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A Clipped Wing: An Assessment of the Effectiveness of the B-21

Abstract

This thesis examines the effectiveness of the Northrop Grumman B-21 long range strike bomber in advancing the ability of U.S. policy makers to achieve national security objectives. The operational value of the B-21 is assessed through analysing its probable role in four hypothetical combat scenarios, and the relative effectiveness of the B-21 is measured alongside the potential performance of alternative systems. This operational analysis is augmented by a consideration of the shape of recent U.S. national security strategies, as well as the anticipated future security environment, which provides the foundation of an analysis of the ability of the B-21 to support U.S. security objectives within the context of U.S. policy makers' intended approach to foreign policy. This thesis concludes that the B-21 provides a limited increase in the effectiveness of U.S. military operations, and its procurement is incompatible with the anticipated future shape of U.S. security strategy and global interaction.

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of the Requirements for the Degree

Master of Arts

by

Aidan Thomas Hughes

June 2016

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Glossary of Abbreviations

A2AD	Anti-Access Area Denial
CEP	Circular Error Probable
CAS	Close Air Support
DoD	Department of Defense (U.S.)
HALE	High-Altitude Long Endurance
IADS	Integrated Air Defence System
ISIL	Islamic State of Iraq and the Levant
ISR	Intelligence, Surveillance, and Reconnaissance
JASSM	Joint Air-to-Surface Stand-Off Missile
JDAM	Joint Direct Attack Munition
LRSB	Long Range Strike Bomber
LRSO	Long Range Stand-Off
MANPADS	Man-Portable Air Defence System
NATO	North Atlantic Treaty Organisation
RPA	Remotely Piloted Aircraft
UN	United Nations

Chapter One: Introduction

"Hitler built walls round his 'Fortress Europe' but he forgot to put a roof on it."

F.D. Roosevelt, 1943¹

On the 27th of October 2015, the U.S. Department of Defense (DoD) announced the award of a \$55bn contract to Northrop Grumman for the production of a new Long Range Strike Bomber (LRSB), designated the "B-21".² This contract marked the end of a research and design phase that had lasted for almost a decade, and started the wheels turning on the production of the first new U.S. long range strike aircraft since the twenty-first, and final, B-2 'Spirit' rolled off Northrop Grumman's production line and entered service in 1997.³ Never before has the U.S. spent so long without a LRSB either in production or being designed under contract.⁴

¹ Donald L. Miller, *Masters of the Air: America's Bomber Boys Who Fought the Air War Against Nazi Germany* (New York: Simon and Schuster, 2007), 202.

² U.S. Department of Defense, "Air Force awards contract for long range strike bomber," *Defense.gov*, October 27, 2015, accessed October 28, 2015, <http://www.defense.gov/News-Article-View/Article/626137/air-force-awards-contract-for-long-range-strike-bomber>.

³ Anthony Murch, *The Next Generation Bomber: Background, Oversight Issues, and Options for Congress* (Washington: D.C.: Congressional Research Service, 2008), 6.

⁴ Major Kenneth Fetters, *The Role of the Long-Range Strategic Bomber* (Alabama: United States Air Force Center for Unconventional Weapons Studies, 2014), 7.

Superficially, this decision seems to be consistent with historic military procurement practice: an upgrade in capability, building on existing aircraft to provide a seamless transition to a system designed to be able to deliver ordnance more efficiently and effectively than its predecessors. The equivalent, perhaps, of re-soling a pair of patent leather brogues that are wearing through after many years of use. However, taking this analogy further, re-soling the old pair of shoes does not necessarily make them appropriate for future use. No matter the skill of the cobbler, it is unlikely that the brogues will be suitable footwear if the wearer is attempting to play tennis.

The decision to procure a new LRSB, 're-soling' the existing U.S. LRSB fleet, should not, therefore, be a foregone conclusion, regardless of any perceived shortfall in the current or anticipated future performance of existing U.S. LRSBs. Such an order should not simply represent the purchase of a new system for the U.S. military to deploy in combat, but rather be a statement of purpose, an effective tool that, within the context of U.S. grand strategy, increases the effectiveness of the military component of foreign policy.

This thesis will examine the relevance of the B-21 to U.S. force projection and thus U.S. national security. I will conclude that the procurement of the system does not represent an appropriate appropriation of U.S. Air Force funds and the DoD has committed to spending billions of dollars on a system that is unlikely to radically improve the effectiveness of the U.S. military in enhancing the security of the state. The ultimate decision to approve a design and procure the aircraft appears to have been made on the basis of a time- and capability-based upgrade package to improve the existing

LRSB fleet, rather than against the backdrop of a comprehensive understanding of the future role of such a fleet in U.S. security policy in the current and future context.

Thesis Structure

My conclusion rests on an analysis of the effectiveness of the B-21 in various conflict situations. The potential shape and scope of U.S. involvement in these conflicts is influenced by the foreign policy strategy of the Presidential Administration, a strategy which is itself a function of the Administration's perception of the existing and future international political environment. Consequently, the first section of this paper contains a brief consideration of the evolution of U.S. security strategy since the mid-1990s, based on the National Security Strategies of the Clinton, George W. Bush, and Obama Administrations, as well as the Quadrennial Defense Reviews, and the National Intelligence Council's Global Trends reports of the same time period. The second section considers the emerging and existing external threats to the security of the U.S. and its allies, the possible global pressure-points or events that could lead to U.S. military action, and the current U.S. military posture in the region from which this threat emanates.

The third section considers the likely performance of the B-21 in real-world environments. This section describes four hypothetical scenarios in which the system's effectiveness can be scrutinised, encompassing a range of conflict forms and against a variety of opposition. I commence each scenario with a description of the context, followed by an exploration of the strategic considerations for the U.S. military. The final section of each scenario analysis focuses on the effect that the deployment that the B-21

could have, and the potential for other systems or weapons to perform the same role. The scenarios in the analysis do not represent all possible conflicts that could involve the U.S. military in the next decade and were created on the basis of their relevance to U.S. security and representation of a broad spectrum of types of conflict. Each of these scenarios highlights the probable efficacy of the B-21 in coercing or defeating adversaries of the U.S. through an assessment of both its potential benefits and any operational shortfalls that may prevent the system from performing the role for which it is intended. This contextualises the discussion surrounding the B-21 through the lens of real-world events. Each scenario assumes that U.S. policy makers have made the decision to use kinetic force, or the threat of kinetic force, to resolve the conflict. I do not consider in this paper the relative effectiveness of this approach against diplomatic solutions, or the use of non-kinetic coercive tools such as economic sanctions or cyber-attacks.

The fourth section of the paper contains a consideration of the financial implications of the procurement of the B-21 from Northrop Grumman on the U.S. defence industrial complex, as well as the psychological effect of demonstrating such technological expertise on the policy makers of the U.S.'s near-peer competitors. In the final section of analysis, I examine two further military systems currently under development that have been mooted as alternative long range strike vehicles: the Prompt Global Strike missile system and weaponised High-Altitude, Long Endurance (HALE) remotely piloted aircraft (RPA). A direct comparison is difficult given the embryonic stage of their development, but studying their proposed capabilities provides further insight into the lack of unique effectiveness provided by the B-21. In the Conclusion I

explore the likely performance of the system as a deterrent, as well as how it would fit in the context of the grand strategic options available to U.S. policy makers, drawing together the analysis of the effectiveness of the B-21 in conflict scenarios. Ultimately, the rationale behind its procurement is flawed and the aircraft is unlikely to improve the ability of U.S. policy makers to enhance state security.

Definitions

I describe the military hardware referenced in this paper as a "system" or "platform". The basis of this demarcation encompasses both the capability of the equipment and the role that it is performing. "System" describes equipment used in an operation wherein mission-critical sensors, software, and hardware are predominantly self-contained and integrated in the equipment, thereby allowing its operator to impose costs on the adversary absent the addition of numerous external auxiliary components. This would include a strike aircraft self-designating a target against which to deploy ordnance, and an air defence missile launched autonomously against incoming ordnance. A "platform" describes equipment which facilitates further action wherein, in order for costs to be imposed on the adversary, external auxiliary components or inputs are required. This would include an aircraft deploying ordnance against a target laser-designated by a third party, or an aircraft collecting and disseminating ISR information.

I define military operations in this paper as "strategic" or "tactical". "Strategic" operations are those that attempt to impact the adversary's ability to wage war without being restricted to being in proximity to or engaging their military force directly. This does not preclude attacks on the adversary's forces but, to remain categorised as strategic

strikes, such attacks must not be in direct support or advance of tactical operations. "Tactical" operations are those that attempt to achieve or assist in achieving a specific short-term military objective, in close proximity to or engaging the opposition's military force.

"Deterrence" and "coercion" are simultaneously components of, and aims within, the toolkit of U.S. policy makers. Their difference is rooted in the timing of action or threat. Coercion is responsive, where one or more parties respond to the activities of another by initiating an action that is intended to impose, or threatens to impose, unbearable costs on the opposition. The opposition is offered the opportunity to prevent the imposition of more costs if they conform to the requests of the coercing party. The limited use of force may be used to "communicate...the power to hurt", but is not an end in itself.⁵ Using NATO's definition, deterrence "is the threat of force in order to discourage an opponent from taking an unwelcome action".⁶ The primary form that this takes is through the threat of response, "deterrence by punishment", and described in this paper as "active deterrence".⁷ This relies on the belief of the opposition that the deterring party would be able to impose costs that outweigh the benefit of the potential action. Deterrence is also manifested through the demonstration of resilience, which I refer to in this paper as "passive deterrence".⁸ This relies on the belief of the opposition

⁵ Thomas C. Schelling, *Arms and Influence* (New Haven: Yale University Press, 1966), 3.

⁶ North Atlantic Treaty Organisation, "Deterrence: what it can (and cannot) do," accessed January 19, 2015, <http://www.nato.int/docu/Review/2015/Also-in-2015/deterrence-russia-military/EN/index.htm>.

⁷ Ibid.

⁸ North Atlantic Treaty Organisation, "Deterrence: what it can (and cannot) do"; Andrew F Krepinevic Jr., "Strategy in a time of austerity," *Foreign Affairs* Volume 91, Issue 6: 67.

that they are unable to impose costs on the deterring party that will be significant enough to engender the outcome that they desire. As "unmistakably offensive weapons", LRSBs are generally, although not exclusively, a function of active, rather than passive, deterrence but have, according to former Defense Secretary Hagel, been "essential for keeping our deterrent edge".⁹

Coercion is also differentiated from 'hot war' through intent. 'Hot war' is, to use Schelling's terminology, "brute force".¹⁰ It is the ultimate expression of coercion, aiming to make a belligerent change their position, but through the "elimination of a military obstacle", and, if the required concessions are not made, potentially concluding with the complete destruction of the ability of the opposition to function.¹¹ Coercion may use force, but this force is leveraged on the understanding that "it is the expectation of more violence that gets the wanted behaviour".¹²

The History of Airborne Long Range Strike

Understanding the place of long range strike aircraft in the pantheon of options available to policy-makers requires an appreciation of the history of such systems. This must encompass the aircraft themselves, their performance and capabilities, and the strategic thinking that underpinned their development and role in conflict.

⁹ Rebecca Grant, *Return of the Bomber: The Future of Long Range Strike* (Arlington: Air Force Association, 2007), 31; Andrew Tilghman, "Hagel backs Air Force plans for long-range strike bomber," *MilitaryTimes.com*, January 13, 2015, accessed August 20, 2015, <http://www.militarytimes.com/story/military/pentagon/2015/01/13/hagel-backs-air-force-plans-for-long-range-strike-bomber/21713815/>.

¹⁰ Schelling, *Arms and Influence*, 1.

¹¹ *Ibid.*, 2.

¹² *Ibid.*, 3.

Aerial bombardment commenced within months of the first use of an aircraft in a military context. In November 1911 Lt. Giulio Gavotti dropped explosives on Turkish troops. Although it does not appear that any damage was caused, the precedent was set and the delivery of explosives from aircraft became a regular feature of sorties flown during the latter years of the First World War.¹³ However, given the relatively limited range of the aircraft and the predominant strategic thinking of military commanders, which conceived of ground forces as being the decisive factor in the conflict and aircraft playing a directly supporting role, the majority of bombing missions were tactical in nature and did not require interdiction markedly beyond the combat zone.¹⁴ In addition, the weight of ordnance that could be carried by aircraft, and the accuracy with which it could be delivered, limited the efficacy of aerial bombardment against targets that required any degree of precision.¹⁵ Nevertheless, the rapid development of aircraft technology, in conjunction with evolving strategic thinking, facilitated the emergence of long range bombing. Notably, the German Air Force used Gotha bombers and Zeppelin airships to drop bombs on London, bringing the conflict directly to the civilian population. Although physical damage was limited, the psychological effect of the operations was more significant.¹⁶

¹³ Stephen Budiansky, *Air Power: The men, machines, and ideas that revolutionized war, from Kitty Hawk to Gulf War II* (New York: Viking, 2004), 45.

¹⁴ Giulio Douhet, *The Command of the Air*, translated by Dino Ferrari (Washington, D.C.: Coward-McCann, 1998), 10.

¹⁵ Budiansky, *Air Power*, 94.

¹⁶ Budiansky, *Air Power*, 90.

During the inter-war period concepts of the strategic potential of air power evolved, in particular the idea of expanding the combat zone and targeting the civilian population with kinetic force deployed from the air.¹⁷ Such action was intended to cause a critical collapse in morale that would lead to the capitulation of a state without requiring the total defeat of their military. One of the chief proponents of the concept of strategic bombing, the Italian military strategist Giulio Douhet, predicted that "citizens will be combatants...in [the] face of the technical development of aviation [there is] no effective defense against determined efforts of the enemy to bomb our cities".¹⁸ The Hague Convention of 1907 had prohibited "the attack or bombardment, by whatever means, of towns, villages, dwellings, or buildings which are undefended", leaving the obvious potential for the legal bombardment of defended locations.¹⁹ The 1923 Hague Rules of Air Warfare prescribed more stringent requirements on belligerents, designating aerial bombardment "legitimate only when directed at a military objective, that is to say, an object of which the destruction or injury would constitute a distinct military advantage to the belligerent".²⁰ These laws were never formally accepted by the major powers.²¹

¹⁷ Ibid., 133.

¹⁸ Douhet, *Command of the Air*, 10.

¹⁹ International Conferences (The Hague), *Hague Convention (IV) Respecting the Laws and Customs of War on Land and Its Annex: Regulations Concerning the Laws and Customs of War on Land*, October 18, 1907, accessed November 5, 2015, http://avalon.law.yale.edu/20th_century/hague04.asp.

²⁰ "The Hague Rules of Air Warfare: Article 22" The Hague, February, 1923, published on *LawofWar.org*, accessed August 8, 2015, http://lawofwar.org/hague_rules_of_air_warfare.htm.http://lawofwar.org/hague_rules_of_air_warfare.htm.

²¹ Howard M. Hensel, *The Legitimate Use of Military Force: The Just War Tradition and the Customary Law of Armed Conflict* (Surrey, England: Ashgate, 2008), 194.

The latter years of the Second World War marked the most intensive use of LRSBs, with senior Allied air force personnel adhering to the concept of Sir Stanley Baldwin, the British Prime Minister, that "the bomber will always get through", even in the face of mounting losses, and arguing that strategic bombing would be sufficient to force Nazi Germany to capitulate.²² Three distinct facets of long range bombing emerged that have defined the subsequent use of LRSBs. The first was the saturation bombing of industrial zones and transport hubs, which was intended to have the second-order effect of causing the civilian population to pressure the political leadership to surrender. The lack of accuracy in the delivery of ordnance and the resilience of the production lines and rail networks ultimately meant that such attempts were not as effective in disrupting the German war effort as had been anticipated.²³ The second facet was precision attacks against targets behind the front line whose destruction were intended to provide a strategic advantage. Such raids required particular skill and were generally undertaken by specialised squadrons equipped with advanced bomb-aiming equipment, the most notable being the R.A.F.'s 617 Squadron, whose aircraft destroyed the Möhne and Edersee dams, sank the battleship 'Tirpitz' and collapsed the tunnels that were to house the V3 long range guns.²⁴ The third facet was the use of LRSBs in a tactical capacity in support of ground operations. The degree of accuracy required to perform this role was often lacking, as demonstrated by the failure of LRSBs to destroy

²² HC Deb 10 November 1932, vol 270, col 631.

²³ Budiansky, *Air Power*, 301.

²⁴ Paul Brickhill, *The Dam Busters* (London: Pan Books, 1999).

the gun emplacements that were covering the Normandy beaches assaulted on D-Day.²⁵ Furthermore, attempts to degrade the defences at Caen and Monte Casino prior to a land-based assault were ineffective due to an over-estimation of the ability of the ordnance deployed to critically degrade German defences.²⁶

Long range bombing was not exclusive to the European theatre. The 'Doolittle Raid' on Tokyo in April 1942 gave a demonstration of the psychological effects that long range bombing could have. Sixteen North American B-25 'Mitchell' aircraft, deployed from an aircraft carrier in the Pacific, dropped ordnance on Tokyo. Although the military benefits of the sortie were limited, the raid demonstrated the vulnerability of Japan to aerial assault, despite the nominal front lines of the conflict in the Pacific theatre being far removed from the main Japanese islands.²⁷ Although the primary stated intention of the Allied heavy bombing campaign in both Japan and Germany was to directly disrupt the Axis war effort through strikes on targets such as transport networks and manufacturing plants, civilian casualties were high. This was heightened by the use of incendiary munitions, particularly in cities in which there was a high proportion of wooden buildings, leading to 'Fire Storms' in cities such as Dresden, Hamburg, and Tokyo in which the cumulative total of civilian casualties are estimated to have numbered over 170,000.²⁸ The dropping of nuclear weapons on Hiroshima and Nagasaki

²⁵ Anthony Beevor, *D-Day: The Battle for Normandy* (London: Penguin, 2009), 91.

²⁶ Budiansky, *Air Power*, 305.

²⁷ *Ibid.*, 268.

²⁸ Richard G. Davis, *Carl A. Spaatz and the Air War in Europe* (Washington, D.C.: Smithsonian Institution Press, 1992), 426, 557; Budiansky, *Air Power*, 338.

in August 1945 was the apotheosis of long range bombing, combining the penetrative capability of the long range bombers with the destructive power of atomic bombs.

After the losses suffered by air force personnel in long range bombing missions, the nuclear raids demonstrated the potential ability of LRSBs to perform the strategic role that had been prophesied with the bomber 'getting through', regardless of the defensive systems. However, subsequent historiographical debate as to whether the nuclear raids caused the ultimate surrender of Japan, as well as the failure of strategic bombing to cause the German civilian population to turn against the Nazi party, are indicative of the inability of strategic bombing to have the effect that had been expected by its proponents. Nevertheless, the concept of using LRSBs to deliver nuclear ordnance against cities would become a critical component of Cold War strategy.²⁹

Although the nuclear mission was a primary focus of LRSBs during the Cold War, their most notable actions were in a conventional strike capacity. The culmination of strategic air operations by U.S. forces in the Vietnam war was Operation Linebacker II, which took place in December, 1972 and involved more than 200 LRSBs over an eleven-day campaign to destroy major target complexes in the Hanoi and Haiphong areas.³⁰ This task could only be performed by LRSBs because of their extensive range and payload advantage over alternative contemporary ground-attack aircraft. In spite of over 700 sorties being flown by Boeing B-52 'Stratofortresses' and widespread damage

²⁹ Budiansky, *Air Power*, 353.

³⁰ Marshall Michel, "The Christmas Bombing," *AirSpaceMag.com*, January, 2001, accessed December 26, 2015, <http://www.airspacemag.com/military-aviation/the-christmas-bombing-1813815/?no-ist>.

to North Vietnamese infrastructure, U.S. policy makers were criticised for the indiscriminate nature of the bombing and it is difficult to objectively identify significant advantages that the U.S. gained from the campaign, even if popular understanding in the U.S. was that it had been successful.³¹ In addition, the B-52 force suffered heavy losses, indicating that, without much improved survivability, air defence systems had negated the penetration capability of the contemporary LRSBs.

Operation Niagara II, which took place between January and March 1968, also demonstrated the firepower that the USAF LRSB fleet could bring to bear in the Vietnam War, and hinted at the future close air support(CAS) role that U.S. LRSBs would play as more advanced tactical precision munitions became available. Arguably "the most concentrated application of aerial firepower in the history of warfare", Operation Niagara II involved a combination of medium range strike aircraft and around sixty B-52s delivering ordnance to support U.S. ground forces that had been surrounded at the combat base of Khe Sanh.³² In total, the B-52s delivered almost 60,000 tons of ordnance, and the degree of damage that the aircraft caused led U.S. General Westmoreland to claim that the B-52s "broke the back of the North Vietnamese Army at Khe Sanh".³³ However, later analysis of the air campaign cast some doubt over this claim. In particular, the B-52 missions required a fifteen-hour lead time, making them significantly less flexible than artillery and medium range aircraft, and the North

³¹ Bob Woodward, *The Last of the President's Men* (New York: Simon & Schuster, 2015),113.

³² James H. Willbanks, *The Tet Offensive: A Concise History* (New York: Columbia University Press, 2007), 22.

³³ Peter Brush, "Operation Niagara: Siege of Khe Sanh," *HistoryNet*, June 12, 2006, accessed April 19, 2016, <http://www.historynet.com/operation-niagara-siege-of-khe-sanh.htm>.

Vietnamese forces usually had "timely and accurate warnings of impending B-52 attacks".³⁴ In addition, there was reluctance among the ground forces to trust the accuracy of the bombing and, in the initial phase of Operation Niagara II, the B-52s were prohibited from deploying ordnance closer than two miles from U.S. troops.³⁵

Operation Black Buck, which took place during the Falkland's War, demonstrated the potential of LRSBs to strike targets that were perceived to be invulnerable due to their distance from weapons systems that had enough power to disrupt Argentine operations. This mission moved away from the saturation bombing of Operation Linebacker II and focussed on a single strategic target: the runway at Port Stanley's airport. Avro 'Vulcan' LRSBs of the Royal Air Force performed what were then the longest-ranged bombing sorties undertaken, flying from Ascension Island, almost 7,000 nautical miles from the target. The raid did not cause lasting damage to the airstrip but proved the potential for LRSBs to cover long distances and deliver ordnance accurately against a precise target.

The changing nature of warfare following the end of the Cold War has required LRSBs to be able to perform a more tactical role in order to remain relevant to the prevalent military operations, with "moving target and maritime targeting solutions" now almost pre-requisites in "contemporary strike missions".³⁶ This has been apparent in the

³⁴ Brush, "Operation Niagara."

³⁵ John Morocco, *Thunder From Above: Air War, 1941-1968* (Boston, MA: Boston Publishing Company, 1984), 179.

³⁶ Lt. Col. Jeff Schreiner, "B-2 Pilot's Lessons For LRSB, America's New Bomber," *BreakingDefense.com*, September 16, 2014, accessed August 28, 2015, <http://breakingdefense.com/2014/09/b-2-pilots-lessons-for-lrsb-americas-new-bomber/>.

Middle East where U.S. LRSBs have used precisely-targeted ordnance against targets of opportunity and in a (CAS) role. Despite its status as the "only nuclear capable bomber capable of employing long range standoff weapons", in recent conflicts the role of the B-52 has been to loiter over the combat zone and respond to the requests of ground forces to deploy short or medium range ordnance, rather than striking static locations that were designated as aiming points prior to the commencement of the sortie.³⁷ Indicative of the perceived flexibility of LRSBs in strategic thinking, more traditional LRSB missions have also taken place, notably the ultimately aborted attacks on Libya using Northrop Grumman B-2 'Spirits'. Furthermore, in the first three days of Operation Enduring Freedom, B-2s undertook six missions, each of which was a seventy-hour round-trip sortie launched from and ultimately recovering to Whiteman Air Force Base, Missouri, following a crew change-over in Diego Garcia, and ordnance deployed from B-2s struck ninety-six targets in and around Baghdad on the first night of Operation Iraqi Freedom.³⁸

In addition, LRSB fleets are being used by Russian and U.S. policy makers in shows of force. Although these missions are not intended to include the delivery of ordnance, they are a reminder that a LRSB can threaten the security of a state even if no ground combat is taking place and the state from which the aircraft are launched is situated thousands of miles away. Russian Tupolev Tu-95 'Bear' LRSBs regularly

³⁷ Jeremiah Gertler, *U.S. Air Force bomber sustainment and modernisation: Background and Issues for Congress* (Washington, D.C.: Congressional Research Service, 2014), 16; Grant, *Return of the Bomber*, 14.

³⁸ David Noland, "The Bone is back," *Air and Space Magazine*, May, 2008, accessed September 11, 2015, <http://www.airspacemag.com/military-aviation/the-bone-is-back-25563932/?no-ist>; Global Security, "B-2 Operations," *GlobalSecurity.org*, accessed April 19, 2016, <http://www.globalsecurity.org/wmd/systems/b-2-ops.htm>; Fox News, "B-2 Bombers Lead 'Shock and Awe' ," *FoxNews.com*, March 26, 2003, accessed April 19, 2016, <http://www.foxnews.com/story/2003/03/26/b-2-bombers-lead-shock-and-awe.html>.

encroach on the airspace of NATO states, and U.S. B-52s were flown close to North Korea following the nuclear test of January, 2016, as well as challenging the Chinese attempts to control the air zone around the Spratly Islands.³⁹

Operational U.S. Long Range Strike Bombers

The LRSB fleet has been "one of the most flexible and lethal tools" of the U.S. military, with the systems providing access to targets without requiring the conquest of territory.⁴⁰ However, the ability of the U.S.'s current fleet of LRSBs to operate with impunity is being degraded by the increasingly sophisticated Anti-Access Area Denial (A2AD) capabilities of states, notably China and Russia.⁴¹ Consequently, although the aircraft have the potential to accurately deliver a significant weight and range of ordnance, for more than eighty-two percent of the U.S. LRSBs, their operation is becoming viable only in a permissive air environment as their detection, interception, and destruction is otherwise likely to occur due to the development of modernised

³⁹ Tony Munroe and Jack Kim, "U.S. flies B-52 over South Korea after North's nuclear test," *Reuters.com*, January 11, 2016, accessed January 12, 2016, <http://www.reuters.com/article/us-northkorea-nuclear-idUSKCN0UN0Y420160111>; BBC News, "China accuses US of B-52 'provocation' over Spratly Islands," *BBC.com*, December 19, 2015, accessed January 2, 2016, <http://www.bbc.com/news/world-asia-china-35140802>.

⁴⁰ J. Randy Forbes and Chris Stewart, "Prioritize the long range strike mission," *The National Interest*, November 20, 2013, accessed August 18, 2015m <http://nationalinterest.org/commentary/prioritize-the-long-range-strike-mission-9432>.

⁴¹ *Ibid.*; The Economist, "Who's afraid of America?" *Economist.com*, June 13, 2015, accessed December 18, 2015, <http://www.economist.com/news/international/21654066-military-playing-field-more-even-it-has-been-many-years-big>; David Axe, "A \$550 million Air Force bomber so good it will never be used," *Reuters*, October 22, 2015, accessed October 30, 2015, <http://blogs.reuters.com/great-debate/2015/10/22/a-550-million-air-force-bomber-so-good-it-will-never-be-used/>.

integrated air defence systems (IADS) and networks nullifying their defensive capabilities.⁴²

The existing fleet comprises three aircraft types: the Boeing B-52 'Stratofortress', the Rockwell B-1B 'Lancer' and the Northrop Grumman B-2 'Spirit'. Appreciating their unique strengths and vulnerabilities provides context to the perceived requirement for a new system, and also a foundation for current U.S. perceptions of the value and role of LRSBs in security policy and conflict.

Boeing B-52 'Stratofortress'

With the first variant introduced in 1952, the B-52 is the numerical mainstay of the U.S. LRSB fleet with fifty-eight aircraft operational and eighteen in reserve, and is intended to be in operation "until at least the 2040 time period".⁴³ As a "standing symbol of U.S. power", B-52s have been deployed in U.S. bases across the globe and, at 8,800 miles, extended by air-to-air refuelling, has the longest range of the aircraft in the U.S. LRSB fleet.⁴⁴ In addition, the B-52 is "capable of dropping or launching the widest array of weapons in the U.S. inventory", both nuclear and conventional, and can carry a maximum payload of 70,000lb.⁴⁵

⁴² Kelley Saylor and Paul Scharre, "The Imperative of Long-Range Strike," *DefenseNews.com*, March 16, 2015, accessed August 17, 2015, <http://www.defensenews.com/story/defense/commentary/2015/03/16/commentary-imperative-long-range-strike/24849285/>.

⁴³ RT network, "What do we know about the long range strike bomber?" *RT.com*, March 5, 2015, accessed September 29, 2015, <https://www.rt.com/usa/238105-long-range-strike-bomber/>.

⁴⁴ Jonathan Beale, "The B-52 bomber is a long-standing symbol of US strength," *BBC News*, June 13, 2014, accessed August 29, 2015, <http://www.bbc.com/news/world-us-canada-27825255>.

⁴⁵ U.S. Air Force, "B-52 Stratofortress," *AF.mil*, accessed September 10, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104465/b-52-stratofortress.aspx>.

However, the B-52's survivability in contested air environments is limited. In the strategic context in which it was designed, LRSBs were still generally conceived as participating in mass raids and saturating a target with ordnance, rather than conducting precision strikes on multiple targets. Suppression of air defences would primarily be conducted by other strike aircraft supporting the B-52's mission. The increasing accuracy of air-to-ground targeting systems and precision guided weaponry has meant that the B-52 is now capable of performing missions against targets that require extreme precision. The weight of ordnance that can be carried and the long-endurance feature of the aircraft mean that it has been of great value in recent conflicts in the Middle East, directly supporting ground operations. However, the survivability shortfall remains. The 50,000ft ceiling of the B-52 does not provide immunity from surface-to-air missile systems larger than Man-Portable Air Defence Systems (MANPADS) and, although it carries sophisticated jamming systems, it is unlikely to survive in anything other than extremely low-threat environments without support.⁴⁶

Rockwell B-1B 'Lancer'

The B-1B is the only super-sonic LRSB in the U.S. fleet. Initially developed in the 1970s as a replacement for the B-52, the first B-1 project was halted before being resurrected by the President Reagan administration in 1981 with the aircraft, designated the B-1B, becoming operational in 1986. Despite numerous calls for the B-1B to be retired or the fleet reduced from its current roster of sixty-two aircraft, the aircraft has

⁴⁶ Murch. *The Next Generation Bomber*, 5.

provided support for ground operations in the Middle East.⁴⁷ Forty percent of the total tonnage of ordnance dropped by coalition aircraft in the first six months of Operation Enduring Freedom were deployed by B-1Bs.⁴⁸ At around 7,500 miles, the B-1B has a slightly shorter maximum range than the B-52 but with a payload of 75,000lb it has a greater carrying capacity than any other aircraft in the U.S. LRSB fleet, although this does not include nuclear ordnance.⁴⁹

Although the B-1B has a relatively low observable profile it was designed to penetrate air defence systems primarily through its velocity and a low-altitude approach.⁵⁰ The success of such tactics relies on the adversary being unable to acquire and maintain a lock on the B-1B. At the time of its introduction, the performance of the B-1B made this tactic viable. However, more modern IADS have a far greater ability to acquire and intercept a B-1B, and the aircraft is unlikely to be able to operate effectively in a contested air environment against a technologically advanced opponent without meaningful support.⁵¹

⁴⁷ Matthew Cox, "Retire B-1 fleet to save future bombers: Defense experts," *DoDBuzz.com*, September 17, 2013, accessed September 19, 2015, <http://www.dodbuzz.com/2013/09/17/retire-b-1-fleet-to-save-future-bombers-defense-experts/>; U.S. Air Force, "B-1B Lancer," *AF.mil*, accessed September 10, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104500/b-1b-lancer.aspx>.

⁴⁸ U.S. Air Force, "B-1B Lancer."

⁴⁹ *Ibid.*

⁵⁰ Lt. Col. Paul J. Frichtl, "Limitations of the conventional role of the B-1B in the European theater," research report no. AS-A220 571, Air War College, Alabama, 1989, 1.

⁵¹ Fetters, *Role of the Long-Range Strategic Bomber*, 16.

Northrop Grumman B-2 'Spirit'

The most modern aircraft in the U.S. LRSB fleet, the B-2 was optimised for low observability, with the intention of evading detection by enemy radar before delivering conventional or nuclear weapons. The original design process commenced during the Cold War with an anticipated production run of one hundred aircraft. The collapse of the Soviet Union altered the strategic landscape and only twenty-one B-2s were built, with an individual unit cost of around \$1bn.⁵² Nevertheless, the decrease in the perceived requirement for a strategic nuclear weapon delivery system at the end of the Cold War did not negate the capability of the B-2 as a mechanism for deploying conventional ordnance, due to its low observability. As a result, its function was expanded to facilitate the delivery of "large numbers of satellite-guided bombs", rather than being focused on strategic nuclear strike.⁵³

The B-2 is ordinarily based at Whiteman Air Force Base, Missouri, and is rarely deployed from overseas bases since the systems were withdrawn from permanent deployment at Anderson Air Force Base, Guam, in 2010.⁵⁴ The aircraft has a maximum range of just under 7,000 miles. Consequently, from Whiteman a B-2 is able to reach the western border of Iraq, if it flew eastwards, and Japan if it flew west, although in both

⁵² U.S. Air Force, "B-2 Spirit," *AF.mil*, accessed September 10, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104482/b-2-spirit.aspx>.

⁵³ Thomas Donnelly, Anand Datla, and Robert Haffa, *Buying the B-3* (Washington, D.C.: American Enterprise Institute, 2015), 13.

⁵⁴ Zachary Keck, "Watch out, China: America sends most advanced bombers to Asia-Pacific," *NationalInterest.org*, August 12, 2015, accessed September 14, 2015, <http://www.nationalinterest.org/blog/the-buzz/watch-out-china-america-sends-most-advanced-bombers-asia-13553>.

instances the aircraft would require refuelling if it were to return to its home base in a single mission. The B-2 has a maximum payload of 40,000lb, which can be configured to carry both conventional or nuclear weapons. The low observable characteristics of the aircraft have not been comprehensively tested in a battlefield environment, with combat operations limited to a relatively minor role over Kosovo, Afghanistan, Iraq and Libya; in total, four B-2s were deployed in the first month of Operation Iraqi Freedom.⁵⁵

The aircraft's design continues to render it undetectable in most circumstances although this is changing with the latest "long-wavelength search radars".⁵⁶ The B-2 relies almost entirely on remaining undetected. Once acquired and locked, its survivability is low. In the short term it seems likely that the B-2 will continue to be able to conduct night-time missions within the airspace of states hostile to the U.S. with a limited possibility of detection. It should not, however, be assumed that this will always be the case and the improving capability of detection systems could render the B-2 almost valueless in operating within an air environment contested by a technologically capable adversary.

Likely Performance Attributes of the B-21

Despite the secrecy surrounding the B-21, certain suppositions can be made from the information that has been released by the DoD. The initial contract awarded to

⁵⁵ David Lerman, "Almost nobody believes the U.S. Air Force can build an affordable bomber," *Bloomberg*, April 22, 2015, accessed August 14, 2015, <http://www.bloomberg.com/news/articles/2015-04-22/air-force-promise-of-affordable-u-s-bomber-finds-few-believers>; Lt. Gen. T. Michael Moseley, *Operation IRAQI FREEDOM - By the Numbers* (USCENTAF Assessment and Analysis Division, April 2003), 7.

⁵⁶ Loren Thompson, "The Air Force's B-3 Bomber isn't as secret as it seems," *Forbes*, March 9, 2015, accessed September 12, 2015, <http://www.forbes.com/sites/lorenthompson/2015/03/09/the-air-forces-b-3-bomber-isnt-as-secret-as-it-seems/>.

Northrop Grumman required the construction of one hundred aircraft. The DoD anticipates that the B-21 will ultimately replace the entire U.S. LRSB fleet after its introduction, expected to be in 2025.

The B-21's range has not been disclosed by Northrop Grumman or the DoD. However, because the DoD has designated the aircraft as a 'Long Range Strike Bomber' with "the ability to cross the globe in hours" it is likely that its range will be at least 5,000 miles un-refuelled, and probably akin to the B-2.⁵⁷ Given the number of B-21s to be produced it also seems unlikely that they will all be based with the B-2s at Whiteman Air Force Base and there has been no confirmation as to whether they are ultimately intended to remain based in the U.S. homeland or be permanently deployed overseas.

Although it is unlikely to be nuclear-capable as soon as it is operational, a primary specification of the B-21 was that it should be capable of deploying nuclear weapons.⁵⁸ Because of the DoD's intention to replace the U.S. LRSB fleet with this system it seems likely that all conventional air-to-ground weapons in the U.S. arsenal will be able to be deployed from it.⁵⁹ Notably, this would include the Boeing GBU-57A/B 'Massive Ordnance Penetrator', which is intended to be used against buried or heavily fortified targets, and the Joint Direct Attack Munition (JDAM). The DoD also anticipates that the B-21 will deploy the next-generation Long Range Standoff (LRSO)

⁵⁷ Kris Osborn, "Air Force plans major step in Long Range Strike Bomber program," *Defensetech.org*, September 15, 2014, accessed September 17, 2015, <http://defensetech.org/2014/09/15/air-force-plans-major-step-in-long-range-strike-bomber-program/>.

⁵⁸ *Ibid.*

⁵⁹ Loren Thompson, "B-3: The inside story of America's next bomber," *Forbes*, September 2, 2015, accessed September 2, 2015, <http://www.forbes.com/sites/lorenthompson/2015/09/02/b-3-the-inside-story-of-americas-next-bomber/>.

Cruise Missile, which has a projected range of around 1,500 miles.⁶⁰ If this is the case, the B-21 may not be required to penetrate too deeply into enemy airspace to deliver the ordnance, particularly if the missile is capable of loitering and selecting an appropriate static or moving target autonomously. Consequently, the B-21 could potentially remain outside the A2AD network of the opposition force and launch the weapon to either hit pre-defined co-ordinates, or loiter and search for moving targets in a designated area.

It has also been suggested by the DoD that the B-21 will have the capability not only to deploy ordnance, but "act as a critical node inside the future combat cloud".⁶¹ In order to perform this role, the system would also carry intelligence, surveillance and reconnaissance (ISR) sensors, as well as communications hardware. If this is the case, it is unclear whether the system would be intended to perform this role simultaneously with bombing missions. However, the assignment of all of the B-21s to Air Force Global Strike Command suggests that its primary functions remains the deployment of ordnance.⁶²

⁶⁰ James Drew, "A-10 replacement? USAF strategy calls for 'future CAS platform'," *Flight Global.com*, August 12, 2015, accessed August 15, 2015, <http://www.flightglobal.com/news/articles/a-10-replacement-usaf-strategy-calls-for-39future-cas-415639/>; Marina Malenic, "USAF wants to dodge latest air defences with bomber's new secret weapon," *Jane's Defence Weekly*, January 27, 2015, accessed September 12, 2015, <http://www.janes.com/article/48385/usaf-wants-to-dodge-latest-air-defences-with-bomber-s-new-secret-weapon>.

⁶¹ James Drew, "It's large and lethal, but is LRS-B a bomber?" *FlightGlobal.com*, June 10, 2015, accessed August 12, 2015, <http://www.flightglobal.com/news/articles/analysis-it39s-large-and-lethal-but-is-lrs-b-a-413378/>.

⁶² U.S. Air Force, "AF realigns B-1, LRS-B under Air Force Global Strike Command," *AF.mil*, April 20, 2015, accessed November 17, 2015, <http://www.af.mil/News/ArticleDisplay/tabid/223/Article/585547/af-realigns-b-1-lrs-b-under-air-force-global-strike-command.aspx>; James Drew, "Russia and China's bomber plans could muster support for LRS-B," *Flight Global.com*, August, 2015, accessed August 10, 2015, <http://www.flightglobal.com/news/articles/russia-and-chinas-bomber-plans-could-muster-support-for-415472/>.

Basing the design on the assumption that "the stealthy LRSB is crucial to...project military power at any time and place" (author's emphasis), the B-21 will have a low observable profile; the initial designs suggest that its basic airframe is similar to that of the B-2.⁶³ It is thus likely to have a sub-sonic flight profile, at least when operating within range of adversaries' radar systems. Although it is not mutually exclusive, if the design emphasises stealth its post-detection survivability is likely to be compromised through a lack of speed and manoeuvrability, relying on jamming or spoofing any anti-aircraft missiles that are launched against it. The specifications of the B-21 also claim that it will be "optionally manned".⁶⁴ This does not mean that the system will, as a primary flight configuration, be remotely piloted; the Boeing 777 is technically "optionally manned" simply because of the technical assistance provided to its aircrew by electronic systems.⁶⁵ Furthermore, although the prospect of the B-21 being remotely piloted potentially increases the performance envelope of the system, while also creating new operational vulnerabilities, the improvement in capability is difficult to quantify. It is also unlikely to significantly modify the fundamental strategic function of the system.

⁶³ Donnelly et al., *Buying the B-3*, 3; Mike Martin, "Air Force reveals B-21 long range strike bomber," *U.S. Air Force*, February 26, 2016, accessed February 26, 2016, <http://www.af.mil/News/ArticleDisplay/tabid/223/Article/673784/air-force-reveals-b-21-long-range-strike-bomber.aspx>.

⁶⁴ James Drew, "New details emerge about LRS-B as contract announcement nears," *FlightGlobal.com*, September 4, 2015, accessed September 6, 2015, <https://www.flightglobal.com/news/articles/new-details-emerge-about-lrs-b-as-contract-announcem-416426/>.

⁶⁵ Rakesh Krishnan Simha, "Supersonic folly: Why new strategic bombers are airborne dinosaurs," *Russia and India Report*, November 21, 2013, accessed August 28, 2015, http://in.rbth.com/blogs/2013/11/21/supersonic_folly_why_new_strategic_bombers_are_airborne_dinosaur_s_31019.

Chapter Two: The Evolution of U.S. Global Outlook and Foreign Policy

The broad function of U.S. Presidential Administrations remains consistent, centred on the responsibility for the physical security of U.S. citizens against attack by states or militant non-state organisations. Nevertheless, the foreign policy and security position of respective Presidential Administrations, which are outlined in the National Security Strategies and, in later years, the Quadrennial Defense Reviews, are not unchanging. They are set against the backdrop of a particular understanding of the drivers of the international system, their interpretation of the role of the U.S. in that system, and an evolving global context.

The Global Trends reports published by the National Intelligence Council every four years since 1997 also give an indication of the perceived direction of international relations and the drivers that will influence it. This provides further context to the Administrations' policies in elucidating the anticipated future challenges to the U.S. against which their policies are intended to hedge. This changing context is exemplified by the consideration of the impact of radical Islam on international security in the Global Trends report written in 2004.⁶⁶ Although Islamic extremism had been referenced in the two previous versions of the document as a potential destabilising influence in particular

⁶⁶ National Intelligence Council, "Global Trends 2020," Report no. NIC 2004-13 (Pittsburgh: U.S. Government Printing Office, December 2004), 12.

states, in 2004 it is ascribed far greater importance as a driver that directly affects the global community in its own right.

The stability of the international system and the relationship between the U.S. and its allies are critical themes that run through the National Security Strategies of the Clinton, George W. Bush, and Obama Administrations, and the Quadrennial Defense Reviews. Overall, there is an acknowledgement that the international system is in a state of flux. The Global Trends reports published since 2004 suggest a devolving security situation and a growing potential for interstate conflict. This is bolstered by the admission in the 2001 Quadrennial Defense Review that the U.S. is in "a war", and the 2014 Quadrennial Defense Review states that its 2010 counterpart was a "wartime strategy".⁶⁷

The diffusion of power away from states and the increasing significance of transnational crime or terrorist organisations and NGOs play a central role in the National Security Strategies, Quadrennial Defense Reviews, and Global Trends reports. "Globalisation" is first referenced in the National Security Strategies in 1998, although an appreciation of "global forces" appears in 1997.⁶⁸ At the end of the twentieth century, the National Security Strategies and Global Trends reports suggest that it is intra-state, rather than inter-state, conflict that is likely to dominate the security environment in the coming years. However, a changing perception is evident in the subsequent Global

⁶⁷ U.S. Department of Defense, *Quadrennial Defense Review Report* (Washington, D.C.: Department of Defense, 2001), iii; U.S. Department of Defense, *Quadrennial Defense Review 2014* (Washington, D.C.: Department of Defense, 2014), 12.

⁶⁸ The White House, *A National Security Strategy for a New Century* (Washington, D.C.: The White House, 1998), 1; The White House, *A National Security Strategy for a New Century* (Washington, D.C.: The White House, 1997), 2.

Trends reports, and the possibility of inter-state regional conflict starts to be considered more likely in the fifteen-year time-frame that the report covers. This is crowned in the 2030 Global Trends report, published in 2012, in which a "conflict involving great powers is not inconceivable", despite the "disincentives" for such an occurrence.⁶⁹

The role and significance of international institutions in shaping and maintaining global order is also central to the Administrations' strategies, and there is a heavy emphasis on ensuring that the international system that was created following the Second World War remains strong. It is, however, acknowledged that this is likely to be increasingly difficult, and the Global Trends report published in 2008 suggests that, by 2025, an "international community composed of nation states will no longer exist", while the 2010 National Security Strategy suggests that there is a need to "modernise" international institutions.⁷⁰ This is reiterated in the Obama Administration's 2015 National Security Strategy, which stresses the importance of "fortifying" existing international organisations to ensure their continued value.⁷¹

Closely tied to the importance of institutions, the foundation of U.S. strategy within the Clinton, George W. Bush, and Obama Administrations is maintaining and building leadership of the international community, with the word "lead" appearing thirteen times in President Obama's 1,300 word preface to the 2015 National Security

⁶⁹ National Intelligence Council, "Global Trends 2030: Alternative Worlds," Report no. NIC 2012-001 (Published online, www.dni.gov/nic/globaltrends), 47; *Ibid.*, viii.

⁷⁰ National Intelligence Council, "Global Trends 2025: A Transformed World," Report no. NIC 2008-003 (Washington, D.C.: U.S. Government Printing Office, 2008), v; Barack Obama, *National Security Strategy* (Washington, D.C.: The White House, 2010), 3.

⁷¹ Obama, *2015 National Security Strategy*, 23.

Strategy.⁷² With apologies to Shakespeare's Malvolio, the National Security Strategies of all three of these Administrations suggest that the U.S. was 'born' to lead through its resource advantages, has achieved a leadership status, and has had a position of leadership thrust upon it by other states who are reluctant to act without the support of the U.S.⁷³ This responsibility is embraced rather than rejected.⁷⁴ There is, however, a self-serving component to this attitude given the "levers of power" that the U.S. can use to shape the global system to its advantage.⁷⁵ The Obama Administration's National Security Strategies have an additional component to the requirement to lead in raising the spectre that, without consistent U.S. demonstration of leadership in global affairs, the state may no longer be the "security partner of choice" of other states, and U.S. policy makers will therefore find it more difficult to shape the global order to the benefit of the U.S.⁷⁶

There is also a shift in the intended style of U.S. leadership that is apparent in the National Security Strategies of the three most recent Presidential Administrations. In 1997, the National Security Strategy referred to "exerting leadership."⁷⁷ By 2015, the proposed leadership style had become less dominant, with the U.S. "underwriting"

⁷² Obama, *2015 National Security Strategy*, i-ii.

⁷³ George W. Bush, *The National Security Strategy of the United States of America* (Washington, D.C.: The White House, 2006), 17.

⁷⁴ Obama, *2015 National Security Strategy*, 7.

⁷⁵ National Intelligence Council, "Global Trends 2020," Report no. NIC 2004-13 (Pittsburgh: U.S. Government Printing Office, December 2004), 63.

⁷⁶ U.S. Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington, D.C.: Department of Defense, 2012), 3.

⁷⁷ The White House, *A National Security Strategy for a New Century* (Washington, D.C.: The White House, 1997), 5.

security with the intention to "provide operational support", moulding the actions of the U.S. to those of other states.⁷⁸

Similar to the changing approach to leadership, the Clinton, George W. Bush, and Obama Administrations all stress the critical importance of alliance structures to U.S. security, particularly with regard to managing the relationship that the U.S. has with China and Russia, but the proposed dynamic of the relationships between the U.S. and its allies evolves between the mid-1990s and 2015. Even in 2006, the emphasis is on "strengthening relationships", protecting partners and "assuring" allied states of U.S. strength and constancy.⁷⁹ By 2010, however, the emphasis shifts to using alliances as "force multipliers" to support U.S. activities, particularly with regard to military action.⁸⁰ There was a further alteration at the start of the second decade of the twenty-first century, and increased significance is given to efforts to "build the security capacity of partner states" in order to minimise the requirement for U.S. forces to be involved in conflicts; in 2010, this role was stated as the third priority for the DoD in the U.S. Quadrennial Defense Review.⁸¹

The forward deployment of U.S. forces is also a theme across the National Security Strategies of the recent Presidential Administrations, as well as the Quadrennial Defense Reviews. However, the primary rationale and format of forward deployment

⁷⁸ Obama, *2015 National Security Strategy*, 7; *Ibid.*, 9.

⁷⁹ The White House, *A National Security Strategy for a New Century* (Washington, D.C.: The White House, 1997), 11; *Ibid.*, 22.

⁸⁰ Barack Obama, *National Security Strategy* (Washington, D.C.: The White House, 2010), 41.

⁸¹ U.S. Department of Defense, *Quadrennial Defense Review Report* (Washington, D.C.: Department of Defense, 2010), viii.

also appears to change between the 1996 and 2015. At the end of the twentieth century, the central function of forward deployments is to improve the self-reliance of the U.S. security establishment in ensuring that the U.S. military can respond swiftly to emerging threats and deter potential attackers.⁸² However, the 2006 Quadrennial Defense Review stresses the need for a flexible force that is ready to "surge" to the required area, rather than having U.S. forces stationed in significant numbers overseas.⁸³

The step back from the permanent forward deployment of large numbers of U.S. troops outlined in these documents emphasises the perceived requirement for the U.S. military to have power projection capability. Improving weapons technology is regularly noted in the National Security Strategy documents, and the maintenance of a nuclear weapons capability was stressed even during the Obama Administration. The perceived importance of technology is also central to the concept of "Dissuasion", a strategic approach that was outlined in the 2001 Quadrennial Defense Review, and has remained at least on the fringes of U.S. security policy considerations during the subsequent Obama Administration.⁸⁴ Although dissuasion is, in essence, a form of deterrence, unlike most U.S. deterrent strategies since the mid-1990s, which generally engage allied states, the success of dissuasion rests solely on U.S. capability, primarily that of the U.S. military industrial complex. Under this approach it is intended that the U.S. can "dissuade other countries from initiating future military competitions...through the

⁸² The White House, *A National Security Strategy for a New Century* (Washington, D.C.: The White House, 1998), 12.

⁸³ U.S. Department of Defense, *Quadrennial Defense Review Report* (Washington, D.C.: Department of Defense, 2006), v.

⁸⁴ U.S. Department of Defense, *Quadrennial Defense Review 2001*, 11.

conduct of its research, development, test, and demonstration program...maintaining or enhancing advantages in key areas of military capability".⁸⁵

The development of the B-21 is a reasonable example of this concept in practice, not least because no other state has yet developed a low observable LRSB that comes anywhere near matching the capabilities of the B-2. Dissuasion is founded on the premise that U.S. industry is capable of continually improving existing technologies, that such improvements cannot be matched by the technological experts of other states, and that, over the long term, the cost of this development is outweighed by the savings made through reducing the number of personnel in the military, whose function is replaced by the new technological capability. The unilateral aspect of dissuasion is somewhat at odds with the intention to work closely with regional partners and it also suffers from the conflation of capability and effectiveness. Although the B-21 may be more capable than an equivalent aircraft deployed by another state, and may demonstrate a level of observability that makes it difficult for any IADS to perform a successful interception, this does not necessarily make the aircraft an effective tool in achieving U.S. security objectives. If this fault line in the strategy's logic is appreciated by the policy makers of another state, U.S. military spending will only dissuade them from seeking parity in capability, not from developing strategies that could be effective in exploiting U.S. weaknesses. Pure military capability manifested in technological superiority, as has been proven in numerous conflicts, is not a guarantor of victory.

⁸⁵ U.S. Department of Defense, *Quadrennial Defense Review 2001*, 12.

In concert with the seeming retraction of forward deployed forces, "power projection" is given specific attention in the 2014 Quadrennial Defense Review, which stresses the need to maintain "the U.S. Air Force with global power projection capabilities".⁸⁶ However, this concept is not synonymous with the total withdrawal of U.S. forces from overseas locations and a reliance on weapons systems that deliver ordnance at extreme ranges without the need to deploy outside the U.S. Instead, according to the 2014 Quadrennial Defense Review, power projection includes "preposition" and "the ability of our forces to move rapidly from place to place, and our forces' ability to operate anywhere around the world".⁸⁷ Consequently, while the LRSB fleet may be a component of power projection capability, so is a medium range strike aircraft that can deploy whenever or wherever it is required.

Overall, the National Security Strategies, Quadrennial Defense Reviews, and Global Trends reports suggest that U.S. policy makers are acutely aware of the way in which the international system is changing. There is, however, an intent to try to maintain what they perceive to be the existing U.S. position of strength through international organisational mechanisms. The significance of leadership and the intention of U.S. policy makers to fulfil a leadership role is forcefully proposed in the 2015 National Security Strategy, although the way in which this leadership is intended to be manifested has altered since the late 1990s. Similarly, although maintaining the ability to "act unilaterally when necessary" remains a central goal of U.S. policy makers, the importance of working with allies and leveraging their capabilities plays an

⁸⁶ U.S. Department of Defense, *Quadrennial Defense Review 2014*, ix.

⁸⁷ *Ibid.*, 19.

increasingly important role.⁸⁸ The ultimate goal is to cement the power that the U.S. has in the international system and community, and a function of that is demonstrating the capability and intent to work in concert with friends and allies to the strengthen the relationships that are required in order to meet this objective.

A new LRSB has been a procurement objective throughout the time period covered by all of these security strategies. Despite these incremental changes that, cumulatively, have altered the security policy of the U.S. government, the desire to develop a new LRSB has remained. The survival of the B-21 development programme throughout the changes in administration and policy approaches is, however, more a testament to the inability of policy makers to modify their position on the LRSB procurement programme than the aircraft's universal appropriateness. Slavishly adhering to the procurement of a weapons system in which its primary capabilities, notably its range, carrying capacity, and low observability, signal a desire to remain aloof from close engagement and act unilaterally, fundamentally undermines a state policy that is predicated on being an accepted global leader, building relationships with allied states in order to help them to maintain their own security, and forward deploying military forces when the situation demands.

Nevertheless, developing a full appreciation of the lack of value that the B-21 provides to U.S. policy makers requires the intended shape of security policy to be operationalised and put in the context of the circumstances in which the aircraft could be used. The following chapter therefore builds on this understanding of U.S. security

⁸⁸ Obama, *2015 National Security Strategy*, 8.

policy through considering the potential regional challenges to U.S. security and the U.S. policy makers' possible responses. The overlay of these insights onto the broad shape of U.S. security policy outlined above forms the foundation of the scenario analyses that comprise Chapter Four of this paper. This ensures that when the role of the B-21 is put under the analytic spotlight, an appreciation of the aircraft's relative effectiveness is developed in the context of not only military operations but also against the backdrop of the broader consideration of U.S. security policy.

Chapter Three: Global Threats to U.S. Security

U.S. security, in its broadest form, faces a spectrum of threats, ranging from the infrastructure damage caused by climate change to the relative strength of the U.S. economy being eroded by other states, particularly China. With a more traditional understanding of security, the security of the U.S. and its allies is challenged by states and non-state actors that have an adversarial attitude towards the state, but also by the emergence of regional conflicts which may not directly threaten U.S. security but cause the state's policy makers to expend resources on its resolution. It is these threats and situations against which military force and the B-21 are likely to be leveraged.

An analysis of the global security situation reveals a plethora of potential conflicts that could affect the population in the combat area. By dint of geographical fortune, however, the civilian population of the U.S. is provided with a degree of protection due to the "stopping power of water".⁸⁹ Consequently, an attack on the U.S. by state forces would be conducted through an air strike or a long range missile attack. The threat of a terrorist attack in the U.S. homeland remains. Such an event is, in isolation, unlikely to have as great a destructive effect as a kinetic attack by a technologically advanced conventional force. Nevertheless, because of the importance

⁸⁹ John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: Norton, 2013), 44.

that is given to ensuring the security of the population, it seems inevitable that the U.S. will, as outlined in the 2015 National Security Strategy, continue to devote considerable resources and energy in engaging in counterterrorism operations.⁹⁰

The global involvement of the U.S., through both formal alliances and market-based economic ties, means that overseas events that are not focussed on the U.S. can nevertheless impact the state and cause the U.S. policy makers to expend resources to ensure that the negative effects on the U.S. economy or citizens is minimised. However, the directions from which U.S. policy makers feel that the greatest security threats to the U.S. or its allies are most likely to emanate are indicated by the U.S. military's posture and deployment of assets.

The presence within the U.S. military of regional commands is mirrored below in the following exploration of the three geographic areas and states in which the continuation of current trends has the potential to be of greatest threat to U.S. security: East Asia and the Pacific, the Middle East, and Russia. Although South America is also an area of focus for U.S. foreign policy, particularly given the economic ties that the U.S. has with the region, it is of relatively low security significance by comparison to the three regions that will be examined in this thesis. There is little imminence of the collapse of a major South American state, which could leave a vacuum that is exploited by groups antithetical to U.S. interests, and the potential for any South American state to threaten U.S. citizens and seriously undermine U.S. security is almost non-existent. Even if this were to occur, the level of disruption that the action would cause is likely to

⁹⁰ Barack Obama, 2015 National Security Strategy (Washington, D.C.: The White House, 2015), 9.

be limited because of the defensive systems that the U.S. military has in place, and the lack of capacity in the state militaries of South American states.

Each section contains an assessment of the current situation in the region, highlighting the potential security implications for the U.S. This is followed by an overview of current U.S. military posture in or towards the region, which provides the basis for the scenario analyses in the subsequent chapter.

East Asia and the Pacific

The Obama Administration's self-designated "pivot" to Asia indicates the perceived importance of the region.⁹¹ Economics are part of the rationale behind this strategic focus; states in Asia and the Pacific Rim were the recipient of twenty percent of total exports from the U.S. in 2014.⁹² Despite a recent slowdown, the "Tiger Economies" are still considered to have high potential for growth, and represent an opportunity for U.S. businesses to tap into a market that could ultimately bolster the economic standing of the U.S. Greater involvement in the economies of the region could also be considered to be the leveraging of soft power, and a method of preventing them from becoming further intertwined with the Chinese economy.

China's first deployment as part of a UN peacekeeping force occurred in 2015, and 1,031 personnel, including infantrymen, medics and engineers, are stationed in South Sudan, suggesting that Chinese policy makers are aware of the benefits of working

⁹¹ Kurt Campbell, and Brian Andrews, *Explaining the US 'Pivot' to Asia* (London: Chatham House, 2013), 2.

⁹² The U.S. Census Bureau, "U.S. internal trade data," *Census.gov*, February, 2015, accessed February 25, 2016, <http://www.census.gov/foreign-trade/data/index.html>.

within international institutions.⁹³ Nevertheless, China's actions in the global arena do not suggest that the state's policy makers are intending to usurp and replace the U.S. However, while it may not have surpassed the U.S. by any single metric of strength, the rise of China as an economic and military power has weakened the relative international position of U.S., thereby increasing the challenge that U.S. policy makers face in ensuring that their state remains the global leader.

Discerning the grand strategy and long term goals of China's policy makers is difficult. Nevertheless, Mearsheimer suggests that it is inevitable that there will be a clash between China and the U.S. and the potential for this to occur has increased due to Chinese expansionism and aggression in the South China Sea.⁹⁴ This has been manifested through attempts to claim the Spratly island chain as Chinese territory. Some 750 miles from mainland China, there is little legal justification for these claims and the deployment of military vessels and troops has heightened concerns in the region.⁹⁵ This has been exacerbated by the Chinese policy of creating new islands, which are then claimed as Chinese territory.

The Chinese military is also improving. Numerically powerful, the force is being equipped with increasingly sophisticated weaponry. The lack of an aircraft carrier had hobbled the relative capability of Chinese forces to engage in combat in the South China

⁹³ Karen Allen, "What China hopes to achieve with first peacekeeping mission," *BBC News*, December 2, 2015, accessed December 2, 2015, <http://www.bbc.com/news/world-africa-34976580>.

⁹⁴ John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: Norton, 2013), 360-412.

⁹⁵ Adam P. Liff, and G. John Ikenberry, "Racing toward Tragedy?: China's Rise, Military Competition in the Asia Pacific, and the Security Dilemma." *International Security* 39, no. 2 (2014): 56; Goldstein, Avery. "China's real and present Danger." *Foreign Affairs* 92, no. 5 (September/October 2013): 136.

Sea but, with the first Chinese-built carrier due to be commissioned before 2020, the situation is changing.⁹⁶ Although the Chinese military can theoretically hold targets at risk across the South China Sea by using missile systems based in mainland China, the aircraft carrier provides additional flexibility in power projection, facilitating the use of medium range strike aircraft against targets that they may otherwise have been unable to reach without refuelling, as well as extending the boundaries of the Chinese A2AD network.

The Chinese Air Force is also able to field aircraft that are modelled on the technology used by the Russian and U.S. militaries. The state has also committed to upgrading its LRSB fleet, although details of the expected capability of the system and its intended delivery date remain scant.⁹⁷ In addition, the Chinese military fields an advanced A2AD network. These hardware improvements run in tandem with the strong cyber capability that is available to Chinese policy makers. While it is difficult to apportion state responsibility for acts of aggression that occur in cyberspace, it seems apparent that the Chinese government has at least tacitly supported efforts by its citizens to disrupt U.S. activities through cyber attacks, notably the hack in 2015 of a database of DoD employees' details.⁹⁸

⁹⁶ Global Security, "Aircraft Carrier Project Phase 2 - New Construction," *GlobalSecurity.org*, accessed January 11, 2016, <http://www.globalsecurity.org/military/world/china/cv-phase-2.htm>.

⁹⁷ James Drew, "Russia and China's bomber plans could muster support for LRS-B," *Flight Global.com*, August 6, 2015, accessed August 10, 2015, <http://www.flightglobal.com/news/articles/russia-and-chinas-bomber-plans-could-muster-support-for-415472/>.

⁹⁸ BBC News, "US hacking: Military and intelligence data 'accessed'," *BBC.com*, June 13, 2015, accessed January 3, 2016, <http://www.bbc.com/news/world-us-canada-33120405>.

Chinese forces cannot yet engage with the U.S. military on equal terms, but the capability gap is closing and the state represents a threat to U.S. security. This is particularly the case with regards to naval power. The Chinese military gaining the ability to deny the U.S. Navy access to the South China Sea would be a considerable impediment to U.S. policy makers' efforts to balance against perceived Chinese aggression in the region. Even without an aircraft carrier being added to the Chinese fleet, the possibility of this situation occurring in the short- to medium-term is becoming more plausible. In purely numerical terms, the Chinese Navy outnumbered the U.S. Navy by around 300 ships, although 125 of these are inshore patrol craft. Notably, the Chinese military has emphasised the ability to deliver large quantities of firepower from seaborne platforms, with its frigate fleet outnumbering its U.S. counterpart by forty-eight vessels to six while its total number of destroyers is, at thirty-two, half that of the U.S. Navy.⁹⁹

The number of vessels in the Chinese Navy does not necessarily equate to effectiveness in defeating the U.S. at sea. Nevertheless, "China can now hold the U.S. Navy's surface fleet at risk at significant ranges from the mainland".¹⁰⁰ This capability is not solely generated by the Chinese Navy's vessels, with land-launched missiles and medium range strike aircraft also threatening U.S. ships. By 2017, the Chinese military will have a slight advantage over the U.S. in anti-surface warfare in the initial stages of a conflict that is restricted to the waters around Taiwan, particularly because of

⁹⁹ Global Firepower, "Military power comparison results for United States of America vs. China," *GlobalFirepower.com*, accessed March 28, 2016, <http://www.globalfirepower.com/countries-comparison-detail.asp?form=form&country1=United-States-of-America&country2=China&Submit=Compare+Countries>.

¹⁰⁰ Eric Heginbotham et al., *The U.S. - China Military Scorecard* (Santa Monica: RAND Corporation, 2015), 198.

improvements in attack submarine technology.¹⁰¹ Over longer distances from the Chinese mainland, such as a conflict around the Spratly Islands, there would still be relative parity, but the direction of the trend in the relative power balance over the past decade has been in favour of the Chinese Navy.¹⁰² Should a Chinese aircraft carrier be deployed that carries fifth-generation fighter aircraft, the operational challenges facing the U.S. military are likely to become even more acute.

Chinese growth represents an existential challenge to the U.S. perceptions of global primacy and, particularly through the aggressive posture of the Chinese military in the South China Sea, a threat to the U.S. ability to dominate a region militarily. By closing the gap on the U.S. in any metric of economic and military power, China reduces the ability of the U.S. to leverage soft or hard power in their sphere of influence. Furthermore, this may induce other states to lose confidence in the ability or willingness of the U.S. to provide effective support, or change perceptions that the U.S. is the optimal international partner.

Chinese military strength is a particular challenge to U.S. global primacy. The relative strength and capability of the two militaries means that a full-scale hot war between the states is likely to lead to severe force degradation for both sides, regardless of which achieves eventual military victory. Such loss of capability would affect the ability of U.S. policy makers to wield influence in other regions. The posture of the Chinese military in the South China Sea is also indicative of the challenge that is posed

¹⁰¹ Heginbothan et al., *The U.S. - China Military Scorecard*, 99.

¹⁰² *Ibid.*, 99.

to the U.S. strategic position in the region. Should China be able to establish permanent bases on the islands, it will provide launch-points for further military operations, augmenting the existing threat to the U.S. military from Chinese long range missiles, naval vessels and aircraft. This would again degrade the ability of the U.S. to wield influence in the region, and the numerical advantage of the Chinese forces over other state militaries in East Asia puts pressure on U.S. policy makers to commit to defending its allies, rather than relying solely on the security strategy policy of assisting in their development of military capability.

The existing bilateral security relationships between the U.S. and other states in the region also affect U.S. security. Unless it is willing to breach its formal agreements, which seems unlikely given the emphasis that U.S. policy makers have placed on supporting the state's allies, the U.S. military is obliged to come to the aid of allied states if they are under threat. Consequently, Chinese provocation and actions that are directed at other states in the region, notably the Philippines, may force the U.S. to deploy its military even if the strategic situation is not necessarily conducive to their success.¹⁰³

North Korea also represents a threat to U.S. security and to the security of the U.S.'s allies in East Asia and the Pacific. North Korean policy makers have seemingly little regard for international conventions, particularly concerning nuclear missiles. "Supreme Leader" Kim Jong-un's statement on the 1st of January 2016 re-iterated the position that the North Korean military would "respond" to aggression and did not intend

¹⁰³ U.S. Department of State, "U.S. Collective Defense Arrangements," *State.gov*, accessed January 12, 2016, <http://www.state.gov/s/l/treaty/collectivedefense/>.

to instigate conflict.¹⁰⁴ Nevertheless, the "nuclear readiness" ordered by Kim Jong Un in response to sanctions proposed by the U.S. in March, 2016 suggests that the North Korean leadership's interpretation of a proportionate response to aggression, as well as its definition of an aggressive act, may differ from that of Western states.¹⁰⁵

In a comparison of military capability, North Korea is comprehensively outgunned by U.S. forces in numerical and technological terms. However, the proximity of North Korea to allies of the U.S., notably South Korea and Japan, significantly increases the threat that they represent. The North Korean military has the capability to cause widespread damage in Seoul, the capital of a state with whom the U.S. has a bilateral collective defence agreement, through the use of conventional artillery and short range missiles.¹⁰⁶ These strikes could be conducted with little prior warning, limiting the time-frame available to act preventatively. This threat is further heightened by North Korean efforts to develop a viable delivery system for their nuclear material, which could cause an even greater degree of damage.

Having pledged support to South Korea and consistently voiced opposition to North Korea's military posture, were the U.S. military not to intervene should a conflict between the two nations escalate it would represent a lack of willingness to support

¹⁰⁴ The National Committee on North Korea, "Kim Jong Un's 2016 New Year Address," *NCNK.org*, January 2, 2016, accessed February 2, 2016, <http://www.ncnk.org/resources/news-items/kim-jong-uns-speeches-and-public-statements-1/kim-jong-uns-2016-new-year-address>.

¹⁰⁵ BBC News, "North Korean leader urges nuclear readiness," *BBC.com*, March 4, 2016, accessed March 5, 2016, <http://www.bbc.com/news/world-asia-35723070>.

¹⁰⁶ Jeremy Bender, "Here's the kind of damage North Korea could do if it went to war," *BusinessInsider.com*, August 26, 2015, accessed March 29, 2016, <http://www.businessinsider.com/damage-north-korea-could-do-if-it-went-to-war-2015-8>.

allied states and "lead with purpose".¹⁰⁷ As noted by numerous theorists, it is the willingness of a state to use power, rather than merely its presence, that deters or coerces other states into action.¹⁰⁸ Consequently, if U.S. policy makers do not act or withdraw U.S. forces from the region, thereby allowing North Korea to position itself aggressively, they may lose the ability to wield influence in other regions.

The Middle East

While U.S. ground troops are not actively engaged in combat in the Middle East, around 14,000 remain in Afghanistan and Iraq in a consultancy and training role.¹⁰⁹ In addition, U.S. aircraft are partners in coalition ground attack and ISR missions against the so-called 'Islamic State of Iraq and the Levant' (ISIL). Militant organisations, both local and transnational, are disrupting peace and stability, notably in Iraq, Syria, Afghanistan and Yemen.

The Middle East has become a breeding-ground for terrorist organisations and non-state militias, with the sectarian schism between Sunni and Shi'ite Muslims becoming wider and more fractious. Consequently, in order to maintain true to the intention stated in the 2015 National Security Strategy to "combat the persistent threat of

¹⁰⁷ Obama, *2015 National Security Strategy*, 2.

¹⁰⁸ Schelling, *Arms and Influence*, 7.

¹⁰⁹ BBC News, "How many foreign troops are in Afghanistan?" *BBC.com*, October 15, 2015, accessed January 4, 2016, <http://www.bbc.com/news/world-south-asia-11371138>; Eric Bradner, Barbara Starr, and Jim Acosta, "White House authorizes up to 450 additional troops in Iraq," *CNN.com*, June 10, 2015, accessed November 12, 2015, <http://www.cnn.com/2015/06/09/politics/u-s-considering-1000-additional-troops-in-iraq/>.

terrorism", U.S. policy makers must retain a degree of involvement in the region.¹¹⁰ In Afghanistan, the initial coalition invasion in 2001 removed the Taliban from power and saw the installation of a democratically elected government. This government is, however, now coming under pressure from militant Islamic organisations looking to re-assert control. The rise of ISIL is also indicative of the lack of strong central governments and committed military in Iraq and Syria and demonstrates the power of non-state actors in shaping national and international security.

The collapse of nation states in the Middle East would be a severe blow to U.S. policy makers' efforts to maintain the Westphalian system across the globe. This is made more acute by the anti-U.S. sentiment in the region. ISIL and the Taliban both have more parochial concerns than al-Qaeda, but ISIL has demonstrated a willingness to attack the U.S. and its allies if there is an opportunity.¹¹¹ If these organisations are able to become permanent fixtures in the political landscape of the Middle East, it will be more difficult for the U.S. to influence the policy makers in the region, and increases the ability of Islamic terrorist organisations to plan an attack on the U.S.

Iran's political and military posture also represents a threat to the security of the U.S. and its allies. Some of this threat will be mitigated if the agreements made within the nuclear deal of 2015 are adhered to as the threat of nuclear strike by the state will be significantly reduced. However, Iranian policy makers' continued hostility towards the U.S. and Israel means that the threat to U.S. security remains. While not a direct threat

¹¹⁰ Obama, *2015 National Security Strategy*, 8.

¹¹¹ Graeme Wood, "What ISIS Really Wants," *TheAtlantic.com*, March, 2015, accessed 14 November, 2015, <http://www.theatlantic.com/magazine/archive/2015/03/what-isis-really-wants/384980/>.

from Iran, the state's alleged support for transnational terrorist organisations who are engaged in activities against the U.S. or its allies further undermines U.S. security.

The adherence of Iranian policy makers to Shia Islam also puts the state in conflict with some of the U.S.'s most important allies in the region, notably Saudi Arabia and Qatar. If the Iranian posture becomes more aggressive, the U.S. military may be required to assist in coercing Iranian policy-makers into changing their posture. This could pull the U.S. into a conflict with a state that, while not a near-peer competitor, has reasonable technological and numerical military strength. Given the delicate nature of the sectarian tension in the region, conflict with Iran, particularly if U.S. forces are supported by militaries from Sunni states, may result in a flare-up of sectarian violence. If Iran is able to develop a nuclear weapon, enormous damage would be inflicted on the U.S.'s allies in the region should deterrence fail and the weapon be launched.

The alliance between the U.S. and Israel also adds to the complexity of the situation in the Middle East. Israel's continued conflict with Palestine, and their very existence in the region, causes tension with other states. This is particularly acute in Iran, with Israel being named by Ayatollah Khomeini as the "Little Satan", to the "Great Satan" that is the U.S.¹¹² However, the stated desire of U.S. policy makers to support democracy, the historic ties between the U.S. and Israel, and the strategically significant geographic location of Israel in supporting U.S. intelligence and military activity in the region, increases the importance of ensuring the state's security. President Obama has taken a less indulgent approach towards Israel than previous Presidents. Nevertheless,

¹¹² Ze'ev Maghen, "Eradicating the 'Little Satan'," *Wall Street Journal*, 5 Jan, 2009, accessed January 12, 2016, <http://www.wsj.com/articles/SB123093176783149767>.

even with Prime Minister Netanyahu's belligerent stance on foreign and domestic policy in the face of international pressure, U.S. strategy remains wedded to supporting Israel. Consequently, were Israel to be attacked by another state it seems likely that the U.S. would provide material assistance to augment the aid that is already being supplied, even if the direct threat to "vital" U.S. national security interests limited.¹¹³

The security situation in the Middle East impacts U.S. security more deeply than simply the increased potential for attacks occurring against U.S. citizens if terrorist organisations are able to base their operations in the region. U.S. military action in the region since 2001, as well as the U.S.'s network of alliances, has bound the state to the Middle East. Withdrawing all support for the Iraqi and Afghan governments, and failing to contribute to the coalition attacks on ISIL, would not only represent a break from the emphasis on preventing terrorism outlined in the 2015 National Security Strategy but would also be tantamount to an admission of failure, and thus an acknowledgement of the inadequacy or unwillingness of the U.S. military to provide protection to allied states.

Furthermore, in 2015 the U.S. imported approximately 550 million barrels of oil from the Persian Gulf and the oil trade has shaped the approach of U.S. policy makers to the region since the middle of the twentieth century.¹¹⁴ The depth of this relationship and the ongoing oil requirements of the U.S. social and business complexes means that this facet of the relationship is likely to remain on the U.S. foreign policy agenda in the

¹¹³ The White House, *A National Security Strategy for a Global Age* (Washington, D.C.: The White House, 2000), 10.

¹¹⁴ U.S. Energy Information Administration, "Petroleum and Other Liquids," *EIA.gov*, accessed March 30, 2016. https://www.eia.gov/dnav/pet/pet_move_impqus_a2_nus_ep00_im0_mbb1_a.htm.

short to medium term at least. However, the advancement in extraction techniques means that shale gas reserves and previously inaccessible oil deposits can be accessed by U.S. oil companies and it is not inconceivable that the U.S. will be energy independent before 2030.¹¹⁵ Although in this circumstance U.S. policy makers may believe it to be politically expedient to continue to import oil from the region even if energy production in the U.S. is sufficient to meet domestic requirements, the dynamic of the relationship with oil-producing states in the Middle East would change and the incentive for U.S. policy makers to be involved in a regional conflict, particularly if this would require deploying U.S. troops on the ground, would be reduced.

Although U.S. policy makers have remained consistently averse to re-inserting U.S. combat troops on the ground in the Middle East since their withdrawal in 2010, a change may be forced in this policy if the U.S.'s allies come under sustained pressure from state or non-state militaries. Even without committing ground forces, it seems likely that U.S. aircraft will be required in the region in order to degrade the capabilities of non-state militias and prevent terrorist organisations that threaten U.S. security from operating openly. In addition, the lack of U.S. forces acting in combat roles on the ground in the Middle East does not mean that there will not be a military presence. In order to maintain the ability to respond rapidly to emerging situations, and demonstrate continued support to allies in the Middle East, it seems likely that the U.S. military will retain overseas bases in the region.

¹¹⁵ National Intelligence Council, "Global Trends 2030," v.

The Russian Sphere of Influence

Under President Putin, Russia has taken an aggressive foreign policy stance. The state has intervened in the civil war that erupted in Ukraine on a covert basis, and formally provided aerial assistance to President Assad's forces in Syria. In addition, Russian policy makers have pressed the claims of the state to control regions of the Arctic, deploying anti-aircraft missiles and other military assets to bases on Kotelny Island and in Alexandra Land. Russia's mistrust of the U.S. is epitomised by their identification of the North Atlantic Treaty Organisation (NATO) and the U.S. as a "threat".¹¹⁶ This also adds to the requirement for sensitivity in interactions with Russia to avoid a situation escalating into military conflict.

The increasing Russian involvement in global affairs represents a direct challenge to U.S. primacy. In particular, the deployment of Russian combat aircraft in Syria changed the dynamic of U.S. military action in the region, requiring senior U.S. Air Force personnel to meet with their Russian counterparts in order to co-ordinate their efforts, and Royal Air Force combat aircraft operating in the theatre were equipped with air-to-air missiles.¹¹⁷ Russian policy makers' belligerent stance in the Arctic is manifested in the deployment of troops and military equipment to Northern Russia, conducting more frequent military manoeuvres in the region, and continuing to claim that the Siberian and Eurasian continental shelves that are accepted as Russian territory

¹¹⁶ BBC News, "Russia security paper designates Nato as threat," *BBC.com*, December 31, 2015, accessed December 31, 2015, <http://www.bbc.com/news/world-europe-35208636>.

¹¹⁷ Dario Leone, "Interesting picture shows a fully armed RAF Typhoon participating in ISIS air war during AAR," *The Aviationist*, December 31, 2015, accessed January 20, 2016, <http://theaviationist.com/2015/12/31/typhoon-taking-fuel-from-kc-135/>.

extend to the North Pole.¹¹⁸ These activities threaten the access of U.S. civilian and military vessels to the region, and by extension challenge U.S. primacy and the state's ability to provide military support for its allies in the Arctic Council. Consequently, unless U.S. policy makers are prepared to accept this weaker position and loss of face on the international stage, an action which would potentially undermine U.S. attempts to demonstrate global leadership, political manoeuvres are required to coerce Russian policy makers into modifying their approach to the region and deter them from similar action in the future.

The spectrum of possible diplomatic approaches to resolving this conflict is broad. Using the legal channels of international organisations to block Russian claims to extend their territorial rights in the region, or threatening the imposition of sanctions, could cause a change in Russian policy. Nevertheless, if such peaceful approaches are unsuccessful, engaging in limited kinetic attacks against Russian forces in the region to signal the capability and intent to protect access to what U.S. policy makers perceive to be global commons remains an option.

By remaining passive and not showing the "vigorous" leadership to which U.S. policy makers have committed, it suggests that they are not prepared to risk a conflict with a state that, while it may not be a near-peer competitor with regards to economic

¹¹⁸ Catherine Trainor, "Why Russia's Arctic strategy is starting to worry NATO," *Russia Direct*, November 19, 2014, accessed March 29, 2016, <http://www.russia-direct.org/why-russias-arctic-strategy-starting-worry-nato>; United Nations Division for Ocean Affairs and the Law of the Sea, "Commission on the Limits of the Continental Shelf (CLCS) Outer limits of the continental shelf beyond 200 nautical miles from the baselines: Submissions to the Commission: Partial revised Submission by the Russian Federation," *UN.org*, Last Modified December 1, 2015, accessed March 25, 2016, http://www.un.org/depts/los/clcs_new/submissions_files/submission_rus_rev1.htm.

strength, has a sizeable and capable military.¹¹⁹ The potential for the Russian military to engage in an aggressive action that would give NATO member states little choice but to honour their commitment to collective action is limited because of the likelihood of a military defeat for the Russian forces. However, this does not mean that Russia cannot or will not push the boundaries of international law, as appears to have been the case in the involvement of Russian troops in Ukraine. This presents U.S. policy makers with the challenge of trying to act in a manner that retains the support of the international community while maintaining a posture that prevents Russia from increasing its power by reference to the U.S. Even if Russian forces do not prosecute direct strikes against the U.S. or its allies, the redeployment of Russian troops to strategically important locations from which kinetic attacks can be launched against the U.S. or its allies can be seen to be solidifying their position, putting the U.S. at a disadvantage. As with a hot war against Chinese forces, although the U.S. military are likely to ultimately vanquish their Russian counterparts, the capability of the Russian military is such that the U.S. forces would suffer significant losses during the conflict.

¹¹⁹ General Lloyd J. Austin III, "Commander U.S. Central Command on the Posture of U.S. Central Command," *Statement Before the House Appropriations Committee*, March 26, 2015.

Chapter Four: Scenario Analyses

The scenario analyses below explore the intended role and likely effectiveness of the B-21 across a range of possible conflict environments, informed by the strategic challenges of the previous chapter. The B-21 is due to enter service in 2025 and the scenarios represent events occurring after the system becomes operational. However, given the turbulence of the global security situation, anticipating the situation in more than a decade's time with any degree of exactitude is difficult. As a result, there are two key assumptions made in the construction of the scenarios:

1. Any actions taken by the belligerents in the period between 2015 and the scenario occurring will follow the trends that were extant in 2015.
2. Any commitments to military spending or definitive actions that had been due by 2025 are assumed to have been completed on schedule, otherwise military strength will be assumed to remain at its 2015 level.

The study could be expanded through additional scenarios, and the identification of the areas of greatest threat to the U.S. can be debated. However, the scenarios analysed also represent a spectrum of types of conflict in which U.S. forces may be engaged, facilitating a thematic consideration of the tactical and strategic challenges that

the U.S. military, and in particular the B-21, may face in the coming decade. The efficacy of the military in acting as a deterrent is difficult to quantify, and by definition the realisation of any security threat indicates that deterrence has failed. Each of the hypothetical scenarios outlined are intended to be a backdrop against which the efficacy of U.S. military systems can be assessed and, while the potential deterrent effect of U.S. forces will be considered, this represents a secondary aspect of the analysis.

Hypothetical Scenario One: Countering Chinese Aggression in East Asia

Chinese policy makers continue to claim that the area contained within the 'Nine-Dash Line' is Chinese sovereign territory. Their island-building programme has led to territories populated by Chinese civilians and permanent military installations that provide the first layer of the Chinese A2AD network. In addition, two of the islands contain airstrips that house Chinese Chengdu J-20 fifth-generation multi-role fighter aircraft.

The Chinese government has stated that any attempt to position military vessels within the area bounded by the Nine-Dash Line would be met with kinetic force. The U.S. military has been drawn into the emerging conflict through their regional alliances and the Chinese response to attempts to manoeuvre military vessels and aircraft through the waters that are claimed as part of Chinese territory. U.S. military aircraft have been identified and locked by Chinese radar systems, as well as being intercepted and chaperoned by Chinese military aircraft, while naval vessels have been similarly tracked by Chinese radar systems and shadowed by Chinese naval and aerial assets at ranges of up to 200 miles outside the Nine-Dash Line.

Chinese policy makers' aggressive stance on the South China Sea has caused concern among other states in the region and the situation has escalated with the launch of an anti-aircraft missile at a South Korean Lockheed Martin F-35 'Lightning II' that had entered the north-eastern portion of the territorial waters claimed by China. Under the terms of the 1953 "Republic of Korea Treaty", following an "armed attack" on Korea, the U.S. is obliged to "act to meet the common danger".¹²⁰ Although this does not necessarily require the U.S. military to deploy, pressure is being put on U.S. policy makers to leverage military power against China in order to prevent them from gaining full strategic domination of the South China Sea and deter any further aggressive actions. Such action is likely to require missions being launched against the Chinese mainland as well as against Chinese military forces deployed in the South China Sea.

Strategic considerations for U.S. military action

The purpose of the U.S. military engaging in this conflict is to demonstrate the ability of the U.S. military to impose costs that Chinese policy-makers find intolerable, thereby coercing a change in Chinese foreign policy. Ultimately, this policy change must be long term, with Chinese policy makers convinced that further attempts to assert dominance in the South China Sea will be unsuccessful. The situation in this scenario has gone beyond the U.S. military acting as a deterrent; the Chinese forces have deployed kinetic force within an area that only Chinese policy-makers recognises as its sovereign territory. Instead, the U.S. forces are partaking in coercion.

¹²⁰ U.S. Department of State, "U.S. Collective Defense Arrangements".

In order to achieve these goals, Chinese policy-makers must be convinced that Chinese forces are incapable of preventing attacks by the U.S. military and that any efforts by the Chinese forces to impose similar costs will not succeed. The U.S. force structure that is best suited to completing this mission is a combination of naval and air assets. Ground forces may be valuable in taking and holding the Spratly Islands to prevent their use as bases for Chinese forces, but they will not provide the determining factor of the conflict as a ground conflict on the Chinese mainland is not a viable military option for the U.S.¹²¹

Despite the U.S.'s alliances within the region being the primary cause of the military deployment, the role of these states in the conflict is restricted primarily to providing bases from which the U.S. military can launch attacks, and demonstrating resilience in the face of any Chinese attacks that penetrate their defensive networks. There is little offensive military capacity among the U.S.'s allies in the region; while the South Korean military is technologically strong, it is numerically limited and must remain wary of North Korean policy makers exploiting any turbulence and attacking South Korea, nominally in support of its Chinese ally. Similarly, while Australia has capable military force, it lacks the ability to project force over long ranges and has seemingly little desire for a direct military confrontation with China. Japan has committed to maintaining a defensive posture and only using force if Japan's survival is at stake, all other non-military options have been exhausted, or other UN peacekeeping

¹²¹ Robert D. Kaplan, "How we would fight China," *The Atlantic*, June 2005, accessed December 23, 2015, <http://www.theatlantic.com/magazine/archive/2005/06/how-we-would-fight-china/303959/>.

troops are under threat. Even in these cases, "the use of force is limited to the minimum necessary to deter aggression".¹²²

The imposition of costs on China is reliant on the realisation of an ability to penetrate Chinese defensive systems and deliver ordnance against static and mobile targets. Consequently, attacks are likely to be conducted by ground attack aircraft or long range cruise missiles deployed from the ground or naval vessels. These strikes will have the dual foci of degrading the Chinese military's defensive network, particularly the A2AD capability, and preventing the deployment of hardware that could be used to conduct counter-strikes against U.S. assets or allies. Chinese ground-launched cruise missiles and ground attack aircraft represent the most severe threats to the security of the U.S.'s allies. The DH-10 missile, which can be deployed from mobile launchers, has a range of around 1,550 miles, rendering almost the entirety of the South and East China seas, and the states with coastlines on these waters, vulnerable to attack.¹²³ Of symbolic significance, if not also military, is removing Chinese presence from the Spratly Islands. The military aircraft based there can both prevent the operation of U.S. forces and conduct ground attack missions. Stopping these aircraft from performing either of these roles is critical for the U.S. military's campaign. The likely deployment of a Chinese aircraft carrier before 2025 provides an additional dimension to U.S. operations in the region.¹²⁴ Aircraft launched from the vessel provide an extension to the Chinese

¹²² Franz-Stefan Gady, "Toothless tiger: Japan Self-Defence Forces," *BBC News* October 15, 2015, accessed April 19, 2016, <http://www.bbc.com/news/world-asia-34485966>.

¹²³ Jeffrey Lin and P.W. Singer, "China shows off its deadly new cruise missiles," *PopSci.com*, March 10, 2015, accessed September 23, 2015, <http://www.popsci.com/china-shows-its-deadly-new-cruise-missiles>.

military's A2AD network, and could also threaten U.S. vessels and ground bases in the region.

According to its proponents, this scenario should provide a template for the leveraging of many of the assets that are unique to the B-21. Although the U.S. Global Strike Command does not ordinarily permanently deploy its assets in the territories of other states, the motto of the 8th Air Force includes the phrase "Global Strike on Demand".¹²⁵ LRSBs have deployed to the Pacific region and in December, 2015, there was a diplomatic incident when two B-52s encroached on airspace over the Spratly Islands that the Chinese government claimed to be their territory.¹²⁶ Although this event was explained as a navigational error, it also represented a reminder to the Chinese forces of U.S. military capability in the region. However, the B-52 remains vulnerable to technologically strong IADS, and in this scenario the key for the U.S. military is to demonstrate efficacy in penetrating the Chinese A2AD network, rather than providing a visible reminder of U.S. military assets whose real effectiveness is limited.

Role of the B-21

The B-21 has been described as "one of the centerpieces of the Asian Pivot", providing a penetrative counterpoint to the growing technological sophistication of the Chinese military.¹²⁷ A strong A2AD network, and the ability to "project a large volume

¹²⁴ Global Security, "Aircraft Carrier Project Phase 2".

¹²⁵ 8th Air Force, "8th Air Force Mission," accessed August 3, 2015, <http://www.8af.af.mil/>.

¹²⁶ BBC News, "China accuses US of B-52 'provocation' over Spratly Islands".

¹²⁷ Robert Farley, "America's LRS-B stealth bomber: Headed for a 'Crash Landing'?" *DefenseDaily.com*, September 14, 2015, accessed October 1, 2015, <http://www.defensedaily.com/lrs-b-to-avoid-pitfalls-of-b-2-f-35-programs-analysts-say/>.

of precision firepower out roughly 2,000 kilometers from China's coast", challenges the "free movement of [U.S.] forces in the theater", an operational capability on which "the success of any major operation or campaign depends".¹²⁸ The Chinese missile-based defensive system is augmented by land-based aircraft, potentially including those deployed on man-made islands in the South China Sea to provide a further buffer against attacks and, should its development be completed on schedule, fighter and strike aircraft from an aircraft carrier. The B-21 is intended to provide penetrative capabilities, putting strategic and tactical targets within this zone, particularly missile launch sites, at risk. However, the strategic concept is fundamentally undermined by the inability of the system to loiter within the area covered by the IADS. The B-21 will augment the capability of U.S. military operations in the region but requires significant support if missions that involve the system are to be effective.

The B-21 has three potential functions in this scenario: First, its presence can be used as an indication of the U.S. military's strength and U.S. policy makers' willingness to act. Its proposed capability, particularly with regard to its low observability, make the system a greater threat than the B-52. Second, the system can be used to strike strategic targets in order to coerce Chinese policy makers into renouncing their claim to the South China Sea and deter any future hostile actions. Third, the system can be used to strike

¹²⁸ The Economist, "Battle joined: Three of the world's biggest defence companies are locked in a contest that could reshape the industry," *Economist.com*, May 2, 2015, accessed August 12, 2015, <http://www.economist.com/news/business/21650144-three-worlds-biggest-defence-companies-are-locked-contest-could-reshape>; Robert Haddick, "Why the New Bomber is a Good Investment," *War on the Rocks*, February 26, 2015, accessed August 12, 2015, <http://warontherocks.com/2015/02/why-the-new-bomber-is-a-good-investment/>; Milan Vego, "The Factor of Space," *Joint Operational Warfare*. (Newport, RI: Naval War College, 2009), III-7.

tactical targets in order to degrade Chinese military strength to the point at which it is no longer able to threaten the activities of the U.S. military or its allies in the region.

The B-21 would, in particular, be required to strike missile launch sites; "hunting mobile missiles" has been described as the system's "single most important mission".¹²⁹ However, the likely effectiveness of the system in this role is questionable. LRSBs in Iraq during the first Gulf War were unable to prevent Scud tactical ballistic missiles from being deployed against coalition forces, despite the geographic circumstances being in favour of the air campaign and a relative lack of an A2AD network.¹³⁰ The generation of land-based missiles that the Chinese military would deploy are solid-fuelled and "can be erected and launched in under ten minutes".¹³¹ In addition, the range of these missiles means that their launch positions can be in a variety of locations and in "complex" terrain without jeopardising their effectiveness.¹³² In order to prevent these missile launches, the U.S. Air Force would have to maintain constant coverage over a broad swath of Chinese territory. Low observability does not equate to invisibility. The most advanced radar systems in 2016 rendered the B-2 detectable and, although the performance of the B-21 will not be known until its design is at a greater level of maturity, it cannot be assumed that it would be able to operate entirely undetected within a sophisticated

¹²⁹ Jim Hasik, and Rachel Rizzo, "Commentary: What to ask about new long range strike bomber," *DefenseNews.com*, October 26, 2015, accessed October 28, 2015, <http://www.defensenews.com/story/defense/commentary/2015/10/26/commentary-what-ask-new-long-range-strike-bomber/74641056/>.

¹³⁰ William Rosenau, *Special Operations Forces and Elusive Enemy Ground Targets* (Santa Monica: RAND Corporation, 2001) 33; T.X. Hammes, "Rethinking Deep Strike in the 21st Century," *War on the Rocks*, February 3, 2015, accessed August 12, 2015, <http://warontherocks.com/2015/02/rethinking-deep-strike-in-the-21st-century/>.

¹³¹ *Ibid.*

¹³² Hammes, "Rethinking Deep Strike".

IADS.¹³³ Unless the aircraft demonstrates a degree of survivability, the design of which is antithetical to optimising the low observable properties of the system, the detection of the B-21 is likely to lead to its destruction if no further protection is provided. Furthermore, daylight renders the system visible to the naked eye, regardless of its low observable properties, thus reducing the time that a fleet of B-21s can remain in Chinese airspace undetected and limiting the system's effectiveness.¹³⁴

The suggestion that the system will ensure "the unique capacity of the U.S. to intervene anywhere, anytime, with decisive military force" on a unilateral basis is proven to be misleading in this scenario.¹³⁵ If the B-21 is to be effective, the U.S. Air Force requires the ability to operate from bases in the region. In order to reach the Chinese mainland and return in a single flight, the system would require air-to-air refuelling. It would be possible to launch and recover the B-21 from Guam to strike a target in mainland China, and not rely on air-to-air refuelling. However, Anderson Air Force Base is within range of the Chinese DF-26 intermediate range ballistic missile, which has been dubbed the 'Guam Killer', greatly increasing the risk of maintaining a campaign from that location alone.¹³⁶ Although it is technically possible for a series of tanker aircraft to provide the requisite support for the operation after launching from Hawaii

¹³³ Loren Thompson, "Some disturbing facts about America's Dwindling Bomber Force," *Forbes*, August 16, 2013, accessed September 12, 2015, <http://www.forbes.com/sites/lorenthompson/2013/08/16/some-disturbing-facts-about-americas-dwindling-bomber-force/>.

¹³⁴ Hammes, "Rethinking Deep Strike".

¹³⁵ Robert Farley, "What is the US Air Force's New Bomber For?" *TheDiplomat.com*, March 13, 2014, accessed September 18, 2015, <http://thediplomat.com/2014/03/what-is-the-us-air-forces-new-bomber-for/>.

¹³⁶ Franz-Stefan Gady, "Revealed: China for the First Time Publicly Displays 'Guam Killer' Missile," *TheDiplomat.com*, August 31, 2015, accessed November 14, 2015, <http://thediplomat.com/2015/08/revealed-china-for-the-first-time-publicly-displays-guam-killer-missile/>.

and the mainland U.S., the logistical challenges of doing so for the duration of a long-term campaign are monumental: a single B-21 launched from Hawaii would require the support of at least three refuelling aircraft to conduct a single strike on China, and four would be required if the aircraft were to launch from the mainland U.S.¹³⁷ Instead, LRSB operations launching from the U.S. would rely on support from tankers that are based in multiple locations in the region. The centrality of the refuelling aircraft to the success of any U.S. LRSB mission necessitates maintaining the security of the aircraft and the bases from which it is launching. To provide protection from Chinese fighter aircraft, the tankers need to be supported by similar systems. This necessitates the presence of U.S. fighter wings in the region, either in air bases on land in allied states or from aircraft carriers.

Accepting the requirement for these bases facilitates the potential forward deployment of the B-21, providing operational flexibility. However, the presence of these airfields also facilitates the deployment of medium range strike aircraft that can prosecute interdiction missions against targets in mainland China, Chinese-held islands, and provide opposition to the Chinese Navy. The F-35 has a range of around 1,200 miles, putting mainland China comfortably in range of systems based in Okinawa or South Korea.¹³⁸ There is undoubtedly a political risk from deploying the aircraft in these locations, but this is not dissimilar to the risk of deploying refuelling aircraft to the same

¹³⁷ David Cenciotti, "All you need to know about last week's B-2 stealth bombers round trip mission across the Atlantic," *The Aviationist*, September 18, 2013, accessed September 14, 2015, <http://theaviationist.com/2013/09/18/b-2-atlantic-mission/>.

¹³⁸ Global Security, "F-35 Joint Strike Fighter (JSF) Lightning II," *GlobalSecurity.org*, accessed December 12, 2015, <http://www.globalsecurity.org/military/systems/aircraft/f-35-specs.htm>.

bases. There is, of course, a qualitative difference between tanker and strike aircraft, a difference that has been noted by the Australian government in their reluctance to allow U.S. LRSBs to be permanently stationed in Australian territory.¹³⁹ However, this difference should not be overestimated. If the tanker aircraft are not permanently deployed at these bases in East Asia, then their transfer to those locations potentially indicates that a strike is being planned, even if the aircraft that would deploy the ordnance are not based alongside them. This may, therefore, make these base locations a primary target of the Chinese A2AD network.

The capability of medium range strike aircraft to prosecute a strike mission further undermines the requirement for the B-21 in this scenario. The function of any ground attack aircraft is to deploy ordnance against a target; the aircraft itself is simply a delivery mechanism and the capability of the ordnance is of at least equal importance in defining the effectiveness of a mission.¹⁴⁰ Unless the A2AD network has been degraded to the point that the LRSB can loiter unsupported within Chinese airspace, strike missions are only going to be effective against static targets. Such targets could include air bases, permanent radar sites, communications hubs, or missile silos. Consequently, unless the U.S. develops a land-based equivalent of the LRASM that is able to identify appropriate aim points autonomously, cruise missiles with programmable GPS / Inertial Navigation Systems are likely to be the most effective ordnance. It is to perform this

¹³⁹ Ely Ratner, *Resident Power: Building a Politically Sustainable U.S. Military Presence in Southeast Asia and Australia* (Washington, D.C.: Center for a New American Security, 2013), 24.

¹⁴⁰ Sydney J. Freedberg Jr., "New Nuke Cruise Missile As Crucial As New Bomber: Haney," *BreakingDefense.com*, September 18, 2014, accessed August 28, 2015, <http://breakingdefense.com/2014/09/new-uke-cruise-missile-as-crucial-as-new-bomber-haney/>.

role that the DoD is developing the new long range standoff cruise missile.¹⁴¹ The existing AGM-158 JASSM-ER has a range of over 600 miles and a Circular Error Probable (CEP) of less than five metres - comparable to a laser-designated Paveway II.¹⁴² The upgrade is likely to extend this, mitigating the operational drawbacks of the "short legs" of medium range strike aircraft.¹⁴³ Regardless of whether the target is strategic or tactical, except in cases where the GBU-57A/B is used, the ordnance deployed by the B-21 or by medium range attack aircraft will be identical.

Deploying a stand-off air launched cruise missile minimises the time that the deploying aircraft is required to spend within the Chinese A2AD network coverage and is difficult to intercept before it reaches the target. The B-21 is not required to deliver this ordnance. The low observable properties and the survivability of the F-35 make it possible to launch the aircraft from an overseas base, such as Okinawa, and manoeuvre into an appropriate position to deploy the missile. The obvious drawback of using the F-35 rather than the B-21 is its reduced carrying capacity. Eight F-35s are required to deploy the same number of AGM-158 JASSM-ERs as a single B-2.¹⁴⁴ However, this is balanced by the reduction in the risk of total operational failure that is achieved by separating the locations of missile deployment. In addition, in the event of detection

¹⁴¹ James Drew, "Bombers vs. boomers? DOD faces a nuclear spending dilemma," *FlightGlobal.com*, June 26, 2015, accessed September 25, 2015, <https://www.flightglobal.com/news/articles/bombers-vs-boomers-dod-faces-a-nuclear-spending-dilemma-414053/>.

¹⁴² Christopher Harmer, "Required sorties and weapons to degrade Syrian Air Force excluding Integrated Air Defense System (IADS)," lecture at the Institute for the Study of War, July 31, 2013, accessed January 13, 2016, <http://understandingwar.org/sites/default/files/RequiredSorties-to-DegradeSyrianAirPower.pdf>.

¹⁴³ Grant, *Return of the Bomber*, 30.

¹⁴⁴ Missile Threat, "AGM-158A/-B (JASSM/JASSM-ER)," *MissileThreat.com*, accessed December 3, 2015, <http://missilethreat.com/missiles/agm-158a-b-jassmjassm-er/>.

and interception, either pre or post missile deployment, the F-35 is likely to have a greater degree of survivability than the B-21.¹⁴⁵

The B-21 has also been proposed as contributing to the naval conflict in this scenario.¹⁴⁶ There is no reason why the system could not deploy air-to-sea missiles, notably the LRASM, and the loiter capability would potentially facilitate ISR missions. However, the effectiveness of the system in this role is likely to be surpassed by alternative U.S. military technologies acting in concert. Again, not retaining the use of bases in allied states in the region nullifies the potential for the system to loiter in the battlespace, thereby reducing its effectiveness in an ISR role. If these bases exist there seems little reason not to use a variant of the General Atomics MQ-1 'Predator', the ISR-based precursor of the MQ-9, or a similar HALE RPA. Although the currently fielded systems are vulnerable if operating in a contested air environment, they can carry advanced ISR equipment, have "long-endurance" capability and, with the MQ-9 and MQ-1 having a unit cost of around \$20m and no aircrew on board, are more expendable than the B-21.¹⁴⁷ The MQ-1 can remain airborne without refuelling for over eighteen hours, and this is likely to be extended in future versions of the aircraft as the air-to-air refuelling capability of unmanned systems evolves.¹⁴⁸ General Atomics' Lynx Multi-

¹⁴⁵ Dave Majumdar, "America's F-35 stealth fighter vs. Russia's Su-35: Who wins?" *NationalInterest.org*, September 15, 2015, accessed December 12, 2015, <http://nationalinterest.org/blog/the-buzz/americas-f-35-stealth-fighter-vs-russias-su-35-who-wins-13855>.

¹⁴⁶ Haddick, "Why the New Bomber is a Good Investment".

¹⁴⁷ U.S. Air Force, "MQ-1B Predator," *AF.mil*, accessed October 12, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104469/mq-1b-predator.aspx>.

¹⁴⁸ BBC News, "Unstaffed drone refuelling test 'successful'," *BBC.com*, October 8, 2012, accessed August 17, 2015, <http://www.bbc.com/news/technology-19871063>.

mode Radar suite can be operated in "Maritime Wide Search Area" mode and provides "photographic quality" video imagery in all weathers at ranges of up to fifty miles.¹⁴⁹ This is comparable to the Recon/Optical CA-295 camera used in the Raytheon Technical Services Company SHARP, the ISR system carried by the Lockheed-Martin P-3 "Orion" maritime surveillance aircraft.¹⁵⁰

In an anti-shipping role, the only advantage of the B-21 over alternative systems is its carrying capacity and potential for a single aircraft to launch multiple attacks in a single mission. However, a fleet of medium range strike aircraft launched from land bases in the region or aircraft carriers would be capable of delivering large volumes of firepower. Consequently, although adding the B-21 to this sector of the conflict would augment the ability of U.S. aircraft to disrupt Chinese naval activities, a greater increase in the effectiveness of the U.S. military would be achieved through the deployment of remotely piloted aircraft, and a co-ordinated campaign founded on medium range multi-role fighter aircraft operating alongside the U.S. Navy's attack vessels. Land-based medium range strike aircraft would be able to hold vessels at risk in strategically important regions of the South China Sea from a base in the Philippines, and the East China Sea is comfortably within the combat radius of aircraft launched from South

¹⁴⁹ General Atomics Aeronautics, "Lynx Multi-mode Radar," *ga-asi.com*, accessed March 20, 2016, <http://www.ga-asi.com/lynx-multi-mode-radar>; General Atomics Aeronautics, "GA-ASI Revolutionizes SAR Full-Motion Video," *ga-asi.com*, June 19, 2013, accessed March 20, 2016. <http://www.ga-asi.com/lynx-multi-mode-radar>.

¹⁵⁰ M.D. Duncan et al., "Technology Demonstration of SHARP, the Navy's Next-Generation Tactical Reconnaissance System," *National Research Laboratory Review 2002*, accessed March 29, 2016, <http://www.nrl.navy.mil/research/nrl-review/2002/optical-sciences/duncan/#sthash.joRupRsZ.dpuf>.

Korea or Okinawa. Consequently, fears that without the B-21 the U.S. military in this scenario would be reliant on an aircraft carrier are misplaced.¹⁵¹

Procuring the B-21 is not a prerequisite in demonstrating the military dominance of U.S. forces in the South and East China Seas. Using the B-21 to prevent the Chinese military from deploying mobile missile launchers is unlikely to be effective, even if the system was able to penetrate the Chinese A2AD network. Furthermore, the effective operation of the B-21 in this environment is reliant on its low observability alone, rather than survivability in the event of detection. This operating capability is not guaranteed going forward. The ultimate aim of a ground attack mission is to deploy ordnance against a target. In this scenario, the loiter capability of the system cannot be fully exploited due to the strength of the Chinese IADS and A2AD network. Consequently, it is only static targets that can be consistently held at risk, and can be struck precisely with missiles pre-loaded with the target's location. The B-21 is not the only aerial system capable of attaining a position from which such ordnance can be deployed.

Hypothetical Scenario Two: Defeating ISIL in the Middle East

ISIL has defied the expectations of military strategists and the core of the organisation has survived attacks from state forces, including the air campaigns of the U.S. and Russia. However, they have been contained in a limited geographic region in northern Iraq and Syria. Although large-scale and lasting advances are no longer a central component of their campaign, limited and localised attacks remain a frequent feature of the conflict. ISIL are increasingly encouraging overseas attacks on civilians in

¹⁵¹ Simha, "Supersonic folly".

states that have conducted action against them. The U.S. intelligence services have indicated that attacks on the U.S. homeland are imminent.

Although not under imminent threat of collapse, the government of Iraq remains unable to command total control of the state's security, with sectarian violence a constant catalyst of conflict. The Afghan government has been forced to relinquish control of the south of the country, with the Taliban the de facto authority in the region. Protests against governments in the Arabian Peninsula have continued sporadically but have had little effect in altering the political status quo. Saudi Arabia and Qatar remain allies of the U.S. and the U.S. military has permanent bases in both states. President Assad's Syrian government retains control of Damascus, Homs and Aleppo but the remainder of the country is riven by militant groups vying for primacy, with no rebel organisation having the strength to irremediably defeat the government forces. U.S. policy makers remain reluctant to commit to providing overt military support to any group.

Strategic considerations for U.S. military action

According to the 2015 National Security Strategy, conducting counterterrorism operations is one of the key roles of the U.S. military.¹⁵² ISIL's existence threatens U.S. security directly, through potential attacks on the U.S. homeland, and also threatens states that are allied to the U.S. In addition, the U.S. has retained a degree of influence in the region and consistently played an active role in its security through links with state militaries even after combat troops were removed from the region, a function of the

¹⁵² Obama, *2015 National Security Strategy*, 26.

U.S.'s security strategy to build up allies' capabilities, and U.S. aircraft performed intelligence-gathering and ground attack roles in ground operations against ISIL.

By increasing the direct threat to the security of the U.S., ISIL puts U.S. policy makers under pressure to act, in particular to engage in a campaign that causes the collapse of the group. The desire of U.S. policy makers to avoid unilateral action, as well as the experience of U.S. forces in Afghanistan and Iraq in the first decade of the twentieth century, means that U.S. military action is likely to be as part of a coalition. The universal condemnation of ISIL's actions, and the level of threat that they pose to the security of other states, means that engendering some level of support for action is probable. U.N. Resolution 2249 (2015), which calls on member states with the requisite capacity to take "all necessary measures" to prevent and suppress ISIL campaigns, further legitimises U.S. action in the region.¹⁵³ However, the U.S. military has greater strength than those of its likely partner nations. Consequently, in real terms the U.S. forces are likely to bear the greatest burden.

The ultimate intention of the action is to allow space for achieving the long-term goal of reducing the propensity for violent extremism to be fomented in the region. However, although the "battle for hearts and minds" is unlikely to be achieved through military action alone, stabilising the security situation is the critical first step.¹⁵⁴ If

¹⁵³ United Nations, "Security Council 'Unequivocally' Condemns ISIL Terrorist Attacks, Unanimously Adopting Text that Determines Extremist Group Poses 'Unprecedented' Threat," *UN.org*, November 20, 2015, accessed December 22, 2015, <http://www.un.org/press/en/2015/sc12132.doc.htm>.

¹⁵⁴ Scott Feil, "Building Better Foundations: Security in Postconflict Reconstruction," in *The Battle for Hearts and Minds: Using Soft Power to Undermine Terrorist Networks*, edited by Alexander T. J. Lennon, (Cambridge, Mass.: MIT Press, 2003), 194.

terrorist organisations have the scope of capability to operate unchallenged and engage in recruitment activities, the battle is made more difficult to win. Consequently, ISIL must be comprehensively defeated, rather than simply contained. To accomplish this, ISIL leadership must be removed and the fighting capacity of the organisation degraded completely, rendering them unable to engage in military action in the Middle East. ISIL's narrative also requires their continued action and a demonstration of forward momentum. If ISIL becomes irrelevant and impotent, recruitment is more difficult. This is made more acute if the organisation is becoming demonstrably weaker and unable to provide basic services for its members. It has been suggested that ISIL's strategy is to draw western nations into another costly and lengthy campaign in the Middle East, believing that such action would ultimately strengthen their cause.¹⁵⁵ However, this strategy is based on the assumption that ISIL's military will resist a sustained campaign against them by a technologically advanced and numerically superior force. If the organisation is perceived to be under intolerable pressure and on the point of collapse, recruiting further support will be difficult.

Nevertheless, it is important that a concerted military effort against ISIL is concluded quickly. A lengthy conflict potentially provides ISIL with greater recruitment opportunities, and may also reduce the will of the populations whose militaries are involved in the conflict to support continued action. This would be exacerbated if an ending to the conflict seemed distant and the perceived threat from ISIL actions to civilians outside the Middle East was reduced. The failure of coalition air strikes to impose cataclysmic costs on ISIL following the group's emergence in 2014 indicates that

¹⁵⁵ Wood, "What ISIS Really Wants".

a ground operation is required to engender its ultimate defeat.¹⁵⁶ The assertion that, regardless of their strike capability, military aircraft are unable to hold territory is regularly levelled at strategists who have claimed that air power alone is capable of winning a conflict.¹⁵⁷ In this case, the argument is valid. Aircraft can be used to conduct targeted strikes on ISIL's leadership which, if successful, may fundamentally alter their ability to operate as a united force. In isolation, however, this does not guarantee the collapse of the organisation - although now fractured, both al-Qaeda and the Taliban remain viable terrorist groups despite the deaths of their respective figureheads. Similarly, ISIL's force structure makes it difficult to inflict catastrophic military losses. Troops are dispersed, there is little heavy armour and few strategically critical static locations. Consequently, engendering the irremediable defeat of the organisation as a unified and military force requires the commitment of ground troops. In previous engagements, particularly in Ramadi in 2015, a key tactic of ISIL was to leave small pockets of troops or individuals to conduct harrying actions, attriting their opposition and slowing their advance without scoring, or attempting to score, a broader victory. Counteracting this requires a methodical and committed approach, accepting the potential for losses but ensuring that each area cleared of ISIL forces is secured and protected from counterattacks.

In addition, ISIL regularly operates within a civilian population and in urban locations. Consequently, the potential for collateral damage is high and the requirement

¹⁵⁶ BBC News, "What is 'Islamic State'?" *BBC.com*, accessed December 15, 2015, <http://www.bbc.com/news/world-middle-east-29052144>.

¹⁵⁷ David Rothkopf, "Why the U.S. Can't Beat an Army the Size of a Junior College," *Time.com*, October 31, 2014, accessed November 16, 2015, <http://time.com/3547026/us-army-match-for-isis/>.

for precision is acute. This again reduces the likely efficacy of a campaign based solely on air strikes. Even with the precision weapons currently deployed by the U.S. Air Force, the blast radius is not insignificant. The 'Hellfire' missile, for example, the ordnance most regularly deployed from RPA against high-value targets, uses semi-active laser homing and has a CEP of between three and eight metres, with a blast and fragmentation radius of between fifteen and twenty metres.¹⁵⁸ Collateral damage in this scenario has three potential outcomes. First, the Western press cover conflicts in increasing detail, and there is a strong moral disquiet around civilian casualties.¹⁵⁹ This can have a strong influence on the popular support for a conflict, reducing the scope of operations that are deemed to represent an appropriate balance of risk and reward. Second, ISIL thrive on popular support. Should the coalition of forces that are fighting against them be perceived to have little regard for civilian life, the ability of ISIL to draw in recruits increases. Third, a lack of physical infrastructure and consequent low standard of living can lead to dissatisfaction within society, one of the key drivers in the emergence of militant groups who seek to alter the status quo.¹⁶⁰ Consequently, regardless of the damage caused during the conflict, ensuring that at least basic services are provided shortly after its conclusion is critical in ensuring that the civilian population do not resent those who espouse to be their liberators. It is thus difficult to conceive of

¹⁵⁸ Derek Gregory, "Theory of the drone 12: 'Killing well'," *Geographical Imaginations*, December 8, 2013, accessed January 2, 2015, <http://geographicalimagination.com/tag/hellfire-missile/>; Derek Gregory, "Lines of descent," *Open Democracy*, November 8, 2011, accessed January 2, 2015, <https://www.opendemocracy.net/derek-gregory/lines-of-descent>.

¹⁵⁹ Michael Scheuer, *Imperial Hubris* (Washington, D.C.: Brassey's, 2004), xv, 241.

¹⁶⁰ Corinne Graff, "Poverty, Development, and Violent Extremism in Weak States," in *Confronting Poverty: Weak States and U.S. National Security*, edited by Susan E. Rice, Corinne Graff, and Carlos Pascual (Washington, D.C.: Brookings Institution Press, 2010), 43.

an air campaign in urban locations that, in isolation, is capable of both defeating the adversary and minimising the impact of the conflict on civilians, a critical component of the 'battle for hearts and minds'. This would be exacerbated by the promotion of the ISIL narrative that a reliance on air strikes are a symbol of weakness and indicative of a martial culture that lacks resolution and fortitude.¹⁶¹

Counteracting ISIL with military force also provides a signal to militant organisations that the U.S. positioning of counterterrorism operations at the forefront of national security strategy is more than rhetoric. The degree of threat that ISIL poses to the U.S. way of life in the short term is debateable, but they undoubtedly represent one of the most strategically significant extremist groups in existence, by virtue of their profile and latent potential based on their relative economic and numerical strength.¹⁶² Consequently, by ignoring this threat, U.S. policy makers would undermine their intended position as world leaders and renege on their commitment to counterterrorist operations. This would be detrimental to engendering support for future operations by reducing the faith of the policy makers of allied states that their U.S. counterparts would remain true to their initial strategic goals. In addition, by acting against ISIL, it signals to other groups with similar aims, particularly those who have an anti-U.S. stance, that they will not be allowed to operate with freedom ad infinitum. Furthermore, by attacking ISIL, U.S. policy makers again demonstrate their commitment to upholding the

¹⁶¹ Andrew Johnson, "ISIS to U.S.: 'Don't be Cowards and attack us with drones...send your soldiers'," *National Review*, August 8, 2014, accessed October 12, 2015, <http://www.nationalreview.com/corner/384981/isis-us-dont-be-cowards-and-attack-us-drones-send-your-soldiers-andrew-johnson>.

¹⁶² Global Security, "ISIL-2," *GlobalSecurity.org*, accessed December 15, 2015, <http://www.globalsecurity.org/military/world/para/isil-2.htm>.

Westphalian system. Although the intended outcome of the campaign would be to increase the security of the U.S. population, this is founded on the goal of ensuring the primacy of state governments in the Middle East and their ability to deal with non-state actors. The presence of forces that act outside this framework as a matter of course provide a dimension to international politics which the U.S. strategy and foreign policy is not designed to accommodate.

It is also important to note the difficulty in conducting deterrence operations against ISIL. The implications of this for the B-21 is that it will be used solely as a weapon within a hot war environment, rather than being an escalatory tool that, through its mere forward deployment or limited operations, could change the course of the conflict. The concept of deterrence is predicated on a common understanding of rationality. When engaging with a rational actor, some estimation of the scope of the costs that can be imposed may be estimated on the basis of shared understandings of aims and relative strength. This assumption of rationality undermines the theory of deterring non-state actors through the demonstration of power.¹⁶³ ISIL's understanding of costs and goals are fundamentally different, not least because their overarching aims are perceived to be God-given. Consequently, to demur from the activities that they perceive to be theologically-ordained would be blasphemous, and there is no cost that can be threatened that would outweigh this driver. In addition, ISIL presents a public position that it is confident of its ultimate success in a conflict with the U.S. military and

¹⁶³ Daniel L. Byman, Matthew C. Waxman, and Eric Larson, *Air Power as a Coercive Instrument* (Santa Monica: RAND Corporation, 1999), 126; Byman et al., *Air Power as a Coercive Instrument*, 125-126.

an international coalition.¹⁶⁴ To back down from this rhetoric would be to cede control, undermining their momentum and requiring a change in narrative that may not engender popular support. Similarly, ISIL's bureaucracy and infrastructure is not part of a broad international network and, as a result, sanctions are difficult to implement. Concerted efforts to stop refineries from purchasing oil drilled in ISIL's territory may stunt the organisation's funding, but is difficult to regulate and may not have a tangible impact for some time.

Passive deterrence and demonstrating to ISIL the resilience of the U.S. social order to ISIL's attacks is similarly unlikely to be efficacious unless there is a paradigm shift in the rhetoric of U.S. politicians and media. President Obama's State of the Union Address in January 2016 outlined the position that ISIL, while posing a limited threat to the security of U.S. citizens through sporadic terrorist attacks, do not threaten the political or social order of the U.S.¹⁶⁵ However, this position was decried by right-wing politicians and the associated media, with Senator Rubio stating that Obama "consistently underestimated" the group.¹⁶⁶ Given this interpretation of ISIL's threat, deterring ISIL's attacks through demonstrating restraint in response is antithetical to the U.S. government's priority of defending its citizens. In addition, given that goading the U.S. public and policy makers is a theme of ISIL's propaganda and activities, it seems

¹⁶⁴ Wood, "What ISIS Really Wants."

¹⁶⁵ The White House, "Remarks of President Barack Obama – State of the Union Address As Delivered," *Whitehouse.gov*, January 13, 2016, accessed February 20, 2016, <https://www.whitehouse.gov/the-press-office/2016/01/12/remarks-president-barack-obama-%E2%80%93-prepared-delivery-state-union-address>.

¹⁶⁶ CBS News, "Transcript: Sixth Republican top-tier debate 2016," *CBSnews.com*, January 15, 2016, accessed January 21, 2016, <http://www.cbsnews.com/news/transcript-sixth-republican-top-tier-debate-2016/>.

likely that a lack of U.S. response would be spun as a strategic success, making ISIL's recruitment easier and increasing the pressure on U.S. policy makers to respond.

ISIL's forces are technologically limited in comparison with the U.S. military and, in numerical terms, the U.S. military also has a strong advantage. A bare comparison of force capability based on numbers and hardware can, however, be unhelpful, giving only a limited indication of effectiveness. Nevertheless, it is significant that ISIL lacks a sophisticated IADS, long range targeting and electronic warfare equipment. This highlights the long-term challenge for ISIL's military in hampering the operations of U.S. forces. It would be naive to equate this to a simple U.S. military victory - the history of irregular warfare has comprehensively demonstrated the reverse. Nevertheless, the U.S. military technological capability is a fundamental component of its effectiveness and ability to maximise its capacity.

The inability of ISIL to disrupt the U.S. military's electronic systems does not guarantee U.S. victory. This is also prime example of a situation in which a dissuasion strategy is unlikely to be efficacious: ISIL appear to be prepared to fight U.S. forces regardless of their relative lack of capability and limited defence spending. ISIL's likely avoidance of a conflict which pits their military against U.S. forces in a quasi-symmetric fashion in the near term challenges the U.S. military's dominant operational capacity.¹⁶⁷ In particular, ISIL are likely to operate in small groups, making it difficult for the U.S. forces to inflict a decisive defeat. The lack of an obvious centre of gravity within ISIL that can be easily attacked with kinetic force is typical of irregular conflict. The Vietnam

¹⁶⁷ David E. Johnson, "Ground Combat," *RAND Corporation*, December 23, 2015, accessed February 2, 2016, <http://www.rand.org/blog/2015/12/ground-combat.html>.

conflict demonstrated the limits of the effectiveness of U.S. strike capability against an irregular opponent.¹⁶⁸ As a result, targets for the U.S. military are likely to be tactical, requiring the precise delivery of ordnance, rather than ordnance designed for a strategic strike against a fixed structure. In addition, as the conflict between ISIL forces and the U.S. military develops, ground forces are likely to require support. Consequently, it is likely that U.S. artillery and air strikes will be most regularly used to assist ground operations, rather than being strategic independent attacks.

Role of the B-21

The likely fluidity of a hot war scenario involving U.S. ground forces and ISIL's military, as well as ISIL's logistics and command structure, limits the number and value of strategic targets. However, advances in targeting systems in the late 1990s has enabled what were nominally strategic bombers to deploy precision-guided conventional ordnance in a CAS role.¹⁶⁹ U.S. B-52s and B-1Bs deployed the majority of air-to-ground ordnance throughout Operations Enduring Freedom and Iraqi Freedom.¹⁷⁰

The two major attributes common to U.S. LRSBs that facilitate effective action in CAS is the systems' ability to loiter and deploy a large volume of ordnance against

¹⁶⁸ T. X. Hammes, "Independent long-range strike: A failed theory," *War on the Rocks*, June 8, 2015, accessed August 23, 2015, <http://warontherocks.com/2015/06/independent-long-range-strike-a-failed-theory/>.

¹⁶⁹ Jonathan Marcus, "Analysis: Risks of new B-52 role," *BBC News*, December 6, 2001, accessed September 17, 2015, http://news.bbc.co.uk/2/hi/south_asia/1695292.stm; Robbin Laird, "What The B-3 Bomber Should Be," *BreakingDefence.com*, May 12, 2015, accessed August 21, 2015, <http://breakingdefense.com/2015/05/what-the-b-3-bomber-should-be/>.

¹⁷⁰ U.S. Air Force, *Securing the High Ground: 2010 Combat Air Force Strategic Plan* (Virginia: U.S. Air Force, 2010), 14.

numerous targets in a single sortie. This is, however, only effective if the air defence systems of the opposition are incapable of challenging the loitering aircraft.

Consequently, although such an activity would be difficult to conduct against an opposition military that has the technological capability of China, for example, this threat has not been posed to the U.S. LRSB fleet operating in the Middle East. As a result, B-1Bs and B-52s have been deployed over Afghanistan and Iraq and assigned to orbit in "a block of grid-box engagement zones" until requested by a forward air controller when a target has been identified and air strikes are required.¹⁷¹ A typical B-1B sortie in Operation Enduring Freedom during its early years was described by aircrew as containing strikes on around eighteen targets in multiple locations.¹⁷² The maximum capacity to conduct strikes in this role is limited only by the quantity of payload carried and pilot fatigue. Given that U.S. B-2 pilots have undertaken missions with flights in excess of thirty hours, and the B-21 is likely to be able to undertake missions of a similar length, a fleet of LRSBs can provide almost universal coverage of the battlespace in which the bulk of the combat against ISIL's military would take place.¹⁷³ This allows several controllers to task the aircraft during the same sortie, with satellite uplinks of targets demonstrating the flexibility that the systems can provide.¹⁷⁴ By way of comparison, a "prolonged" mission conducted with an A-10 Thunderbolt, a system that

¹⁷¹ Grant, *Return of the Bomber*, 14.

¹⁷² *Ibid.*, 15.

¹⁷³ Drew, "It's large and lethal"; Andrew Hunter, "Should the United States Buy the Long Range Strike Bomber? Yes," *War on the Rocks*, July 9, 2015, accessed August 5, 2015, <http://warontherocks.com/2015/07/should-the-united-states-buy-the-long-range-strike-bomber-yes/>.

¹⁷⁴ Grant, *Return of the Bomber*, 14.

was designed specifically for CAS missions and has a reputation for a high loiter time, can, at its longest, last for four hours.¹⁷⁵

This flexibility is further manifested in the variety of payload configurations and quantity of lightweight 'smart' ordnance that LRSBs can deploy. Consequently, a range of different targets can be attacked in a dynamic combat environment, with the LRSB able to respond to circumstances that require strikes against heavy armour, tactical and mobile targets or dug-in positions. During the six weeks of Operation Desert Storm, coalition air forces struck 35,085 targets.¹⁷⁶ Assuming that the B-21 is able to carry a payload that equates roughly to the maximum payload of the B-2, and that thirty-five are deployed on one sortie in theatre daily - around one third of the total number of systems due to be held in the U.S. Air Force inventory - this would enable the LRSB fleet to deploy 2,800 500lb GBU-31 bombs with JDAM guidance kit every twenty-four hours. In one week, the B-21 fleet alone could deliver fifty-six percent of the total strikes prosecuted in Operation Desert Storm, providing precise and timely support to ground operations.¹⁷⁷

Using ship- or land-launched missiles to perform a similar role is impractical due to the cost of individual missiles and the difficulty of supplying such volume to maintain a strike performance that would match that of an LRSB fleet.¹⁷⁸ Using the Raytheon

¹⁷⁵ Winslow Wheeler, "The MQ-9's Cost and Performance," *Time*, February 28, 2012, accessed February 16, 2015, <http://nation.time.com/2012/02/28/2-the-mq-9s-cost-and-performance/>.

¹⁷⁶ Haddick, "Why the New Bomber is a Good Investment".

¹⁷⁷ Ibid.

¹⁷⁸ Ibid.

"Tomahawk" as an example, long range cruise missiles with the precision that is required for them to be used flexibly in support of ground operations are likely to cost in the region of \$1.8m per missile. By comparison, a Mk-84 dumb bomb with the JDAM guidance package costs around \$28,000.¹⁷⁹ Although the explosive power is markedly lower than the Tomahawk, it is adequate in most CAS missions. The largest missile cruiser currently fielded, Russia's *Admiral Nakhimov*, can carry a maximum of eighty cruise missiles and ninety-six anti-aircraft missiles.¹⁸⁰ A single B-1B can carry twenty-four cruise missiles.¹⁸¹ Aside from the use of smaller ordnance, if the B-21 can carry a similar number of cruise missiles as the B-1B and just fifteen aircraft are deployed in support of anti-ISIL operations in the Middle East, the number of targets that can be struck by the fleet without their being re-armed is more than twice the total number of missiles, both cruise and anti-aircraft, carried by a dedicated missile cruiser.¹⁸²

There is, however, a disconnect between the argument that the B-21 can be stationed in the U.S. homeland and also convert its "long range" capability into "long endurance" to loiter over the battlefield in Syria and Iraq. In both Operation Desert Storm and Operation Enduring Freedom, LRSBs flew lengthy sorties, with B-2s launching from Whiteman Air Force Base to strike Taliban targets and B-52s flying

¹⁷⁹ Federation of American Scientists, "Mk84," *Fas.org*, last Modified February 17, 2015, accessed March 26, 2016, <http://fas.org/man/dod-101/sys/dumb/mk84.htm>.

¹⁸⁰ Oleg Kuleshov, "Largest missile cruiser to hold hypersonic missiles," *Russia & India Report*, November 12, 2015, accessed March 29, 2016, http://in.rbth.com/economics/defence/2015/11/12/largest-missile-cruiser-to-hold-hypersonic-misiles_539715.

¹⁸¹ Boeing, "B-1B Lancer," *Boeing.com*, accessed October 23, 2015, <http://www.boeing.com/defense/b-1b-bomber/>.

¹⁸² *Ibid.*

missions of over 14,000 nautical miles.¹⁸³ Although the aircraft can be provided with new targeting information en route, they were launching against static and pre-ordained targets. Pilot fatigue meant that once ordnance had been launched, they left the battlespace without loitering and awaiting further targeting information. Unless the LRSB is entirely remotely piloted—which seems unlikely—in order to exploit the long endurance capability, the systems will have to launch from bases close to the theatre, undermining the precept of the LRSB allowing U.S. policy makers to avoid relying on overseas bases. In addition, to maximise its time over the battlespace, the LRSB requires air-to-air refuelling. This further increases the reliance on the policy makers of neighbouring states continuing to be receptive to the U.S. Air Force operating from their territory, and also that appropriate base security can be maintained.

One of the defining features of the B-21 is its low-observable characteristics. In this scenario, however, this is likely to be redundant as ISIL do not have sophisticated A2AD networks or Integrated Air Defence Systems (IADS). There is little need to repeat the extreme caution at the commencement of Operation Enduring Freedom, which saw B-2s being used to suppress what were believed to be anti-aircraft missiles capable of successfully engaging non-stealthy aircraft.¹⁸⁴ Any U.S. LRSB would be able to operate with almost total impunity within the battlespace in this scenario. As such, claims that the B-21 is a "cost-effective" method of delivering large quantities of ordnance in unconventional warfare while being used in a CAS, interdictory, or

¹⁸³ Drew, "It's large and lethal".

¹⁸⁴ Grant, *Return of the Bomber*, 15.

battlespace preparation role are misguided.¹⁸⁵ Compromises to range and payload will have to be made in the airframe design if the aircraft is to have truly low-observable characteristics. Consequently, greater cost efficiency would be attained were the system to be designed to carry a large weight and range of ordnance, and deploy it accurately, without regard for its observability.

If U.S. policy makers wanted to provide CAS and anticipated operating against opposition with limited technological capability, it would be more appropriate to base a new LRSB on the B-52 than the B-2. There is limited risk to the aircraft from the opposition forces and the design focus would be on the critical attributes of endurance and carrying capacity, rather than survivability.

The effective conduct of CAS and air interdiction from a loitering aircraft with no low-observable properties has been demonstrated by the performance of the AC-130, a Lockheed Martin C-130 "Hercules" that is modified by Boeing to contain an array of ground attack equipment, notably heavy cannons.¹⁸⁶ This is not a new concept, the original modification of the Hercules to create a dedicated ground attack platform was originally fielded in the early 1970s.¹⁸⁷ The design has been refined and the aircraft's performance was lauded for its effectiveness in Afghanistan and Iraq, indicating again that low observability adds little, if any, effectiveness if the aircraft is used in a

¹⁸⁵ Saylor and Scharre, "The Imperative of Long-Range Strike."

¹⁸⁶ U.S. Air Force, "AC-130U," *AF.mil*, January 20, 2016, accessed April 18, 2016, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104486/ac-130u.aspx>.

¹⁸⁷ *Ibid.*

permissive air environment to conduct CAS, air interdiction or battlespace preparedness.¹⁸⁸

Alternatively, if the DoD required the ability to deploy heavier ordnance from the aircraft, including cruise missiles, if the situation demanded, it is not inconceivable that a modified version of a commercial aircraft, that has already been designed to maximise haulage capability, could be used. It is difficult to accurately predict the cost of developing such an aircraft but studies undertaken at the U.S. Air University, Alabama, in 1996 suggest that a Boeing 747-400 could be purchased and re-fitted with bomb delivery mechanisms for just over \$500m, after accounting for inflation.¹⁸⁹ However, the carrying capacity of a Boeing 747 variant is, at 248,600lb, more than three times that of the B-1B.¹⁹⁰ This would theoretically enable to aircraft to carry over one hundred cruise missiles or multiple hundreds of smaller air-launched ordnance.¹⁹¹ In addition, its endurance capability without air-to-air refuelling would be greater than the B-1B or the B-2 but, at around 8,300 miles, approximately 500 miles shorter than the B-52.¹⁹² The direct conversion of a Boeing 747 to a bomber is technically challenging, in part because

¹⁸⁸ U.S. Air Force, "AC-130U".

¹⁸⁹ Bryan J. Benson, "Transport Bombers: Shift in Precision Guided Munitions Delivery," *School of Advanced Airpower Studies*, 1996, republished online by Federation of American Scientists, February 17, 2015, accessed March 25, 2016, <http://fas.org/man/eprint/benson.htm>.

¹⁹⁰ U.S. Air Force, "B-1B Lancer."

¹⁹¹ Tyler Rogoway, "Why Boeing's Design For A 747 Full Of Cruise Missiles Makes Total Sense," *Foxtrot Alpha*, July 19, 2014, accessed March 22, 2016, <http://foxtrotalpha.jalopnik.com/why-boeings-design-for-a-747-full-of-cruise-missiles-ma-1605150371>.

¹⁹² U.S. Air Force, "B-52 Stratofortress".

of its low-wing structure destabilising the aircraft at the point of ordnance deployment.¹⁹³ Nevertheless, considering the potential of the aircraft as a bomber provides an indication of the relative lack of capability of the B-21 performing a CAS role in an uncontested air environment against a long range strike aircraft that has been designed with this function as its primary role.

It has been proposed that the B-21 will also perform an ISR role.¹⁹⁴ In this scenario, such capability would be beneficial, augmenting the capabilities of ground forces. In addition, the LRSB would potentially be able to operate independently from ground control and conduct strikes against targets of opportunity while loitering. This would, however, again compromise the strike capacity of the system, requiring additional hardware and, potentially, additional crewmembers to operate the ISR equipment. The cost and endurance capability of the remotely piloted aircraft available to the U.S. military, particularly the MQ-9 'Reaper', suggest that such a compromise is unnecessary.¹⁹⁵ Both systems can be fielded simultaneously as part of the broader network of military operations, allowing the LRSB to leverage its maximum strike capability. It is also more difficult to conduct stealthy ISR missions in daylight with an LRSB; even without sophisticated detection systems, the aircraft is likely to be visible when manoeuvring into an appropriate range from which to deploy its ISR sensors and hardware.

¹⁹³ Strategy Page, "Warplanes: Let Us Try Again To Turn The 747 Into A Bomber," *StrategyPage.com*, August 23, 2009, accessed March 20, 2016, <https://www.strategypage.com/htm/htairfo/20090823.aspx>.

¹⁹⁴ Schreiner, "B-2 Pilot's Lessons."

¹⁹⁵ Simha, "Supersonic folly".

Despite the quantity of ordnance that the B-21 could deploy in a CAS role in this scenario, two of the fundamental tenets of the system's proponents, its ability to strike targets after launching from the U.S., and its penetrative capability, are redundant. The long endurance capability of the B-21 can only become an effective attribute if the system launches from bases close to its area of operations, thus creating the requirement for the U.S. policy makers to maintain friendly relationships with the governing bodies of states in the region. ISIL do not possess an IADS or A2AD network that is able to defend against the B-1B or B-52 and further low observability features add little value to the system's performance. The "dislocated authority" of ISIL's military and political structure results in targeting and identification challenges for the U.S. military engaged in operations against it.¹⁹⁶ General Carlisle, one of the U.S. Air Force's "most ardent champions of air power" conceded that ISIL will "never be defeated from the air".¹⁹⁷ Air power provides unique ISR capability and potentially vital support to ground operations in both strategic and tactical capacities. The lack of strategic targets in this scenario, as well as the desire to avoid infrastructure damage, renders air power's strike capability most effective when deployed in a CAS role or used to deploy ordnance against high-value targets. The B-21, with its long endurance and payload flexibility, is capable of CAS, but it is not optimised for performance in this capacity due to the emphasis on low observability. Similarly, although the B-21 could be used to deliver the small, accurate ordnance that is likely to be used against high-value targets, U.S. Army Colonel Steve

¹⁹⁶ Byman et al., *Air Power as a Coercive Instrument*, 126; Byman et al., *Air Power as a Coercive Instrument*, 115.

¹⁹⁷ Erwin, "Best of times, worst of times for air power," *National Defense Magazine*, July, 2015, accessed September 24, 2015, <http://www.nationaldefensemagazine.org/archive/2015/July/pages/BestofTimesWorstofTimesforAirPower.aspx>.

Warren's assertion that the battlefield successes that Iraqi and Syrian forces have had against ISIL in the past year is, at least in part, "attributable to the fact that the organization is losing its leadership" because of Coalition air strikes; this role is currently being performed more than adequately by MQ-9s and medium range strike aircraft.¹⁹⁸ Deployment of B-21s in this scenario would undoubtedly improve U.S. military capability, but it would represent a failure on the part of the U.S. military procurement process to adequately foresee future challenges and provide appropriate equipment.

Hypothetical Scenario Three: Countering a Nuclear Iran

Iran has used the relaxation of sanctions to improve their economic position. In addition, the nuclear deal agreed in 2015 has prevented comprehensive inspections of Iranian nuclear facilities. Iran has exploited this lack of oversight to create a nuclear warhead. Russian missile technology has been obtained by the Iranian military and they have claimed the ability to launch a nuclear strike over inter-continental range within two hours of the launch order being given.

Iran's increasing military and economic strength has encouraged Iranian policy makers to take an aggressive foreign policy stance. Anti-Israeli rhetoric has been a theme of public pronouncements by the Iranian government, alongside condemnation of U.S. military and diplomatic involvement in the Middle East. Diplomatic relations between Iran and Saudi Arabia deteriorated after the Shia cleric Nimr al-Nimr was executed by the Saudi Arabian security forces in January 2016.¹⁹⁹ Iranian naval

¹⁹⁸ Yeganeh Torbati and Walter Strobel, "U.S.-led air strikes kill IS leaders linked to Paris attacks," *Reuters.com*, December 29, 2015, accessed April 18, 2016, <http://www.reuters.com/article/us-mideast-crisis-islamicstate-strikes-idUSKBN0UC1B220151229>.

commanders have also expressed their desire to attain a dominant position and control shipping in the Persian Gulf. The Iranian military have deployed assets to the Strait of Hormuz and Iranian policy-makers have re-iterated threats to close the strategically critical body of water if any threat is made to Iranian security. The Iranian forces do not, however, have technological parity with the U.S. military. Their IADS prevents most U.S. aircraft from operating with total impunity but is vulnerable to being overwhelmed by advanced electronic warfare and air-to-ground missiles with passive radar homing. In addition, the Iranian Air Force operates only a limited number of air superiority fighter aircraft. Iranian ground forces are also less well equipped than their U.S. counterparts, lacking fifth-generation heavy armour and artillery. In a conventional conflict, they are likely to provide little resistance to a concerted assault by U.S. forces.

Strategic considerations for U.S. military action

Iran's geographic location gives the state strategic significance and facilitates its close interaction with neighbouring states. In purely military terms, this impacts the dynamic of defending against an Iranian attack. A gradual build-up of Iranian forces is likely to be noted by those that it is traditionally antithetical to, particularly given the ISR capability of the U.S. and the continued military readiness of neighbouring states. Nevertheless, a situation could escalate rapidly and an Iranian missile launch could leave the state in which the target lies with little time to deploy countermeasures. In addition, Iran has a geographically significant strategic position in controlling the Strait of Hormuz, through which shipping, notably oil tankers, must pass in order to enter the

¹⁹⁹ BBC News, "Sheikh Nimr al-Nimr: Saudi Arabia executes top Shia cleric," *BBC.com*, January 2, 2016, accessed January 3, 2016, <http://www.bbc.com/news/world-middle-east-35213244>.

Persian Gulf.²⁰⁰ This represents a potential economic stranglehold on Kuwait, Bahrain, Qatar, and the United Arab Emirates. In addition, if an adversary of Iran is able to conduct naval operations in the Persian Gulf, it potentially provides the opportunity to conduct sea-launched cruise missile strikes and aircraft carrier operations from close proximity to Iranian territory. Unimpeded seaborne operations in the Persian Gulf by anti-Iranian naval forces could also facilitate troop landings and, if an appropriate logistical chain is created, resupply operations for ground forces operating on Iranian soil.

An Iranian military that can deploy nuclear weapons increases the threat that it poses to neighbouring states, and potentially provides Iranian policy makers with the opportunity to cause catastrophic damage to allies of the U.S. in the Middle East. Consequently, if the U.S. military is to be able to prevent the effective operation of Iranian forces it must have the ability to respond quickly in the event of the rapid escalation of a conflict, or the capacity to pre-empt an Iranian attack and degrade the Iranian military, rendering them unable to provide meaningful opposition to U.S. forces. The consequence, in the hypothetical scenario described above, of Iranian policy makers' potential to launch a nuclear strike with limited prior warning in response to a perceived or real threat to their existence is that an opposition force must be able to negate this capability without giving the Iranian forces an indication of the imminence of the attack.

The short-term goal of U.S. military action against Iran in this hypothetical scenario, whether it is used to deploy kinetic force or simply manoeuvres and re-

²⁰⁰ General Lloyd J. Austin III, "Posture of U.S. Central Command".

positions, is to deter or coerce Iranian policy makers into stepping back from an aggressive course of action. Long-term, it is to change the mindset of Iranian policy makers, reducing the potential for Iranian military action against allies of the U.S. in the Middle East. However, given the longevity and depth of anti-U.S., and particularly anti-Israeli, feeling in Iran, a fundamental change in opinion of these states and a radical re-framing of Middle Eastern alliance structures is unlikely. As a result, a more realistic approach is to engender a mindset amongst Iranian policy makers that the costs of engaging in disruptive or aggressive action would exceed the potential gains.

A strategy that is reliant on the success of active deterrence is, in this scenario, inherently risky. The line between the success and failure of deterrence is, by definition, extremely slim. If the Iranian military do not deploy a nuclear weapon or launch a conventional strike over its borders, the deterrence can be viewed as a success, albeit other variables may influence Iranian policy makers. Conversely, any strike launched by the Iranian military indicates that deterrence has failed; it is only after the event that the strategy is proven to be ineffective. Signalling intent to Iranian policy makers is a delicate balance and deterrence may fail as a result of either Iranian policy makers doubting the willingness of their U.S. counterparts to order a kinetic attack, or their belief that a U.S. strike is imminent and, consequently, they must act pre-emptively. The temporal differentiation between the two sides of the theoretical line demarcating the success or failure of deterrence is similarly narrow.

The actions of Iranian policy makers demonstrate a degree of rationality and an appreciation of the cost-benefit dyad that is familiar to their U.S. counterparts, even if

their decisions are influenced by contextual factors that may not appear rational to U.S. policy makers.²⁰¹ The imposition of costs can be more effectively targeted against Iran than against a non-state actor and the apparent success of sanctions in modifying the actions of Iranian policy makers in the second decade of the twenty-first century is indicative of this situation.

An Iranian nuclear first strike is likely to be "suicidal" for the regime and would therefore be avoided by Iranian policy makers where possible.²⁰² However, a strategic nuclear weapon provides Iranian policy makers with a tool that could be used in response to an attack on Iran. More importantly, it could also be used pre-emptively if Iranian policy makers perceive their position to be under imminent threat from another state. Relying on an active deterrence strategy that is based on threatening retaliation in the event of an Iranian nuclear strike risks sacrificing a major city in a state that Iranian policy makers believe to be planning to attack Iran; if Iran launches a strategic nuclear weapon at an urban centre, regardless of the costs that could be imposed on the regime following the manifestation of a failed deterrent strategy, the damage is likely to be appalling. It is unlikely that U.S. policy makers or their partners in the region would be willing to absorb this cost and rely solely on the threat of retaliation to prevent its imposition.

²⁰¹ Mehdi Khalaji, "A Deal Among Enemies," *The Washington Institute for Near East Policy*, October 16, 2015, accessed January 4, 2016, <http://www.washingtoninstitute.org/policy-analysis/view/a-deal-among-enemies>.

²⁰² Matthew Kroenig, "Time to Attack Iran: Why a Strike is the Least Bad Option," *Foreign Affairs*, 91, no. 1 (January/February 2012): 78.

Passive deterrence based on a presumption of preventing a launched Iranian nuclear weapon reaching its target is a similarly risky strategy in this scenario given its destructive potential. Of Iran's neighbours who may be susceptible to a missile attack, only Israel has the potential to be able to intercept the ordnance before it reaches its target. Similarly, the short temporal period between a missile being launched in Iran and reaching its target in the region is indicative of the danger and difficulty of attempting to demonstrate the ability to adequately defend against a strike.

The destructive potential of an Iranian strategic nuclear weapon and the likely reluctance of U.S. policy makers to risk its use means that a strategy based on preventing its launch is more attractive than threatening the destruction of the state in the event that the ordnance is deployed. Deterring Iranian policy makers from deploying a strategic nuclear weapon therefore requires an active deterrence strategy that balances signalling the intent and capability to prevent its launch, without risking an Iranian pre-emptive attack that is founded on the belief that a strike on Iranian nuclear facilities is imminent.

The destruction of Iranian nuclear weapon facilities is likely to require a large weight of ordnance. Even if the Iranian nuclear missile is not ultimately designed to be silo-launched, it should be expected that its location prior to deployment is well protected, both with IADS to prevent ordnance from reaching them, and construction that mitigates the effect of any ordnance that is deployed. It was with the purpose of striking underground and hardened static targets that the U.S. military procured the GBU-57A/B Massive Ordnance Penetrator. Secretary of State John Kerry obliquely

referred to the potential of these weapons when questioned about the options available to U.S. policy makers were Iran to renege on the nuclear deal agreed in 2015.²⁰³

The parlous state of Middle Eastern politics in the wake of the U.S.-led invasions of Afghanistan and Iraq indicates the significance of post-conflict planning; the heated debates within the DoD about responsibility for the reconstruction of Iraqi infrastructure and subsequent creation of the Office of the Coordinator for Reconstruction and Stabilization Department within the Department of State is an indication of the centrality of this component in defining the ultimate success of military action. The U.S. military's approach to conflict that puts a premium on civilian life should interlock with counter-extremism strategies that are founded on the assumption that deprivation can spawn radicalisation. The consequence of this is that collateral damage must be kept to a minimum to maximise support for, or acceptance of, U.S. military action. This is particularly the case if U.S. policy makers believed that simply removing Iran's nuclear capabilities would not alter the state's disruptive and destabilising effect on the region in the medium to long term and thus facilitating the smooth transition of power to a new government would be an essential component in ensuring that the conflict ultimately has positive consequences in the long term.

Further to maintaining infrastructure, it is important that any U.S. military action taken against Iranian targets does not result in a power vacuum in Iran that can be exploited by groups that have the potential to destabilise the region further. The key decision for U.S. policy makers and any supporting coalition in this scenario is whether

²⁰³ Michael Crowley, "Plan B For Iran," *Politico.com*, June 24, 2014, accessed August 29, 2015, <http://www.politico.com/magazine/story/2015/06/plan-b-for-iran-119344>.

the existing Iranian government can be deterred or coerced away from threatening the security of the U.S. or its allies through engendering an appreciation of the ineffectiveness of Iranian forces. If this is not the case, the dynamic of the conflict is altered dramatically and introduces the likely requirement for a ground force presence in Iran to forcibly remove the Iranian government and oversee the transition of power.

Creating a coalition to counter the aggression of Iranian policy makers has political as well as operational significance, and is made more challenging by the generally low opinion of the U.S. in the region.²⁰⁴ Such an alliance would, in this scenario, demonstrate that a state cannot operate outside the accepted international system without risking extreme censure in the form of kinetic attack, again bolstering the attempts of U.S. policy makers to maintain international institutions. However, in order to demonstrate the global leadership that the U.S. policy makers have also espoused, every effort needs to be made to engender near-universal support. Consequently, if the intention of U.S. policy makers is to degrade Iran's military capability in order to deter any acts of aggression, the blessing of international organisations such as the UN may be required. By definition this stalls U.S. military action, potentially providing Iran with the opportunity to launch their own attack before the U.S. military is turned onto Iranian targets.

Role of the B-21

There are two key components to this conflict: first, Iranian policy makers' capability to deploy a strategic nuclear weapon must be removed. Second, if a military

²⁰⁴ Richard Wike, Bruce Stokes, and Jacob Poushter, "America's Global Image," *Pew Research Center*, June 23, 2015, accessed January 14, 2016, <http://www.pewglobal.org/2015/06/23/1-americas-global-image/>.

campaign is to be prosecuted with the intention of forcing the capitulation of the Iranian political regime, the capability of the Iranian military must be appreciably degraded. The B-21 has unique attributes that could be critical in the successful prosecution of the former mission, but it does not provide a unique effectiveness; the ordnance required to prosecute these phases of the conflict successfully can be deployed by medium range strike aircraft, or via long range cruise or ballistic missiles. Furthermore, the B-21's contribution in the latter mission, particularly in a tactical role, requires protective support to ensure the aircraft's survival, necessitating overseas basing for U.S. aircraft. There is potential for the B-21 to be used as part of a deterrent strategy to prevent aggressive action being instigated by Iranian policy makers and could demonstrate the U.S.'s ability to conduct strikes on Iranian facilities. However, as will be discussed below, the aircraft is unlikely to allow U.S. policy makers to bridge the gap between signalling intent and capability without risking the pre-emptive launch of an Iranian nuclear weapon.

While the USAF's General Carlisle may be correct in his assertion that "no single tactical strike is going to change the war", denying the opposition the ability to deploy their most destructive weapon radically alters the shape of the conflict.²⁰⁵ The destruction of underground targets from the air can be difficult, requiring specialist ordnance and precise targeting.²⁰⁶ Iran's nuclear facilities in this scenario, in particular any nuclear missile silos, fall into this category of target. In the existing U.S. arsenal of air-launched ordnance the GBU-57A/B is likely to be necessary if these targets are to be

²⁰⁵ Erwin, "Best of times, worst of times for air power".

²⁰⁶ Michael Crowley, "Plan B For Iran".

comprehensively degraded, and only the B-2 and B-52 are capable of carrying this ordnance, with the B-21 likely to be added to this list.²⁰⁷ However, an air-launched cruise missile with the same penetrative capability within a smaller casing is under development, anticipated to be operational roughly simultaneously with the introduction of the B-21.²⁰⁸ This ordnance is intended to be able to be carried by medium range strike aircraft. In this scenario, however, if the U.S. intends to carry out a strike without using the airspace of any state other than Iran or deploying an aircraft carrier, it will require the ordnance to be developed in accordance with the proposed timeline and a delivery system with greater range than a medium range strike aircraft.

If U.S. policy makers engender a coalition of states, including those in the Middle East, to oppose Iranian action, it would facilitate the deployment of U.S. aircraft from closer to Iran and potentially provide a greater range of mission routing options. This would also provide U.S. policy makers with the opportunity to escalate the conflict prior to committing to military action; the deployment of attack aircraft would be a demonstration of capability and intent. If this fails to coerce Iranian policy makers away from an aggressive course of action, the aircraft are in a position to conduct a strike more rapidly than if they were required to launch from the U.S. U.S. policy makers could order a strike on Iranian air defences without tying the raids to an attack on Iranian

²⁰⁷ Global Security, "GBU-57/B Massive Ordnance Penetrator (MOP)," *GlobalSecurity.org*, accessed January 1, 2016, <http://www.globalsecurity.org/military/systems/munitions/mop.htm>.<http://www.globalsecurity.org/military/systems/munitions/mop.htm>.

²⁰⁸ Hans M. Kristensen, "LRSO: The nuclear cruise missile," *Federation of American Scientists*, October 20, 2015, accessed November 2, 2015, <https://fas.org/blogs/security/2015/10/lrso-mission>; Department of the Air Force, Air Force Materiel Command (AFMC), Air Armament Center (AAC), Capabilities and Planning Development Division (AAC/XRS), "Next Generation Penetrator," Broad Agency Announcement, No. BAA-PKES-11-0002_NG_Penetrator_-_Final. Florida, 2010.

nuclear facilities and attempt to deter Iranian policy makers from further aggressive behaviour by demonstrating the fallibility of their IADS and A2AD network. However, there is a danger that such a strike is misconstrued as a precursor to a strike on the nuclear facilities, rather than a distinct mission. As such, it could engender the pre-emptive launch of Iran's nuclear weapon.

The availability of bases in this scenario also creates the opportunity to support the LRSB mission against Iranian nuclear missile facilities with medium range strike aircraft creating a gap in the IADS, as they did at the commencement of Operation Desert Storm, through which the LRSB can manoeuvre into an appropriate position from which to deploy ordnance.²⁰⁹ However, the intention in the first Gulf War was to delay the advance warning that the Iraqi military would otherwise have had of the forthcoming assault.²¹⁰ In this scenario, however, if a B-21 were tasked with deploying ordnance against an Iranian nuclear missile launch site it is intended to remain undetected throughout its time in Iranian airspace. If this is to be the case, it is reliant on its low observable features, rather than supporting aircraft degrading the IADS. Furthermore, if the ability to create a gap in the Iranian IADS exists, this reduces the potential advantage of leveraging the B-21's low observable properties. Given that a medium range strike aircraft tasked with deploying ordnance against Iranian nuclear facilities that is launched from the same base as those that are intended to degrade the IADS has adequate range to conduct its mission, the supporting operations increase the potential for its success, thus reducing the need to deploy the B-21.

²⁰⁹ Benjamin S. Lambeth, *The winning of air supremacy in Operation Desert Storm* (Santa Monica: RAND Corporation, 1993), 2.

²¹⁰ *Ibid.*, 2.

Using an ICBM to strike a hardened static target in Iran remains an option for U.S. policy-makers, negating the otherwise singular advantage that the long range capability of the B-21 could provide in this scenario. The seeming lack of a conventional warhead on U.S. ICBMs is an impediment to the use of such a weapon as any strike with today's ICBMs would, by definition, be nuclear, but former Defense Secretary Gates's statement that "in addition to the nuclear deterrent... we have prompt global strike affording us some conventional alternatives on long range missiles that we didn't have before" suggests that a conventional ICBM may be imminent, or possibly already available.²¹¹ The development of non-nuclear ICBMs as part of a "Prompt Global Strike" system with improved accuracy has the potential to reduce the political impediment to conducting an inter-continental missile strike. However, this technology, which is further considered below, is embryonic and, while it may provide an effective capability in the future, it is conceptually and practically unproven.²¹² Nevertheless, the primary impediment to Prompt Global Strike is the missile propulsion and control, rather than the warhead, and the emphasis on the creation of such a weapon suggests that developing conventional long range strike via an inter-continental missile is a consideration for the DoD.

The refusal of U.S. policy makers to agree to a "No First Use" policy, as well as the 2010 Nuclear Posture Review's pointed exclusion of Iran and North Korea as targets for a nuclear strike, indicate the willingness of U.S. policy makers to deploy nuclear

²¹¹ Amy F. Woolf, *Conventional Prompt Global Strike and Long-Range Ballistic Missiles: Background and Issues* (Washington, D.C.: Congressional Research Service, 2015), 31; DefenseTech, "Gates Says U.S. Has Conventionally Armed ICBMs," *DefenseTech.org*, April 12, 2010, accessed October 17, 2015, <http://www.defensetech.org/2010/04/12/gates-says-u-s-has-conventionally-armed-icbms/>.

²¹² Woolf, *Conventional Prompt Global Strike*, 1.

weapons, although this should be considered unlikely due to the broader political ramifications of such a strike.²¹³ In the event that Iranian policy makers cannot be deterred, the destruction of the state military's nuclear capability represents an effective method of preventing an overwhelmingly destructive attack on the populations of neighbouring states. Military action, particularly when it may involve nuclear ordnance, should be a measure of last resort due to its destructive possibility and potentially unpredictable consequences. In this scenario, if the situation has deteriorated to the extent that the launch of an Iranian nuclear weapon appears imminent, the strike must be rapid and effective. Such deterioration is unlikely to be short-term, giving U.S. policy makers the opportunity to secure basing or overflight concessions from the governments of states that neighbour Iran. If this has occurred, the requirement for a long range strike bomber could be reduced; assuming that the GBU-57A/B replacement ordnance is operational no point in Iran would be out of range for an F-35 launched from Iraq, Afghanistan, Bahrain, or an aircraft carrier off the coast of Dubai.²¹⁴ Although in 2016 U.S. forces have access to bases in the region, notably in Kuwait, Qatar, and Saudi Arabia, as well as Afghanistan and Iraq, this is not guaranteed to be the case in the future given the dynamic and volatile political landscape of the region.²¹⁵ If such bases are not available, or the GBU-57A/B replacement is not operational, the unique use of a B-2 or

²¹³ Jack Mendelsohn, "NATO's Nuclear Weapons: The Rationale for 'No First Use'," *ArmsControl.org*, July, 1999, accessed January 23, 2015, http://www.armscontrol.org/act/1999_07-08/jmja99.

²¹⁴ Lockheed Martin, "F-35 Lightning II," *F35.com*, accessed August 17, 2015, <https://www.f35.com/>.

²¹⁵ MilitaryBases.com, "U.S. Military Bases," *MilitaryBases.com*, accessed March 30, 2016, <http://militarybases.com/>; Grant, *Return of the Bomber*, 17.

B-21 launched from U.S. territory is implausible without violating the sovereign airspace of countries other than Iran.

The B-2 mission from Whiteman Air Force Base to Libya required two refuelling points, one of which was provided by aircraft launched from western Europe.²¹⁶ Although the direct distance from Guam to western Iran is similar to that from Missouri to Libya, the logistical challenge of flying air-to-air refuelling aircraft from the same location would be significant, exacerbated by the requirement of avoiding detection, as well as the potential need to remain outside the sovereign airspace of states other than Iran. It would also require a lead-time in excess of twelve hours between the launch order being given and the strike occurring, even if the aircraft were already prepared for the mission.

There is a degree of flexibility in this lead time which allows the decision-maker to recall the aircraft before the strike occurs, and this has been proposed as a key benefit of the LRSB.²¹⁷ However, this attribute provides little advantage, particularly in this scenario. The recall order would only be given if the situation changes and a strike is no longer deemed necessary. Assuming that all diplomatic options have been exhausted prior to the launch order being given, most plausibly the altered situation would be the targeted state's policy makers being coerced by the knowledge that strike aircraft are en route, thus demonstrating the willingness of their counterparts in the coercing state to use kinetic force. This fundamentally undermines the concept of using a low-observable

²¹⁶ Cenciotti, "All you need to know".

²¹⁷ Fetters, *Role of the Long-Range Strategic Bomber*, 4.

aircraft. If Iranian policy makers were informed that the launch has occurred, the twelve-hour lead time provides the opportunity for the pre-emptive deployment of the nuclear weapons that the LRSB were intended to destroy.

Alternatively, if Iranian policy makers were informed of the aircraft's presence as the systems close in on the target, they would be left with little time in which to demonstrate an alteration of their policy. In addition, if Iran has procured or developed an advanced air defence system, intimating the presence of a low observable aircraft, particularly if a time deadline is given before they are scheduled to reach the point at which weapons would be deployed, provides the Iranian military with the opportunity to concentrate its defences and improve their chances of detecting the aircraft. The B-21's likely lack of survivability post-detection means that the likelihood of a successful strike would then be greatly decreased.

Basing B-21s in Diego Garcia brings the aircraft much closer to Iran than launching from Guam. However, reaching a point at which ordnance can be effectively deployed against a target in northern Iran remains outside the unrefuelled combat radius of any of the existing U.S. LRSBs launching from Diego Garcia.²¹⁸ Nevertheless, a strike mission using only aircraft based on the island would be feasible. The B-21 is likely to be able to be refuelled outside Iran's IADS in order to mitigate the risk to the tanker aircraft and increase the potential that the strike aircraft can enter Iranian airspace undetected, while having the range to be able, depending on their flight profile, to return to Diego Garcia or to a rendezvous with a tanker aircraft south of Oman during their

²¹⁸ U.S. Air Force. *U.S. Air Force Long-Range Strike Aircraft White Paper* (2001), 24.

recovery. It is likely that the tanker could deploy from, and recover to, Diego Garcia in conducting this supporting mission.²¹⁹ This potentially provides U.S. aircraft with the ability to conduct an effective strike on a target in northern Iran without using bases in other states, and only systems with low observable properties would be required to enter the Iranian IADS.

The range of the B-21 in this scenario provides compelling rationale for its use, but it is not without shortfalls. The Center for Strategic and Budgetary Assessments suggested that "fighter aircraft [sic] could also contribute indirectly to future strike campaigns by suppressing threats".²²⁰ If medium range strike aircraft were to be used in this "tunnelling" role, it would be necessary to base them closer to Iran than Diego Garcia, which necessitates either the deployment of an aircraft carrier or the use of bases in overseas states.²²¹ In such an event the added value of the B-21 is limited, particularly given that the number of targets within the mission will be small; the same results are likely to be achieved by a fleet of medium range aircraft launching from a state close to the Iranian border.

The location of Diego Garcia provides U.S. policy makers with the opportunity to use the B-21 as an escalatory tool to signal to their Iranian counterparts an intent to conduct a kinetic attack, as well as providing a reminder of capability. In order for this to be effective, however, their deployment would have to be advertised and, if the

²¹⁹ Military.com, "KC-46A Tanker," *Military.com*, accessed January 28, 2016, <http://www.military.com/equipment/kc-46a-tanker>.

²²⁰ Mark Gunzinger, and Bryan Clark, *Sustaining America's Precision Strike Advantage* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2015), 31.

²²¹ *Ibid.*, 37.

historic U.S. use of LRSBs as deterrent instruments is to be maintained, this suggests that they will be flown close to Iranian airspace. Without the support of fighter aircraft, this is an inherently risky action and is reliant on Iranian policy makers not acting aggressively and ordering their own aircraft to attempt to shoot down the B-21s. The need for visibility in conducting such a deterrent mission means that it is likely to take place in daytime, which negates the survivability of the B-21. The Iranian destruction of a B-21, particularly if it takes place in international airspace, is likely to engender a strong response from U.S. policy makers. Understanding this, Iranian policy makers may decide to pre-empt such an attack by launching their nuclear weapons, thus undermining the deterrent effect of the B-21 deployed in Diego Garcia.

If Iranian policy makers perceive the deployment of B-21s to Diego Garcia to be a threat, they may commence pre-emptive action, thus undermining the deterrent intention of the deployment. Alternatively, the Iranian policy makers could order their IADS to be bolstered on their southern border, particularly through the deployment of fighter aircraft on patrols at their extreme range over the Arabian Sea. Although they may be unable to detect the B-21s, the tanker aircraft that would be required to refuel the bombers prior to their entering Iranian airspace if the B-21s are to recover to Diego Garcia would be vulnerable. Even if fighter aircraft protecting the tankers could be deployed from an aircraft carrier in the region, unless they were ordered to attack the Iranian aircraft before air-to-air missiles were launched at the tankers, they could not provide complete protection. This would be further complicated by the deployment of S-400 missiles in southern Iran, which have the capability to strike an aircraft at ranges of

around 250 miles.²²² The distance of these batteries from Diego Garcia, as well as their ability to be transported, would make it difficult to assure their destruction in a preparatory attack conducted by B-21s from Diego Garcia. Consequently, without using bases in states neighbouring Iran the deployment of B-21s to Diego Garcia without the concurrent deployment of an aircraft carrier from which fighter support and strikes on Iranian missile batteries can be orchestrated provides a limited increase in the ability of U.S. to conduct effective airstrikes in northern Iran. Were an aircraft carrier to be deployed in the Persian Gulf, the combat radius of the F-35 would facilitate a strike in northern Iran, without the requirement for the B-21 to be present in the region.²²³

Launching an ICBM from the U.S. or, more likely given the political precedent that the use of an ICBM would set, a SLBM, with a conventional warhead would provide effective strike against a time-sensitive but static target without requiring the deployment of U.S. troops in foreign states. Assuming that the missiles have been primed and aimed, the time between the launch order being given and the target being struck would be less than one hour.²²⁴ A submarine deployed in the Arabian sea could launch an SLBM that strikes a target in Iran while minimising the possibility of detection by the Iranian Navy as well as limiting the time available for Iranian policy makers to respond. The trajectory of an ICBM launched from the U.S. would be likely to take it above the

²²² Deagel, "40N6E," *Deagel.com*, accessed March 21, 2016, http://www.deagel.com/Surface-to-Air-Missiles/40N6E_a000990001.aspx.

²²³ Lockheed Martin, "F-35B - The World's First Supersonic STOVL Stealth Aircraft," *LockheedMartin.com*, accessed March 27, 2016, http://www.lockheedmartin.com/content/dam/lockheed/data/aero/documents/f-35/collateral/2012%20update/F-35B_STOVL.pdf.

²²⁴ Mitch Bott, *Unique and Complementary Characteristics of the U.S. ICBM and SLBM Weapon Systems* (Washington D.C.: Center for Strategic and International Studies, 2011), 76.

international airspace of the states over which it travels before striking a target in Iran. Although it is possible to intercept ballistic missiles, doing so requires technological capability demonstrated thus far by only a limited number of advanced militaries.²²⁵ The potential for the Iranian military to prevent a U.S. ICBM or SLBM from reaching its target is, therefore, as limited as their potential to detect a low observable aircraft operating in their airspace. Consequently, the risk of mission failure in using either system is similar.

In a ground campaign against Iranian forces, the B-21 would provide capability augmentation due to its carrying capacity and range, as well as its low observability giving additional protection against IADS. This would particularly important if the Iranian military attempted to fight a conventional conflict. However, if the system is to loiter it requires the IADS to have been decisively degraded. Operating in daylight puts the system at risk of detection, and its presence will be known following its first strike. The Iranian Air Force operates third- and early fourth-generation fighter aircraft that are unlikely to survive combat with their U.S. counterparts. However, the likely lack of survivability of the B-21 post-detection, particularly against aircraft, makes it vulnerable. Similarly, loitering in an area in which S-400 and, potentially, S-500 anti-aircraft missile systems are deployed is high-risk. Consequently, if the B-21 is to perform a consistently valuable role in this phase of conflict in daylight as well as at night, Iranian air defences have to be suppressed. The system itself can play a role in this, deploying anti-radar missiles and conducting attacks on air bases. However, support from fighter aircraft will

²²⁵ Missile Threat, "Defense Systems," *MissileThreat.com*, accessed January 23, 2016, <http://missilethreat.com/defense-systems/>.

be required to provide protection until the Iranian IADS no longer represents meaningful opposition. The logistics of supporting and implementing a ground campaign necessitates bases close to Iran. This facilitates the deployment of medium range strike aircraft, supported by air-to-air refuelling aircraft. Air superiority must be achieved to allow air-to-air refuelling to take place without forcing the aircraft providing CAS, interdiction, or battlefield preparation to spend excess time in transit rather than on patrol.

Air power's contribution in a broader military campaign in this scenario must be balanced against the need to minimise civilian casualties in order to appease Western press and public, reduce the potential for the U.S. military to be vilified, and facilitate a transition of power wherein the new government's primary role is not simply to coordinate infrastructure repairs. Consequently, the majority of missions conducted by the U.S. Air Force are likely to be tactical. This does not preclude the use of the B-21, and its carrying capacity could be beneficial, but interdiction in support of ground operations can be carried out by medium range strike aircraft. This would be more difficult to maintain if the conflict centred on the geographic centre of Iran due to the distances involved. However, the support of neighbouring states, notably Iraq and Afghanistan, would provide U.S. forces with air bases that facilitate comprehensive aerial coverage of Iran. This could be augmented with the capture and use of Iranian air bases.

Acting as part of a broader force preventing the Iranian military from disrupting shipping in the Strait of Hormuz is a role that the B-21 could perform, particularly if it is capable of deploying the LRASM, but is not optimised for such a capability and is

unlikely to be effective in anti-submarine warfare. The straight is narrow, only twenty-one miles wide, and the Persian Gulf itself covers only 97,000 square miles. Consequently, the B-21's high-altitude capability gives the system the ability to act as an ISR platform or network hub. However, because of the relatively limited area, a similar role in monitoring surface vessels in the region could be performed by RPA, medium range aircraft, or by U.S. naval vessels located in the Persian Gulf.²²⁶ Similarly, anti-submarine warfare and mine detection requires specialised equipment. This is unlikely to be most efficiently or effectively deployed from the B-21. Consequently, the added value of using the B-21 in naval warfare in this scenario is limited.

Although the potential for the B-21 to deploy the GBU-57A/B against an Iranian nuclear missile facility appears to provide compelling rationale behind its procurement, in reality it provides only a limited augmentation to U.S. military effectiveness. Without bases in neighbouring states or overflight permission, there are serious logistical challenges in mounting a strike mission, not least the need for numerous tanker aircraft to support a single LRSB, which are inherently vulnerable to the more modern models of anti-aircraft missiles. Should bases or overflight permission be granted, particularly from Iraq, Azerbaijan or Turkmenistan, the three neighbouring states closest to Tehran, the effectiveness of the B-21 is increased. However, these bases would also allow medium range strike aircraft to hold targets at risk across Iran. In this event, the B-21 has an advantage only in its likely ability to deploy the GBU-57A/B. The completion of the development of smaller ordnance that engenders similar outcomes negates the need

²²⁶ Anthony H. Cordesman, Alexander Wilner, Michael Gibbs, and Scott Modell, *US-Iranian Competition: The Gulf Military Balance - I (10th Edition)* (Washington D.C.: Center for Strategic and International Studies, 2013), 95.

for the B-21 to be the delivery system. Given that only a single strike is required against a static target, an ICBM or SLBM is likely to be as effective in removing the Iranian military's nuclear capability as the B-21 deploying the GBU-57A/B. However, given the foreign policy outlook of U.S. policy makers, the likelihood of the complete breakdown of relationships with governments in Middle Eastern states is extremely limited, and the loss of basing rights in Qatar and Saudi Arabia is similarly unlikely. Consequently, while the discussion around the potential use of ICBMs and SLBMs is valid, it is the relative effectiveness of the B-21 measured against medium range strike aircraft that is of greater value.

In an anti-shipping role against the Iranian Navy, a critical phase of the conflict if the Strait of Hormuz is to remain open, the B-21 is unlikely to provide ISR or strike capability that markedly enhances that which is demonstrated by existing systems. In the ground phase of a conventional conflict against Iranian forces the B-21 would be a benefit for U.S. forces, but it would initially require support from fighter aircraft to ensure air superiority if it is to be used in a loitering capacity. If this is the case, what is required is an aircraft optimised as a long-endurance CAS system, rather than pressing into service an aircraft that is designed to evade radar detection and deliver strategic strikes.

Hypothetical Scenario Four: Countering Assertive Russian Action in the Arctic

President Putin's belligerent and aggressive position has continued, and tensions over the control of the Arctic have increased. Russian policy makers contend that the region is part of Russian territory and have stated that any attempts by private companies

or state actors to conduct operations without approval by Russian authorities represents an attack on Russian sovereignty. Russian policy makers attempt to signal military capability and intent through regular flights towards the airspace of NATO states by Russian LRSBs.

Russian military forces have consolidated their position in the Arctic and have permanent bases on Kotelny Island and in Alexandra Land. The central components of the installations are surveillance and detection systems to intercept air, surface and undersea approaches, with a limited A2AD network and an IADS. A high level of defence spending has given the Russian military strong technological capability, including fifth-generation fighter aircraft. In addition, the Russian military can to deploy nuclear ground-launched missiles that have the range to strike the continental U.S.

The governments of European allies of the U.S. are concerned about an escalation of a conflict with Russia, acknowledging that the mutual defence obligations of NATO would oblige them to provide martial assistance were Russia to launch a kinetic attack.²²⁷ Western European states have an IADS capability that can detect and intercept Russian legacy LRSBs. However, the numerical advantage held by Russian ground forces is such that they would be able to overwhelm Western European ground-based defences.

Strategic considerations for U.S. military action

U.S. military action in this scenario is intended to coerce Russian policy makers into changing their behaviour, without instigating a hot war outside the Arctic region or

²²⁷ North Atlantic Treaty Organisation, "Collective defence - Article 5," accessed December 19, 2015, http://www.nato.int/cps/is/natohq/topics_110496.htm?.

causing a reactionary attack on U.S. citizens and infrastructure. The ultimate intention is to reduce the threat to U.S. security through degrading the ability of the Russian military to dominate the Arctic region, thereby asserting U.S. military superiority. There is potential that this may take the form of a demonstration of force through a kinetic attack on Russian military assets.

In accordance with the stated desire of the Obama Administration to work, wherever possible, within international institutions, U.S. policy makers engage with their international counterparts in the Arctic Council to resolve differences in the region and create behavioural norms. Although a member of the Arctic Council and espousing the "preservation of the Arctic as an area of peace and cooperation", the attainment of this is undermined by Russian military deployments in the region and their policy makers' claims on geographic regions that are of disputed ownership.²²⁸

Successful coercion of Russian policy makers through action in the Arctic region may have broader foreign policy implications and strengthen the U.S. position in attempts to coerce or deter other states from undertaking actions that could harm U.S. security. Despite the end of the Cold War and the collapse of the Soviet Union, both Russian and U.S. policy makers appear to perceive the power of the other state as a threat.²²⁹ Russian military action in former Soviet states, as well as involvement in Syria, has strengthened the impression that the two states remain competitors. In this

²²⁸ Russia, Ministry of Foreign Affairs, "Arctic Council: Russian Federation," *Arctic-council.org*, last updated September 10, 2015, accessed October 2, 2015, <http://www.arctic-council.org/index.php/en/about-us/member-states/russian-federation>; Wojciech Lorenz, "Arctic Cooperation in the shadow of Russian Bombers," *The Polish Institute of International Affairs Bulletin* 53 (785) (May 26, 2015), 1.

²²⁹ BBC News, "Russia security paper designates Nato as threat".

scenario, Russian action in the Arctic consolidates this impression. Leadership can be demonstrated through a range of actions, but U.S. military strength continues to be an important part of the national psyche and a cornerstone of international relationships and agreements.²³⁰ The Arctic situation outlined in this scenario gives the U.S. military the opportunity to demonstrate its continued superiority over its Russian counterpart. If successful, this could act as a check on Russian policy makers who may otherwise believe that the Russian military can be used to effectively challenge U.S. security, or the security of its allies, thereby increasing the potential for escalation that results in a military engagement. In addition, the successful coercion of Russian policy makers through the actions of the U.S. military would also serve as a reminder to other states of its strength. Russia, alongside China, represent competitors to the U.S. that are as close to near-peer as the state has had for many decades. Forcing the Russian military to back down, acknowledging the likelihood of their defeat by U.S. forces, would be a powerful signal of the benefit of partnering with the U.S. military.

The success of a coercive strategy requires a demonstration of capability and, significantly, willingness to act. The threatened or conducted actions must demonstrate that the costs that can be imposed on Russia by the U.S. military have a proportionately greater effectiveness than the reverse, and that these costs outweigh the anticipated benefits of defiance.²³¹ A willingness to act can be demonstrated through an escalation ladder of signalling. There is no prescribed method of escalation, and it is impossible to know what action would represent the point at which the strategy would be effective.

²³⁰ Obama, *2015 National Security Strategy*, 4.

²³¹ Byman et al., *Air Power as a Coercive Instrument*, 15.

However, in this scenario, particularly as the U.S. policy makers would be keen to avoid actions that provoke kinetic retaliation and avoid an escalation into a hot war, it is easier to demonstrate capability through shows of force than to prove willingness.

The existence of the Arctic Council and the NATO alliances should provide U.S. policy makers and military with backing in any efforts to coerce Russian policy making. However, members of NATO that do not have a vested interest in Arctic affairs may be reluctant to provide their full support to an operation that risks escalation and the triggering of Article Five without a demonstration of the benefits that they would receive. Despite the Russian military's numerical superiority over European NATO members, they are likely to suffer extensive losses in a hot war and lack the ability to comprehensively prevent the advanced militaries of Western nations imposing costs.²³² As a result, a demonstration of willingness by the policy makers of other NATO and Arctic Council states to support U.S. activities provides considerable force augmentation. It is therefore critical for the U.S. policy makers to also demonstrate that they are acting in the common good, rather than solely for U.S. interests, and that they value the support of allied militaries. In addition, the geographic position of Arctic Council and NATO states also provide the U.S. military with the opportunity to broaden its options for a strike that affects Russian interests, thus increasing the likelihood of threatening Russian policy makers with costs that are great enough to render the coercive strategy successful.

²³² Andrew Tilghman, and Oriana Pawlyk, "U.S. vs. Russia: What a war would look like between the world's most fearsome militaries," *MilitaryTimes.com*, October 5, 2015, accessed December 4, 2015, <http://www.militarytimes.com/story/military/2015/10/05/us-russia-vladimir-putin-syria-ukraine-american-military-plans/73147344/>.

Role of the B-21

Central in appraising the role of the B-21 in this scenario is considering the rationale behind the deployment of Russian troops, and notably anti-aircraft systems, in the Arctic. Fundamentally, this basing is symbolic of power and ownership, demonstrating Russian military strength and their ability to resist military action by states whose policy makers challenge the Russian claims to areas of the Arctic. The defensive systems also present a tactical challenge for U.S. forces who may otherwise have routed aircraft over the Arctic to strike targets in Russia.²³³

There are two broad military options available to U.S. policy makers to coerce their Russian counterparts to remove these forces. The first is to impose costs on Russia through actions in other theatres in which Russian policy makers have an interest in controlling, either using the action to signal willingness to engage militarily or using the continuing imposition of costs as a bargaining chip with which to cause the removal of Russian military bases in the Arctic. The second is to demonstrate that the U.S. military is capable of imposing costs directly on the Russian forces in the Arctic and that their presence is not an impediment to U.S. military action.

Unless Russia engages in overtly aggressive action in the Arctic or deploys incontrovertibly offensive weapons systems, it is unlikely that a pre-emptive strike against a target on the Russian mainland would be legally acceptable; if the U.S. wishes to be a global leader, such a blatant violation of international law and moral acceptability would be difficult to countenance and risks the possibility of the situation escalating to a

²³³ Lorenz, "Arctic Cooperation," 1.

nuclear exchange. Military force could be leveraged in support of organisations that are acting against Russian control in Eastern Europe, notably the state government in Ukraine whose military is engaging non-state actors who are at least tacitly supported by Russian troops.²³⁴ However, even in the event that U.S. policy makers commit to providing combat support, the B-21 is not optimised for the unconventional nature of the conflicts. Direct attack support can be provided from dedicated CAS aircraft and ground-combat equipment based in the state, with ISR roles performed by platforms that have been designed for that function, such as the MQ-9. The ranges involved in supporting government forces in Ukraine facilitates the deployment of medium range strike aircraft in both strategic and tactical roles, and the advantage of the extended range offered by the B-21 provides limited increase in the effectiveness of aerial strike.

The deployment of U.S. forces in order to demonstrate willingness to use military force may have an effect on Russian policy makers, but using the B-21 to maintain an aggressive posture is illogical. The Russian Air Force's operation of its LRSB fleet is indicative of the perceived psychological value of their presence, rather than demonstrating their value as an ordnance delivery system or platform in the event of an escalation to hot war. The Russian aircraft that are used to approach U.S. and NATO airspace, typically the Tu-95 'Bear', lacks any low observable properties. Detecting their presence and intercepting the aircraft is relatively simple.²³⁵ However, such flights allow

²³⁴ Mark Urban, "How many Russians are fighting in Ukraine," *BBC News*, March 10, 2015, accessed January 12, 2016, <http://www.bbc.com/news/world-europe-31794523>.

²³⁵ Carlo Kopp, "Eurofighter Typhoon," *Air Power Australia*, August, 2000, accessed November 14, 2015, <http://www.ausairpower.net/Analysis-Typhoon.html>.

the IADS of U.S. and NATO states to be tested, and are a signal of willingness to use military force.

It is notable that when U.S. policy makers demonstrated U.S. military power following the test of a North Korean warhead in January 2016 it was B-52s that were flown close to North Korean airspace, rather than B-2s.²³⁶ Giving the opposition the opportunity to gain first-hand experience of the capability of a system that relies on its low observable properties for its survival is counter-intuitive. The U.S. Air Force deployed B-52s to Sweden in 2015 in an attempt to coerce Russian policy makers into taking a less aggressive position on Ukraine, but it was the forward deployment of the systems and the consequent rapidity with which they could launch a strike that was intended to evoke a response, rather than ongoing flights and probing Russian IADS.²³⁷ Similarly, the potential outcomes of deploying the B-21 close to Russian airspace are generally antithetical to the desired coercive intentions due to the requirement for visibility. If the aircraft is flown at night and its low-observable properties prevent its detection by Russian anti-aircraft systems, its lack of visibility limits its value as a coercive tool. This can be overcome by conducting an action that has an observable outcome within an area that should be covered by the Russian IADS. Achieving this without violating Russian airspace is difficult. If the aircraft is flown at night and its low-observable properties do not prevent its detection by Russian anti-aircraft systems, its value as a coercive instrument is greatly reduced. Operating in daylight increases the

²³⁶ Munroe, and Kim, "U.S. flies B-52 over South Korea".

²³⁷ Umberto Bacchi, "Russia: US B-52 bombers over Baltic Sea for Sweden military drill," *International Business Times*, May 22, 2015, accessed September 13, 2015, <http://www.ibtimes.co.uk/russia-us-b-52-bombers-over-baltic-sea-sweden-military-drill-1502591>.

system's visibility, but also provides Russian forces with the opportunity to practice interceptions. This would be beneficial if such attempts were routinely unsuccessful, but may ultimately result in the effectiveness of the B-21 being reduced in its ability to deploy ordnance successfully and, by extension, to coerce or deter action by foreign policy makers.

The second option for U.S. policy makers is to degrade the Russian military forces in the permanent bases in the Arctic. The likelihood of kinetic force being used in this scenario remains limited due to the potential for escalation into a broader hot war that could impose significant costs on the U.S., regardless of the eventual outcome. Nevertheless, it is in this scenario that the B-21 can provide greater effectiveness than any other currently fielded weapons systems.

The S-400 missile batteries deployed on Katyn Island and Alexandra Land represent a threat to U.S. aircraft attempting to operate in their vicinity; even the B-2 may not be immune from detection and engagement by the system.²³⁸ The S-400 has a maximum range of 250 miles, marginally greater than the 217 mile range of the JASSM. Consequently, it seems likely that a fifth-generation medium range strike aircraft would be able to enter the periphery of the airspace covered by the S-400 batteries, launch a JASSM at a static target, and exfiltrate before affective anti-aircraft action can be taken. Using the B-21, multiple missiles can be launched from a single aircraft in a single mission, increasing the number of aiming points. However, in this scenario the operational value of striking multiple targets in a single mission is reduced by the

²³⁸ Thompson, "Some disturbing facts".

overarching requirement of demonstrating capability. Striking a single target can be as effective a demonstration of capability as multiple strikes.

Consequently, the critical attribute of the B-21 over a medium range strike aircraft in this scenario is the ability to manoeuvre into an appropriate firing position following a launch from the U.S. The closest permanent U.S. military airstrip to Kotelnny Island is Eilson Air Force Base, Alaska, 1,700 miles away. A cruising F-35 would be capable of manoeuvring into position to deploy a JASSM against Russian military positions on Kotelnny Island with one air-to-air refuelling, but would require two further full refuellings in order to return to Eilson Air Force Base. The presence of the tanker aircraft is likely to be detected by Russian radar, limiting the degree of surprise that the strike aircraft can achieve. In addition, the refuelling aircraft represent a keystone of a strike mission in this scenario, and their destruction could be catastrophic to its potential success. Consequently, protection from Russian fighter aircraft would be required, as well as ensuring that the tankers remain outside the range of anti-aircraft missiles based in the north-eastern reaches of the Russian mainland. Although not a logistical impossibility, particularly given the superiority of U.S. fighter aircraft over their Russian counterparts, it adds a greater degree of complexity to the use of medium range aircraft launching out of the U.S. mainland. The climactic conditions in the region negates the option of deploying an aircraft carrier to facilitate the launch of medium range aircraft

from closer to Kotelny Island.²³⁹ The B-21, however, is likely to have the range to reach Kotelny Island and return to a base in Alaska without requiring refuelling.

Alexandra Land is out of realistic range for medium range aircraft launching out of the U.S. It is also out of range for a B-2, and thus probably the B-21, without air-to-air refuelling taking place, although only one refuelling would be required, likely to be in the region between the U.K. and Iceland. Notably, this is out of the range of fighter aircraft launching from Russia.²⁴⁰ In both the potential strikes on Alexandra Land and Kotelny Island, the B-21 may have a further advantage over medium range strike aircraft in its ability to deploy long range air launched cruise missiles; the U.S. ALCM-86, while only deployable from a B-52, has a maximum range of over 1,500 miles, facilitating the deployment of ordnance from well outside the range of Russian ground-launched anti-aircraft missiles.²⁴¹ The creation of the new LRSO cruise missile could, however, negate this advantage.

A strike on Alexandra Land or Kotelny Island could also be conducted with land-, sea- or submarine-launched long range cruise missiles, without the need to deploy U.S. troops overseas. A notable drawback of this approach is the difficulty of differentiating between the launch of a nuclear and a conventional ballistic missile. Even if the U.S. used an ICBM with a conventional warhead, Russian policy makers would be unable to

²³⁹ Nicole Klauss, "US Navy lacks ability to operate in Arctic, games reveal," *Alaska Dispatch News*, April 28, 2012, accessed October 3, 2015, <http://www.adn.com/article/20120428/us-navy-lacks-ability-operate-arctic-games-reveal>.

²⁴⁰ Deagel, "Strike and Fighter Aircraft," *Deagel.com*, accessed September 12, 2015, <http://www.deagel.com/Strike-and-Fighter-Aircraft.htm>.

²⁴¹ Thompson, "B-3 Bomber isn't as secret as it seems".

identify it as non-nuclear prior to its detonation, which has the potential to lead to dangerous escalation. A submarine-launched missile strike on Alexandra Land or Kotelny Island may be effective in degrading the Russian military forces but, like the B-21, the launch vehicle is likely to rely on its low-observable properties to evade interception, and the missile launch may also be mistaken for a nuclear strike. The probable escalation of the conflict to the point at which a strike on the Russian forces is deemed necessary gives U.S. submarines the opportunity to manoeuvre into an appropriate firing position, but also provides Russian forces with a window of opportunity to deploy defensive systems and make loitering in the region more challenging.

Deploying U.S. aircraft to Norway would increase the options available to strike Alexandra Land. In addition, deploying strike systems to northern Norway is a signal of willingness to Russian policy makers to use military force as part of a coercive strategy. However, the potential effectiveness of medium range strike aircraft in conducting a kinetic attack on Alexandra Land means that it is not an absolute necessity that it is the B-21 that is deployed. Tromsø lies just under 900 miles from Alexandra Land, and it is technically feasible for a cruising F-35 to deploy a JASSM at the extreme of its range and return to an air base in Norway without refuelling. In reality, it is likely that an air-to-air refuelling would be required to provide the strike aircraft with the opportunity to operate within a performance envelope beyond simply optimising their flight profile for fuel efficiency. This is particularly the case given that the F-35 relies on its survivability post-detection, rather than solely on its low observable properties making it invisible to adversaries. Norwegian policy makers have an interest in ensuring that Russia does not

control the Arctic, given their proximity to the region and involvement in the Arctic Council.²⁴² Nevertheless, the political ramifications of launching a strike from Norwegian territory could be significant, drawing a response from Russia that imposes costs on Norway, potentially through kinetic action. This could also lead to further escalation if NATO's Article Five is invoked. Consequently, the prosecution of this military action requires a unity of purpose between U.S. and Norwegian policy makers and, potentially, a further commitment to Norway to offset or prevent any imposition of costs.

Using the B-21 to strike Russian military positions on Kotelny Island is not the only military option available to U.S. policy makers but, given the existing weapons systems, it is likely to provide the most efficient strike solution. However, unless it is capable of carrying an air-launched cruise missile with a range of over 400 miles, it will be required to rely on its low observable properties for its survival within the Russian IADS. Should the new LRSO cruise missile have the range expected at this stage of its development, its carriage by the F-35 negates the need for the B-21 as the deployment mechanism. The F-35 could deploy the ordnance from outside the Russian IADS, and conduct the entire mission without requiring air-to-air refuelling.

Similarly, if U.S. policy makers were willing to act unilaterally in this scenario, a strike on Alexandra Land is likely to be feasible for a B-21 launching out of the U.S., provided that air-to-air refuelling is conducted. It would not be a logistical impossibility for the refuelling aircraft to also launch from the U.S. mainland. Assuming that the

²⁴² Norway, Ministry of Foreign Affairs, "Arctic Council: Norway," *Arctic-Council.org*, last updated September 10, 2015, accessed October 2, 2015, <http://www.arctic-council.org/index.php/en/about-us/member-states/norway>.

systems remained undetected prior to the strike occurring, this also mitigates the potential for a missile launch being misinterpreted as a nuclear strike. Generating an alliance with Norwegian policy makers to use air bases in northern Norway would, however, facilitate the use of medium range strike aircraft, as well as providing the opportunity to demonstrate willingness to Russian policy makers through the deployment of offensive systems close to their border.

Chapter Five: Cost Considerations and Psychological Impact

Untrammelled Soviet military spending played a role in the regime's ultimate demise.²⁴³ While there is no suggestion that the procurement of the B-21 represents a similar threat to the U.S. political structure, regardless of the degree of military effectiveness that the B-21 may represent its cost and budgetary implications merit consideration. The decision to procure the B-21 is conceptually flawed from an operational military perspective. However, in pure cost terms the system is affordable, even within the budgetary constraints imposed on the DoD following the 2011 Budget Control Act and subsequent sequester.²⁴⁴

The public cost estimates for the system released by the DoD in 2010 indicated that the entire programme would cost £55bn, roughly \$550m per aircraft.²⁴⁵ The DoD Fiscal Year 2016 Budget Request cites this programme as the fourth most expensive project of the "Aircraft and Related Systems" category of weapons procurement.²⁴⁶

²⁴³ Robyn Lim, *The Geopolitics of East Asia* (New York: Routledge, 2003), 138.

²⁴⁴ Donnelly et al., *Buying the B-3*, 1.

²⁴⁵ Rich Smith, "Will America's B2 Bomber Be the Last Bomber We Ever Build?" *TheMotleyFool.com*, August 23, 2015, accessed September 23, 2015, <http://www.fool.com/investing/general/2015/08/23/will-americas-b2-bomber-be-last-bomber-we-build.aspx>.

²⁴⁶ Office of the Under Secretary of Defense (Comptroller)/CFO, *Program Acquisition Cost by Weapon System: United States Department of Defense Fiscal Year 2016 Budget Request* (United States Department of Defense, February, 2015), 5.

Nevertheless, "affordability" has been a precept of U.S. Air Force pronouncements regarding the system with emphasis on the "cost considerations".²⁴⁷ An inauspicious precedent on defence spending has been set by the DoD, with the spiralling costs of developing the F-35 in particular leading to intense criticism.²⁴⁸ Concerns have been voiced at the potential for the B-21 to demonstrate a similar cost escalation, particularly because of the Future Years Defense Plans since 2014, in which the budget for Research and Development is indicated to increase year-on-year.²⁴⁹ Nevertheless, past performance is no guarantee of future performance, and the potential for the B-21 to run over budget should be examined on its own merits.

The B-21's procurement process, which emphasised the need for bidding companies to conduct a high level of research and development before bidding for the contract, has resulted in the chosen design having a "level of maturity" greater than that usually seen in military hardware at the same stage in the procurement cycle.²⁵⁰ Consequently, although the system will be further modified before its full-scale production and operational readiness, it is likely that the costs of the additional research and development process will be minimised. Research and development costs for the B-21 are also suppressed by the emphasis on the system building on existing technology,

²⁴⁷ RT network, "What do we know?".

²⁴⁸ Winslow Wheeler, "The jet that ate the Pentagon," *Foreign Policy*, April 26, 2012, accessed September 28, 2015, <http://foreignpolicy.com/2012/04/26/the-jet-that-ate-the-pentagon/>.

²⁴⁹ Aaron Mehta, "USAF eyes cost-plus bomber contract," *DefenseNews.com*, March 5, 2015, accessed September 4, 2015, <http://www.defensenews.com/story/defense/air-space/strike/2015/03/05/lrsb-bomber-cost-plus-contract-air-force/24432697>; Congressional Budget Office, *Long-Term Implications of the 2014 Future Years Defense Program* (Washington, D.C.: Congressional Budget Office, November, 2013) 37.

²⁵⁰ Axe, "A \$550 million Air Force bomber"; Thompson, "The inside story of America's next bomber".

rather than designing individual components "from scratch".²⁵¹ It is the cost of research and development that has raised the overall spending on the F-35 to over \$1tn; the unit cost is, at \$142m, only around \$25m higher than the cost of the McDonnell-Douglas F-15K 'Strike Eagle', in 2016 dollars, despite a generational shift in capability.²⁵² This is buttressed by the B-21's "modularity" and connections to "off-board capabilities...provided by other aircraft and orbital reconnaissance satellites".²⁵³ Consequently, incremental improvements or modifications to individual components can be made to maintain the B-21's anticipated technological edge without affecting the broader system.²⁵⁴

Despite this flexibility, in order to maximise the potential for the B-21 to stay within budget U.S. policy makers must retain a consistent approach to the development of the system and the design brief. During the procurement process the Lockheed Martin F-22 'Raptor' suffered "requirements creep", with the design of what was intended to be an air superiority fighter aircraft being modified to incorporate a ground attack component.²⁵⁵ This caused a consequent increase in the time and costs associated with the research and design phase. If similar changes of direction are made to the B-21's design brief, cost escalation is likely. Absent this scenario, aside from reservations based

²⁵¹ Thompson, "B-3 Bomber isn't as secret as it seems".

²⁵² Global Security, "F-15K / FX Next-Generation Fighter," *GlobalSecurity.org*, accessed February 13, 2016, <http://www.globalsecurity.org/military/world/rok/rox-rok.htm>.

²⁵³ Colin Clark, "Kendall, LaPlante Complete long-range strike bomber review," *BreakingDefense.com*, June 4, 2015, accessed August 25, 2015, <http://breakingdefense.com/2015/06/kendall-laplante-complete-long-range-strike-bomber-review-exclusive/>.

²⁵⁴ The Economist, "Battle joined".

²⁵⁵ Donnelly et al., *Buying the B-3*, 14.

on the historic procurement of U.S. military systems there is little reason to suggest that the cost of procuring the B-21 will grow exponentially, above inflation, from the price currently budgeted.

Defence spending in the U.S. Federal budget for the 2015 Fiscal Year accounted for more than \$600bn.²⁵⁶ Within this, \$63.6bn was budgeted for research and development and \$100.8bn on procurement.²⁵⁷ Assuming that defence spending follows a broadly similar pattern for the next decade, the procurement of the B-21 represents an outlay of less than one percent of total U.S. defence spending. Unforeseen situations may result in drastic changes to the U.S. defence budget in the coming years but, unless an unexpected and exponential increase in the cost of the B-21 occurs, cutting this procurement programme is unlikely to have a significant economic impact.

The industrial context of procuring the B-21 provides a backdrop for the decision to follow the Northrop Grumman design. Two bids were submitted for the production of B-21, one from Northrop Grumman and one a joint bid from Lockheed Martin and Boeing.²⁵⁸ The DoD insisted that the selection decision to select the Northrop Grumman

²⁵⁶ Office of the Under Secretary of Defense (Comptroller), *National Defense Budget Estimates for FY 2015*, (Washington, D.C.: Department of Defense, April, 2014), 6.

²⁵⁷ Office of the Under Secretary of Defense (Comptroller), *RDT&E Programs (R-1) - Department of Defense Budget: Budget Amendment to the Fiscal Year 2015 President's Budget Request for Overseas Contingency Operations (OCO)* (Washington, D.C.: Department of Defense, June, 2014), II; Office of the Under Secretary of Defense (Comptroller), *Procurement Programs (P-1) - Department of Defense Budget: Budget Amendment to the Fiscal Year 2015 President's Budget Request for Overseas Contingency Operations (OCO)* (Washington, D.C.: U.S. Department of Defense, June, 2014), IIA.

²⁵⁸ Lara Seligman, Aaron Mehta, and Andrew Clevenger, "As Industry Awaits Bomber Contract, New Details Emerge," *DefenseNews.com*, September 5, 2015, accessed September 14, 2015, <http://www.defensenews.com/story/defense/air-space/strike/2015/09/05/industry-awaits-bomber-contract-new-details-emerge/71668882/>.

bid was made solely on the basis of the capability of the proposed systems.²⁵⁹ Nevertheless, had Lockheed Martin - Boeing been awarded the contract for the B-21, it is likely that the manned military aircraft design arm of Northrop Grumman would have been put under threat of closure.²⁶⁰ Conversely, the locked-in payments for the F-35 ensure funding for Lockheed Martin's military aircraft department, and the KC-46 'Pegasus' tanker aircraft, based on a Boeing 767 airframe, will maintain the company's ties with the U.S. military.²⁶¹ U.S. Secretary of Defense Carter, formerly chief of technology acquisition at the Pentagon, warned against actions that "reduce the...technological talent pool" available to the DoD.²⁶² By awarding the contract for the B-21 to Lockheed Martin, U.S. policy makers would have jeopardised competition between design groups and potentially limited the capability of the U.S. technology industry to produce cutting-edge military aircraft. Regardless of the veracity of the claim by Frank Kendall, the head of Pentagon acquisition, that "industrial base issues would play no role in the contract decision", awarding the contract to Northrop Grumman maintains diversity in aviation technology.²⁶³

However, keeping Northrop Grumman's manned military aircraft design bureau open should not in itself be the rationale behind the production of the B-21. If the

²⁵⁹ Colin Clark, "Tough Choices For DoD On Long Range Strike Bomber," *BreakingDefense.com*, April 2, 2015, accessed August 16, 2015, <http://breakingdefense.com/2015/04/tough-choices-for-dod-on-long-range-strike-bomber/>.

²⁶⁰ RT network, "What do we know?".

²⁶¹ Boeing, "KC-46A Pegasus," *Boeing.com*, accessed October 15, 2015, <http://www.boeing.com/defense/kc-46a-pegasus-tanker/>.

²⁶² RT network, "What do we know?".

²⁶³ Clark, "Kendall, LaPlante Complete long-range strike bomber review".

ongoing existence of this department was of central concern to the DoD, funding could have been provided for alternative projects that would improve the effectiveness of the U.S. military through leveraging their knowledge-based point of difference, low observable aircraft technology, rather than committing to the creation of the B-21. Although this may necessitate greater collaboration between aircraft design departments in the creation of future airborne systems, the emphasis on the modularity of new military equipment suggests that a trend in this direction is already emerging.

The procurement of the B-21 is a demonstration of the continued technological capability of the U.S. military industrial complex, and supports the premise that the U.S. military must have a capability advantage over its potential foes.²⁶⁴ In spite of its diminishing ability to remain undetected in advanced IADS, the low observable properties of the B-2 have not yet been reproduced by China or Russia, despite policy makers of both states suggesting that the development of low observable LRSBs may occur in the near future.²⁶⁵

Regardless of its ultimate cost, the production of an expensive, high-technology piece of equipment is also further confirmation of the U.S. commitment to defence spending and maintaining pre-eminence in military equipment, an indication to policy makers from other states that the U.S. is able to wield major military capability in

²⁶⁴ U.S. Department of Defense, *Quadrennial Defense Review 2014*, 64.

²⁶⁵ Franz-Stefan Gady, "China Wants to Develop a New Long-Range Strategic Bomber," *TheDiplomat.com*, July 13, 2015, accessed September 12, 2015, <http://thediplomat.com/2015/07/china-wants-to-develop-a-new-long-range-strategic-bomber/>; James Drew, "Russia and China's bomber plans could muster support for LRS-B," *FlightGlobal.com*, August 6, 2015, accessed August 23, 2015, <https://www.flightglobal.com/news/articles/russia-and-chinas-bomber-plans-could-muster-support-for-415472/>.

defence of its interests. This impression of strength may also provide a degree of peace of mind to certain portions of the U.S. population. The size and potential firepower of the B-21 gives the aircraft a powerful symbolism, one that is encapsulated by the regular use of B-52s in flyovers at U.S. sporting events. It is, however, difficult to quantify the value of this psychological component, particularly given the lack of certainty about the responses of the state policy makers of other states. It may be that the dissuasion component of the B-21's procurement has an effect, and the proven ability of the U.S. to develop an aircraft that major state adversaries are incapable of replicating in the short term deters those states from challenging the U.S. position, thereby providing U.S. policy makers with greater latitude for action. However, this is not a given. If state policy makers from a near-peer competitor perceive the U.S. to be a threat, then the B-21 may lead them to greater defence spending in order to match the U.S. military, an action which could result in an upward spiral of arms production if U.S. policy makers continued to base their procurement decisions on the basis of symmetric capability. In addition, it would be a mistake to assume that defence spending by states will always focus on identical capabilities, or even that greater spending necessarily results in a more effective force in any given scenario. If the policy makers of another state perceive a weakness in the U.S. military, they may be able to exploit it without requiring a level of spending that matches U.S. military expenditure, further undermining the potential that the dissuasion strategy would secure the U.S. forces as the dominant global military, capable of conducting effective operations against any adversary and under any circumstance.

The lack of augmentation to the U.S. military's effectiveness that is provided by the B-21 undermines the potential psychological effect of demonstrating technological capacity through the aircraft's procurement. If the military strategists of a near-peer competitor of the U.S. truly appreciate the effectiveness of U.S. forces and the limited role that the B-21 will play in enhancing it, unless their policy makers believe that absolute technological parity in every facet of the military is required in order to prevent effective U.S. military action, the mere production of the B-21 is of limited value.

The B-21 certainly demonstrates the ability to of the U.S. military industrial complex to produce an aircraft that is unique. However, as the aircraft does not represent a transformation of U.S. military effectiveness, this demonstration is unlikely to alter the balance of power and perception of the U.S. military as a potential adversary. For example, although it is perhaps less headline-grabbing than the B-21, the procurement of an air-launched long range cruise missile with autonomous target-selection capabilities would demonstrate both technological expertise in advance of near-peer competitors while increasing the effectiveness of the U.S. military. Technological advantage in military equipment is, although not a panacea, undoubtedly beneficial. Demonstrating the ability to consistently produce weapons systems that are more advanced than those of potential adversaries can impact their willingness to engage in military conflict. Consequently, concentrating resources on the development of unique and advanced technology that would provide the U.S. military with a truly overwhelming advantage in its efforts to defeat potential adversaries could be of benefit to U.S. policy makers. Because of its failure to radically increase the effectiveness of the U.S. military, the B-21 does not represent this technology.

Chapter Six: Alternative Future Long Range Strike Systems

A 'Prompt Global Strike' system and a weaponised version of Northrop Grumman's 'Global Hawk' RPA have been touted as possible alternatives to the B-21. Both have the potential to provide long range strike capability and augment U.S. military power projection, but neither are universal solutions for U.S. security in the short term. Nevertheless, their potential capabilities are impressive enough to merit further exploration.

Prompt Global Strike

'Prompt Global Strike' is an embryonic system that is intended to give U.S. policy makers the opportunity to strike any target on the globe from the U.S. in under an hour without requiring the overseas deployment of U.S. personnel.²⁶⁶ Multiple designs have been trialled but, as of January 2016, no decision has been reached on the form that the system should take. However, as a foundation, the 'Prompt Global Strike' system is intended to carry a conventional warhead and will use hypersonic propulsion technology to manoeuvre at more than five times the speed of sound.²⁶⁷

²⁶⁶ Woolf, *Conventional Prompt Global Strike*, 1.

²⁶⁷ *Ibid.*, 6.

One of the primary benefits of Prompt Global Strike would be its conventional inter-continental strike capability, allowing a strike to be made from the U.S. that does not automatically escalate the conflict to the nuclear level. In particular, and as significant as the conventional nature of the warhead, if the initial launch of the Prompt Global Strike warhead did not resemble that of an ICBM, it could mitigate the problem of an inter-continental missile launch being misconstrued as the start of a nuclear strike.²⁶⁸ This represents a technological challenge as the SCRAMJET propulsion required for hypersonic flight cannot be used for an initial launch from the ground, but it is not an impossibility.²⁶⁹ Furthermore, if there is any ambiguity with regards to the nature of the warhead if it is detected at the point of launch or during the flight, it is likely that the strike will occur before a response can be arranged. Consequently, its non-nuclear status will be apparent and the likelihood of further escalation into nuclear conflict would be reduced.

The hypersonic speed of Prompt Global Strike makes defending against it difficult. The technology required to intercept an ICBM is advanced, but defensive systems are becoming increasingly sophisticated.²⁷⁰ Prompt Global Strike missiles, by virtue of the speed and, potentially, lower observable characteristics than traditional ICBMs, have a greater probability of reaching their intended target.

²⁶⁸ The Economist, "Speed is the new stealth," *Economist.com*, June 1, 2013, accessed October 23, 2015, <http://www.economist.com/news/technology-quarterly/21578522-hypersonic-weapons-building-vehicles-fly-five-times-speed-sound>.

²⁶⁹ Gunzinger, and Clark, *Sustaining America's Precision Strike Advantage*, 49.

²⁷⁰ Missile Threat, "Defense Systems".

However, despite these capabilities, Prompt Global Strike is not a panacea in all conflict situations. As a system that is intended to be fielded in the U.S. and is designed to launch quickly, as an escalatory tool it is of limited value, relying entirely on the opposition's interpretation of U.S. policy makers' willingness to order a strike. A potential further corollary of this is that an opposition force who believe that the launch of a Prompt Global Strike missile is imminent and lack the technology to defend against it could launch a pre-emptive strike, which may be nuclear. In addition, it is difficult to maintain an ongoing campaign using solely long range conventional missiles. Consequently, its value is against an opponent that is vulnerable to strategic strike. While the rapidity of the missile may facilitate an attack on some targets of opportunity, realistically it is static and permanent targets that will be the focus of attacks and such missions are reliant on accurate targeting data.

In terms of delivering ordnance to a target at extreme range, Prompt Global Strike offers strong potential capability for the U.S. with a system that could provide rapid inter-continental conventional strike; a system that is technologically revolutionary. However, the unproven nature of the system is problematic as there is no realistic expectation of it being fielded in the foreseeable future. Over \$1.1bn has been spent on the development of a Prompt Global Strike system between FY2008 and FY2016, with few concrete results.²⁷¹ Consequently, while the potential capabilities of Prompt Global Strike hint at an effectiveness that could dramatically enhance the U.S. foreign policy toolkit, particularly in deterring aggressive action by policy makers of states with high

²⁷¹ Woolf, *Conventional Prompt Global Strike*, 24-30.

levels of technological development, it is not a system against which the efficacy of the B-21 should be considered in isolation.

High-Altitude Long Endurance Remotely Piloted Aircraft

The U.S. military and intelligence community have frequently used RPA since their initial deployment in Bosnia in 1995, with the systems truly entering the public consciousness with their use in Afghanistan and Iraq from 2003.²⁷² The primary High-Altitude Long Endurance (HALE) aircraft have been the General Atomics MQ-1 'Predator' and MQ-9 'Reaper', with the latter's strike capability adding a new dimension to its operational function. Northrop Grumman's RQ-4 'Global Hawk' is an evolution of these systems. It is powered by a turbofan engine rather than a turboprop, providing a fifty percent increase on the speed of the MQ-9 to over 350mph, and a twelve-fold increase on the system's maximum range which, for the RQ-4, now stands at over 14,000 miles.²⁷³ If the nascent air-to-air refuelling capability is honed, the systems could stay airborne almost indefinitely. Excluding the research and development costs, each unit of the system cost \$131.4m.²⁷⁴ This figure is skewed by the relatively few systems that were purchased, but nevertheless it is more expensive, per unit, than the projected price of the B-21.

²⁷² Air Force Technology, "Predator RQ-1 / MQ-1 / MQ-9 Reaper UAV, United States of America," *Airforce-Technology.com*, accessed September 21, 2015, <http://www.airforce-technology.com/projects/predator-uav/>.

²⁷³ U.S. Air Force, "RQ-4 Global Hawk," *AF.mil*, accessed October 12, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104516/rq-4-global-hawk.aspx>; U.S. Air Force, "MQ-9 Reaper," *AF.mil*, accessed October 12, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104470/mq-9-reaper.aspx>.

²⁷⁴ U.S. Government Accountability Office, "Defense Acquisitions: Assessments of Selected Weapon Programs," Report no. GAO-13-294SP (Washington, D.C., March, 2013), 113.

However, despite the suggestion that the B-21 would be "optionally manned", given the technological problems that have beset existing U.S. RPA it seems unlikely that it will be remotely piloted from the outset. Even with comprehensive upgrades a weaponised version of the RQ-4 is unlikely to provide the effectiveness that would merit the replacement of existing strike aircraft in the near term, particularly in a hot war with a technologically advanced opposition. This would remain the case unless a breakthrough can be made in the speed, manoeuvrability or radar signature of RPA without compromising strike capacity. In addition, the payload of the existing U.S. RPA is relatively limited; even the RQ-4 has a carrying capacity of less than half of the weight of a single JASSM, limiting its strategic strike potential.²⁷⁵ The Northrop Grumman X-47B 'Pegasus' represented a breakthrough of sorts, with the aircraft demonstrating a degree of low observability, and a rapidity unmatched by existing U.S. RPA, in addition to launching from and recovering to an aircraft carrier.²⁷⁶ However, the aircraft was purely developmental and had no carrying capacity. Consequently, while the X-47B demonstrated something of the potential of military RPA, it requires considerable evolution if it is to be effective in a warfighting capacity.

The comparison between B-21's capabilities and the current tranche of RPA is not entirely reasonable given the lack of confirmed performance data on the B-21 and the potential for the development of remotely piloted aircraft in the coming decade. In unconventional warfare against a non-technologically advanced opponent, where there is

²⁷⁵ U.S. Air Force, "RQ-4 Global Hawk".

²⁷⁶ Marina Malenic, "Debate over UCLASS capabilities increases programme risk, auditors warn," *Jane's Defence Weekly*, May 5, 2015, accessed August 23, 2015, <http://www.janes.com/article/51133/debate-over-uclass-capabilities-increases-programme-risk-auditors-warn>.

limited risk of their being intercepted, RPA can be superbly effective in an ISR role and performing tactical or strategic strikes with relatively light ordnance, potentially including the B61 tactical nuclear bomb. However, the development that would be required for one of these aircraft to carry and deploy even a single long range cruise missile effectively appears to be some way off.

It is obvious that the B-21 not the only long range strike option to hold targets that are in contested air environments at risk, even when they have the protective buffer of distance from deployed U.S. forces. Nevertheless, the challenges of developing a 'Prompt Global Strike' system or HALE RPA with a greater range but similar carrying capacity to the B-21 appear to support the argument that the B-21 is a good investment, not least because both Prompt Global Strike and a purpose-built HALE RPA are unlikely to be fielded before the B-21, and certainly demonstrates the capability of the aircraft. However, this does not change the fact that the B-21 offers a limited improvement to the effectiveness of existing systems, and a fleet of fifth-generation medium range strike aircraft provide similar destructive capability and more flexible escalatory potential, while according more closely with the intended shape of U.S. interaction with the global system.

Considering the capabilities of 'Prompt Global Strike' provides an indication of the overarching challenge of using conventional long range missiles as a tool to advance political objectives due to the relative lack of escalatory potential. However, it also highlights the possibility of using a delivery mechanism other than an aircraft to deploy a warhead against a strategic target. This is the function that is, in theory, the primary role

of the B-21. The use of ballistic missiles, whether inter-continental or submarine-launched, is not necessarily universally appropriate, but with regards to effectiveness based on the likelihood of destroying a target, it remains as valuable as the B-21.

Chapter Seven: Conclusion

The central consideration of the value of a weapons system is its effectiveness; not simply raw performance, but its ability to effect the mission required by the policy makers that order its use. Although predicting future requirements is challenging, this consideration must also be the foundation of the procurement process. The suggestion that "the choice of long range bomber could affect the U.S.'s military capabilities for at least the remainder of this century" is reasonable, but it fundamentally misunderstands the nature of procurement and requirement.²⁷⁷ The concept of maintaining like-for-like hardware capability, prevalent during the Cold War, is anachronistic. This outdated attitude was demonstrated in the requirement for a "broad range of capabilities" in order to "hedge against" the uncertainty of future security requirements that was called for by Peter Pace, the former Chairman of the Joint Chiefs of Staff, in his assessment of the 2005 Quadrennial Defense Review.²⁷⁸ The shortfall in effectiveness is of greater importance, from a relative or individual perspective, and would indicate the inability of the U.S. military to perform the role for which it is required. This is linked to, but not universally paralleled by, capability. Nevertheless, the procurement of the B-21 provides

²⁷⁷ Robert Wright, "Defence groups in under-the-radar race to replace cold war relic," *Financial Times*, June 12, 2015, accessed September 2, 2015, <http://www.ft.com/cms/s/0/c6732e04-0944-11e5-b643-00144feabdc0.html#ixzz3e3prnfG2>.

²⁷⁸ Grant, *Return of the Bomber*, 18.

no notable improvement to the effectiveness of the military toolkit available to U.S. policy makers.

The B-21 is a system that has been designed "for a war that no-one wants to fight".²⁷⁹ Precision weapons facilitate the use of LRSBs in some form of CAS role, but it is evident that this is not the primary intended function of the B-21. More significant is the implicit suggestion that the mere presence of the system would be sufficient to deter potential adversaries from engaging in action that may be harmful to the U.S. Undermining this suggestion is the fact that the B-21 does not enhance the ability of U.S. policy makers to demonstrate the "Four Cs" inherent in deterrence.

Although deploying "a nuclear capable bomber...sends a message", there is not necessarily an indication of "commitment".²⁸⁰ The ability of U.S. policy makers to signal through the use or deployment of military forces is valuable; reliance on an "escalation scaffold" creates the potential for the U.S. policy makers to be forced into military action in otherwise unfavourable circumstances should the threat of force not be heeded. LRSBs can be used as a mode of signalling; the deployment of Russian LRSBs in the North Atlantic has been described as "sabre rattling" by U.K. policy makers and senior military personnel, and U.S. policy makers have deployed B-52s in the South China Sea and flown them close to North Korean airspace as a reminder of military strength and an indication of disapproval of Chinese and North Korean activities.²⁸¹

²⁷⁹ Kelsey D. Atherton, "What's so scary about a nuclear armed drone?" *Popsci.com*, December 17, 2014, accessed September 14, 2015, <http://www.popsci.com/whats-so-scary-about-nuclear-armed-drone>.

²⁸⁰ Beale, "The B-52 bomber".

However, it is notable that B-2s are rarely used in this signalling capacity. The B-21 could replace the B-52 as a signalling tool, but it is not the only system that could do so. F-22s have been deployed in South Korea to signal to North Korea, and the positioning of the U.S. fleet, particularly aircraft carriers, has also been used as a signalling mechanism.²⁸² Ships are not always able to deploy as quickly as aircraft, so it is not a like-for-like alternative, but the lack of a new LRSB does not fundamentally alter the rungs of the escalation ladder available to U.S. policy makers.

Indicating commitment also requires more subtle signalling than the deployment of military hardware and is reliant on the policy makers of an opposing group or state believing that a threat will be carried out. The presence or otherwise of the B-21, whether based in the U.S. or forward deployed, is indicative of capability, not commitment. Forward deploying, or aggressively operating, medium range strike aircraft, particularly the F-35, presents a similar degree of effectiveness with regards to military might, and would be a similar signal of U.S. power and commitment as the deployment or operation of the B-21.

The "command and control" element of deterrence has been encapsulated within the discussion surrounding the B-21 due to its ability to "be recalled" en route, unlike a missile, increasing its flexibility and adding a further rung to the escalation ladder.²⁸³

²⁸¹ BBC News, "How to spot a Russian bomber," *BBC.com*, February 20, 2015, accessed October 23, 2015, <http://www.bbc.com/news/blogs-magazine-monitor-31537705>.

²⁸² Franz-Stefan Gady, "US deploys F-22 Stealth Fighters to South Korea to Deter Pyongyang," *TheDiplomat.com*, February 17, 2016, accessed February 28, 2016, <http://thediplomat.com/2016/02/us-deploys-f-22-stealth-fighters-to-south-korea-to-deter-pyongyang/>.

²⁸³ Thompson, "Some disturbing facts".

This argument is based on the assumption that the aircraft would be launched on a strike mission while negotiations were ongoing. Such an outlook seems flawed and is more indicative of the potential lengthy time period between the launch of a sub-sonic aircraft and the deployment of ordnance. Precipitating military action should be a measure of last resort, after all other options have been exhausted. Once the decision has been taken, the initial strike, particularly if it is strategic in nature, should be made with the greatest expediency, accounting for operational factors that may impact the mission, such as time of day over the target or the time required to array forces for a broader assault. Were medium range strike aircraft to be forward deployed, a reasonable expectation in the course of an escalatory process, a strike could be made with a similar or greater degree of rapidity as a strike conducted using the B-21. In addition, the shorter time between the launch of a missile with inter-continental range and its reaching the target, as opposed to the strike being undertaken with the B-21, means that the window in which policy makers must make a decision on conducting a kinetic attack is not radically altered. This would be compounded if hypersonic inter-continental missiles were to be developed.

Using the launch of the B-21 as leverage within negotiations is similarly flawed. The basis of the capability and effectiveness of the B-21 as a strike system is its low observability and thus its ability to maintain an element of surprise. Giving the opposition advanced warning of its arrival would potentially strip the system of some of this advantage. Even if this were not the case, when the imminent application of kinetic force has been threatened if a particular action has not been undertaken, and such an action has not occurred, the opposition is signalling their belief that the threatened action

will either not occur or can be withstood. The likelihood of this position changing after they are informed that the B-21 has been launched and will conduct an attack seems slim.

The degree to which the B-21 would enhance U.S. policy makers' "clarity of intent and message" is negligible. It does not alter the positioning of thresholds for action, nor does it necessarily change the dynamic of the action that can be threatened as the B-21 is not unique in its ability to deploy any ordnance other than the GBU-57A/B. Most importantly, this feeds into the "capability" pillar of deterrence. It is in this sector that the B-21 would be expected to enhance the U.S. position, but the absence of the system does not automatically compromise the overarching capability of the U.S. military due to alternative systems offering an equal or greater degree of effectiveness.

It is likely that the B-21 will be a capable system at the point of its introduction. However, the consequent effectiveness is defined by circumstance, and the circumstances in which its capability is likely to provide a unique degree of effectiveness are narrow. In unconventional warfare, the threat to the B-21 would be limited. Consequently, its carrying capacity and loiter capability can be leveraged to provide CAS, air interdiction or battlespace preparation. However, this is not the role for which the aircraft is intended or optimised and its use in such a scenario would indicate a failure in strategic planning. If conflict against a technologically limited opponent is considered to be a primary feature of U.S. military operations, U.S. defence procurement should budget for the development of a combat aircraft optimised for such a scenario,

rather than focusing funds and efforts on maintaining the system's ability to operate within denied environments.

In a conventional conflict, the effectiveness of a system is a function of its ability to deploy the requisite ordnance. The B-21 is reliant on its low observability and consequent ability "to fly undetected" to perform this function.²⁸⁴ The claim of the former Deputy Assistant Secretary of Defense for Forces Transformation, Col. Gunzinger, that "stealth as a concept will never be obsolete" is a truism and his subsequent statement that bombers "need...to be survivable" reveals the flaw in the initial argument: stealth is not synonymous with survivability.²⁸⁵ This is particularly accentuated by the ongoing balance between offense and defence, with the evolution of detection systems demonstrating the "high probability that stealthy aircraft can be seen and intercepted within the next decade".²⁸⁶ The concept of low observability will, as Gunzinger suggests, never be obsolete, but the practicality of maintaining a totally stealthy system over an indefinite period in the face of technological advances in defensive systems is likely to remain unobtainable. Consequently, the possibility of the B-21 being able to loiter within an advanced IADS without detection is remote; the "militarily successful strikes" that the U.S. LRSB fleet has prosecuted in post-2001 conflicts in the Middle East, particularly against mobile targets, is founded on their ability to operate without a realistic threat being posed by the opposition.²⁸⁷ In the event

²⁸⁴ RT network, "What do we know?".

²⁸⁵ Lerman, "Almost nobody believes the U.S. Air Force can build an affordable bomber".

²⁸⁶ Hammes, "Rethinking Deep Strike".

²⁸⁷ Hunter, "Should the United States Buy the Long Range Strike Bomber".

that U.S. forces have total air superiority, the potential to conduct air-to-air refuelling negates much of the long endurance advantage held by the B-21 over medium range aircraft.

Asserting that the B-21 is required in order to ensure the continued ability of U.S. forces to "penetrate deep into...defended airspace" is a similarly outdated concept, based on the early years of strategic bombing when ordnance deployed from an aircraft would fall almost vertically.²⁸⁸ The requirement to strike a target in a conventional conflict that is behind the front line is likely to remain but, with advent of long range air-launched missiles, the aircraft deploying the ordnance can do so from an increased range. Consequently, the significance of a deep-penetrating bomber is significantly reduced and, as has been demonstrated in the scenarios analysed above, the required ordnance can, in the vast majority of cases, be deployed against the same target by medium range aircraft. The intended development of a new LRSO cruise missile capable of being carried by a medium range strike aircraft would further reduce the requirement for the deploying aircraft to penetrate deep into the opposition's airspace.

Underpinning the argument for the procurement of the B-21 is the concept that "facilities in allied territory" will be of little moment, allowing the U.S. to conduct strikes unilaterally and without the need for external support or basing.²⁸⁹ This argument is undermined by the requirement for air-to-air refuelling if the B-21 is to launch from the U.S. and conduct a mission to all but the eastern reaches of Russia or the northern

²⁸⁸ Saylor and Scharre, "The Imperative of Long-Range Strike"; P. F. M. Fellows, *Britain's Wonderful Air Force* (London: Odhams Press, 1942), 99.

²⁸⁹ Drew, "It's large and lethal".

portion of South America, and return without landing. In theory, tanker aircraft may also be able to launch from the U.S. to support a mission, but the logistics of such an operation are complex, requiring multiple aircraft to conduct refuelling operations to enable the tankers themselves to remain airborne. More realistically, the B-21 would require support from tanker aircraft based overseas, as has been the case for B-2 missions. As a result, the concept of the B-21 facilitating a withdrawal from overseas basing without a consequent negative impact on the ability of the U.S. to deploy kinetic force from the air is fanciful. Furthermore, the argument that states would allow U.S. tanker aircraft to deploy in period of conflict or tension, but refuse to allow strike aircraft to use the same bases, demonstrates a lack of understanding of the centrality of refuelling aircraft to U.S. strike missions that use LRSBs. Consequently, it seems likely that a state with a capable A2AD network would be as likely to target these bases as they would if strike aircraft were to be deployed to them.

Analysing the value or likely consequences of following the grand strategic options available to U.S. policy makers is beyond the scope of this paper, but considering the role of the B-21 in these contexts provides further indication of the awkwardness of its fit as a foreign policy tool, regardless of how U.S. national security strategy evolves in the coming years.

Although the B-21 appears to support a "Core National Security" strategy, the requirement for air-to-air refuelling and difficulty in maintaining consistent strategic strike missions at extreme range undermines its value. The 'stopping power of water', which has provided the U.S. population with a degree of protection from foreign

military, is also a constraint on U.S. power projection. If the U.S. military is to conduct operations against targets overseas with an aircraft that is intended to recover to the U.S., overseas bases are required. Given the "Core National Security" strategy's emphasis on disassociation with overseas states, re-establishing relations to the point at which U.S. forces can be deployed there is likely to be a lengthy process. As a territory, Guam's Andersen Air Force Base provides a degree of permanence for military deployments outside Hawaii or the mainland U.S. and does not require the permission of the governing body of the island to remain in situ. It also provides a valuable base for the B-21, which would be within range of the South and East China Sea, as well as mainland China. However, Guam may be impacted directly by China's A2AD network, particularly given the development of the DF-26 missile. In addition, if U.S. policy makers fear that an attack on the U.S. may emanate from the region, and defence relationships with other states have not been maintained, the operation of U.S. forces is likely to be predictable and the single operating location is at risk of being contained by a technologically advanced opposition force.

At the opposite end of the spectrum, the B-21 would be antithetical to a "Dominance" strategy, and its effectiveness were such a strategy to be followed could be replicated by alternative systems. In particular, the LRSB symbolises stand-off capability, an attitude of keeping potential opponents at arm's length and conducting strategic strikes. This is in contradiction to the principles of U.S. dominance, which requires an impression of ongoing involvement. Without maintaining bases overseas for tanker aircraft, from which medium range strike aircraft could also deploy, this cannot be achieved with the B-21. Nevertheless, if the U.S. military's current reluctance to deploy

the B-2 overseas, other than to Guam, is reversed with the B-21, it could be a signal of commitment to allies. This rationale for its procurement is undermined by the likely effectiveness of medium range strike aircraft being similarly forward deployed. An F-35 may not be able to deploy the same volume of ordnance, but it is likely to be able to engage the targets that would be available to the B-21, with the same type of ordnance. The sole exception to this is the GBU-57A/B, and this advantage would be non-existent following the development of jet-propelled penetrating ordnance.

Cutting overseas defence commitments back on the basis of resource and threat, as proposed by "Retrenchment", would facilitate the leveraging of the B-21's capability to deploy quickly in the event of an escalating conflict. However, the impediments to it demonstrating a unique efficacy within the "Core National Security", "Dominance", and "Offshore Balancing" grand strategies are also apparent in this context. If the system is to provide an "over the horizon" threat, air-to-air refuelling aircraft are likely to be required to be forward deployed in order to provide the requisite support for aircraft launching out of the U.S. These forward bases are not part of a policy of "great power land grabs", but a necessary stepping stone to ensuring effective strike missions.²⁹⁰ Consequently, as part of an escalatory process, the deployment of medium range strike aircraft to the air bases that were to be used by the tanker aircraft demonstrates a similar probability of an effective strike, and thus is likely to represent as effective a deterrent or coercive strategy as deploying the B-21. In addition, the challenge of demonstrating commitment to allied states without the overseas deployment of the B-21 is as apparent

²⁹⁰ Joseph M. Parent and Paul K. MacDonald, "The Wisdom of Retrenchment," *Foreign Affairs* Volume 90, no. 6: 36.

within the "Retrenchment" strategy as it is within "Dominance", or even "Offshore Balancing".

As a tool within a "Littoral Enforcement" strategy, the B-21 provides a degree of "over the horizon" capability, albeit with the same caveat that it is likely that air-to-air refuelling aircraft based overseas would be required if the aircraft was intended to launch from and recover to a base in the mainland U.S., and removing U.S. forces from overseas bases raises the question of commitment to allies. Critically, this also challenges the perception that the B-21 can enable U.S. forces to be the decisive player in a conflict without committing troops on the ground. In an unconventional conflict against a non-state actor the B-21 may be able to offer extensive strike capability, but it is telling that in the operations against ISIL it is RPA and medium range strike aircraft that are performing the bulk of ground-attack missions, rather than the existing LRSB fleet. Given the U.S. support for the Iraqi government in particular, and the desire of the Obama administration to avoid committing ground forces, this would theoretically be an ideal opportunity to engage LRSBs within what otherwise appears to be a "Littoral Enforcement" strategy. Similarly, in a conventional conflict against technologically advanced opposition, the decisive edge that the U.S. policy makers seek to provide is unlikely to be generated by the B-21 alone, unless air superiority has already been achieved. If this is not the case, unless the system operates only at night it will be imperative that it is supported by fighter aircraft. If air superiority has been achieved, a similar degree of effectiveness in ground attack operations is likely to be possible through the use of medium range strike aircraft supported by air-to-air refuelling tankers.

The U.S. 2015 National Security Strategy emphasises U.S. "leadership" while retaining the ability to act unilaterally.²⁹¹ Differing definitions of 'leadership' exist, and the National Security Strategy gives no indication of the exact form that such leadership will take. Nevertheless, it is reasonable to suggest that U.S. leadership would be founded on maintaining and developing a network of global relationships with states whose policy makers look to the U.S. for support, thus creating the opportunity for U.S. policy makers to engender the collective action that they deem to be in the best interests of all parties. The "need for a new long range strike aircraft" to "execute the tenants of...security strategy", as claimed by David Deptula, Dean of the Mitchell Institute for Aerospace Studies, is therefore difficult to reconcile.²⁹² The B-21 is a symbol of stand-off power, disassociating the deployment of kinetic force from other operations, in spite of the use of B-52s and B-1Bs in CAS roles. If the leadership ideals of the U.S. 2015 National Security Strategy are to be pursued, the procurement of a system that facilitates the deployment of kinetic force in such a fashion does little to realise them.

Even as an accepted global leader it is not a given that the U.S. forces will have basing rights in every state - Turkish policy makers' reluctance to allow U.S. forces to deploy from the state for operations against opposition forces in Iraq being a prime example.²⁹³ An inability to access "front-line states" represents a challenge to operations by medium range aircraft, but it is by no means insurmountable, and the B-21 would not

²⁹¹ Obama, *2015 National Security Strategy*, 8.

²⁹² Drew, "It's large and lethal".

²⁹³ Grant, *Return of the Bomber*, 16.

automatically negate them.²⁹⁴ This is particularly the case if U.S. policy makers are reluctant to violate the airspace of states that deny the U.S. aircraft overflight rights. If the situation is grave enough for such violations to be an accepted risk, medium range strike aircraft with supporting tanker aircraft could be an effective alternative.

The psychological component of developing the B-21 giving the U.S. military another capability advantage over their Russian and Chinese counterparts is only superficially significant. It is, again, the potential effectiveness of the U.S. military that can be leveraged and impacts the U.S. position in the global order, rather than the capability of individual components within it. Policy makers of states who see themselves in competition with the U.S. should be concerned with the costs that U.S. soft or hard power can actually impose on them, and their ability to respond to or pre-empt the imposition of these costs. The failure of the B-21 to radically improve the effectiveness of the U.S. military means that the mere act of creating it is not in itself going to drive a major alteration in the ability of U.S. policy makers to shape events.

The procurement of the B-21 is, therefore, a misguided policy based on a mistaken conflation of capability and effectiveness, as well as institutional blindness to a changing security context. Global leadership requires commitment to other states, and the resolve and capability to honour these commitments. Even in the event that this leadership is based on enhancing the ability of allied states to support themselves militarily rather than relying on assistance from U.S. forces, it is important that the U.S. military can respond to escalating situations and retain the ability to deploy kinetic force

²⁹⁴ Grant, *Return of the Bomber*, 17.

if the situation requires. The B-21 is not required for this to be achieved and the degree of effectiveness that the aircraft would provide can be replicated with alternative systems.

The concept that the U.S. long range bomber is able to deploy "weapons on target from [its] home station" is only partially true.²⁹⁵ The function of a strike aircraft is to deploy appropriate ordnance on a target and, for the U.S., the bomber's mission is to deploy ordnance that holds targets at risk all over the globe. To attain this position, air-to-air refuelling is required. Given this fact, medium range strike aircraft, appropriately and realistically forward deployed, can demonstrate the same degree of effectiveness as the B-21. The critical point is whether the aircraft can manoeuvre into position in order to operate its sensors effectively and deploy this ordnance. The capabilities of the B-21 provide, at most, a limited degree of unique effectiveness. The "dazzling performance of precision weapon-equipped fighters in Operation Desert Storm" is unlikely to be replicated in every scenario, and the aircraft did not perform effectively in every role, but it is an indication of what the systems can achieve in modern warfare.²⁹⁶

Consequently, U.S. procurement should concentrate on the ongoing development of new long range air-launched cruise missiles that can be carried by the F-35, and a replacement for the GBU-57A/B. Contrary to the assertion that "replicating the new bomber's strike capacity with a standoff missile would require the Pentagon to design and acquire a weapon it has never contemplated before", the creation of ordnance that can strike targets without the launch vehicle entering contested airspace has long been a

²⁹⁵ U.S. Air Force, "AF realigns B-1, LRS-B under Air Force Global Strike Command".

²⁹⁶ Grant, *Return of the Bomber*, 10.

focus of development. Again emphasising the delineation between capability and effectiveness, the critical requirement is that the ordnance that is deployed by the U.S. military can effect the destruction of the target. This remains the case regardless of the launch vehicle. The carrying capacity of the B-21 will provide a capability advantage over medium range strike aircraft, but classing this as a unique superiority in effectiveness assumes the unlikely event that a multi-aircraft raid by medium range strike aircraft is a practical impossibility.

It is only by tradition that the air arm of the U.S. nuclear triad has been perceived to be based on the LRSB fleet. In reality, medium range strike aircraft such as the Grumman A-6 'Intruder' and General Dynamics F-111 'Aardvark' have been critical components of the nuclear strategic force.²⁹⁷ The likely ability of the F-35 to deploy the B61-12 continues the tradition of air-launched nuclear weapons in the U.S. armoury.²⁹⁸ Given the U.S. policy makers' emphasis on minimising civilian casualties, and the reluctance to engage in nuclear warfare, the development of air-launched strategic nuclear weapons that have a warhead too large to be carried by a medium range strike aircraft, thus limiting their effectiveness as the launch vehicle, seems unlikely. Consequently, the decision not to procure a new LRSB would not markedly impact the effectiveness of the U.S. military's nuclear triad.

The procurement of new weapons systems and ordnance is a multi-faceted decision but, at its core, should be founded on anticipated military requirements. While

²⁹⁷ Budiansky, *Air Power*, 399; Thomas B. Cochran, William M. Arkin, and Milton M. Hoenig, *Nuclear Weapons Databook: Volume 1* (Cambridge, Mass.: Ballinger Publishing Company, 1984), 206.

²⁹⁸ Deagel, "B61 Mod 12," *Deagel.com*, accessed October 12, 2015, http://www.deagel.com/Bombs-and-Guidance-Kits/B61-Mod-12_a002968002.aspx.

the reasons for state policy makers to engage in conflict may be constant, its conduct is constantly in flux, and weapons reflect this. It is always a temptation to maintain a pathway of capability, making incremental improvements to existing systems regardless of a changing security context. This is exacerbated by the potentially lengthy temporal period for the procurement of a complex system, and the difficulty in accurately predicting future requirements. Nevertheless, paradigm shifts in weapons technology indicates that slavish adherence to previous policy is not universal. U.S. policy makers now have the opportunity to embrace such a change without compromising the effectiveness of their military. Rather than procure the B-21, U.S. policy makers can construct a force that is optimised for twenty-first century conflict and U.S. national security strategy, instead of remaining wedded to a weapons system whose effectiveness is unlikely to be unique and is suggestive of an approach to conflict that remains rooted in the Cold War.

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