



# Post-9/11 US thinking and approaches to nuclear deterrence: the Bush Doctrine and the role of nuclear weapons in US deterrence strategy

James Johnson<sup>1</sup> 

Accepted: 28 June 2023  
© The Author(s) 2023

## Abstract

Charting a course through US administrations from the late 1990s to the present day, this article considers the George W. Bush administration's thinking on nuclear deterrence in the aftermath of the terrorist attacks of 9/11: What was distinctive about the Bush administration's thinking and approach to nuclear deterrence? To what extent, and to what effect have the Bush administration's approaches proved enduring? The article considers the *prima facie* contradictory nature of the administration's deterrence objectives against the backdrop of a shifting security environment, characterised by the proliferation of WMDs to 'rogue states' and non-state actors, nuclear multipolarity, disruptive emerging technologies, and long-held US commitments to its global allies and partners—ensuring the centrality of nuclear weapons in US national security policy, despite sustained efforts to reduce this reliance.

**Keywords** Bush Doctrine · Nuclear deterrence · Non-state actors · Emerging technology · Rogue states · Missile defence

## Introduction

Charting a course through US administrations from the late 1990s through to the present day, this article considers the Bush administration's thinking and approaches to nuclear deterrence—associated with the 'Bush Doctrine' (Lefaber 2002; Jervis 2003). What (if anything) was distinctive about the Bush administration's thinking and approach to nuclear deterrence? To what extent did the Bush Doctrine represent a reduced role for nuclear weapons and break from Cold War-era classical deterrence? To what extent, and to what effect have the approaches the administration set in train proved to be enduring in the so-called second nuclear age?

---

✉ James Johnson  
james.johnson@abdn.ac.uk

<sup>1</sup> Department of Politics and International Relations, University of Aberdeen, King's College, Aberdeen AB24 3FX, UK



Deterrence, broadly defined, is about influencing an adversary's sense of risk, cost–benefit assessment, and decision-making outcomes. Effective deterrence requires a deep understanding of the other side's interests, priorities, strategic objectives, and perceptions. Deterrence strategies can flounder 'when the attacker decides that the defender's threat is not likely to be fulfilled', caused by a perceived weakness in either another's capacity or resolve to carry out a threat (Russett 1963: 102–103). Successful deterrence strategies depend on several interconnected factors: (1) rationality on *both* sides to ensure threats will be enough to shape the other's behaviour<sup>1</sup>; (2) the adversary's perception of the defender's capacity and resolve (or will) to punish violations (or cross red-lines) or deny objectives; (3) the deterrent threat must be communicated and understood unambiguously—'through the din and noise' of world politics; and relatedly, (4) defenders must also reassure aggressors that threats (or demands) will *not* be carried out in a *fait accompli* in the event demands are met (Schelling 1980: 11; Payne 2001: 7–15).

Nuclear deterrence has undergone several transformations. In light of changes to the geopolitical (from bipolarity to unipolarity, and finally multipolarity), technological landscapes (missile defences, hypersonic weapons, and Artificial Intelligence (AI) and autonomy), and 'new' security threats and domains (non-states, grey-zone conflict, the militarization of space, and cyberspace), political scientists have conceptualised four 'waves' of deterrence theorising (Sechser 2010; Knopf 2010). Succeeding waves progressively built upon the first wave's foundation, creating a more complex, nuanced, and applicable theory in light of new research, novel methodologies applied from other disciplines (military and non-military), and lessons from real-world events (Braga and Weisburd 2012; Guerette and Bowers 2009; Bennett et al 2006).

The fourth wave followed the end of the Cold War and continues to the present day. It coincided with the broader features of the second nuclear age—a period in which direct nuclear threats between nuclear-armed states have largely been replaced by threats posed by regional 'rogue'<sup>2</sup> and non-state actors (especially terrorists) armed with chemical, biological, or nuclear weapons—inherited by the Bush administration. It is also characterised by nuclear multipolarity, which is expected to pose a greater threat to nuclear stability and be significantly more difficult to manage than a world consisting of two superpowers (Gray 1999; Payne 1996). These approaches were accompanied by the expansive use of traditional deterrence concepts, which thereby broadened the scope and practice of deterrence, *inter alia* including conventional deterrence, extended deterrence (and its opposite 'central deterrence'), interwar and intrawar deterrence, and more recently, cross domain and cyberspace

<sup>1</sup> The rationality of the US is generally assumed and unchallenged. An interesting possibility to consider is whether 9/11 was traumatic to the nation, or the leader(s), in such a way that rationality was threatened. The author thanks the anonymous reviewer for this suggestion. For a contrarian perspective on US rationality and deterrence see (e.g., Payne 2001; Stein et al. 1985; Morgan 2003).

<sup>2</sup> The notion of a 'rogue state' is a US-centric concept defined specifically in relation to threats posed to the United States. The definition of what makes a state 'rogue,' and whether 'rogue' states can be deterred, has been the source of scholarly debate (e.g., Smith 2006; Payne 2001; Pollack 2002).



deterrence (Gerson 2009; Sobelman 2016/17; Brooks and Rapp-Hooper 2013; Tellis et al., 2013; Wilner 2020).

The George W. Bush administration had four—and *prima facie* contradictory—overarching deterrence goals: (1) to reaffirm and strengthen deterrence and to signal resolve; (2) to extend its range and scope to achieve new policy ends; (3) reducing the reliance on deterrence; and (4) altering the way the US practiced deterrence given the perceived risks of proliferation of WMDs to ‘rogue states’ and terrorists (Knopf 2008: 235). This recalibration can be attributed to concerns that terrorists and other non-state actors had value systems so different from the USA that they could launch an attack even when faced with a threat of punishment that would effectively deter state actors—including the USA itself (Knopf 2008: 245). Taken together, these goals were designed to provide a form of ‘unidirectional deterrence,’ a one-way deterrent capability that denied adversaries an ability to deter the USA, thus sustaining American military primacy and creating additional strategic options to calibrate its posture to suit particular threats—thus a kind of ‘tailored deterrence’ (Knopf 2010: 3).<sup>3</sup>

This article is organised into three sections. The first considers the Bush administration’s thinking and approaches to nuclear deterrence in the aftermath of the terrorist attacks of 9/11. This section will unpack the Bush Doctrine that became associated with an aggressive nuclear posture, a pre-emption policy, a re-focus on missile defence, a new concept of tailored deterrence and a re-affirmation of US military primacy. It contends that despite commonly held perceptions of contemporary observers—and notwithstanding fundamental shifts in other areas of US foreign policy—the Bush Doctrine did not represent a radical new approach to classical nuclear deterrence, let alone the abandonment of a role for nuclear weapons.

The second section of the article examines the elevated role of advanced conventional weapons—especially missile defence and conventional counterforce capabilities—in strategic war planning to support national and regional deterrence objectives during the Bush administration. The commitment to a ‘new triad’ of nuclear and non-nuclear delivery systems to buttress the US’s overall deterrence posture was subsequently broadly reaffirmed during both the Obama and Trump administrations.

The final section considers the implications of the Bush Doctrine for nuclear deterrence in the modern information age, characterised by the cumulative impact of disruptive technologies (quantum computing, hypersonic weapons, cyberspace, and AI), associated with the broader ‘Fourth Industrial Revolution’ (Klaus 2016). The article concludes that while particular features distinguished the Bush Doctrine from those that followed and came before, its approach to long-held US strategic objectives was generally consistent with other post-Cold War administrations and was indeed reaffirmed by the succeeding Obama and Trump administrations.

---

<sup>3</sup> The concept of ‘tailored deterrence’ was first formally used in the 2006 Quadrennial Defense Review (QDR). This described a shift from a ‘one size fits all deterrence—to tailored deterrence for rogue powers, terrorist networks and near-peer competitors’. (US DoD 2006: vi).



---

## The Bush Doctrine: something old, something new, and something borrowed

The perception that the Bush administration post-9/11 set in motion a downgrading process—or even abandoned entirely—the role of nuclear weapons and classical strategic deterrence approaches has been convincingly refuted by scholars (Knopf 2008; Kristensen 2005). Rather, they argue, it retained the centrality of nuclear weapons and nuclear deterrence, notwithstanding the existence of seemingly contradictory goals, a real shift in other foreign and security policy areas, and new deterrence concepts that added to a sense of some confusion.

The attacks on 9/11 by non-state terrorists sparked a new wave of deterrence theorising and analysis (Knopf 2008; Steff 2020: 55–75). Following the attacks, many raised doubts about the efficacy of traditional deterrence approaches in deterring non-state terrorist actors bent on destruction and not perturbed by the threat of punishment. Notably, this view resonated with long-standing factions within the Republican Party—the neoconservatives or neocons—who had denounced US Cold War deterrence policies and advocated nuclear warfighting options, opposed multilateral arms control, and supported robust missile defences and the quest for escalation dominance—deterrence by denial rather than punishment (Jervis 2003: 369). The first-term Bush administration included prominent neocon advocates or sympathisers, including Vice-President Dick Cheney, Secretary of Defense Donald Rumsfeld, Deputy Secretary of Defense Paul Wolfowitz, and Assistant Secretary of State for Non-proliferation and International Security John Bolton.

As Bolton posited, terrorists willing to fly airplanes into buildings are ‘not going to be deterred by anything’ (Broad et al 2001). In a similar vein, scholar Colin Gray noted that following 9/11, ‘the Bush administration did not formally retire deterrence as concept or policy, but it left observers in no doubt that in the global war that it declared against terrorism, deterrence generally would be left on the bench’ (Gray 2003: 7). These concerns within the administration helped prompt the propagation and development of the Bush Doctrine—associated, as noted, with an aggressive nuclear posture, a policy of pre-emption, a re-focus on missile defence, a new concept of tailored deterrence, and a re-affirmation of US military primacy. Post-9/11, President Bush himself acknowledged the need for a shift in US deterrence policies because of perceived vulnerability, shock, and new dangers. In a 2002 address in Cincinnati, Bush stated that after 9/11, ‘America felt its vulnerability’, adding that ‘the doctrine of containment just doesn’t hold any water....my vision shifted dramatically after September 11, because I now realise the stakes, I realise the world has changed’ (Bush 2002b). The discussions that follow here will now consider these core elements of the Bush Doctrine with regard to nuclear deterrence.



## **Aggressive nuclear posture and re-affirmation of nuclear deterrence with new missions**

Then—Secretary of Defense Donald Rumsfeld stated in the foreword of the 2001 US Nuclear Posture Review (NPR) that the document ‘puts in motion a *major change* in our approach to the role of nuclear offensive forces in our deterrent strategy’ (US DoD, 2001—emphasis added).<sup>4</sup> Despite the portrayal by the Bush administration—in numerous statements and congressional testimonies by its officials—of a *reduction* in the role of nuclear weapons and reliance on deterrence,<sup>5</sup> the Bush Doctrine represented a demonstrably more aggressive nuclear posture; combining the modernisation of US nuclear forces maintained on high-alert, a policy of pre-emption, an elevated role for conventional capabilities and missile defence capabilities in nuclear planning, and a conceptual re-affirmation of nuclear deterrence with expanded missions and roles (Kristensen 2005: 13–14).

These goals were also explicitly reflected in the 2002 US National Security Strategy (NSS) (Bush 2002a). This NSS enshrined a pre-emption policy and the option for preventative action—subsequently operationalised during the Second Gulf War in 2003—as well as reaffirming the rationale for a national ballistic missile defence (BMD) infrastructure (discussed below). The document also expounded a strategy of sustaining US global military primacy (or hegemony) to counter the proliferation of nuclear weapons and other WMD, legitimatising a policy of deterrence by denial to dissuade adversaries—notably rogue states and terrorists—from developing these capabilities in the first place, including denying terrorists and rogue states WMD technology and financial aid to acquire them.

The 2001 NPR’s claim of a ‘major change’ in the role of nuclear weapons was largely obfuscated by the notion that an aggressive nuclear force structure—and US military primacy more broadly—would axiomatically strengthen deterrence. The report had stated that nuclear weapons:

Provide credible military options to deter a wide range of threats, including WMD and large-scale conventional military force. These nuclear capabilities possess unique properties that give the US options to hold at risk classes of targets [that are] important to achieve strategic and political objectives (US DoD, 2001).

US military primacy (or hegemony) is implied in the review’s emphasis on dissuading future military competitors. For example, the review stated that in order to sustain their deterrent effect, ‘US nuclear forces must maintain a strong and visible state of readiness.....permitting a swift response to any no-notice nuclear attack against the USA, its forces, or allies’. It added that the defence of the USA was best served through a ‘defense posture that makes possible war outcomes so *uncertain*

---

<sup>4</sup> The Nuclear Posture Review is a classified report. Excerpts are available at [www.globalsecurity.org](http://www.globalsecurity.org)

<sup>5</sup> For example, analysts at the Brookings Institution argued that the Bush administration had ‘effectively abandoned a decades-long consensus that put deterrence and containment at the heart of American foreign policy’. See Lindsay and Daalder (2003: 125).



and dangerous, as calculated by potential adversaries, as to remove all incentives for initiating attack under any circumstances' (US DoD, 2001—emphasis added). In short, US military primacy was clearly implied in the language used in the review to dissuade future military competitors—notably China and Russia.

This tacit deterrence-through-primacy logic was also clear in President Bush's 2002a, b address at West Point (effectively unveiling that year's NSS), where he stated that 'America has, and intends to keep, *military strengths beyond challenge*, thereby making the destabilizing arms races of other eras pointless and limiting rivalries to trade and other pursuits of peace' (Bush 2002a—emphasis added). This logic, in other words, implicitly tied the Administration to the premise of 'hegemonic stability theory': a belief that the world must avoid returning to a traditional multipolar balance of military power to avoid uncertainty and danger without the stability provided by US hegemony, and the broader goal of 'Pax Americana' based on US technological, economic, and military dominance (Snidal 1985; Mastanduno 1997/98; Ikenberry 2002; Johnson 2019).

The logic implicit in these statements is not new to deterrence theory and is consistent with classical or traditional notions of deterrence, that posit the 'threat of military retaliation to forestall a military attack'—or deterrence by retaliation (Morgan 1985: 29). Indeed, the Bush Doctrine's interpretation of deterrence adopted an even narrower definition than the classical approaches, implying the threat of massive retaliation with nuclear weapons alone. Further, this narrow interpretation demurred from the Department of Defense's (DoD) official definition at the time: 'the prevention from action by fear of the consequences'—an understanding that did not require that deterrence necessarily be military, let alone nuclear (DoD, 2006: 160).

### **Bush's 'tailored deterrence': pre-emption, rogue states, and non-state threat**

Then—Assistant Secretary of Defense Peter Flory stated in 2006 congressional testimony that 'declaratory statements will also need to be tailored' (Flory 2006). Rather than downgrading the role of (classical) nuclear deterrence, the Bush administration recognised the fallibility of traditional deterrence by retaliation models in the context of purportedly 'sub-rational'<sup>6</sup> rogue states and their megalomaniacal leaders (such as Saddam Hussein in Iraq and Kim Jong-il/Kim Jong-un in North Korea), and undeterrable terrorists (Payne 2001: 7–16). It thus elevated the role of deterrence by denial to strengthen deterrence at the margins (see Smith 2006; Lebovic 2007).<sup>7</sup> In short, 'tailored deterrence' sought to apply traditional deterrence notions to specific situations in the post-9/11 context, recognising that deterrence strategies work in specific ways against specific adversaries—rather than in an indiscriminate general sense.

<sup>6</sup> By confusing 'rational' with 'reasonableness,' policymakers may think that when adversaries fail to act as assumed, they appear irrational. An actor can be 'rational' within their own particular belief structure or theoretical framework of understanding.

<sup>7</sup> The Bush administration was also concerned about the capacity of potential adversaries to deter the United States, which is, however, beyond the scope of this article.



Assistant Secretary Flory opined that US defence planners operated from an assumption that ‘deterrence continues to be important, but uncertain’ (Flory 2006). In the same year, the Bush administration’s new NSS stated that ‘the new strategic environment requires *new approaches* to deterrence and defense. Our [US] deterrence strategy *no longer rests primarily* on the grim premise of inflicting devastating consequences on potential foes’ (Bush 2006: 22—emphasis added).<sup>8</sup> An evident osmosis within the Bush administration of perceived dangers and uncertainties had prompted it to explicitly countenance the use of pre-emption and preventative action—including the threat of invasion and regime change—an impulse juxtaposed with a desire to make deterrence more robust. Cognisant of traditional deterrence’s fragilities in the face of new (especially non-state) threats, the administration sought alternatives to deterrence by punishment—closely associated with the Cold War—in order to make deterrence more effective.<sup>9</sup>

While the emphasis the Bush Doctrine placed on pre-emption and prevention distinguished the administration from its predecessors, historical continuity elements can also be found in these ostensibly radical and idiosyncratic policies. For example, some have viewed the Bush administration’s pre-emption policy as a reincarnation of the preceding Clinton administration’s Counterproliferation Initiative, designed to improve the US military’s ability to effectively respond to regional WMD proliferation challenges (Litwak 2017: 57–61). US preventative operations against terrorists also had their roots in strategic debates dating back to the Reagan administration in the mid-1980s (Tucker 1997). However, Bush’s Doctrine was the first to outline specific scenarios in which nuclear weapons might be used pre-emptively.

The historical record demonstrates that in international relations states rarely pursue sustained moderate military policies when they are not compelled to do so by the actions of others (Waltz 1991; Krauthammer, 1990/91). As a corollary, while particular features and emphases distinguished the Bush Doctrine from those that came before and after, its approach to long-held core US strategic objectives: reducing the role of nuclear weapons for American national security, sustaining military primacy, preventing nuclear terrorism and proliferation, and a robust regional nuclear deterrence stance to reassure allies and partners, were consistent with the broad strategic goals of all administrations in the post-Cold War era. They were subsequently reaffirmed during the Obama and Trump administrations (US DoD 2010a; US DoD 2018).<sup>10</sup> For example Trump’s 2018 NPR stated:

There is no ‘one size fits all’ for deterrence. The requirements for effective deterrence vary given the need to address the unique perceptions, goals, inter-

<sup>8</sup> This statement implied that the Bush administration inherited an approach *based solely* on the threat of massive nuclear retaliation, a declaratory policy that was effectively abandoned during the 1960s.

<sup>9</sup> The notion of deterrence by punishment has been defined as convincing an opponent that the risk/cost of an undesirable action it may take will exceed any possible gains (George and Smoke 1974: 11).

<sup>10</sup> The Obama administration reduced the size and role of the nuclear weapons arsenal by ratifying the New START agreement with Russia and adopting negative security assurances, reducing but not eliminating the role of nuclear weapons in deterring non-nuclear attacks. In a similar vein, in late 2020 the incoming Biden administration proposed a review of US nuclear modernisation programmes and nuclear weapons’ role in deterrence strategy.





ests, strengths, strategies, and vulnerabilities of different potential adversaries. The deterrence strategy effective against one potential adversary may not deter another (US DoD 2018: 26).

Scholars Alexander George and Richard Smoke famously defined deterrence as ‘the persuasion of one’s opponent that the costs and/or risks of a given course of action he might take outweigh its benefits’ (George and Smoke 1974). This understanding implies that deterrent strategies (i.e. threats and inducements) might be devised to prevent a situation from escalating by making a particular action (or counteraction) unnecessary—including through reassurances or concessions. A deterrence doctrine premised on the threat of pre-emption, but absent credible assurances, means that deterrence can fail even when the deterrent threat itself is credible.

As Thomas Schelling wrote over 50 years ago ‘to say, one more step and I shoot, is a credible deterrent threat only if paired by the implicit assurance, ‘if you stop I won’t’ (Schelling 1966: 164).<sup>11</sup> Without these assurances, therefore, rogue states could be *more* incentivised to pursue WMD in an effort (however unrealistic) to deter US military primacy. In other words, if others perceive deterrent threats as a general strategy of hostility and bellicosity, then these are problematic when used to deter *specific* situations or behaviour. For example, in the aftermath of the 2003 Iraq invasion, evidence emerged that indicated North Korea, Iran, and Syria increased their efforts to pursue ballistic missile capabilities and WMD (Steff 2016: 97). In addition to rogue states and terrorists, other established nuclear powers (especially Russia and China) also felt threatened by the Bush administration’s aggressive pursuit of a US BMD shield to complement and bolster its superior nuclear sword, as discussed below (Kroenig 2018). With this in mind, Russia’s annexation of Crimea in 2014 and subsequent invasion of Ukraine in 2022 and China’s assertive military behaviour in the South China Sea and the Taiwan Straits, can in part be attributed to earlier tensions generated by Bush’s pursuit of a BMD shield.

Furthermore, despite the Bush administration’s ‘tailored’ approach to deterrence, that encompassed a range of non-nuclear alternatives to buttress and complement (not replace) classical deterrence, nuclear weapons remained a core feature of the US’s overall deterrence playbook to combat the WMD problem. For example, the 2006 Quadrennial Defense Review (QDR) stated that to ‘strengthen deterrence, and hedge against future strategic uncertainty, the DoD will develop a wider range of conventional and non-kinetic deterrent options *while maintaining a robust nuclear deterrent*’ (US DoD 2006: 6—emphasis added). 12 years later, the Trump administration’s 2018 NPR reaffirmed that nuclear weapons ‘provide a necessary, unique, and currently irreplaceable contribution’ to ‘hedge against an uncertain future’, enhance deterrence and ‘reduce potential adversaries’ (i.e. China, Russia, and North Korea) belief that they can gain an advantage through a ‘break out’ in their nuclear capabilities’ (US DoD 2018).

<sup>11</sup> In a well-known example, President John F. Kennedy’s public pledge in 1962 not to invade Cuba – assuring the Soviets that withdrawal would not invite future demand—helped resolve the missile crisis.





Critics at the time and more recently have argued that this hedging strategy—pursued by successive administrations since the early 1990s—went against the nature of multilateral arms control and non-proliferation efforts, demonstrating that the USA is not serious about its commitments under Article VI of the Non Proliferation Treaty (NPT) (Grossman 2011; Kristensen 2005, 2002: 25–26).<sup>12</sup> Given that none of the potential (subsequently realised in the case of North Korea) nuclear rogue states could develop an arsenal to rival the US, the decision to maintain a sizable deployed nuclear arsenal with thousands more weapons in reserve was and continues to be predicated on deterring China and Russia (Kristensen and Korda 2020).<sup>13</sup> In sum, despite the Bush administration’s greater emphasis on deterrence by denial than its predecessors, the Bush Doctrine’s affirmation of a threat of massive nuclear retaliation (i.e. deterrence by punishment) intimated a sustained adherence to traditional (or classical) nuclear deterrence approaches.

Change, however, could be found in the reconfigured US nuclear force structure introduced in the 2001 NPR, which effectively dismantled the traditional delineation between nuclear and conventional weapons and warfare—combining a nuclear and conventional offensive leg of the US triad and expanding the potential targets and missions for these weapons. In addition to advocating ways in which nuclear weapons might be used in warfighting scenarios, that NPR also sketched out the rationale for a ‘new triad’—building on the traditional triad of intercontinental ballistic missiles (ICBM), strategic bombers, and submarine-launched missiles—combining nuclear and conventional offensive weapons (or ‘non-nuclear strike capabilities’) in active and passive defences—that is, the balance between defending against an impending attack and striking preemptively against the anticipation of a future attack. Moreover, missile defence capabilities were formally integrated into US nuclear strategy ‘to help provide deterrence and protection against attack, preserve US freedom of action, and strengthen the credibility of US alliance commitments’ (US DoD 2001).

Significantly in this context, US Strategic Command (STRATCOM) transitioned from an exclusive nuclear mandate to one that now included several non-nuclear missions, combining nuclear and non-nuclear strategic capabilities in a single leg of the US triad; signalling to defence planners that *both* options were on the table in future (and especially regional) contingencies. This shift also created the perception amongst US allies and adversaries that US nuclear weapons were more militarily usable than in the past—that is, it fomented the perception that the introduction of conventional weapons into the nuclear architecture might bolster US deterrence. Consequently, this posture lowered the threshold (or broke the ‘nuclear taboo’) for

---

<sup>12</sup> The ‘hedge’ refers to a reserve of thousands of nuclear warheads established in the early 1990s, that were removed from operational status by arms control measures that called for the destruction of delivery platforms but left the warheads intact.

<sup>13</sup> The US and Russia possess more than 90 per cent of the world’s nuclear weapons stockpiles. As of 2019, the US had an inventory of 6,185 nuclear warheads; of these, 2,385 were retired and awaiting dismantlement, and 3,800 were part of the US stockpile. Of the stockpiled warheads, the US stated in its March 2019 New START declaration that 1,365 were deployed. See Kristensen and Korda 2020.



the use of nuclear weapons, and risked encouraging nuclear proliferation (Tannenwald 2007; Quester 2006).

### Missile defences to augment nuclear warfighting

The role of missile defence capabilities was another distinctive feature of the Bush Doctrine. While this approach was not entirely new—like the use of conventional forces in strategic planning more generally—it featured more prominently in terms of mission scope (i.e. enhancing the survivability of nuclear forces and offensive capabilities in their own right), as part of a broader ‘active’ defence doctrinal platform. In short—and notwithstanding the Bush administration’s official rationale for withdrawing from the Anti-Ballistic Missile (ABM) treaty and seeking congressional funds to support an ambitious missile defence programme—missile defences were no longer considered simply as a purview of nuclear deterrence to protect people from nuclear attack, but rather to protect military assets and enhance US offensive nuclear capabilities (White House 2001).<sup>14</sup>

Upon the announcement of the US’s withdrawal from the ABM treaty, the Bush administration controversially portrayed its new BMD capabilities as a positive contribution to deterrence (by denial) *vis-à-vis* terrorists and rogue states (White House 2001). Perhaps even more Pollyannaish, it was assumed that US reassurances would assuage Russia and China that the goal of these capabilities outside of the ABM framework was not to undermine their second-strike capabilities—or ‘security dilemma sensibility’ (Booth and Wheeler 2008). Unsurprisingly, Moscow and Beijing rejected the US assurances. They insisted that US BMD might eventually threaten their strategic forces and that regional forward deployments of BMD—explicitly foreseen by the White House in 2001—to support the security of US ‘friends and allies’ (NATO *vis-à-vis* Russia, and South Korea and Japan *vis-à-vis* China) —would complicate regional deterrent balances, thus threatening Russian and Chinese strategic deterrence (White House 2001; Steff and Khoo 2017).

In a joint statement in 2001, Russia and China opined that US BMD plans were ‘aimed at seeking unilateral military and security [nuclear] superiority [US withdrawal from the ABM Treaty would] trigger off another round of the arms racing and subsequently reverse the positive trend that emerged in world politics after the end of the Cold War’ (Nuclearfiles.org 2000). Several detached observers also argue that rather than functioning as a force for stability, let alone supporting global non-proliferation efforts (an argument advanced in the 2001 and 2010 NPRs), the pursuit of BMD by President Bush, continued during the Obama and Trump administrations, contributed to regional arms racing and security dilemma dynamics. These dynamics intensified strategic competition between nuclear-armed rivals, ironically also prompting rogue states (Iran and North Korea) to accelerate their own indigenous nuclearisation efforts (MacDonald and Ferguson 2015; Steff and Khoo 2017).

<sup>14</sup> The Bush administration’s official rationale for the US withdrawal from the 1972 ABM Treaty was that it was a Cold War relic that constrained the US from developing a national missile defence capability, one of the Administration’s top priorities.



While US BMD capabilities have enjoyed strong bipartisan support in Congress, the pursuit of an effective missile defence shield has been accompanied by increasingly intense debate about the technical veracity of these systems,<sup>15</sup> the cost-effectiveness of defensive capabilities (compared to relatively cheap offensive missiles), the nature of the ballistic missile threat, and the deterrence and assurance benefits of BMD, particularly its implications for strategic stability with Russia and China. Despite early moves in the Obama administration to cut many missile defence programmes (the budget of the Missile Defense Agency was cut by \$1.4 billion in 2009), the president crafted a missile defence shield in Europe (the European Phased Adaptive Approach (EPAA)), a departure from Bush's focus on homeland defences, which has proved to be the US's most robust foreign deployment of ballistic missile defences to date. During Obama's second term and following a series of North Korean missile tests in 2012, both homeland and regional defences were strengthened (Paltrow 2017).<sup>16</sup>

The Trump administration's 2019 BMD review proposed a further expansion in the role and scope of US missile defences, focusing not only on ballistic missiles but also other types of missile threats (i.e. regional cruise and hypersonic weapons). For the first time since the late 1990s, this review explicitly identified Russia and China as adversaries that the US national BMD system must help defend against. The review also placed greater emphasis on the importance of space and new technologies (such as AI-machine learning technology, hypersonic glide vehicles, and cyber-enabled left-of-launch operations) to intercept missiles during the vulnerable boost phase. Specifically, the review proposed the improvement and expansion of existing capabilities, developing more technically advanced ones, and allocating funds to study the feasibility of deploying a space-based missile intercept layer. It also called for further integration of offensive strike operations—a key feature of the Bush Doctrine—with the Aegis Missile-3 defence interceptor (US DoD 2019).

The focus on BMD during the Bush administration coincided with qualitative improvements in US nuclear delivery systems' accuracy and survivability. These improvements in turn ushered in a new era of conventional counterforce capabilities—designed to disarm or destroy an adversary's nuclear forces—which have, and continue to, chip away at the foundations of nuclear deterrence: premised on the size, mobility, hardened and relatively hidden features of states' nuclear arsenals. For example, the Bush administration studied means to locate mobile missile launchers—notably Chinese and Russian mobile ICBMs—and use ground and space-based

---

<sup>15</sup> The US DoD's independent testing office reports that missile defence capabilities can defend the US homeland against only a small number of intercontinental ballistic missiles that employ 'simple countermeasures'. The office also judges that missile defences to protect allies and US troops deployed abroad offer a 'limited capability' against small numbers of intermediate-range and medium-range ballistic missiles. Aside from the point-defence Patriot BMD system, no BMD systems have been used in combat.

<sup>16</sup> For example, in 2013 then-Defense Secretary Chuck Hagel announced an ambitious plan to increase the number of Ground-Based Interceptors from 30 to 44 and the deployment of an additional TPY-2 radar in Japan, as well as the deployments of Terminal High Altitude Area Defense (THAAD) systems to the island of Guam, and later South Korea.



technology (electronic warfare jamming devices and anti-satellite weapons) to interfere with or destroy an adversary's vulnerable satellites (Weiner 2005).

### **An elevated role for advanced conventional weapons in US nuclear deterrence**

A distinctive feature of the Bush Doctrine was, as noted, the increased prominence of advanced conventional weapons in nuclear defence planning. The 2001 NPR stated that 'targets that may have required a nuclear weapon to achieve the needed effects in previous planning may be targeted with conventional weapons'. The review added that 'integrating conventional and nuclear attacks will ensure the most efficient use of force and provide US leaders with a broader range of strike options' (US DoD 2001). Many defence analysts continue to argue that integrating nuclear and conventional warheads with ballistic missiles or nuclear-enabled platforms (especially armed with BMD countermeasures) harbinger grave implications for crisis stability (Kristensen 2005; Acton 2017; Steff and Khoo 2017). A nuclear-armed state that comes under attack from conventionally armed ballistic missiles at the outset of a conflict might conclude that it is the target of a 'bolt from the blue' nuclear first strike and respond in kind with nuclear retaliation.

As the 2001 NPR explained, US STRATCOM sought to integrate the USA and allied offensive and defensive capabilities 'to exploit the full range of characteristics offered by US strategic nuclear forces *to support national and regional deterrence objectives*' (US DoD 2001—emphasis added). In further committing US conventional and nuclear forces to regional targeting—and with pre-emptive optionality—the Bush Doctrine significantly expanded the scope of the US's long-standing extended deterrence policy, and in turn lowered the threshold for the use of nuclear weapons and raised important questions about counter-value targeting with nuclear weapons and international law (CJCS 2004: 34–35).

The elevation of the role of non-nuclear strategic weapons—notably precision munitions, missile defence, and later cyber and counter-space weapons—in strategic planning set in train by the Bush administration proved an enduring feature of US deterrence strategy and policy during the Obama and Trump administrations. Both the 2010 and 2018 NPRs rejected the notion that nuclear weapons exist to deter *only* nuclear attacks. They advocated the development and maintenance of capabilities (such as low-yield submarine-launched ballistic missiles and sea-launched cruise missiles), that critics argued by making nuclear weapons 'more usable' might lower the nuclear threshold (Hersman 2018). Ahead of his inauguration in January 2021, president-elect Joe Biden pledged to reduce the US's 'excessive expenditure' on nuclear weapons, criticising President Trump's decision to develop new sea-launched and submarine-launched cruise missiles.<sup>17</sup> The expectation that Biden will take a fresh look at the nuclear modernisation programme has prompted renewed debate about the future of US nuclear deterrence (Gordon 2020).

Despite downplaying the role of nuclear weapons—and much like the Bush and subsequent Trump administrations—the Obama administration combined a

<sup>17</sup> The 2018 NPR, for instance, proposed the creation of two new nuclear capabilities; a low-yield variant of the Trident D5 submarine-launched ballistic missile, and a sea-launched cruise missile. The



prominent role for strategic non-nuclear capabilities (i.e. Bush's 'new triad') with an affirmation that US nuclear forces 'be postured and planned' so that the 'USA should have a wide range of effective response options available to deter potential regional threats' (US DoD 2010a). President Obama's 2010 NPR and Ballistic Missile Defence Review (US DoD 2010b) explicitly stated that the development of missile defences and conventional strike capabilities were a critical enabling factor in reducing nuclear weapons in regional security architectures and moving towards a world free of nuclear weapons (US DoD 2010b: 33).<sup>18</sup> Further, the 2010 NPR advocated developing and maintaining robust long-range nuclear and non-nuclear strike capabilities (such as dual-payload bombers, air-launched cruise and long-range stand-off missiles) to supplement US forward military presence and strengthen regional deterrence.

In a broad affirmation of Obama's 2010 NPR, President Trump's 2018 version reiterated US commitment to the modernisation of the now established Bush era new triad combining nuclear and non-nuclear delivery systems, prioritising investment to modernise and strengthen US nuclear arsenals and nuclear weapons infrastructure (US DoD 2018).<sup>19</sup> Trump's NPR also advocated Bush-style 'tailored deterrence options' including the modification of 'a small number' of low-yield nuclear missiles to strengthen US regional deterrence (US DoD 2018). The pursuit of 'low-yield' (or tactical) more 'useable' nuclear weapons was also a key feature of the Bush administration's 'tailored deterrence', as noted earlier; enabled by the removal of a decade-old ban on research on developing low-yielding nuclear weapons by Congress in 2003.

The distinction between the Bush, Obama, and Trump approaches and policies was, therefore, more one of context and circumstance than substance, informing and shaping the tone and emphasis of their respective nuclear policies. Like Bush's 2001 NPR, Trump's 2018 version was authored during a time of geopolitical tension and strategic competition—a revisionist China, revanchist Russia, and nuclearisation threats from North Korea. However, President Trump's sabre-rattling rhetoric and emphasis on nuclear weapons as instruments of national power bore little resemblance to the more measured declaratory policies described in his NPR. By contrast, President Obama's 2009 NPR was authored in a comparatively benign security environment, marked by a political backdrop of cooperation and international engagement on non-proliferation and nuclear security issues (such as the ratification of the New START agreement and adoption of negative security assurances).

---

Footnote 17 (continued)

low-yield Trident II D5 was first deployed in 2020, and the sea-launched cruise missile is yet to receive National Nuclear Security Administration R&D funding. See US DoD, 2018.

<sup>18</sup> The US FY 2011 budget allocated \$10.2 billion to develop missile defence capabilities, securing a consensus within NATO to develop a NATO missile defence system—discussed below.

<sup>19</sup> Obama's 2010 NPR had committed \$85 billion to sustain and modernise the nuclear weapons complex and \$100 billion to modernise nuclear delivery systems. Obama's commitment to modernise US strategic forces was essentially ratified in Trump's 2018 NPR.



In his famous address delivered in Prague in 2009, President Obama advocated reducing the role and number of US nuclear weapons in the near term and seeking a world without nuclear weapons in the long run: the ‘global zero’ objective (Obama, 2009). Unfortunately, Obama’s early optimism floundered on the domestic-political realities of the day. Neither Congress (bipartisan), the professional defence community, nor public opinion was convinced that preventing the proliferation of nuclear weapons required US nuclear disarmament and doing so could indeed be counterproductive, because adversaries with much leaner arsenals would likely flout any arms control agreements and thus impair US deterrence (Obama 2020).

Whereas the condition of mutual vulnerability associated with the possession of nuclear weapons can in theory—by creating a military stalemate—enhance deterrence (Waltz 1990; Jervis 1984), the fear that states might develop strike capabilities that threaten the survivability of others’ strategic capabilities—and the concern that an adversary might do so in the future—helps explain why the proliferation of nuclear weapons has continued: as a hedge against technological breakthroughs. This dynamic has been apparent from the Cold War era to the present day (Bracken 1983; Gottfried and Blair 1988).

Yet nuclear superiority—a policy pursued either tacitly or overtly by the Bush, Obama, and Trump administrations—may paradoxically *reduce* US security. It prompted Russia and China (and later North Korea) to mitigate the perceived increased vulnerability of their nuclear deterrence postures by expanding their nuclear arsenals, diversifying their forces, and moving closer towards destabilising launch-on-warning (or ‘hair-trigger’) nuclear postures (Lieber and Press 2006: 7–74; Talmadge 2017: 50–92). The Bush administration’s pursuit of advanced non-nuclear strategic capabilities (such as precision-guided missiles, missile defence systems, counter-WMD capabilities, and counter-space weapons) complementing fortified US nuclear deterrence structures, continued unabated during the Obama and Trump administrations. Eschewing critics of the relentless—and arguably hubristic—pursuit of US military primacy *vis-à-vis* China and Russia, this long-standing and bipartisan policy stance has worsened crisis instability and increased the dangers of arms racing and deterrence failure—thus paradoxically reducing US security (Lieber and Press 2006: 39; Jervis 2003: 265–88).

The historical record is replete with examples of states that seemingly should have been successfully deterred but took up arms because their leaders believed they had no choice but to do so. Scholars have identified several factors that can lead to perception-driven warfare, including: an adversary’s fear of imminent shift in the balance of power or status quo (e.g. Iraq in 1991 and Japan in 1941), the need to divert attention from domestic-political instability or leadership fragility (e.g. the Soviet Union in Afghanistan in 1979 and Japan in 1941), and internal rivalry for power amongst the ruling elites (e.g. Wilhelmine Germany’s naval build-up in the early 1900s) —that can impel states to accept greater risks or pursue opportunistic aggressive paths, resulting in deterrence failure (Lebow 1982: 196–97).



## Nuclear deterrence in the information age

The diffusion of emerging technology into the nuclear deterrence project—in particular advanced non-nuclear counterforce capabilities—can be traced back to the end of the first Gulf War in 1991 and it is associated with the broader information-based ‘revolution in military affairs’ (RMA), or military-technical revolution (MTR) (Mazarr et al. 1993; Arquilla and Ronfeldt 1992).<sup>20</sup> The next stage in this information revolution—which continues to the present day—was facilitated by the cumulative impact of new (and more often than not dual-use) technologies associated with the ‘Fourth Industrial Revolution’, including remote sensing, guidance systems, sensors, data processing, communications, big-data analytics, robotics, additive (or 3D) printing, quantum computing, hypersonic weapons, cyberspace, and AI (Futter 2018; Cimbala and McDermott 2015; Lieber and Press 2017; Johnson 2019, 2020a). Taken together, these technologies will inevitably have a profound impact on nuclear deterrence and the means and ends of future warfare more generally.

This is being felt in several ways. First, enabling AI algorithms to synthesise the big-data analytics revolution to sift through vast datasets, identify patterns, trends, and connections, and in turn make hitherto mobile missile and submerged nuclear forces less survivable (Johnson 2020a). Second, improving the precision and targeting of ‘low-yield’ nuclear and strategic non-nuclear missiles; potentially lowering the political and normative barriers to using nuclear weapons and increasing the threat posed by counterforce capabilities to states’ deterrence forces (Lieber and Press 2017; Futter 2018). Third, using offensive AI-cyber capabilities in a crisis to manipulate (i.e. spoof early-warning systems), sabotage, or even destroy command systems; undermining leaders’ confidence in the robustness and reliability of their command-and-control structures and creating ‘use-them-or-lose-them’ dilemmas (Johnson 2020b; Horowitz et al. 2017). Finally, non-state actors, proxy-hackers, or terrorists might use social media for misinformation or disinformation (such as deep fake technology, spoofing, cyber false flag operations, and false alerts), creating false narratives or amplifying false alarms, and sparking a chain reaction of retaliation and counter-retaliation accidental escalation—akin to a modern-day version of ‘catalytic nuclear war’ (Kobe 1962).

While the potential implications of the introduction of AI-related technology into the nuclear enterprise are profound, since we have yet to see how AI might influence deterrence in the real world—and notwithstanding the valuable insights from experimental wargaming—the discourse today still remains largely a theoretical and speculative endeavour (Johnson 2021; Altmann and Sauer 2017; Geist and Lohn 2018; Saalman 2018). Having said that, some of the issues and potentialities noted here did begin to assume a clearer role in political debates in the USA and among its European allies during 2022, in light of statements by President Putin which seemed to hint at the possibility of Russian nuclear use in the context of further escalation of the conflict in Ukraine.

---

<sup>20</sup> This ‘Information Revolution’ resulted from advances in digitised information, telecommunications technologies, and related innovations in management and organisational theory.





## Conclusions

This article has highlighted and unpacked the core features of the George W. Bush administration's approach to nuclear deterrence: strengthening the credibility of US deterrence and extending it to new missions and domains; an aggressive nuclear posture; a policy of pre-emption; reducing the US reliance on nuclear weapons for deterrence; a concomitant commitment to a 'new triad' of nuclear and non-nuclear delivery systems to buttress overall deterrence posture, emphasising advanced non-nuclear capabilities (especially missile defence and precision missiles); a new concept of tailored deterrence; and a re-affirmation of US military (including nuclear) primacy—associated with the broader premises of the Bush Doctrine (Jervis 2003).

Contemporaries interpreted the *prima facie* contradictory nature of some of these goals as suggesting that after 9/11 the USA had signalled a reduced role for nuclear weapons in deterrence and strategic planning. This perception proved to be mistaken. The apparent tension within and between the Bush administration's deterrence goals can be understood as an attempt to simultaneously make 'deterrence do both more and less' (Knopf 2008: 257). That is, this approach reflected the prevailing strategic beliefs within the administration—in particular amongst its neocon faction—that classical nuclear deterrence approaches were worryingly fallible (the problem of ensuring effective deterrence when faced with actors holding very different motivations and values) and ripe for change in the context of new security challenges posed by international terrorism, rogue states, and WMD proliferation. The concept of tailored deterrence and the pre-emption policy represented the main lines of effort to address these problems.

In sum, despite the Bush administration's greater focus on deterrence by denial than its predecessors, the Bush Doctrine's affirmation of the threat of massive nuclear retaliation (i.e. deterrence by punishment) indicates a continuing adherence to traditional (or classical) nuclear deterrence approaches. Put differently; the Bush administration reaffirmed a commitment to nuclear weapons as the vanguard of the US's broader deterrence and national security goals—an approach that proved enduring through the Obama and Trump administrations that followed.

This article has also highlighted another key distinguishing feature of the Bush administration's approach to nuclear deterrence: the major reorganisation of the US's nuclear force structure introduced in the 2001 NPR, which effectively dismantled the traditional delineation between nuclear and non-nuclear weapons and warfighting. This blurring was evidenced by the promulgation of the new triad concept and full assimilation of missile defences into US nuclear strategy. These distinctive features of the Bush approach have also proved enduring. Moreover, this shift created the perception amongst both allies and adversaries that the USA considered nuclear weapons more usable than in the past. Lowering the perceived threshold for the use of nuclear weapons undermined the nuclear taboo and by encouraging nuclear proliferation, paradoxically, undermined US deterrence efforts.

A further distinctive and related feature of the Bush approach was the increased prominence of advanced conventional weapons (such as precision munitions,



missile defences, and later, cyber and counter-space weapons) in nuclear defence planning. This approach to strategic deterrence set in train by the Bush administration also proved enduring. Both the Obama and Trump administrations rejected the idea that the purpose of nuclear weapons is to deter only nuclear attacks, and taking a lead from the Bush administration, pursued the development of capabilities (such as low-yield nuclear missiles and dual-payload bombers) that might potentially make nuclear weapons more usable and lower the nuclear threshold. In sum, the distinction between the Bush, Obama, and Trump approaches to nuclear deterrence was more one of context and circumstance than substance, reflected in the tone and emphasis of their respective nuclear policies and conditioned by the broader geopolitical backdrop and security challenges.

In the information age—encompassing technologies like remote sensing, guidance systems, data processing, communications, big-data analytics, robotics, quantum computing, hypersonic weapons, cyberspace, and AI—the elevated role for advanced conventional weapons set in train by the Bush administration will likely have far-reaching—and mixed and unexpected—implications for US nuclear deterrence (Johnson 2021): reducing the survivability of mobile missile and submerged nuclear forces; improving the precision and targeting of ‘low-yield’ nuclear and conventional counterforce missiles; threatening nuclear command and control systems with offensive AI-cyber weapons, and using social media and other AI-enabled technologies in misinformation or disinformation campaigns, which risks increasing the dangers of accidental nuclear escalation.

## Declarations

**Conflicts of interest** The authors declare that they have no conflict of interest.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Acton, J.M., ed. 2017. *Entanglement: Russian and Chinese Perspectives on Non-Nuclear Weapons and Nuclear Risks*. Washington, DC: Carnegie Endowment for International Peace.
- Altman, J., and F. Sauer. 2017. Autonomous Weapon Systems and Strategic Stability. *Survival* 59 (5): 117–142.
- Arquilla, J., and D. Ronfeldt. 1992. *Cyberwar is Coming*. Santa Monica CA: RAND.
- Bennett, T., et al. 2006. Does Neighborhood Watch Reduce Crime? *Journal of Experimental Criminology* 2 (4): 459–487.
- Bracken, P. 1983. *The Command and Control of Nuclear Forces*. New Haven, CT: Yale University Press.



- Braga, A., and D. Weisburd. 2012. The Effects of Focused Deterrence Strategies on Crime. *Journal of Research in Crime and Delinquency* 49 (3): 323–358.
- Broad, W. J. et al. 2001. A Nation Challenged: The Threats; Assessing Risks, Chemical, Biological, Even Nuclear. *New York Times*, 1 November, <https://www.nytimes.com/2001/11/01/us/a-nation-challenged-the-threats-assessing-risks-chemical-biological-even-nuclear.html>. Accessed May 19, 2021.
- Brooks, L., and M. Rapp-Hooper. 2013. Extended Deterrence, Assurance, and Reassurance in the Pacific During the Second Nuclear Age. In *Strategic Asia 2013–14: Asia in the Second Nuclear Age*, ed. A. Tellis, et al., 266–300. National Bureau of Asian Research: Seattle, Washington.
- Bush, G. W. 2002a. Remarks by the President at 2002 Graduation Exercise of the United States Military Academy, 1 June, <https://georgewbush-whitehouse.archives.gov/news/releases/2002/06/20020601-3.html>. Accessed May 19, 2021.
- Bush, G.W. 2002b. *President Bush Outlines Iraqi Threat*. Cincinnati, Ohio, 7 October, <https://georgewbush-whitehouse.archives.gov/news/releases/2002/10/2002b1007-8.html>. Accessed May 19, 2021.
- Bush, G. W. 2006. *The National Security Strategy of the United States of America*, September, <https://georgewbush-whitehouse.archives.gov/nsc/nss/2006/>, Accessed May 19, 2021.
- Booth, K., and N. Wheeler. 2008. *The Security Dilemma: Fear, Cooperation, and Trust in World Politics*. New York: Palgrave Macmillan.
- Chairman of the Joint Chiefs of Staff [CJCS]. 2004. JP 3–12, Doctrine for Joint Nuclear Operations, 16 December: 34–5.
- Cimbala, S.J., and R.N. McDermott. 2015. A New Cold War? Missile Defenses, Nuclear Arms Reductions, and Cyber War. *Comparative Strategy* 34 (1): 95–111.
- Davis, N. 1996. An Information-Based Revolution in Military Affairs. *Strategic Review* 24 (1): 43–53.
- Flory, P. 2006. Prepared Statement of Flory, P.C.W., Assistant Secretary of Defense for International Security Strategic Forces Subcommittee, US Senate, 29 March, [http://armed-services.senate.gov/e\\_witnesslist.cfm?id=1842](http://armed-services.senate.gov/e_witnesslist.cfm?id=1842). Accessed May 19, 2021.
- Futter, A. 2018. *Hacking the Bomb: Cyber Threats and Nuclear Weapons*. Washington, DC: Georgetown University Press.
- Geist, E., and A.J. Lohn. 2018. *How Might AI Affect the Risk of Nuclear War?* Santa Monica, CA: RAND.
- George, A.L., and R. Smoke. 1974. *Deterrence in American Foreign Policy: Theory and Practice*. New York: Columbia University Press.
- Gerson, M.S. 2009. Conventional Deterrence in the Second Nuclear Age. *Parameters* 39 (3): 32–48.
- Gordon, M. R. 2020. Biden to Review Nuclear-Arms Programs. *The Wall Street Journal*, 26 December, <https://www.wsj.com/articles/biden-to-review-u-s-nuclear-weapons-programs-with-eye-toward-cuts-11608805800>. Accessed May 19, 2021.
- Gottfried K., and B. G. Blair, (eds). 1988. *Crisis Stability and Nuclear War*. Oxford University Press.
- Gray, C. S. 1999. *The Second Nuclear Age*. Boulder, CO: Lynne Rienner.
- Gray, C. S. 2003. *Maintaining Effective Deterrence*. *Strategic Studies Institute*.
- Grossman, E.M. (2011) Prospects Grow for Cuts to US Nuclear Hedge Force. NTI, 18 August, <https://www.nti.org/gsn/article/prospects-grow-for-cuts-to-us-nuclear-hedge-force/>. Accessed May 19, 2021.
- Guerette, R., and K. Bowers. 2009. Assessing the Extent of Crime Displacement and Diffusion of Benefits. *Criminology* 47 (4): 1331–1368.
- Hersman, R. 2018. *Nuclear Posture Review: The More Things Change, The More They Stay the Same*. CSIS, 6 February, <https://www.csis.org/analysis/nuclear-posture-review-more-things-change-more-they-stay-same>. Accessed May 19, 2021.
- Horowitz, M., et al. 2017. *A Stable Nuclear Future? The Impact of Automation, Autonomy, and Artificial Intelligence*. Philadelphia: University of Pennsylvania.
- Ikenberry, J.G., ed. 2002. *America Unrivaled: The Future of the Balance of Power*. Ithaca, NY: Cornell University Press.
- Jervis, R. 2003. Understanding the Bush Doctrine. *Political Science Quarterly* 118 (3): 365–388.
- Jervis, R. 1984. *The Illogic of American Nuclear Strategy*. London: Cornell University Press.
- Johnson, J. 2019. Artificial intelligence & future warfare: Implications for international security. *Defense & Security Analysis* 35 (2): 147–169.
- Johnson, J. 2020a. Artificial Intelligence in Nuclear Warfare: A Perfect Storm of Instability? *The Washington Quarterly* 43 (2): 197–211.
- Johnson, J. 2020b. Delegating Strategic Decision-Making to Machines: Dr. Strangelove Redux? *Journal of Strategic Studies*. <https://doi.org/10.1080/01402390.2020.1759038>.



- Johnson, J. 2021. Deterrence in the Age of Artificial Intelligence and Autonomy: A Paradigm Shift in Nuclear Deterrence Theory and Practice? *Defense & Security Analysis*. <https://doi.org/10.1080/14751798.2020.1857911>.
- Kingston, R. 2019. *Current US Missile Defense Programs at a Glance*. Arms Control Association, August, <https://www.armscontrol.org/factsheets/usmissiledefense>. Accessed May 19, 2021.
- Klaus, S. 2016. *The Fourth Industrial Revolution: What it Means, How to Respond*. World Economic Forum, 14 January, <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>. Accessed May 19, 2021.
- Knopf, J.W. 2008. Wrestling with Deterrence: Bush Administration Strategy After 9/11. *Contemporary Security Policy* 29 (2): 229–265.
- Knopf, J.W. 2010. The Fourth Wave in Deterrence Research. *Contemporary Security Policy* 31 (1): 1–33.
- Kobe, D.H. 1962. A Theory of Catalytic War. *The Journal of Conflict Resolution* 6 (2): 125–142.
- Krauthammer, C. 1990–91. The Unipolar Moment. *Foreign Affairs*, 70(1), 22–33.
- Kristensen, H.M. 2002. Bomb Deal a Dud (Part One). *Bulletin of the Atomic Scientists* 58 (1): 25–26.
- Kristensen, H.M. 2005. The Role of U.S. Nuclear Weapons: New Doctrine Falls Short of Bush Pledge. *Arms Control Today* 35 (7): 13–19.
- Kristensen, H. M. and M. Korda. 2020. *Status of World Nuclear Forces*. Federation of American Scientists, September, <https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/>. Accessed May 19, 2021.
- Kroenig, M. 2018. *The Logic of American Nuclear Strategy: Why Strategic Superiority Matters*. Oxford University Press.
- LaFeber, W. 2002. The Bush Doctrine. *Diplomatic History* 26 (4): 543–558.
- Lebovic, J.H. 2007. *Detering International Terrorism and Rogue States: US National Security Policy after 9/11*. London: Routledge.
- Lebow, R.N. 1982. Misconceptions in American Strategic Assessment. *Political Science Quarterly* 97 (2): 195–197.
- Lieber, K.A., and D.G. Press. 2006. The End of MAD? The Nuclear Dimension of U.S. Primacy. *International Security* 30 (4): 7–44.
- Lieber, K.A., and D.G. Press. 2017. The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence. *International Security* 41 (4): 9–49.
- Litwak, R.S. 2017. Recalibrating Deterrence to Prevent Nuclear Terrorism. *The Washington Quarterly* 40 (1): 55–70.
- MacDonald, B. W. and C. D. Ferguson. 2015. Chinese Strategic Missile Defense: Will It Happen, and What Would It Mean?. *Arms Control Today*, November. [https://www.armscontrol.org/ACT/2015\\_11/Features/Chinese-Strategic-Missile-Defense-Will-It-Happen-and-What-Would-It-Mean](https://www.armscontrol.org/ACT/2015_11/Features/Chinese-Strategic-Missile-Defense-Will-It-Happen-and-What-Would-It-Mean). Accessed May 19, 2021.
- Mastanduno, M. 1997. Preserving the Unipolar Moment: Realist Theories and United States Grand Strategy after the Cold War. *International Security* 21 (4): 49–88.
- Mazarr, M.J., et al. 1993. *The Military Technical Revolution: A Structural Framework*. Washington, DC: Center for Strategic and International Studies.
- Morgan, P. M. 1985. Saving face for the sake of deterrence. In R. Jervis et al. (Eds.) *Psychology and Deterrence*. Baltimore: John Hopkins University Press.
- Morgan, P.M. 2003. *Deterrence Now*. Cambridge University Press.
- Nuclearfiles.org. 2000. Joint Statement by the Presidents of the People's Republic of China and the Russian Federation, 18 July, <http://www.nuclearfiles.org/menu/key-issues/missile-defense/history/joint-statement-china-russia.htm>. Accessed May 19, 2021.
- Obama, B. 2020. *A Promised Land*. New York: Crown.
- Paltrow, S. 2017. Special Report: In modernizing the nuclear arsenal, US stokes new arms race. Reuters, 21 November, <https://www.reuters.com/article/us-usa-nuclear-modernize-specialreport-idUSKBN1DLIAH>. Accessed May 19, 2021.
- Payne, K.B. 1996. *Deterrence in the Second Nuclear Age*. Lexington, KY: University Press of Kentucky.
- Payne, K.B. 2001. *The Fallacies of Cold War Deterrence and a New Direction*. Lexington, KY: University Press of Kentucky.
- Pollack, K.M. 2002. *The Threatening Storm: The Case for Invading Iraq*. New York: Random House.
- Quester, G.H. 2006. *Nuclear First Strike: Consequences of a Broken Taboo*. Baltimore, MD: Johns Hopkins University Press.
- Russett, B.M. 1963. The Calculus of Deterrence. *Journal of Conflict Resolution* 7 (2): 97–109.



- Saalman, L. 2018. Fear of False Negatives: AI and China's Nuclear Posture. *Bulletin of the Atomic Scientists*. [https://thebulletin.org/landing\\_article/fear-of-false-negatives-ai-and-chinasnuclear-posture/](https://thebulletin.org/landing_article/fear-of-false-negatives-ai-and-chinasnuclear-posture/). Accessed May 19, 2021.
- Schelling, T. 1966. *Arms and Influence*. New Haven: Yale University Press.
- Schelling, T. 1980. *The Strategy of Conflict*. Cambridge, MA: Harvard University Press.
- Sechser, T.S. 2010. Goliath's Curse: Coercive Threats and Asymmetric Power. *International Organization* 64 (4): 627–660.
- Smith, D.D. 2006. *Deterring America: Rogue States and the Proliferation of Weapons of Mass Destruction*. Cambridge: Cambridge University Press.
- Snidal, D. 1985. The Limits of Hegemonic Stability Theory. *International Organization* 39 (4): 579–614.
- Sobelman, D. 2016/17. Learning to Deter. *International Security* 41(3): 151–196.
- Steff, R. 2016. *Strategic Thinking, Deterrence and the US Ballistic Missile Defense Project: From Truman to Obama*. London: Routledge.
- Steff, R. 2020. Nuclear Deterrence in a New Age of Disruptive Technologies and Great Power Competition. In *Deterrence: Concepts and Approaches for Current and Emerging Threats*, ed. A. Filippidou, 57–75. London: Springer.
- Steff, R., and N. Khoo. 2017. *Security at a Price: The International Politics of US Ballistic Missile Defense*. Washington, DC: Rowman & Littlefield.
- Stein, J., R. Lebow, and R. Jervis. 1985. *Psychology and Deterrence*. New York: Johns Hopkins University Press.
- Talmadge, C. 2017. Would China Go Nuclear? Assessing the Risk of Chinese Nuclear Escalation in a Conventional War with the United States. *International Security* 41 (4): 50–92.
- Tannenwald, N. 2007. *The Nuclear Taboo*. Cambridge University Press.
- Trager, T.F. and D.P. Zagorcheva. 2005/06. Deterring Terrorism: It Can Be Done. *International Security* 30(3): 87–123.
- Tucker, D. 1997. *Skirmishes at the Edge of Empire: The United States and International Terrorism*. Westport, CT: Praeger.
- US Department of Defense. 2001. *Nuclear Posture Review [Excerpts]*, 8 January 2002, <http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm>. Accessed May 19, 2021.
- US Department of Defense. 2006. *Quadrennial Defense Review Report*. 6 February, <https://www.hsdl.org/?abstract&did=459870>. Accessed May 19, 2021.
- US Department of Defense. 2010a. *Nuclear Posture Review*. [https://dod.defense.gov/Portals/1/features/defenseReviews/NPR/2010\\_Nuclear\\_Posture\\_Review\\_Report.pdf](https://dod.defense.gov/Portals/1/features/defenseReviews/NPR/2010_Nuclear_Posture_Review_Report.pdf). Accessed May 19, 2021.
- US Department of Defense. 2010b. *Ballistic Missile Defense Review*. <https://dod.defense.gov/News/Special-Reports/BMDR/>. Accessed May 19, 2021.
- US Department of Defense. 2018. *Nuclear Posture Review*. <https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>. Accessed May 19, 2021.
- US Department of Defense. 2019. *Missile Defense Review*, <https://media.defense.gov/2019/Jan/17/2002080666/-1/-1/1/2019-MISSILE-DEFENSE-REVIEW.PDF>. Accessed May 19, 2021.
- Waltz, K. 1990. Nuclear Myths and Political Realities. *American Political Science Review* 84 (3): 731–745.
- Waltz, K. 1991. *America as a Model for the World? A Foreign Policy Perspective*. PS: Political Science and Politics 24(4): 667–670.
- Weiner, T. 2005. *Air Force Seeks Bush's Approval for Space Arms*. New York Times, 18 May, <https://www.nytimes.com/2005/05/18/business/air-force-seeks-bushs-approval-for-space-weapons-programs.html>. Accessed May 19, 2021.
- White House. 2001. *Remarks by the President on Missile Defense*, 13 December, <https://www.armstrongcontrol.org/act/2005-09/features/role-us-nuclear-weapons-new-doctrine-falls-short-bush-pledge>. Accessed May 19, 2021.
- Wilner, A.S. 2020. US cyber deterrence: Practice guiding theory. *Journal of Strategic Studies* 43 (2): 245–280.

