was attacked by a NATO submarine, hinting that it was either American or German. Russia increases the readiness levels of its air defense systems and orders a three-ship squadron from the Northern Fleet to sail to Kaliningrad. Russia claims a 25-mile maritime exclusionary zone around Baltiysk, the naval base hub of Kaliningrad, and has a coast guard cutter enforce it by "shouldering" several German fishing boats. The Russian boat fires several small-caliber rounds over the German vessels. Germany's foreign minister issues a public statement condemning Russia's tactics. The next day, a series of probes and hacking against major banks in Berlin causes losses of €412.5 million. Moscow-based analysts with links to the government suggest that the German bank used these hacks to cover up for loans gone bad.

Dmitry Kiselyov, host of the popular TV show, the *Vesti Nedeli anch,* tells viewers that Russia is under siege by American agents and that only Putin can save Russian interests from further attack. *First Channel,* the most popular TV channel inside Russia, continues to show stories and pictures of Russian emigres in the Baltics, Germany, and Ukraine being abused in demonstrations. Within a week, the apparent chaos in Estonia reported by Russian TV sparks a wave of demonstrations in St Petersburg and Moscow, demanding that Russia intervene to

protect its nationals.

Just before dawn the next day, as the Estonian government frantically tries again to pull together an emergency meeting in Brussels, Russian amphibious ships appear in the harbor at Tallinn and begin landing Naval Infantry at the cruise ship piers to establish "safe zones" for Russian nationals; simultaneously, the Kremlin announces that the Estonian government has agreed to accept Russian troops at each of the major ports and airfields in the country to assist with providing temporary safe havens for its nationals suffering at the hands of "terrorists" and "radicals." Within two hours, Russian paratroopers appear at airports and harbors in Estonia. The Baltic states collectively request meetings of the North Atlantic Council, but again Greece, Hungary, and Bulgaria demur, calling the issue an Estonian domestic problem.

Author's note: This is the kind of multidimensional and nonattributable campaign that the Russians might execute, patterned after their recent actions in the Crimea and the Ukraine as well as Soviet actions in Eastern Europe after World War II. Like many hybrid campaigns, it has small increments to which governments do not react and then an overt action, in this case the movement of Russian troops into the Baltic states, that makes the campaign purpose clear, but too late for the victim to take action.

Diplomatic/Political Surprise

Vignette #15: U.S. Alliances in East Asia Collapse

History: During 2010, North Korea engages in two high-profile provocations against South Korea. In March, North Korea sinks the ROKS *Cheonan*, a South Korean corvette. In November, North Korea bombards Yeonpyeong Island, killing two South Korean soldiers and many civilians.

The future? In retaliation for tightening economic sanctions, North Korea launches conventional missiles at targets in Japan: Misawa, Sasebo, and Iwakuni. While the intended targets appear to be U.S. and Japanese military installations, some of the missiles land in commercial and residential areas, killing about 200 Japanese civilians. In accordance with newly passed legislation making it easier to engage in military actions, the Japanese Diet approves retaliation against North Korea. In solidarity with Japan, the United States passes legislation authorizing military action. At the same time, however, North Korea demands that other countries stay neutral and forbid U.S. forces from using their territory. It particularly warns South Korea, "lest it see Seoul turned into ash." Alarmed at the threats but relieved that it was not the target, South Korea quickly declares that it will stay out of the affair, and limits U.S. access to South Korean facilities. The Philippines and Thailand follow suit, criticizing the attacks, expressing their hopes for "a peaceful resolution of the crisis," but refusing to participate in any countermeasures. New Zealand offers to act as a neutral intermediary. Australia offers military assistance to the United States and Japan, but it is too far away to be really helpful.

Angered by the South Korean decision, U.S. and Japanese officials accuse South Korea of betraying its international commitments. With assets in South Korea unusable, U.S. policymakers are forced to develop new options for thwarting further North Korean attacks. With North Korea hinting at using its nuclear arsenal, the United States has only its assets in Japan, Okinawa, and Guam available. A blockade would be impossible without Chinese and South Korean assistance. Air attacks are possible, but the distances make it more difficult, and the headquarters with the necessary expertise is now isolated in Seoul. Naval operations offer the best military option, but it will take weeks for sufficient naval forces to deploy from the West Coast.

Author's note: North Korea has long engaged in provocative actions, including multiple missile and weapons tests, with missiles flying over Japan or falling short within Japan's exclusive economic zone. North Korea also continues to release provocative statements calling for nuclear attacks on the United States and its allies. As cited in the main text, the Center for Strategic and Budgetary Assessments (CSBA) produced a scenario where North Korea fired nuclear missiles at targets in Japan as a way to break a deadlock on sanctions and economic decline. This vignette hypothesizes conventional missiles and includes effects on other U.S. allies. How the East Asia allies might react to an attack by North Korea is impossible to predict. Although countries would certainly denounce the aggression, North Korean nuclear forces would intimidate many.

Vignette #16: Panama Declares Neutrality in U.S.-China Conflict

History: As part of the 1921 Anglo-Irish Treaty that created the Irish Free State, the United Kingdom retains military control over three deep-water ports in Ireland at Berehaven, Cobh, and Lough Swilly. British forces had used these ports during World War I to defend the approaches to the British Isles against German U-Boats and retained them in case similar threats reemerged. However, seeking to end a costly trade war with Ireland, the Chamberlain government returns the Treaty Ports to Dublin in late 1938. Ireland refuses to let Britain use the ports during World War II. Although Britain partially compensates by using naval and air bases in Northern Ireland and Iceland, the loss of the Treaty Ports imposes significant operational costs on British forces.

The Future? A clash between U.S. and Chinese warships in the South China Sea ignites a crisis in the Western Pacific. As the United States seeks to reinforce its forces in the Pacific and on the West Coast, Panamanian authorities fear that the Panama Canal could become a target for Chinese attack if the canal is used by U.S. warships. Damage to the canal would cause Panama major economic hardship due to Panama's reliance on canal tolls. Panama, therefore, declares the canal closed to all nations' warships and auxiliary vessels carrying military cargos until further notice but assures the world that the canal remains open to commercial traffic. U.S. officials believe economic pressure from Beijing and corrupt officials are involved in Panama's decision.

The United States protests that Panama is violating the 1977 Torrijos–Carter Treaties, which guarantee the canal's permanent neutrality and ensure the United States (and all nations) have military access to the strategic waterway during peacetime and wartime. Panama

counters that it is acting to preserve the canal's neutrality and exercising its sovereign right to self-defense and to control its territory. The canal's closure to U.S. warships causes a massive logistical headache for the Department of Defense. Transit time for warships and military cargos moving from Norfolk to San Diego increases from approximately 7 to 21 days. The Pentagon scrambles to reroute military cargos and adapt to the new conditions. It uses the U.S. freight rail network and air transport to move most supplies, munitions, and personnel across the continental United States.

The canal's military closure generates a political firestorm in the United States. Commentators attribute Panama's decision to Chinese subterfuge and Beijing finally asserting its long-growing global economic influence. The Defense Department argues for the strongest possible action to reopen the canal. Intense political pressure builds on the White House to act and reopen the canal.

The president threatens military action to reopen the canal, moving the USS *Battan* Amphibious Readiness Group (ARG) embarked with the 22nd Marine Expeditionary Unit (MEU) into the Caribbean Sea. Panama declares that it will sabotage the canal's locks if the United States attempts to take the canal by force. SOUTHCOM planners warn that options to seize the canal undamaged are risky and that occupying Panama and securing the canal for the duration of the conflict would require thousands of troops and, perhaps, suppressing an insurgency.

Moreover, many Latin American nations, which had so far expressed mild support for Washington in the crisis in the Pacific, express outrage at the U.S. threats. Beijing stokes divisions among U.S. allies and regional partners by pledging its support for Panama's decision, accepting its new interpretation of the canal's neutrality, and arguing that this is the same American imperialism that it opposes in the South China Sea. Inside the U.S. government, the State and Commerce Departments argue that the total loss of the canal to commercial traffic due to either enemy attack or action by the Panamanian government would alienate allies and partners, hurt the U.S. and world economy, and possibly cause a global recession.

Vignette #17: Cuban Missile Crisis—Round 2

History: In 1962, Nikita Khrushchev, leader of the Soviet Union, deploys military forces and nuclear weapons to Cuba to offset U.S. nuclear superiority and geographical advantage. President John F. Kennedy confronts Khrushchev both publicly and diplomatically. The resulting Cuban Missile Crisis pushes the world to the brink of war. Fortunately, the crisis ends without conflict as the Soviet Union dismantles missile sites and the United States pledges not to invade or bomb Cuba and to close U.S. missile sites in Turkey.

The Future? Cuban president Raul Castro asks Russian president Vladimir Putin for additional Russian support to expand the Cuban offshore oil programs. Continuing U.S. sanctions limit the ability of the Cuban government to access the most current, and safe, technology to exploit the possible 5–9 billion barrels of crude oil off their coast. The Cuban economy is sputtering and its population, young and restless, has seen the wealth of the rest of the world. Castro fears that any further economic stagnation could spark unrest. In exchange for

additional Russian assistance, Castro agrees to grant Russia limited military basing and access to Cuban infrastructure. This basing agreement includes the reestablishment of the Russian signals intelligence post at Lourdes. Russian military forces increase their visits to ports and airfields. The Russian military builds what appear to be permanent facilities to support these ship and aircraft visits. In a national address, President Putin boasts that all his deployed forces can "extend the reach and impose the will of the Russian people . . . through all means . . . both conventional and nuclear." He argues that Russian presence in Cuba is equivalent to U.S. presence in the Baltic states but less threatening because Cuba is separated from the U.S. homeland whereas the Baltic states border Russia. The United States brings its concerns to international institutions, particularly the UN and NATO. Several nations in the Organization of American States declare neutrality in the dispute, arguing that the United States brought this confrontation on because of its continuing intransigence toward Cuba.

Author's note: In the summer of 2014, Russian president Vladimir Putin visited Cuba to discuss his intentions and finalize Russia's plan to eliminate 90 percent of Cuba's debt to Russia while supporting future Cuban development. Initial Russian news reports speculated that Putin's intent was to reopen a spying post in Cuba. President Putin claimed that initial reports were false, yet confirmed that he wanted access to temporary support centers for naval forces in the hemisphere.

On December 17, 2014, President Obama asserted that the U.S. strategy for Cuba, a strategy of isolation that remained remarkably consistent for five decades, no longer served U.S. strategic interests. He restored diplomatic relations to include an embassy in Havana.

Under President Trump, U.S. policy toward Cuba remains uncertain. In September 2017, the Trump administration recalled its officials in Havana after an alleged sonic attack. In addition, President Trump indicated that he intended to reinstate some previously lifted restrictions.

Vignette #18: Senior U.S. Military Commanders Arrested for Alleged War Crimes

History: In 2006 the international criminal court investigates allegations of war crimes by U.S. and UK forces in Iraq. However, it declines to take action, though it notes that "this conclusion can be reconsidered in the light of new facts or evidence." In late 2017, the court's prosecutor opens investigations into allegations of U.S. torture in Afghanistan. The International Criminal Tribunal for the Former Yugoslavia (a separate entity) convicts several high-ranking Serb and Croat military officers and political officials of war crimes and sentences them to prison terms.

The Future? Rising tensions on the Korean peninsula over Pyongyang's nuclear and missile programs result in the outbreak of an intense but limited border conflict along the demilitarized zone (DMZ). While hoping to avoid escalation, U.S. and ROK forces are drawn into tit-for-tat exchanges with North Korean artillery and air defenses across the border. As the fighting drags on, several international NGOs, invited to visit the border by Pyongyang, claim that U.S. and ROK counter-battery fire and cross-border airstrikes are causing large numbers of civilian casualties as well as endangering civilians by employing cluster munitions in populated areas. The accusations stir public outrage in many parts of the world. The

reaction is especially strong in Europe, where U.S. military operations are widely viewed as disproportionate and provocative.

U.S. officials accuse North Korea of staging many of the incidents, deliberately using civilians as human shields, and deploying its forces near schools and hospitals. The Pentagon nevertheless confirms that U.S. forces are employing ground- and air-delivered cluster munitions against North Korean forces in response to its attacks and defend the munition's use as a military necessity, given their effectiveness against targets such as artillery and air defenses. In an incident that further galvanizes world opinion, two U.S. F-16s operating within South Korean airspace fire AGM-154A Joint Standoff Weapons (JSOWs) loaded with BLU-97/B cluster submunitions at a Korean People's Army (KPA) rocket artillery battery in the North Korean border city of Kaesong. The airstrike destroys the artillery unit but also a small school house nearby that was missed by the Seventh Air Force's exhausted targeting analysts. The strike kills more than 50 civilians, including 30 children. North Korean officials rush international press to the site.

Seoul rejects outside calls to investigate the incident. South Korea, however, is party to the Rome Statute, and the International Criminal Court (ICC) claims jurisdiction. An ICC prosecutor opens an investigation, which draws a sharp rebuke from the State Department but is soon forgotten by a deeply distracted Washington. Over several weeks, ICC prosecutors quietly build a case that the deliberate use of cluster munitions in civilian areas in the pursuit of U.S. military objectives constitutes a war crime, and that the U.S. use of cluster munitions contravenes the 2008 Convention on Cluster Munitions signed by 119 states (although the United States, South Korea, and North Korea are not signatories). The prosecutor also notes that past U.S. policymakers had acknowledged that the weapons were "inherently indiscriminate" and that the Obama administration had planned to end their use. Although the strikes in question all took place within North Korea (which is not subject to ICC jurisdiction), U.S. air and ground forces conducted those strikes from inside South Korean territory and airspace, which prosecutors argue gives the ICC jurisdiction.

As shooting incidents on the peninsula continue, the commander of U.S. Pacific Command (PACOM) and the deputy commander of U.S. Forces Korea (USFK) travel to a NATO summit meeting in Brussels as part of a global tour to enlist greater support from the alliance. During their stay, the ICC issues sealed arrest warrants for both officers as well as five other senior U.S. military leaders in the Pacific. The ICC makes a confidential request to the Belgian government to arrest the two U.S. commanders on its behalf. While treaty-bound to comply with the ICC, the Belgian prime minister balks and suggests in an emergency cabinet meeting that the government defer consideration. The Belgian justice minister, a lynchpin political ally and a stern critic of U.S. operations in Korea, threatens to withdraw her party from the already shaky coalition government unless the warrants are executed. With the national government stalemated, the minister-president of the Brussels Capital Region—a member of the Green Party and another fierce critic of U.S. policy—steps in.

After the NATO summit concludes, both commanders are arrested by the Brussels municipal police on the tarmac of the Brussels Airport before they can board their U.S. military aircraft. The arrests ignite a diplomatic firestorm between the United States and Brussels, which

quickly spirals into a standoff between Washington and many other NATO allies and EU members. As Belgian police prepare to transfer the U.S. commanders to The Hague, the U.S. president calls the Belgian prime minister and reminds him that under the American Service-Members' Protection Act of 2002, he is authorized by Congress to use "all means necessary and appropriate" to free U.S. service members detained at the request of the ICC.

Meanwhile, the president orders all U.S. military personnel in Belgium to begin evacuation. Senior officers are forbidden to visit Belgium. This precludes the U.S. general who commands Supreme Headquarters Allied Powers Europe from visiting his headquarters. The Pentagon begins floating concepts for reconstituting NATO headquarters elsewhere in Europe, perhaps in Eastern Europe, which is closer to the Russian challenge.

The U.S. effort to enlist international support collapses as senior military and civilian officials are reluctant to go abroad and allies chafe at the U.S. reaction.

Author's note: International criminal courts have become increasingly aggressive in extending their jurisdiction, not just to failed states but globally, including countries with functioning judiciary systems like the United States and Great Britain. This is especially true for conflicts that the European elites oppose. Although these courts have so far refrained from indicting citizens of these countries, there are many activists who seek to do so in the absence of action by the home country. In 2003 then-Secretary of Defense Donald Rumsfeld threatened to move NATO headquarters if Belgium sought to enforce the law providing universal jurisdiction over war crimes.

Cluster munitions—submunitions dispersed from a shell or missile that spread affects over a wide area— have become extremely controversial because of high dud rates and the potential for civilian casualties. These munitions have been restricted by international treaty (the Convention on Cluster Munitions of 2008), which the United States refused to sign and lobbied strongly against. The U.S. military believes that these munitions are needed in certain situations, particularly in a tough fight such as would occur on the Korean peninsula.

About the Author

Mark Cancian (Colonel, USMCR, ret.) is a senior adviser with the CSIS International Security Program. He joined CSIS in April 2015 from the Office of Management and Budget, where he spent more than seven years as chief of the Force Structure and Investment Division, working on issues such as Department of Defense budget strategy, war funding, and procurement programs, as well as nuclear weapons development and nonproliferation activities in the Department of Energy. Previously, he worked on force structure and acquisition issues in the Office of the Secretary of Defense and ran research and executive programs at Harvard University's Kennedy School of Government. In the military, Colonel Cancian spent over three decades in the U.S. Marine Corps, active and reserve, serving as an infantry, artillery, and civil affairs officer and on overseas tours in Vietnam, Desert Storm, and Iraq (twice). Since 2000, he has been an adjunct faculty member at the Johns Hopkins School of Advanced International Studies, where he teaches a course on the connection between policy and analysis. A prolific author, he has published over 40 articles on military operations, acquisition, budgets, and strategy and received numerous writing awards. He graduated with high honors (magna cum laude) from Harvard College and with highest honors (Baker scholar) from Harvard Business School.

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