



The NORAD 50 anniversary paint on a Royal Canadian Air Force (RCAF) CF-18 in Bagotville, Quebec, Canada on June 22, 2013.

Hardening the Shield: A Credible Deterrent & Capable Defense for North America

By Terrence J. O'Shaughnessy and Peter M. Fesler

Executive Summary

With innovations in long range missiles and foreign missile defense systems as well as a changing Arctic landscape, threats to U.S. national security are closer and less deterred than ever from attacking the U.S. Homeland. Without compromising fiscal resources set for alleviating the COVID-19 crisis, O'Shaughnessy and Fesler lay out where enemy forces, notably China and Russia, are targeting weaknesses in U.S. Homeland defense and how U.S. defense strategies and organizations can be adapted to match the muscle of its offensive force. Their recommendations include the use of existing technologies to elevate equipment, data collection from space systems, data analytics for decision making, augmented communication between certain defensive lines, and cross-cutting collaboration on shared challenges. Retiring from his post in August of 2020, O'Shaughnessy is the former Commander of the United States Northern Command (USNORTHCOM) and North American Aerospace Defense Command (NORAD). O'Shaughnessy is joined by Peter Fesler, NORAD's Deputy Director of Operations.

The brief respite from great power conflict in the late 20th and early 21st centuries is over, and the Homeland is no longer a sanctuary. The National Defense Strategy (NDS) concisely articulates a shift in the security environment, away from one dominated by the threat of violent extremism, toward one in which peer adversaries, possessing the capability to generate catastrophic effects globally, are the paramount concern for the United States. These adversaries have developed the capability and intend to hold critical sites in the United States and Canada at risk with conventional strikes. Recognizing this, the NDS specifically makes direct defense of the Homeland against a peer the number one priority for the Department of Defense. Canada's national defense policy articulated in "Strong, Secure, and Engaged" provides similar guidance.

In response to the changing security environment and guidance from national leaders, the men and women of U.S. Northern Command and the North American Aerospace Defense Command are enhancing their ability to defend against a peer threat. The two commands act as North America's shield, deterring attack, and defending the populations and critical infrastructure of the United States and Canada. Improving defensive capabilities in the face of a growing threat, while accounting for fiscal realities has required the two commands to fundamentally rethink the way they think about defense. Effective Homeland defense against a peer will not be achieved simply by a return to Cold War postures and plans, nor will it be achieved with current post 9-11 counter-terrorism forces. Homeland defense requires a fundamentally new approach and steps are being taken today toward making that approach a reality.

We cannot expect to have the same success defending our homelands against a peer competitor, using the same resources, organization, and focus that we applied to defending against violent extremist organizations that have no ability to hold the homeland at risk.

The Changing Security Environment

Despite the clear shift in the global security environment, there are those that hold to the defense concepts of a bygone era. This is understandable. For more than 30 years since the collapse of the Soviet Union, war for America has been dominated by counter-insurgency and counter-terrorism conflicts. Defense planners have been focused on the difficult challenges associated with defeating insurgencies in largely ungoverned spaces in an effort to prevent terrorist groups from building a base of operations from which to launch the next 9-11 style attack. The American way of war became defined by battles in places with familiar names like, Mogadishu, Korengal, Tora Bora, Fallujah, and Ramadi.

Out of necessity, and due to a lack of a peer, or even near peer military threat, funding for major high-end acquisition programs was shifted to the sustainment of current operations in the war against violent extremism. Gradually, almost imperceptibly, America's Cold War and Desert Storm winning conventional military was transformed into a lethal and effective counterinsurgency force. Like the generations before them, military professionals today (the authors of this paper included) are shaped by their own experiences, and in these experiences the Homeland was, with few exceptions, a secure base from which to launch operations in conflicts on the other side of an ocean.

How Has the Security Environment Changed?

While U.S. and Allied forces fought, learned, and won on the battlefield, America's old adversaries also learned. They deliberately designed strategies and acquired systems intended to circumvent the military strength of the West. Today, the oceans that were formerly the moats that defended the arsenal of democracy have become a means of approach, the Arctic is no longer an icy fortress wall protecting the northern flank, and the skies in which American

airmen operated with impunity for the last three decades have become contested and the preferred domain for adversary kinetic attacks on the Homeland. At the same time the American military was abandoning training for large-scale warfare and retooling for counter-insurgency, her enemies were preparing for a force-on-force fight with the United States, and in doing so they discovered a weakness.

If the traditional American way of war is the deployment of overwhelming force to a fight overseas, then the way to defeat the United States military in the next war, in the minds of her adversaries, is to prevent deployment in the first place. Either through the threat of attacks on economic targets designed to constrain options, or direct strikes on mobilizing forces, the deployment of the American military must be stopped before it starts. The economic engine and carefully orchestrated multi-modal logistical movements that enable the world's preeminent military are now a target.

Growing Adversary Capability

Such a strategy requires new weapons; weapons with sufficient reach to allow for their delivery without directly facing the still very dangerous American military, bypassing its fielded forces completely. This is a significant departure from the past, where great effort was made to keep regional conflicts just that, regional. In this approach, driven by the recognition that building a force sufficient to prevail on the battlefields of Europe or the Western Pacific would be cost prohibitive, the new generation of weapons would be specifically designed for horizontal escalation to strikes against largely unhardened targets in North America.

Most importantly, these weapons would need to be conventional. Both China and Russia have long been able to range any target in North America with nuclear payloads, but the threat of immediate and devastating retaliation by the nuclear triad of United States Strategic Command limited their

utility in hemming in the American military. Using nuclear weapons against targets in North America in an attempt to alter the outcome of a regional conflict would be suicidal, and so they set out on a deliberate path of conventional long-range weapons development.

“Adversaries will threaten the homeland through subversion and coercion and a range of systems, including long-range nuclear armed missiles, conventional precision strike systems, and systems designed to gain information advantage.” – Joint Force 2030

China's approach has been, as would be expected for the Middle Kingdom, patient. In a methodical and steady manner that is difficult for the West to comprehend, Beijing has developed the economic and technological backbone necessary to challenge the United States and its allies. Its weapons of choice: economic coercion and control, and cyber intrusion. Beijing's recent flexing of its economic muscles, and its conduct of a sophisticated and systemic approach to industrial espionage are well documented. Further, the growing indications that Chinese cyber actors have moved beyond data exfiltration to planting leave behind capabilities for future conflict, has earned the close attention of the operators and planners at United States Cyber Command.

Beijing has not limited itself, however, to the development of non-kinetic weapons. Over the past decade, the Chinese People's Liberation Army, or PLA, has fielded a wide array of new systems including solid fueled road mobile ICBMs, hypersonic glide vehicles, quieter submarines, and air refueling capability, the latter of which will likely place targets in the western United States and



PETERSON AIR FORCE BASE, Colorado - Royal Canadian Air Force's Snowbirds aerial demonstration team perform a flyover during the North American Aerospace Defense Command's 60th Anniversary Ceremony on Peterson Air Force Base Colorado, May 12. Photo By: Dennis Carlyle

Canada within range of air launched cruise missiles by the mid-2020s. These systems have dramatically increased to ability of Chinese forces to project power beyond a range needed for defense.

The opaque nature of the Chinese Communist Party makes it difficult to determine Beijing's intent, but Chinese military leaders have not been shy in stating that they believe they must be prepared for war with the United States. Much of Beijing's weapons development is designed to prevent the United States military from deploying into the Western Pacific in a crisis, and military leaders in the PLA frequently speak of a strategy designed to deny access to the theater through attacks at range. If their words are to be believed, cyber and long-range precision strikes on key locations in the United States will be part of this strategy.

To an even greater degree, Russia has invested in the capability to strike targets in North America while remaining below the nuclear threshold. Russian nuclear forces have long possessed the capability to strike targets in North America. More recently, however, the Kremlin has dedicated significant resources toward the creation of a

long-range precision conventional strike capability. The development, acquisition, and deployment of stealthy air and sea-launched cruise missiles, and the modernization of the aircraft and submarines that deliver them, has given Russian military planners their first true conventional capability to strike the Continental United States.

Russian political and military leaders have repeatedly made it clear in public statements that they intend to attack targets in the United States in the event of a conflict elsewhere. Unlike China, there is nothing opaque about the Kremlin's position, and the logic behind the strategy is sound. Russia enjoys a favorable balance of forces in the European Theater at steady state. Russian forces can mass more quickly on their frontier than their NATO foes, but once the West mobilizes, the balance irreversibly shifts in favor of the United States and its allies.

To counter this inevitable shift, a key component of the Kremlin's strategy is the prevention, or at least delay of NATO, and specifically, American military mobilization and deployment into the European Theater. That mobilization funnels through a limited

number of air and sea port facilities and installations in the Continental United States, and these are the sites that Russia's new generation of weapons appear designed to strike.

Russia has also ramped up training for these attacks, with repeated submarine deployments to the Western Atlantic and long-range aviation sorties into the Arctic approaches to North America. Russian activity is no longer limited to the predictable strategic messaging patrols of the mid-2000s, intended to visibly convey the Kremlin's displeasure with Washington and demonstrate relevance in the wake of its Cold War defeat. Tupolev bombers and ultra-quiet nuclear powered submarines now frequently conduct mission rehearsals for strikes on the United States and Canada in areas that are outside of the North American Aerospace Defense Command's radar coverage, and in a manner designed to defeat U.S. Northern Command's maritime Homeland defense forces. Armed with their new generation of long-range weapons, these submarine and bomber crews quietly maneuver to positions where they can hold virtually every point in North America at risk. This is not messaging. The Kremlin's stealthy operations are designed specifically to remain undetected, and what good is a strategic message if it is not received.

Adversary Logic of Horizontal Escalation and Their Balanced Approach

The strategies developed by Russia and China are not without precedent, rather they are the natural progression of military strategic thinking, and their technology development is simply following a very predictable path, one that the United States walked decades ago. Since the late 1980s, American air and naval forces have possessed the capability to conduct long-range, conventional, precision strikes. Every conflict in which the United States has participated since the end of the Cold War has featured live television coverage of the near simultaneous impacts of dozens of land attack

cruise missiles launched from U.S. Air Force and Navy platforms more than one thousand miles away.

Bombers of U.S. Strategic Command regularly prowl the skies in the approaches to both China and Russia, and no other country in the world comes close to the American Navy's command of the seas. The United States military's dominance in the air and at sea provides control of the global commons and largely unfettered access to launch locations within range of virtually every point on the globe. Long-range precision strike is a key component of any American military campaign, and consistent with airpower doctrine, planners consider adversary logistical hubs as lucrative targets. America's adversaries have watched and learned.

To counter what it perceives will be the opening salvos of war with the United States, Beijing has gradually expanded its defenses in an attempt to deny access to the Western Pacific. China's well documented anti-access and area-denial efforts include the fielding of missiles specifically designed to kill the American carriers, and large quantities of cruise and ballistic missiles intended to hammer U.S. forces deployed to regional bases. Beijing has also invested in increasingly sophisticated and dense air defense systems designed to blunt strikes by American aircraft and long range-cruise missiles.

From their increasingly secure territory, Beijing has sought to develop the offensive kinetic and non-kinetic capability to strike American forces at ranges as far away as North America. China's bombers are operating at ever greater ranges, now holding targets in Alaska at risk, and its submarines roam well beyond the confines of the second island chain, creeping ever closer to North America. This balanced approach to offense and defense is designed to deter and if necessary defeat U.S. forces that they perceive will attempt to intervene in Beijing's sphere of influence.

Similarly, the Kremlin has sought to deny American airpower the ability to conduct long-range strikes against key infrastructure by fielding the most modern and capable integrated air defense system in the world. Featuring over fifty battalions of the latest SA-10, 20, 21, and 23 missile systems, which the Kremlin claims have counter-stealth capabilities, Russian air defenders believe they are well equipped to defend against the West's long-range strikes.

Russia's enhanced defense is coupled with an ever increasing capability to strike at range, impeding U.S. force flow and destroying critical infrastructure well outside of the European theater. Conventional attacks on targets deep in the United States and Canada are now firmly entrenched as a necessary component of any war winning strategy in a conflict with the West. The Kremlin has chosen this strategy because it has few other options, and because the United States has given it an opening. This is not supposition. The Kremlin has openly communicated its intent.

Over the past two decades, Russia has set out on a deliberate path to circumvent the West's military superiority. Turning a strategy into doctrine, and doctrine into reality, the Kremlin has modernized its entire air defense network and fielded long-range conventional cruise missiles in sufficient numbers to make the threat of strikes on North America feasible. Some have suggested that these new long-range weapons are intended for regional conflicts. They could, in fact, be used within the confines of the European continent, but it is improbable that the Kremlin would procure weapons with four to five times the range needed for their intended purpose. It is also unlikely that they would pair these weapons with bombers specifically designed for round trip intercontinental flight if their intended targets could be reached by far more numerous and lower cost shorter range aircraft or ground-launched systems.

Russian planners are not stopping with new

weapons. Their fleet of bombers is well into a decade-long modernization program, and plans have been drawn for the development of an entirely new generation of long-range aircraft. In the maritime domain, recent media reports out of the Kremlin highlighted the laying of the keels of additional Severodvinsk class guided missile submarines, similar to the one that now challenges maritime forces on both sides of the Atlantic. Over the next decade the Russian Navy's fleet of these highly capable submarines will increase nearly tenfold.

Military Focus Out of Balance

In stark contrast to the balanced approaches of both China and Russia, the United States has adopted a purely offensive approach that relies on the ability of the American military to mobilize and mass forces at a time and place of its choosing. Very little attention has been focused on defending the Homeland because the basic assumption in the American strategy is that "we will fight the enemy over there so that we don't have to fight them here." That philosophy was reinforced by the nearly three decades of the fight against violent extremism and insurgencies, and in that context, it was a reasonable assumption.

America and her allies must be prepared for the war that is coming and not just the war that they prefer to fight.

This approach is no longer sufficient in light of the threat now posed by Russia and China. Implicit in the current American strategy is the assumption that Washington will be allowed to fight the purely overseas fight that it desires, but Beijing and the Kremlin do not intend to contain conflict at the regional level. In fact to the contrary, they plan to take the fight to North America so that they don't have to fight in Europe or the Western Pacific, or at least to ensure that any fight will be against one

with reduced participation by the United States military.

This is not the first time that the pendulum has swung too far in the direction of the offense.

In the early days of the Cold War, Washington recognized a similar imbalance, and set out to reorient the Department of Defense. In fact, it was this realization that was responsible for the creation of the North American Aerospace Defense Command in the waning days of the 1950s.

The history of the American military provides multiple examples of imbalance and rebalance, and in each, there was an accompanying hesitation. Stasis is easier than change. The whole of an organization is typically designed for the world as it was and not as it is, but change must and does occur. It occurs either by choice, or out of necessity in crisis, and when it is the latter, that change is often too late to avoid unnecessary losses. From Bull Run, to the skies over North Vietnam, to the 21st century wars in Iraq and Afghanistan, history provides numerous examples of the results of slow recognition and adaptation to changes in the character of war.

“The strength of the United States which must be so maintained is an integrated complex of offensive and defensive elements.... Accordingly, each element of this integrated complex should be in proper balance with all the other elements. We shall not have satisfactory over-all strength if one element is allowed to develop out of proportion to the other elements.... In recent years we have emphasized the elements

of peripheral defense, offensive capabilities, and mobilization base more than we have emphasized the element of “continental defense.” Yet this latter element is necessary for the protection of our vitals and for the survival of our population and our Government in the event of attack. ‘Continental defense’ is now clearly inadequate.” -Statement of Policy on Continental Defense (NSC 5408, Feb '54)

Deterrence Out of Balance

Deterrence is the act of discouraging an action or event through instilling doubt or fear of the consequences. Both during and after the Cold War, when the primary threat to the homeland from China and Russia was nuclear, our nuclear forces provided an effective and credible deterrent. Because our forces were postured to ensure a survivable retaliatory capability, no nuclear strike on the United States could prevent a nuclear response, and the consequences of such a response were unpredictable and potentially devastating. In the terms of deterrence theory, this is deterrence by punishment. The credibility of any deterrent threat depends on capability and will. In the context of a nuclear attack, the United States undoubtedly had (and still has) the capability to deliver a devastating response, and it would be dangerous to question Washington’s will.

The promise of devastating retaliation in response to a nuclear first strike is credible. The threat of a nuclear retaliation as a response to a limited, precise conventional strike is less so. Washington would be challenged to find a way to make an adversary believe that in response to a small-scale conventional strike, kinetic or otherwise, it

would unleash its nuclear arsenal, and the threat of conventional retaliation against Russia or China would not promise the level of damage necessary to deter. Sole reliance on deterrence by punishment is insufficient to deter the full range of attack options available to Beijing and the Kremlin. A more balanced approach to deterrence is required.

That approach requires both the promise of punishment and the capacity to resist an adversary attack. The ability to punish exists, but making an adversary believe that a sufficiently capable defense exists may alter his cost-benefit calculus by creating the impression that an attacking force would incur significant loss or have insufficient impact, therefore making launching an attack an undesirable option. If an adversary does not fear punishment and does not believe defense is possible, there is no disincentive. Lack of a defense invites attack, and conversely, the ability to defend and resist deters it. In the words of General George Washington, “To be prepared for war is one of the most effectual means of preserving peace,” and in this case preparedness comes in the form of the ability to defend the Homeland as part of a balanced strategy.

“We must ensure the ability to deter potential enemies by denial, convincing them they cannot accomplish their objectives through the use of force or other forms of aggression.” -2017 National Security Strategy

Restoring Balance and Hardening the Shield

Where the ability to project power, backstopped by U.S. Strategic Command’s nuclear force, represents America’s sword, the defensive capability provided by U.S. Northern Command and its bi-national

partner the North American Aerospace Defense Command (more commonly referred to by its abbreviation, “NORAD”) are America’s shield. Significant effort has been placed on sharpening the sword. The nuclear enterprise is undergoing a complete, decade-long modernization, and the services are recovering from nearly 20 years of war against violent extremists, and retooling for future conflict against peer adversaries. The same cannot be said for the shield.

The shield served well through the Cold War and continues to protect America and Canada from attack by terrorists, but with one notable exception, its last major upgrade occurred in the mid-1980s, and like any tools of war, it needs attention. The bias toward the offense that has rightfully characterized American military planning in the post 9-11 environment has resulted in a lack of focus on defending the Homeland. The shield, while still intact, is showing its age, and it is the recognition by America’s adversaries of the imbalance between offensive and defense capabilities that has led them to consider expanding any future regional conflict to the North American continent.

There is also imbalance within the shield. The sole significant defense modernization effort over the past two decades is the ballistic missile defense system. Comprised of unique sensors and ground based interceptors, this system is designed to shoot down nuclear tipped missiles launched by a rogue nation, namely North Korea. This ballistic missile defense enterprise has enjoyed significant investment over the past decade at billions of dollars per year, and this investment is ensuring that the system remains capable of defending against an increasingly sophisticated North Korean ICBM force. In comparison, the defensive systems designed to defend against the range of threats presented by peer competitors have seen almost no upgrade or investment, and in some cases even the funding for sustainment of the old equipment has been cut. In order to be prepared for war, balance must be restored and the shield must be

hardened.

“We cannot expect success fighting tomorrow’s conflicts with yesterday’s weapons or equipment.”

- 2018 National Defense Strategy

America’s current shield is comprised of multiple single-purpose systems. Scanning the skies for approaching bomber aircraft is NORAD’s early warning radars. Always at the ready guarding against rogue nation nuclear missile attack stands Northern Command’s ballistic missile defense enterprise. At sea, an ever present array of sensors and platforms listen for the faint sounds of approaching adversary submarines. Although these systems remain capable, the shield’s components were each designed to counter a particular threat or weapon, and operate completely independent of each other. The radars used by NORAD to warn of Russian or Chinese ballistic missile attack, for example, are not integrated with those used by Northern Command to engage missiles launched by North Korea. Even if the ballistic missile defense architecture were to detect a launch from China, it would not directly share that information with NORAD’s missile warning systems. The watch standers in the consolidated NORAD and Northern Command headquarters are forced to verbally pass information displayed on independent systems.

The stove-piped character of the shield stands in stark contrast to the offensive capabilities that America’s adversaries are fielding. The weapons available to Beijing and the Kremlin are diverse and designed to complicate defense by simultaneous strikes across multiple domains and through multiple means. They seek to exploit the seams between the existing defensive system, and they are increasingly difficult to detect. To defend against these emerging threats, improvements to the shield are needed, but simply upgrading or replacing each of the shield’s aging single-threat

systems would be costly and likely ineffective, as this approach would fail to close the seams.

“Being strong, secure and engaged in the context of an extraordinarily complex security environment requires a fundamentally new, agile, modern and responsible approach to defence.” – 2017 Canada Defence Policy

A more holistic modernization effort is needed. Designed to achieve deterrence of adversaries by denial of their objectives, and defend the Homelands should that deterrence fail, Northern Command and NORAD have collectively developed a modernization strategy for defense referred to as the Strategic Homeland Integrated Ecosystem for Layered Defense, or SHIELD. SHIELD is not a system, or even a system of systems, it is an ecosystem. It is a fundamentally new approach to defending North America. SHIELD takes advantage of the data provided by traditional and non-traditional sources to provide a layered ability to detect any threat approaching the continent, from the sea floor to on orbit, in what NORAD and Northern Command refer to as “all domain awareness.” It pools this data and fuses it into a common operational picture. Then, using the latest advances in machine learning and data analysis, it scans the data for patterns that are not visible to human eyes, helping decision-makers understand adversary potential courses of action before they are executed. With an understanding of likely enemy actions, it will assist in the development of a response, weighing the risk and reward, looking several moves into the future, and allowing for decision superiority. Finally, the SHIELD will employ an array of new and already fielded defeat mechanisms designed specifically for Homeland defense, preserving more of the force for the forward fight.

Domain Awareness: Anticipating the Attack

Successful defense first requires the ability to detect, track, and identify threats as they approach. To accomplish this, SHIELD does not simply call for the replacement of radars, or the acquisition of a better undersea acoustic sensor. In fact, a key characteristic of SHIELD is its use of a combination of both existing and new equipment and technologies. Some current sensors will be retained and are already part of the SHIELD, as they still provide useful data. Others will be abandoned and funds currently used for their sustainment will be repurposed. In some cases new equipment will be required, but with all of these sensors, their use will be significantly changed from past efforts. No longer will a sensor provide information in a unique format to a specially designed platform. Instead each will provide data to a central library accessible, and more importantly useable by all, as capturing and making sense of the data is the heart of the SHIELD.

In practice, SHIELD will pull in data from a layered sensing grid ranging from current and future on orbit systems, to new long-range sensors currently being sited in several locations in the United States. Combined, these sensors will allow for the detection of threats well before they can reach launch locations for targets in North America. In some cases sensors will be able to see adversary platforms before they even leave their own territory. Sensors will detect, characterize, and track advanced cruise missiles (and the aircraft, ships and submarines that carry them), ballistic missiles, hypersonic weapons, and small unmanned aerial systems at their maximum ranges. This will be accomplished through a global sensing grid that includes a robust and resilient layer of space based systems. The depth, discrimination, and sustained custody available only through the use of on orbit systems will create the time and space needed to respond when faced with weapons designed specifically to compress the time available to

decision-makers.

We cannot deter that which we cannot defeat, and we cannot defeat that which we cannot detect.

This long-range surveillance is the first step in defense, as it will allow for the posturing of forces at the right place and time, and provide warning to key commands, like U.S. Strategic Command and Canada's Joint Operations Command, and non-defense agencies, such as the U.S. Department of Homeland Security. The data from these systems will be combined with that provided by short-range sensors, including terrestrial radars operated by Navigation Canada and its American counterpart, the Federal Aviation Administration. Additional sensors, originally designed for vastly different purposes, are today being used in new and creative ways, and already contribute data to the SHIELD. This data, and that provided by future sensors, will be fused to provide high fidelity tracking of threats as they approach the North American continent, allowing NORAD and Northern Command operators to determine the precise point of attack and execute the defense.

Effective defense must begin with domain awareness. This is not to suggest that NORAD and Northern Command are blind today. In fact, the SHIELD is already being improved. Over the past two years incremental steps have been made to repurpose existing systems and harness the data they provide, but in order to keep up with adversaries that are determined to find and exploit weakness, greater investment is needed.

Joint All-Domain Command and Control: Raising the Shield

Simply detecting and displaying an approaching threat does not constitute a defense. Joint all-domain command and control (JADC2) is command and control for the digital age – the architecture needed to produce faster and better decisions



Royal Canadian Air Force CF-18 Hornet pictured at the 2018 Royal International Air Tattoo at RAF Fairford in Gloucestershire

for our warfighters from the tactical edge to the combatant commander—decision superiority. What makes this different from previous command and control constructs is that it is built on a data-rich foundation that employs the power of modern computing to enhance decision-making. This new capability moves beyond the limitations of human capacities to produce computer-enabled insights that can identify anomalous events, anticipate what will happen next, and generate options with associated repercussions and risks.

To conduct command of control of the joint forces assigned to the defense of North America today, the men and women of the two commands process information from multiple sources and displays to build a mental picture of adversary and friendly activities. They then relay instructions via an array of single service systems. Information passed to aircraft defending against cruise missile attack, for example, are relayed through unique Air Force systems, while critical information needed to defeat an approaching submarine is passed through a U.S. Navy command and control system. Should that submarine make it through the maritime defenses and launch its payload of land attack cruise missiles,

Homeland defense forces would be required to orchestrate the combined defense through two independent and incompatible systems.

The SHIELD will tie these independent systems together into a networked command and control system capable of directing the joint force in all domains, on the land, in the air, on orbit, and at sea. Initially it will not replace each of the Services' existing systems. Rather, it will act as a Rosetta stone capable of interpreting and relaying data from one system to another, and as with SHIELD's approach to the sensors needed for domain awareness, it will also use a combination of new and old. This capability is already being operationally tested in a Northern Command and NORAD initiative known as "Pathfinder." Today, Pathfinder is processing more sensor data than the current command and control system used for air defense of North America. Perhaps more importantly, because of the quantum leap in processing power that has been achieved since the fielding of the current system, and the approach used in SHIELD, Pathfinder is identifying information buried in the data, giving new life to old sensors.

In a recent demonstration, the Pathfinder system

was tied to Federal Aviation Administration radars, and without any modification to the radars themselves, consistently demonstrated an ability to effectively detect and track very small unmanned aircraft, previously thought to be beyond the capability of the system. Through this approach, the opportunities for the enhancement of domain awareness are virtually unlimited, and it does not take a leap of logic to see how this same process may lead to an enhanced capability to track a range of threats designed to evade detection. Similar experiments are being conducted with the full range of sensors currently in use.

JADC2 is about increasing both the breadth and depth of the data analysis. This data-driven approach provides highly granular understanding to move decision-making from reactive to anticipatory and proactive. Decision-makers will have more sophisticated insight into complex problems and make decisions with much clearer understanding of the ramifications on future operations. Modern processing power will be used in conjunction with machine learning, data analytics, and eventually artificial intelligence to look at the vast pool of data available and recognize patterns that are invisible to human analysts. This data, already available today, holds the key to anticipating an adversary's moves before they are executed. By looking at vast quantities of historical data and trends over time, patterns of behavior will be established, making deviations from the norm stand out, allowing leaders at all levels to effectively see into the future. Armed with this data, decisions will be made at a pace necessary to achieve advantage; the speed of relevance in modern warfare.

SHIELD will also use data analytics to aid in the development of friendly courses of action. Again, by recognizing minute and inter-related trends in logistics, readiness, supply, and even weather, SHIELD will allow for the refinement of plans and an understanding of future cost, benefit, and risk in ways that are not even conceivable using current systems. The combination of advanced

understanding of future adversary actions and the development of informed responses will provide the decision superiority necessary for victory on the modern battlefield. As Sun Tzu prescribed, "Know yourself, know your enemy, and in a hundred battles you will not know defeat."

This is not the stuff of science fiction or a glossy brochure that promises future capability never to be achieved. Sensor data is being coupled with data analytics by Northern Command today to great advantage. The SHIELD approach of importing data from multiple distributed traditional and non-traditional sources, and analyzing it for patterns and trends, has allowed Northern Command, in its defense support to civil authorities' role, to anticipate COVID19 outbreaks before they occur. This enabled the command to make informed decisions and position medical equipment and personnel before local medical experts even realized the disease was spreading. Computer-aided decision superiority is becoming reality.

Defeat Mechanisms: Blunting the Attack

Domain awareness and the analysis of data is the core of the SHIELD, but seeing, understanding, and out thinking an enemy although necessary, is not sufficient to deter or defend. Attackers must ultimately be defeated. To engage and defeat approaching threats, Northern Command and NORAD currently rely on equipment designed for offensive actions in other theaters. Stealthy fighter aircraft designed to fly deep into highly defended enemy territory can certainly engage and defeat an approaching bomber or cruise missile over the vast expanses of the Arctic, but the costly capabilities necessary for the attack are not needed for defense over the high north of Canada. Similarly, a surface-to-air missile system designed to move with and protect advancing Army units against air and missile attack is over-designed for the defense of a stationary port. Although effective, repurposing these systems for defensive actions is inefficient and costly, and their use in a defense

role precludes their use in battlefields overseas. Homeland defense is—and must continue to be—complementary to and not in competition with other regional operations.

The forces used by NORAD for air defense today are exactly the same forces needed by Indo Pacific Command to deter and defeat Chinese aggression in the Western Pacific. Similarly, NORAD and the European Command wrestle over a limited number of critical assets as they contemplate the war they may both fight against Russia. SHIELD provides a unique solution to these shortfalls; one that circumvents the current zero sum game approach to the global allocation of forces. It calls for the development and fielding of purpose-built, low cost, persistent systems designed to defend key areas in North America against conventional threats available to Russian and Chinese military planners. The use of this approach reduces the need for forces freeing them up for conflict elsewhere and reduces the overall demand for costly offensive forces.

These purpose built defeat mechanisms fall into two categories. The first is the lower cost applications of existing technologies. This category includes the use of missile systems divorced from their costly launch platforms, such as the Navy's standard family of missiles fired from fixed land-based locations without the associated Aegis weapon system that normally accompanies them. SHIELD leverages the research and development already complete to allow for low cost fielding of these systems in short order. The second category is the use of new technologies designed to invert the cost curve, as today the missiles used in the defense often cost more than those used by the attacker. These new technologies include directed energy and high power microwave weapons with unlimited magazines and high rates of fire. The incremental approach within SHIELD allows for the fielding of current technologies while future capabilities mature and are tested.

How Much Defense is Enough?

Another feature of the SHIELD is its approach to defense and deterrence with respect to sufficiency. Many have suggested to the authors of this paper that the defense of the Homeland is simply too expensive, as it is impossible to defend everything within fiscal limitations. "We can't defend every school in North America" one defense leader remarked. There is merit to these claims, as certainly the defense of everything in North America against all possible threats is unaffordable, but there is also a flaw in this logic. Defense has never implied the protection of everything against all, and it does not in the Homeland defense application.

Clearly it would be unaffordable, and perhaps illogical, to attempt to defend everything of value. Not everything of value, however, is targetable within the limitation of threat systems, and not everything of value is likely to achieve enemy objectives if destroyed; therefore, not everything of value is likely to be targeted. The destruction of a bridge or a power plant in the Midwest would certainly be a loss and would undoubtedly have an impact locally, but its loss would be unlikely to create an economic or logistical impact sufficient to alter the course of a conflict in Europe or the Western Pacific. Enemy planners would almost certainly avoid wasting valuable weapons on targets that would do little to advance their objectives. On the contrary, there are assets that if lost could have significant effect on America's ability to wage war, and these are the likely targets.

The list of the most critical assets in North America is finite and manageable. There are very few conventionally targetable assets that are so vital that threat of their destruction would constrain the range of options available to decision-makers, and even fewer that if lost would generate war losing effects. For obvious reasons, they are not listed in this paper, but it would be foolish to assume that adversaries do not already have an understanding of

vital infrastructure and key nodes. In fact, it is likely an understanding of these vulnerabilities that has led America's adversaries to consider expanding conflict to the North American continent. SHIELD reduces and complicates an adversary's ability to target these most critical sites by maintaining a permanent and standing capability to defend them.

The defensive systems within SHIELD will cover concentrations of critical assets taking away the ability of an adversary to easily generate economic effects that would constrain policy-makers' response options, or impact power projection into the Western Pacific or European theaters. With this backstop of defense in place, some of the assets that are currently tethered to these key sites will then be pushed forward to meet adversary launch platforms at greater range and destroy them before they release their payloads. In a balanced approach, the remaining assets would be freed up to aid in the theater effort.

Engaging the archer instead of the arrow is a key component of the SHIELD approach to defense, as it is the most effective way to invert the cost curve and gain efficiencies. Shooting down twelve cruise missiles, for example, even with a perfect interceptor still takes twelve shots, but shooting down the bomber with that same interceptor will only take one, and if done at range, will preclude the need to engage each cruise missile after launch. Possessing the capability to defeat the launch platform, whether in the air or below the surface of the sea, is also the most effective way to deter. An adversary may be willing to lose cruise missiles in an attack, but the loss of the bombers or submarines that launch them, results in a long-term reduction in capacity, and may give adversary commanders pause.

The SHIELD and the Sword: Balance Restored

The protection of key sites and the ability to hold an attacking force at risk presents a capable defense, and it is a sufficiently capable defense

that will ultimately create credible deterrence—deterrence by denial of an enemy's ability to achieve its objectives. This is the goal of SHIELD, and in a global context an ability to defend at home and simultaneously prevail in a forward fight may dissuade an adversary from even contemplating war.

The innovative approach that is being taken at Northern Command and the North American Aerospace Defense Command is making the defense of the Homelands and deterrence by denial a reality. It is already beginning to shift the balance that has led to the consideration of escalatory strategies in Beijing and the Kremlin. Through the incremental development and maintenance of a strong SHIELD, neither will achieve an ability to strike at will. Their actions will be anticipated, and their forces will be detected before they even leave the security of their own bases. They will be met at ranges that preclude employment of their weapons, and they will fail to achieve their objectives.

The defense of the Homeland, while an absolute necessity, cannot drive the creation of new organizations, nor can it require a larger defense budget. The reality of the current economic climate precludes such proposals. An understanding of the fiscal environment is designed into SHIELD from the start, and recognizing the very real budget limitations challenging the Department of Defense, SHIELD takes a prioritized and incremental approach to defense. Its operational concepts are designed to complement the offense, as opposed to competing for limited resources and reducing capability to fight overseas.

Defense cannot replace offense or deployed operations in military prioritization. The Nation must not simply turn to isolationism and fall back behind the moats and walls of fortress America. The United States and its allies have a key role to play in maintaining the international order, and to withdraw would likely have catastrophic results around the globe. Both the American National

Defense Strategy, and its Canadian contemporary, “Strong, Secure, and Engaged” recognize the need for a secure base of operations and prioritize direct defense of North America as a necessary condition for continued international engagement. SHIELD is designed to ensure that the American military and its Canadian counterpart have a secure Homeland from which to deploy.

The security environment has undergone a tectonic shift over the past decade. The world once dominated by concern over, and singularly focused on, the threat posed by violent extremism has evaporated. In its place is a new and more dangerous environment in which peer adversaries are jockeying for advantage and seeking to exploit weaknesses. The weapons they have fielded are designed specifically to take advantage of the seams that have emerged in the West’s capability to defend. Foremost, in the minds of leaders in Beijing and the Kremlin, is the increasing vulnerability of the Homeland, and both are actively working across all domains, from cyber and space to maritime and air, to find ways to disrupt deployments before they even leave the North American continent.

The “away game” strategy that has dominated American military thinking since the end of the Cold War is no longer sufficient. Adversaries do not intend to allow the American military to fight the war it wants to and deploy unmolested into a theater of conflict. America must, therefore, be prepared to fight the war that is coming, a war that is fought across command boundaries and on both sides of the oceans. Reliance solely on the away fight is a flawed approach, and balance between the offense and defense must be restored.

The United States military has been in this position before, and through deliberate investment has repeatedly found a way to build a force sufficient to both defend at home and project power overseas. When confronted with the threat of Soviet nuclear bombers in the mid-1950s, the National Security

Council recognized a similar imbalance. Within less than a decade, radars were fielded, Arctic bases were built, an entirely new bi-national command was established, and balance was restored.





U.S. Northern Command and the North American Aerospace Defense Command are actively working to once again restore that balance. Within today’s fiscal realities and without degrading the ability for the United States, Canada, and their allies to prevail in war across the oceans, the two commands have developed a fundamentally new approach to defense. This concept, known as the Strategic Homeland Integrated Ecosystem for Layered Defense, or SHIELD, is becoming a reality today. The continued deliberate and prioritized fielding of the systems integral to this approach will create a defense, sufficiently capable to deter adversary attack, enabling continued engagement overseas, and ensuring the security of the American and Canadian populations well into the future.

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