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ARTICLE

Signals of strength: Capability demonstrations and perceptions of military power

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ABSTRACT

States often use demonstrations to improve perceptions of their military power. This topic has received limited attention in the literature, which typically assumes that states disguise or downplay their capabilities, advertise them only to enhance their prestige, or use demonstrations to communicate interests and resolve. Because military strength can be difficult to gauge, however, successful deterrence and assurance can require demonstrations to ensure that capabilities are viewed as credible. This article explains the logic of capability demonstrations, identifies the conditions under which they have the most utility, introduces a typology of demonstration mechanisms, and describes how emerging technology influences demonstrations.

KEYWORDS Signalling; demonstrations; military power; emerging technology

In 55 BCE, during the Roman conquest of Gaul, Julius Caesar led a military expedition against Germanic tribes on the far side of the Rhine. Moving his forces by ship was not a grand enough spectacle for the ambitious proconsul, however, so Caesar directed his engineers to build a large trestle bridge across the river, which they managed to accomplish in just 10 days. Once it was complete, he marched his army to the river's eastern bank and spent nearly 3 weeks conducting punitive attacks before withdrawing his forces back into Gaul. Notably, as soon as the Roman troops had returned, Caesar ordered them to dismantle the bridge. His intended message was hard to miss: Roman legions enjoyed such a level of technological superiority over their foes that they could simply build another one if necessary and attack again whenever they wanted. In other words, rather than burn a bridge behind him to signal his resolve, as the familiar metaphor would suggest, Caesar brought down a bridge in front of him to underscore his strength.[1]

This anecdote from the ancient world illustrates a significant yet understudied feature of international politics: demonstrations of military power.

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[1]Arther Ferrill, *Roman Imperial Grand Strategy* (Lanham, MD: University Press of America, 1991), 22–23.

Even a cursory scan of current events indicates that states often advertise their capabilities to influence assessments of their strength. It also illustrates the effects these efforts sometimes have. Consider recent developments on the Korean Peninsula. In the words of one regime official, Pyongyang's provocative nuclear detonations and long-range missile launches were not only meant to refine its technology but were also intended 'to send a clear message' that it could strike the entire United States.[2] Although North Korea has yet to prove that it can reliably deliver nuclear warheads against targets located thousands of miles away, the messages it has sent have demonstrated 'a credible capability to hold the United States at risk'.[3]

Other contemporary examples are easy to find, which is not surprising given that China appears eager to reveal that it can translate economic growth into military strength, Russia has incentives to convince rivals and clients that it is not as weak as it once was, India wants to show the world that it merits major power status, and the United States is combatting doubts that it can uphold its security commitments. Beijing, for instance, has publicly introduced new and more sophisticated weapons systems, conducted larger and more complex exercises, and deployed forces farther from its shores, all of which has contributed to growing estimations of its power.[4] Likewise, Moscow has implemented numerous short-notice exercises that highlight its capacity to mobilise troops quickly and initiate offensives with little warning.[5] For its part, New Delhi's successful test of a ground-based anti-satellite (ASAT) weapon, which was announced with considerable fanfare, confirmed that it was one of the few states to possess an operational ASAT capability.[6] Finally, Washington has conducted a variety of activities in recent years to reveal new systems and remind observers of its strengths. This includes conspicuously testing a modified version of an air-defence missile in an anti-surface warfare role, which signalled that it was not standing pat while other states outfitted their own vessels with advanced anti-ship missiles, as well as assembling three aircraft carriers in

[2]Zachary Cohen, *et al*., 'New Missile Test Shows North Korea Capable of Hitting All of US Mainland', *CNN*, 30 November 2017, https://www.cnn.com/2017/11/28/politics/north-korea-missile-launch/index.html. Following Pyongyang's first intercontinental ballistic missile test, the United States and South Korea used armed demonstrations of their own to send a message in response: conducting live-fire drills with tactical missiles to show that they could launch rapid, conventional precision strikes against targets deep inside North Korea. United States Forces Korea, 'ROK – US Alliance Demonstrates Precision Firing Capability', 4 July 2017, http://www.usfk.mil/Media/News/Article/1236985/rok-us-alliance-demonstrates-precision-firing-capability/.

[3]Gen Lori J. Robinson, 'Statement before the U.S. Senate Armed Services Committee', 15 February 2018, 4, http://www.northcom.mil/Portals/28/Robinson_02-15-18%20SASC%20Testimony.pdf?ver=2018-02-15-105546-867.

[4]Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2018* (Washington, DC: Department of Defense, 16 May 2018).

[5]Thomas Frear, *et al*., 'Preparing for the Worst: Are Russian and NATO Military Exercises Making War in Europe More Likely?' *European Leadership Network* (August 2015), 4.

[6]Sanjeev Miglani and Krishna N. Das, 'Modi Hails India as Military Space Power after Anti-Satellite Missile Test', *Reuters*, 27 March 2019.

the Sea of Japan for the first time in a decade, which highlighted its unique ability to conduct multi-carrier operations.[7]

In short, states often resort to demonstrations of various kinds that are intended, at least in part, to reinforce or improve perceptions of their military power, for the benefit of both adversaries and allies.[8] Activities such as these have received limited attention in the literature, however, which typically assumes that states disguise or downplay their capabilities, advertise them only to enhance prestige, or use demonstrations to communicate interests and resolve.[9] Yet the credibility of deterrence and assurance depends on military strength, especially in peacetime, and military strength is often difficult to judge accurately before conflict breaks out. This gives states a strong rationale to engage in periodic hard power demonstrations.

Despite this lack of attention, capability demonstrations are likely to become increasingly relevant, especially given the pace and scope of technological change. Today, all the major powers are pursuing 'game-changing' technologies, from robotic systems and hypersonic glide vehicles to directed energy weapons and additive manufacturing techniques. The military implications of these technologies are uncertain in many instances, however, given their novelty, immaturity, or both. Therefore, states that want to reveal the value of their investments and reap the strategic benefits might need to emphasise demonstrations to reduce this uncertainty.

At the same time, although the introduction of any emerging technology can heighten the rationale for demonstrations – in addition to creating new objectives and new audiences for demonstrations, as described below – certain emerging technologies pose unique signalling dilemmas. Specifically, *virtual* technologies that underpin software-based capabilities do not appear as amenable to demonstrations as *physical* technologies that produce hardware-based capabilities, due to their lack of observability. In some cases, observability problems can give states incentives to escalate as they look to showcase capabilities by employing them in operations. In others, observability problems might create persistent uncertainty if the most overt demonstration mechanisms are insufficient to reveal what states possess and what they can do.

The remainder of this article addresses each of these issues. Specifically, the following sections explain the logic of capability demonstrations, identify the conditions under which demonstrations of military power are likely to have the most utility, introduce and illustrate a typology of demonstration mechanisms,

[7]Sam LaGrone, 'Navy Sinks Former Frigate USS *Reuben James* in Test of New Supersonic Anti-Surface Missile', *USNI News*, 7 March 2016; and Lisa Ferdinando, 'Three-Carrier Strike Force Conducts Exercise in Western Pacific', *DoD News*, 13 November 2017.

[8]Robert Jervis, *The Logic of Images in International Relations* (Princeton, NJ: Princeton UP, 1970), 22, 38–39. Of course, some capability demonstrations might be unintentional and still have an impact on observers.

[9]A recent exception is Kyle Haynes, 'Signaling Resolve or Capability? The Difference Matters on the Korean Peninsula', *War on the Rocks*, 10 May 2017.

offer several propositions regarding the impact of emerging technologies on demonstrations, and outline avenues for future research as well as implications for US policy.

Three perspectives on shaping perceptions: Secrecy, swaggering, and shows of force

Power, especially military power, is at the heart of international politics. States therefore devote considerable effort to gauging the distribution of power and discerning any changes, whether by gathering intelligence on their competitors or examining their own strengths and weaknesses.[10] They also try to influence the assessments of others, for instance, by attempting to correct the record when they believe they are being underestimated. Nevertheless, of the three main schools of thought on the role that military forces and military activities can play in shaping perceptions of power, none fully capture this straightforward logic.

The first school of thought maintains that states often forgo brandishing their capabilities because of the potential drawbacks, especially when it comes to new weapons, sensitive programmes, or advanced technologies.[11] Revealing or reaffirming sources of strength can sacrifice operational surprise in future engagements, give opponents the information they need to develop countermeasures, or increase the likelihood of emulation and diffusion.[12] States should therefore avoid demonstrations that might scare rivals and shock them into action. The risk of restraint, of course, is that adversaries and allies could misjudge a state's relative power. As a result, the former might become more likely to engage in aggressive behaviour if they think they cannot be stopped, while the latter might become more likely to distance themselves or defect if they believe they cannot be protected.

A second perspective holds that states do engage in military demonstrations, but only to enhance the status of leaders at home or abroad. This type of behaviour, which is often referred to as 'swaggering', usually takes the form of military spectacles or symbolic defence investments, notably when states parade their armed forces through the streets, in the skies, and on the seas, or when then they acquire sophisticated weapons systems that far exceed their actual security requirements. In some cases, of course, activities characteristic of swaggering might improve third-party perceptions of a state's strength. For instance, highly scripted celebrations might reveal

[10] Aaron L. Friedberg, 'The Assessment of Military Power', *International Security* 12/3 (Winter 1987/88).
[11] Aaron L. Friedberg, *The Weary Titan: Britain and the Experience of Relative Decline* (Princeton, NJ: Princeton UP, 1988), 9; and Thomas G. Mahnken, *Uncovering Ways of War: U.S. Intelligence and Foreign Military Innovation, 1918–1941* (Ithaca, NY: Cornell UP, 2002), 12.
[12] Bernard Brodie, 'Military Demonstration and Disclosure of New Weapons', *World Politics* 5/3 (April 1953), 289–291; and Michael C. Horowitz, *The Diffusion of Military Power: Causes and Consequences for International Politics* (Princeton, NJ: Princeton UP, 2010), 24.

new weapons that represent meaningful upgrades in military power. In the case of swaggering, however, these effects would be incidental and unintentional.[13]

The third and most prominent take on military demonstrations highlights their role in defusing tensions, deterring aggression, or compelling a target to alter its behaviour, mainly by increasing the visibility of military assets – i.e., a show of force.[14] Shows of force play a crucial role in the bargaining literature because they can function as costly signals: actions that distinguish actors who will stand firm from those who will back down.[15] According to the bargaining perspective, states have private information about their resolve and relative power, as well as incentives to misrepresent both to get the best deal. Therefore, to achieve their aims without a conflict, strong leaders must find ways to transmit private information about their determination to fight or confidence they would win, for instance, by mobilising their armed forces or placing them in harm's way.

Importantly, although all shows of force are military demonstrations, not all military demonstrations communicate military power. Rather, most shows of force are indicators of interest or resolve. By using armed forces to set in motion events that might spiral out of control, put leaders' reputations on the line, or expend resources that cannot be recovered, states can indicate their desire to stand firm and willingness to absorb costs.[16] Yet these activities do not necessarily provide observers with additional information about the capabilities states possess, how they might be employed, or their true level of effectiveness.[17] Ultimately, like high-profile examples such as the transit of B-52 bombers through Beijing's newly announced East China Sea air defence identification zone in 2013, which indicated that Washington would not restrict its ability to lawfully send military platforms through international airspace, or the 2-week, 1000-mile road march of US armoured vehicles across eastern Europe in 2015, which was intended to display NATO solidary in the wake of Russia's intervention in Ukraine, shows of force are typically used to highlight what a state is willing to do, not what it is able to do.[18]

[13]Robert J. Art, 'To What Ends Military Power?' *International Security* 4/4 (Spring 1980), 11.

[14]Gordon A. Craig and Alexander George, *Force and Statecraft: Diplomatic Problems of Our Time*, 3rd ed. (New York: Oxford UP, 1995), chap. 15; and Robert J. Art, 'Coercive Diplomacy: What Do We Know?' in Robert J. Art and Patrick M. Cronin (eds), *The United States and Coercive Diplomacy* (Washington, DC: US Institute of Peace Press, 2003).

[15]James D. Fearon, 'Rationalist Explanations for War', *International Organization* 49/3 (Summer 1995).

[16]Thomas C. Schelling, *Arms and Influence* (New Haven: Yale UP, 1966); and James D. Fearon, 'Signaling Foreign Policy Interests: Tying Hands versus Sinking Costs', *Journal of Conflict Resolution* 41/1 (February 1997).

[17]There are some instances in which shows of force might have these effects, however. See Branislav L. Slantchev, *Military Threats: The Costs of Coercion and the Price of Peace* (New York: Cambridge UP, 2012), 78–80.

[18]Julian E. Barnes and Jeremy Page, 'U.S. Sends B-52s on Mission to Challenge Chinese Claims', *The Wall Street Journal*, 27 November 2013; and John Vandiver, 'Dragoon Ride Will Send US Troops Through Eastern Europe in Show of Support', *Stars and Stripes*, 12 March 2015.

Peacetime competition, military complexity, and capability demonstrations

Why have demonstrations of military strength received so little attention, especially in comparison to demonstrations of interest and resolve? The existing literature suggests that interest and resolve are often more important, and more difficult to communicate, than capabilities. These assumptions reflect a narrow focus on crisis dynamics, however, and a failure to fully appreciate the uncertainties surrounding military power.

For instance, the main goal of most signalling arguments is to explain crisis outcomes, and a crisis is first and foremost an exercise in brinkmanship, especially if one or more actors possesses nuclear weapons. Because of their enormous destructive power, it is the willingness to employ nuclear weapons rather than the damage they would inflict that has always been most in doubt. As Glenn Snyder explained in an early discussion of coercive bargaining in the nuclear era, 'calculations of reciprocal *intent*, and attempts to influence such calculations, are likely to become more important as compared with calculations of relative *capabilities*, and the actual clash of capabilities in war'.[19] Thus, the biggest hurdle that leaders must overcome during a crisis is communicating how much they value the issue in dispute and how much they are prepared to suffer to get what they want.[20] Moreover, even if a state wanted to improve assessments of its military strength under these conditions – whether by introducing a new weapons system, revealing a new application of an existing system, or showing proficiency in the use of known capabilities – there are reasons to doubt the utility of these measures when tensions are high.[21]

Although interest and resolve might matter more than capabilities during crises, this calculation can change in peacetime. Specifically, relative power should play a larger role in general deterrence and assurance than it does in immediate deterrence and assurance, mainly because it is more stable and

[19]Glenn H. Snyder, *Deterrence and Defense: Toward a Theory of National Security* (Princeton, NJ: Princeton UP, 1961), 39 (emphasis in original).

[20]Robert Powell, 'Nuclear Brinkmanship, Limited War, and Military Power', *International Organization* 69/3 (Summer 2015), 589; and Vesna Danilovic, 'The Sources of Threat Credibility in Extended Deterrence', *The Journal of Conflict Resolution* 45/3 (June 2001), 343–344. States can manipulate the balance of power during crises to generate a credible commitment, for example, by mobilising or deploying forces so they are better prepared and positioned to fight, which ties a state's hands by improving its odds of winning a conflict. It is important to note, however, that mobilisation and deployment can negatively impact the balance of power as well. For instance, increasing the readiness level of forces provides opponents with strategic warning and enables them to prepare their defences, while sending forces closer to the scene of a possible conflict and massing them together might make them more vulnerable to attack. On this signalling mechanism, see Jervis, *The Logic of Images*, 226–227; and Branislav L. Slantchev, 'Military Coercion in Interstate Crises', *American Political Science Review* 99/4 (November 2005).

[21]Kevin N. Lewis, *Getting More Deterrence Out of Deliberate Capability Revelation* (Santa Monica, CA: RAND, August 1989), 38. For a counterargument, see Brodie, 'Military Demonstration and Disclosure of New Weapons', 301.

more enduring than intentions.[22] Of course, states try to make their commitments appear ironclad through mechanisms such as public statements, private guarantees, arms transfers, high-profile leadership visits, and forward military presence. Nevertheless, intentions can shift rapidly and radically. Capabilities, by comparison, often change slowly and incrementally. As a result, adversaries and allies are likely to have more confidence in a state's ability to uphold its obligations than its willingness to do so.

At the same time, accurate assessments of military power are harder to come by than the bargaining perspective suggests.[23] According to this approach, capabilities are not only less important than interests and resolve, at least during crises, but are also easier to estimate. Although leaders have private information about their state's military strength, that strength is rooted in public information such as the general size, composition, and location of its forces. By contrast, interests and resolve exist almost entirely within the minds of decision-makers, can only be inferred indirectly, and therefore need to be revealed. In reality, however, conventional military power is often ambiguous to observers and, as Richard Harknett has argued, 'highly suspect' in the eyes of potential targets, mainly because it can be influenced by so many different factors.[24]

Every aspect of national power is prone to errors of appraisal. Nevertheless, military power has been and remains uniquely challenging to measure, which partially explains why states sometimes dominate opponents that were predicted to put up a serious fight or struggle to defeat adversaries that were not expected to exact a heavy toll.[25] In his classic essay *Problems of Estimating Military Power*, Andrew Marshall observed that 'most attempts to explicitly measure military power are mere tabulations of forces' that offered little insight into 'the actual capabilities of the forces of one country to deal with another'.[26] This critique still has resonance half a century after it was written.

At least in the public domain, assessments of military power frequently rely on variables such as the amount of money that nations spend on defence each year, the number of men and women in their armed forces,

[22]On the distinction between general (peacetime) and immediate (crisis) deterrence, see Patrick M. Morgan, *Deterrence: A Conceptual Analysis* (Beverly Hills: Sage, 1983), 30.

[23]Geoffrey Blainey, *The Causes of War*, 3rd ed. (New York: The Free Press, 1988), 114; and Arnold Wolfers, *Discord and Collaboration: Essays on International Politics* (Baltimore, MD: The Johns Hopkins UP, 1962), 113.

[24]Richard J. Harknett, 'The Logic of Conventional Deterrence and the End of the Cold War', *Security Studies* 4/1 (Autumn 1994), 91.

[25]On the complexities of assessing military power and military effectiveness, see Allan R. Millet, *et al*., 'The Effectiveness of Military Organizations', *International Security* 11/1 (Summer 1986), 37–71; Stephen Biddle, *Military Power: Explaining Victory and Defeat in Modern Battle* (Princeton, N.J.: Princeton UP, 2004); and Risa A. Brooks and Elizabeth Stanley (eds), *Creating Military Power: The Sources of Military Effectiveness* (Stanford, CA: Stanford UP, 2007).

[26]A.W. Marshall, *Problems of Estimating Military Power* (Santa Monica, CA: RAND, 1966), 2.

and how many advanced weapons systems they possess.[27] Yet military power and effectiveness cannot be reduced to a 'tale of the tape'. Although these metrics are hardly irrelevant, defence spending trends and orders of battle are often inadequate for estimating how armed forces will perform in an actual fight.

For instance, other factors intrinsic to a state's armed forces will influence power and effectiveness. This includes the number and type of forces ready to conduct operations with little warning, the amount of time required to mobilise reserves, the quantity and quality of training that personnel receive, the operational guidance that is codified in official doctrine, and the organisational structures that influence how much coordination and collaboration take place between services and among service components. In addition, factors that are unique to specific contingencies, many of which are shaped by geography and politics, are highly relevant. This might include the logistics and sustainment requirements for deploying and deployed forces, the size and terrain of a theatre, and the level of support that allies provide. Lastly, military strength (especially conventional military strength) is inherently relative: it depends on the forces that an adversary can bring to bear and how well those forces operate given the factors listed above. Collectively, these considerations make military power and effectiveness difficult to assess in advance of a conflict.

Mechanisms for demonstrating military power

Given the significance of military capabilities for deterrence and assurance, as well as the challenges of estimating them accurately, states often have incentives to signal their strength.[28] What measures might they take to do so? The answer to this question is not as obvious as it might seem because efforts to *create* military power – for instance, by increasing defence spending, expanding force structure, developing new weapons, or devising new operational concepts – do not automatically *communicate* military power. States still need to reveal whether and how these inputs enhance outputs such as their readiness to fight, the strategic and operational mobility of their forces, the lethality of those forces against different types of targets, and their resilience to different forms of attack, among other relevant attributes. Of course, efforts to signal strength might go unnoticed by observers that are simply distracted or suffer from biases that negatively influence their ability to process information accurately. Nevertheless,

[27]Mahnken, *Uncovering Ways of War*, p. 177.
[28]On the related question of when states opt to reveal new capabilities, see Robert Axelrod, 'The Rational Timing of Surprise', *World Politics* 31/2 (January 1979).

I outline five demonstration mechanisms that can be used to make military power and effectiveness more evident.[29]

The first mechanism, *employment*, refers to the use of military capabilities in combat or non-combat operations, which is the most unambiguous type of demonstration. In general, any real-world use of military units will communicate information about their strengths and weaknesses, sometimes with far-reaching consequences. For instance, during the 1991 Persian Gulf War, the United States fully introduced many systems that it had been developing to compete with the Soviet Union, such as stealthy strike aircraft and new airborne surveillance platforms, which contributed to a surprisingly easy victory over Iraq. Although this demonstration of power might not have been deliberate, it still had an enormous impact on observers, especially Russia and China, both of which raised their estimates of US capabilities and reexamined their own forces as a result.[30]

A state could, therefore, deliberately employ its military to highlight select capabilities. This need not entail a decision to use force.[31] Once that decision has been made, however, the goal of enhancing deterrence and assurance vis-à-vis third-parties could influence how force is used, just as Caesar's decision to cross the Rhine by bridge rather than with boats was shaped by signalling considerations. For instance, historians continue to debate whether intimidating the Soviet Union was a contributing factor in the US decision to employ nuclear weapons against Japan in 1945. More recently, the US invasion plan for the 2003 Iraq War was influenced by a desire to reveal how quickly a small but sophisticated military could dispatch a much larger opponent.[32] And today, Russia's operations in and around Syria have been interpreted by the US intelligence community 'as a showcase for its military modernization program and advanced conventional weapons systems, including employing systems from outside of Syrian territory to demonstrate its power projection capacity'.[33]

A second mechanism, *exercises*, refers to training manoeuvres that simulate combat or non-combat operations.[34] These activities are often a valuable way to improve the effectiveness of a state's armed forces and

[29]Although these mechanisms are distinct, they can be undertaken simultaneously, such as when technological experiments are embedded within operational exercises.

[30]Stuart Kaufman, 'Lessons from the 1991 Gulf War and Russian Military Doctrine', *The Journal of Slavic Military Studies* 6/3 (September 1993); and Dean Cheng, 'Chinese Lessons from the Gulf Wars', in Andrew Scobell, David Lai, and Roy Kamphausen (eds), *Chinese Lessons from Other Peoples' Wars* (Carlisle, PA: Strategic Studies Institute, 2011).

[31]Fearon, 'Rationalist Explanations for War', 400–401.

[32]Michael R. Gordon and Bernard E. Trainor, *Cobra II: The Inside Story of the Invasion and Occupation of Iraq* (New York: Pantheon Books, 2006).

[33]Defense Intelligence Agency, *Russia Military Power: Building a Military to Support Great Power Aspirations* (Washington, DC: Department of Defense, 2017), 43–44.

[34]The following discussion focuses on field and fleet exercises rather than command post exercises. Because the former are far more visible to observers they are likely to be more useful as signalling tools. Nevertheless, the latter could also be used to showcase command-and-control arrangements and highlight the proficiency of operational staff at various echelons.

a visible means of conveying that effectiveness to observers, although they can also burden military units by increasing their operational tempo and, in some cases, might be mistaken as a cover for initiating conflict. The United States, for instance, holds a variety recurring, large-scale, joint and combined training events, such as Red Flag in the skies over Nevada and Alaska, as well as Malabar alongside Japan, India, and others. Likewise, Russia-watchers pay close attention to Moscow's Zapad and Vostok exercises to gain insights into the proficiency of its forces and their preferred methods of operating.

One of the most significant examples of using exercises to deter and assure was the US Army's REFORGER series (along with the US Air Force's associated CRESTED CAP series), which began in 1969 and continued into the early 1990s.[35] In response to the demands of the Vietnam War and burden-sharing debates within NATO, the United States opted to withdraw a pair of brigades and dozens of combat aircraft from West Germany as a cost-saving measure. These forces returned to the continental United States on the conditions that they would remain committed to the defence of Europe and would redeploy to West Germany each year, where they would integrate with forward-based components of their parent units, marry up with prepositioned equipment sets, and conduct training manoeuvres. In this case, the goal was to deter the Soviet Union and assure NATO allies by demonstrating Washington's capability for rapid transatlantic reinforcement to blunt a Warsaw Pact offensive.[36] For similar reasons, some commentators have suggested implementing future REFORGER-like exercises in the Western Pacific as a response to China's rise.[37]

The third mechanism, *experiments*, includes exploratory trials of emerging capabilities or current capabilities applied in new ways. Given the relatively small-scale and tentative nature of most experiments, they can be a useful method of revealing advances that are not yet and might never become fully operational, along with innovative applications of legacy systems that are not certain to be widely adopted.[38] The United States, for example, has experimented recently with a variety of new technologies, including autonomous, carrier-based unmanned aircraft as well as small, swarming, 3D printed aerial drones.[39] It has also investigated new ways of posturing

[35]Edward J. Drea, *Secretaries of Defense Historical Series Vol VI: McNamara, Clifford, and the Burdens of Vietnam, 1965–1969* (Washington, DC: Office of the Secretary of Defense Historical Office, 2011), chap. 15; and Walter S. Poole, *History of the Joint Chiefs of Staff: The Joint Chiefs of Staff and National Policy, 1965–1968* (Washington, DC: Office of Joint History, 2012), chap. 6.

[36]Robert D. Blackwill and Jeffrey W. Legro, 'Constraining Ground Force Exercises of NATO and the Warsaw Pact', *International Security* 14/3 (Winter 1989/90), 69–71.

[37]Eric Sayers, '15 Big Ideas to Operationalize America's Indo-Pacific Strategy', *War on the Rocks*, 6 April 2018, https://warontherocks.com/2018/04/15-big-ideas-to-operationalize-americas-indo-pacific-strategy/.

[38]Mahnken, *Uncovering Ways of War*, 171–172.

[39]Sam LaGrone, 'Navy Makes History with Unmanned Carrier Launch', *USNI News*, 14 May 2013; Rebecca Grant, 'Airpower against Ships', *Air Force Magazine* (June 2015); and Aaron Mehta, 'Pentagon Launches 103 Unit Drone Swarm', *Defense News*, 10 January 2017.

and deploying its forces to enhance their responsiveness, survivability, and unpredictability, such as sending a handful of F-22 combat aircraft, along with organic refuelling and maintenance support, to major bases as well as austere operating locations.[40]

A notable historical example comes from the Defense Advanced Research Project Agency (DARPA) Assault Breaker programme, which began in 1977 and achieved a breakthrough during a live-fire event in 1982.[41] The objective of this programme was to leverage advances in computer processing to develop a new generation of sensors, submunitions, and delivery systems that would enable the United States to locate and destroy rear-echelon Soviet armoured forces before they reached the forward-edge of the battle area along the inner-German border. The 1982 experiment, which took place at the White Sands Missile Test Range, appeared to confirm the feasibility of using ground-moving target indicator radars and terminally guided submunitions to conduct simultaneous, accurate strikes against multiple targets. It also fuelled Moscow's concerns that the United States enjoyed a significant lead in an emerging military-technical revolution that its theorists had predicted years earlier.[42] Given Assault Breaker's apparent success, contemporary policymakers have pointed to it as a model to emulate. According to then-Deputy Secretary of Defense Robert Work, the United States should aim to conduct an updated version of the experiment, dubbed 'Raid Breaker,' to demonstrate a capability to withstand salvos of guided munitions.[43]

A fourth mechanism, *examinations*, refers to tests of existing capabilities, either to ensure that older systems remain viable or to assess how newer systems are progressing in their development. The former often attracts little notice because it entails routine events with legacy forces. Nevertheless, its importance should not be discounted, especially when it comes to systems that are not employed regularly. For instance, each year the United States conducts flight tests of its Minuteman III intercontinental ballistic missile (ICBM) and Trident II D-5 submarine-launched ballistic missile. Because these ageing weapons have never been employed in combat, regular tests are promoted as a means of reaffirming the 'operational credibility' of Washington's strategic nuclear

[40]On the US Air Force's Agile Combat Employment initiative (which began under the moniker 'rapid raptor') see Amy McCullough, 'Ace in the Hole', *Air Force Magazine* (May 2017).

[41]Barry C. Watts, *Six Decades of Guided Munitions and Battle Networks: Progress and Prospects* (Washington, DC: Center for Strategic and Budgetary Assessments, 2007), 28–31; and Edward C. Keefer, *Secretaries of Defense Historical Series, Vol. IX: Harold Brown: Offsetting the Soviet Military Challenge, 1977–1981* (Washington, DC: Office of the Secretary of Defense Historical Office, 2017), 586–590.

[42]Office of Technology Assessment, *New Technology for NATO: Implementing Follow-On Forces Attack* (June 1987), chap. 7.

[43]Sydney J. Freedberg Jr., 'Work Elevates Electronic Warfare, Eye on Missile Defense', *Breaking Defense*, 17 March 2015, https://breakingdefense.com/2015/03/raid-breaker-work-elevates-electronic-warfare-eye-on-missile-defense/.icb.

deterrent.[44] The latter is likely to receive more attention, especially when it entails the test of an expensive, controversial, or otherwise high-profile new capability. In March 2019, for example, the US Missile Defense Agency (MDA) conducted the first salvo test of the Ground-based Midcourse Interceptor (GBI), successfully using a pair of GBIs to destroy a notional ICBM. According to MDA's director, the 'test demonstrates that we have a capable, credible deterrent against a very real threat'.[45]

A final mechanism is the use of *exhibitions*: the deliberate release of information about key military capabilities. This type of demonstration is typically associated with symbolic and highly publicised events such as national parades, which are used by nations such as North Korea, China, Russia, and others to reveal capabilities to the world. Recently, for example, Pyongyang displayed a new short-range ballistic missile during a celebration of the regime's 70th anniversary; China showcased an improved version of its DF-31 road-mobile ICBM during the 90th anniversary of the People's Liberation Army; and Russia used its 2018 Victory Day parade to confirm earlier claims that it was developing an air-launched hypersonic missile.[46] Nevertheless, exhibitions can come in a variety of forms, including other types of public events, sanctioned press reports, and even images or announcements posted to social media platforms.

Emerging technologies and military demonstrations

Although states have incentives to advertise their strengths and many options for doing so, the relevance, purpose, and character of capability demonstrations can be influenced by exogenous factors. This includes major geopolitical shifts, which create or expand gaps between actual and perceived distributions of power, as well as technological changes, which can have similar effects.[47] Despite recurring debates over technology's influence on military performance and combat outcomes, there is no dispute that it is a critical element of national power.[48] In peacetime, the ability to develop,

[44]Gen Robin Rand, 'FY19 Posture for Department of Defense Nuclear Forces', Presentation to the Senate Armed Services Committee – Strategic Forces Subcommittee, 11 April 2018, 5, https://www.armed-services.senate.gov/imo/media/doc/Rand_04-11-18.pdf.

[45]Lt Gen Samuel A. Greaves, quoted in MDA News Release, 'Homeland Missile Defense System Successfully Intercepts ICBM Target', 25 March 2018, https://www.mda.mil/news/19news0003.html.

[46]Hyonhee Shin, 'North Korea Stages Show of Force with New Missiles During Parade', *Reuters*, 9 February 2018; Michael S. Chase, 'PLA Rocket Force Modernization and China's Military Reforms', Testimony to the U.S. – China Economic and Security Review Commission, 15 February 2018, 5; and Matthew Bodner, 'Russia's Hypersonic Missile Debuts Alongside New Military Tech at Parade', *Defense News*, 9 May 2018.

[47]Robert Gilpin, *War and Change in World Politics* (New York: Cambridge UP, 1981), 32–33.

[48]Ashley J. Tellis, *et al., Measuring National Power in the Postindustrial Age* (Santa Monica, CA: RAND, 2000). On the influence of military technology, see Biddle, *Military Power*; Keir A. Lieber, *War and the Engineers: The Primacy of Politics over Technology* (Ithaca, NY: Cornell UP, 2005); Thomas G. Mahnken, *Technology and the American Way of War since 1945* (New York: Columbia UP, 2008); and David W. Kearn, Jr., *Great Power Security Cooperation: Arms Control and the Challenge of Technological Change* (Lanham, MD: Lexington Books, 2015).

integrate, and exploit new advances is one of the primary ways that a state can stay ahead of its rivals or close the gap with stronger competitors. The extent to which emerging technologies enhance military power depends on considerations that are difficult to predict, however, such as how much and how fast they mature, bureaucratic and normative constraints on their use, and whether they supplement existing capabilities and modify legacy styles of warfare or generate new weapons systems and spur the creation of novel warfighting concepts.[49] Thus, the introduction of emerging technologies – especially those that are unproven but have great promise – can be a significant source of uncertainty. Under these conditions, demonstrations should have added utility for states that want to leverage their accomplishments or avoid an image of falling behind.

In addition, emerging technologies have three distinct effects on this form of signalling. First, they can open new avenues for imposing costs on adversaries rather than just deterring them, and demonstrations have an important role to play in these efforts. Cost imposition involves complicating an opponent's peacetime defence planning and spending decisions through various means of distraction, misdirection, and unpredictability, with the ultimate goal of reducing the attention and resources it can devote to its most threatening investments and lines of effort.[50] Towards this end, demonstrations can help to create functional and geographic dilemmas for rivals – for instance, by multiplying the types of capabilities they need to defend against and the number of locations they need to protect.

Cost-imposing measures can be particularly attractive to states that have an edge in new technologies because they raise the prospect of obsolescing adversary capabilities or inducing opponents to pursue expensive options that are beyond their reach. In the early 20th century, for example, when the speed, protection, and firepower of capital ships were improving at a quick pace, Great Britain's First Sea Lord, Admiral Jackie Fisher, advocated an approach he referred to as 'plunging' to help London retain its command of the seas against increasingly capable maritime competitors. This would have entailed well-timed demonstrations of new ship designs that outclassed those of rivals and, in theory, severely disrupted their construction programmes.[51] Similarly, the early development and eventual revelation of all-aspect, broad-band stealth during the 1970s was expected to channel Soviet investments towards countermeasures that did not pose a significant threat to the United States and its allies, while research into new anti-

[49]Michael C. Horowitz, *The Diffusion of Military Power: Causes and Consequences for International Politics* (Princeton, NJ: Princeton UP, 2010), 24.

[50]Thomas G. Mahnken, 'Thinking about Competitive Strategies', in Mahnken (ed), *Competitive Strategies for the 21st Century: Theory, History, and Practice* (Stanford, CA: Stanford UP, 2012).

[51]Nicholas A. Lambert, *Sir John Fisher's Naval Revolution* (Columbia, SC: University of South Carolina Press, 1999), 246. See also Leo J. Blanken and Jason J. Lepore, 'Slowing Down to Keep the Lead in Military Technology', *Defence and Peace Economics* 22/3 (2011).

ballistic missile systems during the 1980s was driven in part by the calculation that Moscow could not afford to keep pace with the West.[52]

Second, emerging technologies also create different audiences for demonstrations. Specifically, some demonstrations might be geared towards domestic rather than foreign observers – not to enhance national prestige, as in the case of swaggering, but to address internal resistance to new capabilities. Military organisations are often reluctant to adopt alternative ways of doing business that clash with existing modes of operating, endanger the position of influential warfighting communities, and impose substantial adjustment or opportunity costs.[53] At times, therefore, demonstrations can help to overcome these barriers and increase the likelihood that emerging technologies will be embraced.

During the interwar period, for instance, airpower advocate Billy Mitchell's experimental use of bombers to sink battleships defied the predictions of sceptics, highlighted the utility of land-based aircraft for coastal defence, and helped convince a reluctant US Navy to investigate carrier aviation.[54] Likewise, during the late Cold War, a clever demonstration by the Global Positioning System (GPS) programme manager – taking off from and returning to the same location in a helicopter with blacked-out windows that impeded visual flight – converted a key US official into an advocate for space-based precision navigation and timing.[55] As these examples suggest, proponents of innovation within a bureaucracy can use demonstrations to reveal the feasibility of new approaches and press the case for change, either by convincing their colleagues with a compelling proof of concept or marshalling public and political support.

Third, because emerging technologies are often early in their development and closely guarded by the states attempting to leverage them, they can heighten two risks associated with capability demonstrations: the risk of failure and the risk of disclosure. For instance, one downside of demonstrations is that they might not succeed, which can lead observers to conclude that a state is weaker than they had previously thought.[56] Another danger is that demonstrations might share too much information with adversaries, who can then emulate or compensate more easily. Managing these risks can

[52]Hal Brands, *Making the Unipolar Moment: U.S. Foreign Policy and the Rise of the Post-Cold War Order* (Ithaca, NY: Cornell UP, 2016), 76–79.
[53]Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca, NY: Cornell UP, 1994).
[54]John T. Correll, 'Billy Mitchell and the Battleships', *Air Force Magazine* (June 2008); and Roger G. Miller, *Billy Mitchell: 'Stormy Petrel of the Air'* (Washington, DC: Office of Air Force History, 2004).
[55]William J. Perry, *My Journey at the Nuclear Brink* (Stanford, CA: Stanford UP, 2015), 40–41.
[56]The negative impact of unsuccessful demonstrations should depend on observers' prior beliefs, however. For instance, if a weak state with limited technological sophistication tries but fails to demonstrate a new capability, that outcome might not undermine existing assessments of its strength and could still lead observers to raise their estimations, especially if some progress were revealed by a failed demonstration.

influence the mechanisms that states choose when they want to advertise their strengths.

If a state hopes to highlight the potential of emerging technologies or its progress in operationalising them, but also wants to avoid these counterproductive outcomes, then it should place less emphasis on some demonstration mechanisms, such as exercises, and more emphasis on others, such as experiments and exhibitions. Exercises, for example, are often large-scale, high-profile events. Consequently, there is a greater likelihood that shortcomings will be revealed or that the use of new technologies will be so tightly constrained to avoid public failure that the signalling value of the activity is diminished. Experiments, by contrast, are usually smaller-scale efforts that receive less attention, unless they are deliberately promoted. Moreover, failure is a less detrimental outcome because it is widely understood to be part of the innovation process. As for exhibitions, they can be characterised by subtlety rather than spectacle, and therefore can allow a state to demonstrate capabilities without divulging too much. Consider the B-2 stealth bomber. The US government began developing the technology for reduced signature aircraft in the 1970s, publicly announced a breakthrough in 1980, then carefully controlled information on its stealth programmes for the remainder of the decade. It was not until 1988 that the B-2 platform was officially introduced to the world (even though its existence was widely known) in a carefully choreographed press event.[57]

Almost any major technological change can impact demonstrations in the preceding ways. Nevertheless, some contemporary technologies pose added dilemmas when it comes to communicating military strength. Although the lines that divide them are blurred in the information age, virtual technologies that enhance power via the collection, analysis, and application of data should be more challenging to reveal than physical technologies that enhance power through advances in areas such as energetics, structural design, and material sciences. Specifically, capabilities that rely on the former suffer from what I refer to as observability problems, which come in at least two variants.[58]

The first and most obvious observability problem obtains when the *existence* of certain capabilities cannot be known with confidence until after they have been used and their effects have become apparent. Consider the case of offensive cyber weapons. The tools of computer network attack are software-based rather than hardware-based; they are risky

[57] George C. Wilson, ''Stealth' Alters Military Balance, Brown Asserts', *Washington Post*, 23 August 1980; and George C. Wilson, 'Air Force Unveils the B-2, its Radar-Evading Stealth Bomber', *Washington Post*, 23 November 1988.

[58] In addition to virtual technologies, these observability problems could also apply to military innovations in cognitive science and human performance enhancement, which would not be easily visible to observers.

to advertise in advance because they exploit flaws in target systems that can be remedied once identified; and they can be difficult to attribute after the fact absent a claim of responsibility.[59] Thus, it is challenging to determine what capabilities states actually possess and how effective they might be, even if the consequences of their use would eventually become known in many cases. Demonstrating proficiency in offensive cyber warfare for its coercive value might therefore require the most conspicuous form of signalling: employment.[60] For instance, states might look for opportunities to conduct attacks in scenarios where the effects would be obvious, the perishability of cyber tools would not be an overwhelming concern, and deniability would not be necessary or possible. This could include cyber operations to disrupt information systems during conflicts against weaker states – an approach that Russia appears to have adopted in the recent past.[61] Put another way, efforts to reduce the uncertainty surrounding technologies characterised by this observability problem can generate incentives for escalation.

The second and potentially more intractable observability problem obtains when both the *existence* and *effects* of capabilities are difficult to establish, a situation that might characterise many applications of artificial intelligence (AI). In general, AI is often identified as the emerging technology that could most influence military power, whether by automating and improving tasks such as imagery analysis and logistical support functions; assisting decision-making by fusing data from many sources and producing recommended courses of action; or facilitating the development of fully autonomous systems, including weapons that can select and engage targets on their own.[62] Few of these applications would be detectable through traditional demonstration mechanisms, however. As one report notes, 'AI is relatively transparent, meaning that its integration into a product is not immediately recognizable.'[63] In fact, one of the main benefits of AI, at least for the time being, is to increase the efficiency and effectiveness of existing capabilities by reducing (or reorienting) direct human involvement. Thus, even signalling via employment may not be adequate to reveal improvements in military power because those improvements are occurring almost entirely behind the scenes.

[59]Thomas Rid, 'Cyberwar and Peace', *Foreign Affairs* (November/December 2013), 82; and Martin C. Libicki, *Brandishing Cyber Capabilities* (Santa Monica, CA: RAND, 2013).
[60]Martin C. Libicki, *Cyber Deterrence and Cyber War* (Santa Monica, CA: RAND, 2009), 79.
[61]Michael Connell and Sarah Vogler, *Russia's Approach to Cyber Warfare* (Arlington, VA: CNA, 2017), i.
[62]Greg Allen and Taniel Chan, 'Artificial Intelligence and National Security', *Belfer Center Paper* (July 2017); and Michael C. Horowitz, 'Artificial Intelligence, International Competition, and the Balance of Power', *Texas National Security Review* 1/3 (May 2018).
[63]Daniel S. Hoadley and Nathan J. Lucas, 'Artificial Intelligence and National Security', *Congressional Research Service*, 28 April 2018, 2.

For example, machine-learning algorithms could make it easier for a state to locate, classify, and track targets by automatically processing large volumes of data acquired through diverse collection methods. Yet a state would still need to employ legacy weapons systems to engage those targets, and third parties that witness the outcome of these engagements might wonder whether AI was actually used and what effect it really had. This suggests that the emerging technology with the greatest potential to shape the balance of power could also introduce the most uncertainty into strategic interactions, perhaps raising the likelihood of miscalculation absent new, tailored forms of signalling.

Conclusion

When it comes to the role of armed forces in shaping perceptions, the conventional wisdom holds that states frequently hide their capabilities, flaunt them to enhance prestige, or use them during crises to reveal interests and resolve. In peacetime especially, however, they often engage in military activities with another objective in mind: demonstrating their capabilities to adversaries and allies. Through mechanisms such as employment, exercises, experiments, examinations, and exhibitions, states can attempt to reduce the ambiguity that accompanies assessments of military power, even if only partially, and project an image of strength to enhance deterrence, bolster assurance, and impose costs on rivals.

Demonstrations are becoming increasingly relevant, moreover, as the United States, Russia, China, and others pursue emerging technologies with military applications. Because the effects of many emerging technologies remain uncertain, states may need to rely more on demonstrations to capitalise on any progress they achieve. Nevertheless, virtual rather than physical emerging technologies can be difficult to reveal due to observability problems. This, in turn, creates demonstration dilemmas that might only be resolved through aggressive forms of signalling, such as the employment of new capabilities in conflict, or might not be resolvable at all.

Given the growing importance of capability demonstrations, future research could build upon the preceding analysis in several ways. First, tracking the frequency of alternative demonstration mechanisms could help to identify which ones are favoured, by whom, and under what conditions. States might, for instance, prefer certain types of demonstrations over others due to bureaucratic politics, capability attributes, or the intended targets of their signals. Second, a systematic assessment of demonstration risks is warranted. Such an assessment could shed light on the risk of failure, the risk of disclosure, the potential decrement to readiness imposed by mechanisms such as frequent or large-scale exercises, and the possibility

that some demonstrations could contribute to unintended escalation.[64] Third, like all forms of signalling, the outcomes of capability demonstrations are the product of strategic interaction. Consequently, it is necessary to explore the factors that influence when signals are received and how they are interpreted. That, in turn, could require an increased emphasis on organisational and strategic culture within target states, which can shape how attentive they are and how well they process information.[65]

In addition to suggesting avenues for future research, the arguments presented above have several implications for US policy, especially as Washington looks to enhance its military power in an era of renewed great power competition. First, the United States must focus on critical operational challenges. Enhancing deterrence and preserving stability vis-à-vis great powers requires showcasing capabilities and concepts that directly address the threats that competitors pose, such as a growing ability to strike fixed and mobile targets with a high degree of accuracy, as well as an expanding set of kinetic and non-kinetic tools to attack information networks. Simply increasing the frequency or visibility of military activities that highlight legacy capabilities and concepts might help to reaffirm US interests but is unlikely to upgrade estimates of US power. In fact, it could prove counterproductive by sending a message that the United States is not adapting fast enough, or by overtaxing the forces that must carry out these activities.

Second, Washington should place more emphasis on smaller-scale efforts such as modest experiments. Not only are experiments a useful mechanism for demonstrating emerging technologies that remain sensitive or immature, but they can also influence perceptions and channel competitions in other ways; for instance, by affirming a commitment to continuous innovation, wherever it might lead, and by providing a low-cost tool to test a rival's reaction to new technologies, which can inform future cost-imposing strategies.

Finally, because some demonstrations play an important role in building and sustaining ties with international partners, policymakers need to be cognizant of the diplomatic consequences of altering how they signal military power. Allies that are accustomed to joining certain types of demonstrations – especially prominent bilateral and multilateral combined exercises – might become concerned if Washington defers or scales back these activities in favour of other efforts, even if those efforts are better suited to showcasing new capabilities. Explaining the rationale behind any changes, managing expectations, and finding ways to incorporate other states as participants or observers will be necessary for a different portfolio of demonstrations to assure as well as deter.

[64]A prominent example of a demonstration contributing to heightened tensions was NATO's Able Archer exercise in 1983. See Nate Jones, ed., *Able Archer 83: The Secret History of the NATO Exercise that Almost Triggered Nuclear War* (New York: The New Press, 2016).
[65]Mahnken, *Uncovering Ways of War*.

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