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AIR UNIVERSITY

A RAPID GLOBAL EFFECTS CAPABILITY

by

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Abstract

The United States is increasingly concerned with its ability to project power and influence world events.¹ A rapid change in various technologies and their integration into strategies used by adversaries of the United States complicates matters, leading to non-traditional challenges.² Slower growth in the world economy has led to shrinking and static defense budgets not only for the United States, but for allies and adversaries as well. The change in strategic defense spending has steered defense investments in many areas including, but not limited to, basing, emerging technologies, future platforms, and force structure.³

Research included historical references, primary, and secondary sources. Interviews, panels, wargames, and workshops were the primary methodologies for conducting research.

A Rapid Global Effects Capability will provide the Air Force with operational agility.⁴ This ability will enable the Air Force to achieve the core missions of Multi-Domain Command and Control; Adaptive Domain Control; Global Integrated Intelligence, Surveillance, and Reconnaissance; Rapid Global Mobility; and Global Precision Strike in 2035.⁵ The ability to rapidly deliver global effects will have implications to both domestic and foreign policy.

Contents

	Page
DISCLAIMER.....	2
ABSTRACT.....	2
ACKNOWLEDGMENTS.....	4
PURPOSE.....	5
PROBLEM STATEMENT.....	5
THESIS STATEMENT.....	5
SETTING.....	6
CONCEPT DESCRIPTION.....	9
INDUSTRY RESEARCH.....	11
AIR FORCE INTERNAL POLICY IMPLICATIONS OF DEVELOPMENT.....	15
UNITED STATES AIR FORCE WARGAMING RESULTS.....	18
DEPUTY SECRETARY OF DEFENSE WORK’S FIVE POINTS OF INTEREST.....	19
EXTERNAL POLICY IMPLICATIONS OF DEVELOPMENT.....	25
POLICY IMPLICATIONS CONCERNING NEAR-PEER ADVERSARIES..... --CHINA AND RUSSIA	32
ANALYSIS.....	40
RECOMMENDATIONS.....	41
BIBLIOGRAPHY.....	43
ENDNOTES.....	56

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Purpose

The purpose of this research is to provide the Secretary of the Air Force, Chief of Staff of the Air Force, the Air University Commander, and government policy makers with credible research regarding some of the potential policy implications of a Rapid Global Effects Capability.

Problem Statement

The United States is increasingly concerned with its ability to project power and influence world events.⁶ A rapid change in various technologies and their integration into strategies used by adversaries of the United States complicates matters, leading to non-traditional challenges.⁷ Slower growth in the world economy has led to shrinking and static defense budgets not only for the United States, but for allies and adversaries as well. The change in strategic defense spending has steered defense investments in many areas including, but not limited to, basing, emerging technologies, future platforms, and force structure.⁸

Thesis statement

A Rapid Global Effects Capability will provide the Air Force with operational agility.⁹ This ability will enable the Air Force to achieve the core missions of Multi-Domain Command and Control; Adaptive Domain Control; Global Integrated Intelligence, Surveillance, and Reconnaissance; Rapid Global Mobility; and Global Precision Strike in 2035.¹⁰ The ability to rapidly deliver global effects will have implications to both domestic and foreign policy.

Setting

The political environment is calling for a change in investment strategies as they relate to technology. Senator John McCain has highlighted the need to allow the military services to have more ownership over their acquisition processes. He also stressed the importance of the new National Defense Authorization Act (2015) and the need to incentivize commercial investment in a speech to the U.S. Chamber of Commerce.¹¹

In Congressional testimony, the Vice-Chairman of the Joint Chiefs of Staff identified Russia as the leading threat to the existence of the United States.¹² Further, many strategists believe that the only options the military could offer to the President of the United States during Russian aggression in Crimea were either nuclear attack or acquiescence. These viewpoints are an example of the shifting nature of warfare; one in which agility is needed to address a plethora of varied threats.

The 2015 U.S. National Security Strategy outlines the strategic foundation of the United States. It states, “The world is connected by shared spaces—cyber, space, air, and oceans—that enable the free flow of people, goods, services, and ideas. They are the arteries of the global economy and civil society, and access is at risk due to increased competition and provocative behaviors. Therefore, we will continue to promote rules for responsible behavior while making sure we have the capabilities to assure access to these shared spaces.”¹³ The Strategy notes that global access is a fundamental requirement of these shared spaces, and is important for the global economy, peace, and progress. However, the United States must choose which development priorities are most important to its national security, particularly in the pursuit of emerging technologies.

To maintain the dominant air, space, and cyberspace forces in the 2030s the United States armed forces must invest in operational agility enabled by emerging technologies to achieve their

core missions. In choosing its development priorities, the United States must identify what it considers to be its strategic risks throughout the world. The 2015 National Security Strategy lists these strategic risks as:

- “Catastrophic attack on the U.S. homeland or critical infrastructure
- Threats or attacks against U.S. citizens abroad and our allies
- Global economic crisis or widespread economic slowdown
- Proliferation and/or use of weapons of mass destruction
- Severe global infectious disease outbreaks
- Climate change
- Major energy market disruptions
- Significant security consequences associated with weak or failing states (including mass atrocities, regional spillover, and transnational organized crime).”¹⁴

These strategic risks are global, broad, and increasingly dynamic in nature. As an example of a service’s response to the identified strategic risks, in 2015 the United States Air Force produced the Air Force Future Operating Concept.

The Air Force Future Operating Concept is representative of each service’s changing views on the nature of warfare. It outlines what the United States Air Force believes the required force structure, missions, and investment strategy should be to effectively address the strategic risks outlined in the 2015 National Security Strategy. Written with an eye on the 2035-2040 timeframe, “it identifies four emerging trends that are highly likely to characterize the future: increasing speed and proliferation of technological change, geopolitical instability, increasing scarcity of natural resources, and an increasingly important and vulnerable global commons.”¹⁵ As a result of these emerging trends, the United States Air Force identifies operational agility as the cornerstone of future mission success.¹⁶

Operational agility will be the United States Air Force’s and each service’s key to future warfare. The Air Force Future Operating Concept says that operational agility provides “the ability to rapidly generate—and shift among—multiple solutions for a given challenge.”¹⁷ It also

says that operational agility will rely upon “flexibility, speed, coordination, balance, and strength.”¹⁸ As a key to future warfare, operational agility will ensure that the armed forces have the ability to react to a wide range of situations and threats anywhere in the world. Operational agility will allow the armed forces of the United States to achieve their missions.

The core missions that each service identifies aid them in achieving the national security priorities of the United States. The top priority of the Department of Defense (DoD) is to protect the United States and its citizens from attack. This has been the foundational charge to the DoD since its inception. To meet this requirement, each service in the DoD outlines their respective core missions. Throughout history, the core missions of each service have evolved with the current operating environment. For instance, the Air Force Future Operating Concept highlights the evolution of the Air Force core missions as:

Figure 1 – Evolution of the Air Force Core Missions¹⁹

Figure 2. Evolution of the Air Force Core Missions		
1947	Today	Future
Air Superiority Air Reconnaissance Airlift Mobility Strategic Air Force Coordination of Air Defense	Air & Space Superiority Global Integrated ISR Rapid Global Mobility Global Strike Command and Control	Adaptive Domain Control Global Integrated ISR Rapid Global Mobility Global Precision Strike Multi-domain Command and Control

Emerging technologies are enabling this evolution in core missions and are transforming the way that the Air Force conducts its missions in support of the National Security Strategy. A wide range of emerging technologies have made it feasible to develop a Rapid Global Effects Capability.

Concept Description

Mr. Barry Hellman from the Air Force Research Laboratory has been conducting research and development on a Rapid Global Effects Capability. His concept is a launch-on-

demand “space truck” based out of the continental United States. Technical analysis is underway concerning the advantages and disadvantages of vertical and horizontal takeoff and landing. The design has a reusable first stage booster that returns to the launch site approximately thirty minutes after initial launch.

The “space truck” portion of the concept launches from there into low earth orbit between an altitude of 300K and 600K feet, or into space, with re-entry airspeeds of approximately Mach 25. The concept’s initial design allows it to have a 20,000 pound payload, or a 6,000 pound soft payload anywhere in the world within two hours.²⁰ The “space truck” deploys a payload to a target area and then recovers to the launch site or another designated site.²¹

The deployable payload releases approximately 2,500 – 4,000 miles prior to the target area. The payload reaches the ground approximately 20 minutes after release. This creates a three to four minute communications blackout period.²² The anticipated G-loading is six on ascent and nine for capsule re-entry. Mr. Hellman bases his concept on technologies that are currently in development in both the military and commercial sectors.²³

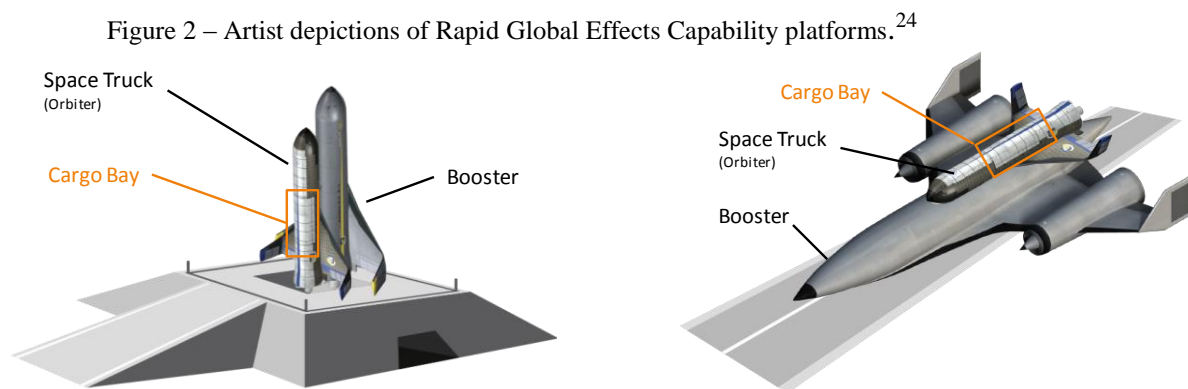




Figure 3 – Artist depiction of Expendable Entry Capsule and its deployment.²⁵



The Department of Defense and commercial industry are currently conducting technological research applicable to a Rapid Global Effects Capability. Commercial investment has led to an environment in which the Technology Readiness Levels (TRLs) of the technology needed to field a Rapid Global Effects Capability is achievable. The technology readiness levels for the technologies currently in research are at a TRL 5 or above.²⁶ According to NASA, “once the proof-of-concept technology is ready, the technology advances to TRL 4. During TRL 4,

multiple component pieces are tested with one another. TRL 5 is a continuation of 4, however, a technology that is at 5 is identified as a breadboard technology and must undergo more rigorous testing than technology that is only at TRL 4.”²⁷ Using technologies that are already being developed allows for government investment later in the development process, thus cutting overall acquisition and costs to the U.S. government. Companies such as SpaceWorks, SpaceX, Blue Origin, and Masten Space Systems are conducting similar research and development.

Industry Research

Research and development of a wide range of technologies is advancing the concept of a Rapid Global Effects Capability. In the commercial sector, SpaceX Designs is the most noticeable entity in the field of space exploration. They are focusing their research and design on efforts to drive down the cost of accessing space through reusable platforms. Ultimately, their goal is the exploration and colonization of Mars by humans. Recently, they have had quite a few important successes.

In 2014, SpaceX and their “commercial space program got approval to take a crew to the International Space Station – SpaceX’s first such mission.”²⁸ These missions represent a shift in U.S. government use of commercial space vehicles to travel to and/or from space. However, this shift is not without a level of accepted risk. In January of 2016, “SpaceX’s...attempt to land a rocket upright on a platform in the Pacific Ocean failed in a spectacular fashion.”²⁹ However, it is important to distinguish acceptable levels of risk from reckless risk in the research and development of technologies associated with space exploration and a Rapid Global Effects Capability.

Acceptable levels of risk are possible due to flexibility in the commercial research and development process. This is a process in which traditional acquisition, research, and development processes controlled by U.S. government cannot compete with. The SpaceX use of the Falcon 9 rocket is an example of this. SpaceX is able to deliver that capability at 1/10th the cost of NASA's approach with their Falcon 9.³⁰

Blue Origin and Masten Space Systems are also leading in various technological development projects involving space exploration. In a historic moment on November 24th of 2015, "Jeff Bezos' rocket ship achieved a breakthrough...by traveling 329,839 feet into outer space and then landing upright upon its return to Earth."³¹ This was the first launch of a rocket in which portions of the rocket are recoverable and are in use again. Bezos' proclaimed, "Full reuse is a game changer, and we can't wait to fuel up and fly again."³² He compares reusing rockets as airlines that fly their commercial aircraft repeatedly. Just recently, on April 2nd of 2016, Blue Origin made their third launch for their New Shepard rocket. "Both the rocket and the capsule, which will eventually carry paying customers, landed successfully. During this test, the capsule was carrying two microgravity experiments from the Southwest Research Institute and the University of Central Florida."³³ Ultimately, reusable rockets will have a dramatic impact on the overall cost to access space.

Masten Space Systems, founded by Dave Masten, is a smaller company in comparison to SpaceX and Blue Origin. Located in the Mojave Desert, they are taking strides to redefine space launch and access. On their company website they laud, "You don't need to be a hundred miles above the Earth's surface to alter the future of space exploration, you just need to be a hundred miles north of Los Angeles. At our testing facility here in the Mojave Desert, we rapidly mature the technologies of the present into the space exploration capabilities of the future."³⁴ The

United States government has realized their expertise in reusing rockets, awarding them contracts in the development of their XS-1 concept.

While difficult to compete with commercial design and acquisitions processes, the U.S. government is investing in technologies involving a Rapid Global Effects Capability. The Defense Advanced Research Projects Agency (DARPA) is exploring a similar concept with their Experimental Spaceplane (XS-1) concept.

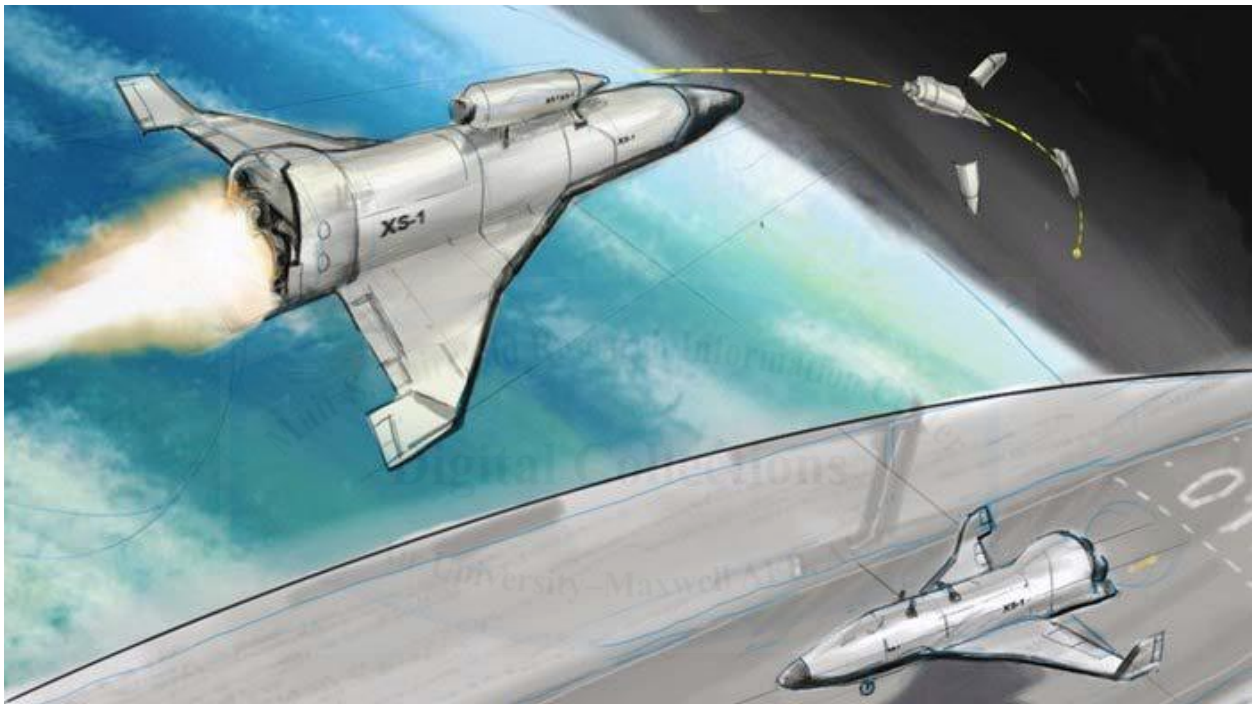
DARPA believes that there is an increasing demand for reusable launch vehicles in the future. They base their beliefs on a growing commercial demand for flexible space launch options that both the United States and international community are demanding, as well as an increasing Department of Defense demand for flexible launch options in response to the changing nature of warfare. The key in each case is the need for flexible launch options.³⁵

In the commercial sector, DARPA outlines the spacecraft market, spacecraft cost, and spacecraft technology as areas influencing the need for flexible launch options. They predict that there will be a large growth in the market of spacecraft development in which the current market is not prepared to meet the demand. They also predict that emerging technologies will drive down the cost of commercial satellite costs, therefore driving the demand for low cost spacecraft to deliver low cost satellites. DARPA also sees a notable reduction in the size of spacecraft technology in the future.³⁶

In the defense sector, DARPA outlines expendable vehicle launch sites, contested space environment, and reusable 1st stage launch sites as areas influencing the need for flexible launch options. They believe that coastal launch sites are important to make an expendable system and that expanded launch flexibility reduces U.S. vulnerabilities to adversaries. They also highlight the changing dynamics of space threats and how they drive a responsive launch capability.

DARPA also stresses that operations that focus on being similar to aircraft will lead to flexible basing and potential inland basing options.³⁷ Together, DARPA's view of the changing commercial and defense sectors has led them to design the XS-1.

Figure 5– Artist Depiction of DARPA's XS-1.³⁸



While DARPA's XS-1 design allows it to operate like a traditional aircraft squadron, there are some notable advantages and differences. One of XS-1's goals is to provide global reach anywhere in the world within ninety minutes. It will have the ability to fly over anywhere in the world at any time. It will use unpredictable overflight patterns that make it difficult for adversaries to target, engage, and defeat. These aspects will make it more survivable in an anti-access area denial (A2AD) environment.³⁹ With the future in mind, the goal is to show reusability with ten flights in ten days.⁴⁰ Reusable, low-cost launch capabilities will make rapid global presence a reality for the United States. Currently, it access to space cost around

\$10,000/kg. Low cost access to space is considered by many to be a factor 10 times lower than that.⁴¹ This number is relative, however, to the economic incentives that asteroid mining and associated activities in space can bring to mankind. However, there are policy implications to consider with its development.

Air Force Internal Policy Implications of Development

A Rapid Global Effects Capability will have internal policy implications for the United States Air Force and its future core missions. The Air Force Future Operating Concept outlines operational agility as the critical factor in its future core missions and warfighting ability. The Air Force core missions of the future will be Adaptive Domain Control, Global Integrated Intelligence, Surveillance, and Reconnaissance, Rapid Global Mobility, Global Precision Strike, and Multi-Domain Command and Control.⁴²

Operational agility is a cornerstone of Adaptive Domain Control. The Air Force Future Operating Concept defines Adaptive Domain Control as “the ability to operate in and across air, space, and cyberspace to achieve varying levels of domain superiority over adversaries seeking to exploit all means to disrupt friendly operations.”⁴³ This core mission is essential to achieving the national security objectives of the United States.

Global Integrated Intelligence, Surveillance, and Reconnaissance operations are an increasingly important core mission of the Air Force. The Air Force Future Operating Concept highlights that “GIISR continues to enable current and future operations through the cross-domain synchronization and integration of: planning and operation of ISR assets; collection using near-ubiquitous sensors; and processing, exploitation and dissemination (PED) of finished intelligence.”⁴⁴ It is a key mission support area that links the other core missions.

Rapid Global Mobility allows the United States to project global power. The Air Force Operating Concept states, “at its core, RGM has always focused on the relocation of manpower and physical materials, but this process now occurs through a much wider portfolio of physical—and virtual—methods across multiple domains.”⁴⁵ Without Rapid Global Mobility, the United States does not have the ability to be a global presence.

Global Precision Strike remains the pinnacle core mission of the Air Force. The United States’ evolution in this domain has allowed it to deter adversaries prior to conflict, and win the nation’s wars if deterrence fails. However, the global strike mission has changed over time. The Air Force Future Operating Concept notes that “integration enable AF assets to conduct *integrated multi-domain* global precision strike using a *balanced capabilities mix* of forces, in collaboration with joint and multinational partners.”⁴⁶ The ability to rapidly perform the global strike mission, to be rapidly present anywhere in the world, while intertwined with other core missions will continue to become more important in the future.

At the center of each core mission previously discussed is the core mission of Multi-Domain Command and Control. Rightfully, the Air Force Future Operating Concept describes command and control as “fundamental to military operations.”⁴⁷ Command and control enables the other core missions to execute effectively. Unfortunately, adversaries of the United States are actively working to prevent the armed forces from achieving their core missions. It will take the vision and leadership of current and future generations for the United States to maintain its competitive advantages.

An important aspect to future investment is the potential inspiration that the United States Air Force will have on the future generations of leaders. A research study was conducted with the Auburn University Air Force ROTC Detachment. The intent of the research was to brief the

detachment on the Rapid Global Effects Capability concept and receive feedback from a generational and inspirational perspective.

The following questions were asked of the cadets in a survey and their responses are annotated:

- Does this inspire the next generation of Air Force Leaders?
 - 100% (64 out of 64) said they were inspired
- Does this motivate you to join/stay in the Air Force?
 - 95% (61 out of 64) said this motivates them to join/stay in the Air Force
- Would you want to be a part of this concept?
 - 94% (60 out of 64) said they would want to be a part of this concept
- What is one word you would use to describe this concept (some words were used more than once)?
 - Wow, Efficient, Deadly, Innovating, Thrilling, Air Superiority, Intimidating, Futuristic, Interesting, Future, Exciting, Effective, Superior, Intriguing, Capability, Revolutionary, Expensive, Powerful, New-Age, Powerful, Controversial, Mind-Blowing, The Future, Intriguing, Awesome, Ambitious, Cool⁴⁸

Overall, the cadets at the Auburn ROTC Detachment were very receptive and motivated about a Rapid Global Effects Capability concept. The ability for the United States Air Force to attract and retain the best and brightest leaders from around the world is the cornerstone of success. A strategy of investing in capabilities that achieve decisive effects against adversaries while inspiring current and future generations is a prudent course of action for the United States Air Force.

While inspirational to future generations of leaders, the precise impacts that a Rapid Global Effects Capability would have on the core missions of the United States Air Force are unknown. Few people can truly envision the potential impact of a Rapid Global Effects Capability and how to properly employ it. In an effort to bridge the gap between today's core missions and the core missions of the future, the United States Air Force Wargaming Institute conducted a wargame on the potential impact of a Rapid Global Effects Capability.

United States Air Force Wargame Results

The Air Force Research Laboratory and Air University sponsored a wargame in June of 2015 to determine how a Rapid Global Effects Capability would impact the Air Force core missions. The wargame team traveled to four locations to conduct research: Air Mobility Command, Air Force Space Command, Air Force Global Strike Command, and the Air Warfare Center at Nellis Air Force Base. Their research found that 92% of participants either "Agreed" or "Strongly Agreed" that the Rapid Global Effects Capability concept was relevant to their mission set.⁴⁹

Participants agreed that the concept would be most effective in conventional strike, command and control, intelligence, surveillance, and reconnaissance, and humanitarian relief missions. Particularly, participants believed that time sensitive missions and targets are uniquely suited to be matched against a Rapid Global Effects Capability.⁵⁰ In a fiscally constrained environment, this may augment current conventional forces in achieving current and future missions. There is a counter-argument as to what current assets or fiscal policies may change in order to invest in the development of a Rapid Global Effects Capability. While outside the scope

of this research, it warrants a discussion at the service and department levels when prioritizing strategic investment strategies.

There were areas, however, that the participants agreed the concept should not be used. Most participants agreed that the concept should not be used for nuclear weapons transport or employment. Participants also questioned the signaling to adversaries that the concept could make as well as the question of stabilizing versus destabilizing effects.⁵¹

Each group of participants also brought up the ability of a Rapid Global Effects platform to deliver drone technology in futuristic strike packages. For instance, a 20,000 pound payload could deliver 20 remotely-piloted aircraft; each with differing capabilities to include strike, communications nodes, and intelligence, surveillance, and reconnaissance. In effect, a Rapid Global Effects Capability could deliver an autonomous strike package with a degree of artificial intelligence in which each drone could ‘talk’ to the others. They could have the ability to operate independently or in an autonomous swarm.⁵² A counter-argument is that remotely-piloted assets can be delivered by air or sea-based platforms. However, this also creates traditional logistics lines of support. A CONUS-based Rapid Global Effects capability limits traditional logistics lines that become expensive. A Rapid Global Effects Capability complements other technologies that are emerging, particularly the technologies that Deputy Secretary of Defense Work has said will be critical to the Department of Defense’s third offset strategy.

Deputy Secretary of Defense Work’s Five Points of Interest and The Future

In November of 2015, Deputy Secretary of Defense Work outlined his five points of interest in emerging technologies. They include Learning Systems, Human-machine Collaboration, Human-machine Combat Teaming, Assisted Human Operations, and Networked-

enabled, Cyber-hardened Autonomous Weapons.⁵³ These five points of interest will shape investment and policy for the Air Force moving forward. There is recent research that complements these points of interest.

Significant research is underway on autonomy and swarming technology. The Air Force Research Laboratory is researching autonomy to counter land mines and sea mines. A dominant question is, “How do we deal with data overload?” Is there a way to couple autonomy and artificial intelligence with human decision makers to reduce tasking overload? Reid Porter works on Data Analytics and Autonomy at Los Alamos National Laboratory and is answering this very question. A Rapid Global Effects Capability offers the solution for delivering a host of emerging technologies, taking advantage of speed and maneuver to create an advantage.

Air University recently conducted a wargame to note the impact that an autonomous swarm capability would have on an integrated air defense system. The technology, called CLEAVER, is a cruise missile launched from an airlift asset. CLEAVER is a light-weight system; a C-17 can carry a substantial number. CLEAVER has standoff capability outside of A2AD environments, such as the one that China is creating in the South China Sea. However, the wargame displayed that CLEAVER’s range is limited because of the delivery requirement from a traditional airlift asset. The CLEAVER system also has the ability to form an integrated network with other CLEAVER assets that are airborne. CLEAVER assets have the ability to perform strike, command and control, and intelligence, surveillance, and reconnaissance missions. Additionally, CLEAVER would have the ability to carry directed energy capabilities.⁵⁴

Perhaps the most high-profile directed energy technology is a system called CHAMP (Counter-electronics High Power Microwave Advanced Missile Project.) CHAMP is a joint

concept technology demonstration led by the Air Force Research Laboratory, Directed Energy Directorate at Kirtland Air Force Base to develop an air-launched directed-energy weapon capable of incapacitating or damaging electronic systems.⁵⁵ This directed energy technology, combined with a Rapid Global Effects Capability, offers operational agility to the armed forces.

A Rapid Global Effects Capability has the potential to link Deputy Secretary of Defense Work's five essential elements of the Third Offset. A Rapid Global Effects Capability could manipulate the aspect of time. It could promote Human-machine collaboration, Human-machine Combat Teaming, Assisted Human Operations, and Network-enabled, Cyber-hardened autonomous weapons. A Rapid Global Effects Capability could have the ability to deliver a swarm of autonomous drones, strike assets, ISR capability, and even satellites to orbit.

The combination of a Rapid Global Effects Capability, autonomy, swarming, and directed energy technology allows for the armed forces to achieve operational agility. As a result, this technology will allow the Air Force to achieve its core missions of Adaptive Domain Control, Global Integrated ISR, Rapid Global Mobility, Global Precision Strike, and Multi-domain Command and Control in 2035. A Rapid Global Effects Capability could have a profound impact on the combat forces of the United States. Research involving United States Air Forces Europe was conducted to analyze the impact that a Rapid Global Effects Capability may have on operations.

In an effort to further explore the lessons learned from the Air Force's Wargaming efforts, interviews were conducted with key staff members of United States Air Forces Europe (USAFE). Those staff members have articulated the potential benefits that a Rapid Global Effects Capability could bring to the challenges they face in their theater. Key areas of

discussion were USAFE Presence/Posture, Command and Control/Command Relationships (C2/COMREL), Basing, Force Structure, and Interoperability.

In discussions involving the United States' military involvement in Europe, there is and has been in the past a balance between presence and posture. Each office at USAFE is addressing to some extent a decreasing U.S. presence in Europe. Members cite basing and personnel downsizing as concerns. Members also cite concerns over the signaling that deployment of the A-10 to Europe sends to potential adversaries. In April of 2015, "demonstrating its commitment to a 'free' and 'secure' Europe, the United States deployed 12 F-15C Eagles and approximately 350 Airmen to Iceland and the Netherlands."⁵⁶ The United States Air Force is deploying weapons systems, maintenance, and support personnel to Europe to deter Russian aggression and assure its allies. This is both time-consuming for personnel and expensive.

With respect to a Rapid Global Effects Capability, members note that its posture could offer a balance to changes in U.S. presence in Europe.⁵⁷ They believe that posturing with CONUS assets that have the ability to rapidly respond to combatant commanders critical needs holds merit in the overall presence/posture dilemma. However, those interviewed also caution that posturing an asset like a Rapid Global Effects Capability comes with C2/COMREL challenges.⁵⁸

Emerging technologies are presenting challenges to USAFE command and control dynamics as well as command relationships. For instance, USAFE members highlight how the operation of remotely piloted aircraft (RPA's) have outpaced current Air Force and Joint Doctrine.⁵⁹ USAFE is at the leading edge in this field and are solving doctrinal challenges at the tactical and operational level in order to support commander and warfighter needs. Currently,

RPA's are controlled from CONUS, launched from USAFE, in support of three different commands (USAFE, AFRICOM, and CENTCOM).⁶⁰

NATO's Ballistic Missile Defense (BMD) C2 structure has current challenges. The U.S. must rely on coalition BMD capabilities to mitigate the High Demand/Low Density asset challenge.⁶¹ This issue has become more problematic due to recent refugee migrations from areas of conflict throughout the Middle East to Europe. In the past, NATO nations have agreed to contribute two percent of each country's gross domestic product to the collective defense of the alliance. Allies to the United States in NATO, now strained with millions of refugees, are finding it difficult to maintain this spending rate on defense.⁶²

Emerging technologies will continue to test C2, COMREL, and current doctrinal policies. USAFE members note that a Rapid Global Effects Capability will have similar challenges to the RPA community in each of these areas, both within CONUS and in various geographic areas throughout the world. USAFE members note that a Rapid Global Effects Capability may be able to aid in the BMD challenges that USEUCOM is facing. Sacrificing a window of time in order to position critical assets away from BMD duties may be a tradeoff that NATO leadership is willing to take. The U.S. would have the ability to maintain its deterrent capability while ensuring allies with a diverse platform and a different response window.⁶³

USAFE is currently undergoing a wide-range of basing changes to support its force of the future. USAFE is currently divesting RAF Mildenhall, RAF Alconbury-Molesworth, and streamlining Lajes AB. Upgrade projects include Special Operations facilities at Spangdahlem AB and tanker facilities at Ramstein AB. Challenges include funding, RC-135 host nation sensitivities, and high-density operations in Germany.⁶⁴

Changes in basing are representative of the challenges that USAFE is facing with presence. A Rapid Global Effects Capability has the ability to offer operational flexibility from CONUS for USAFE that will help alleviate some basing challenges. USAFE members cite that a Rapid Global Effects Capability would alleviate host nation sensitivity to RC-135 basing and operational employment. Basing of the RC-135 has become a sensitive issue due to previous allegations that the United States used various means to collect intelligence on allies. Also, with additions to basing structures in Germany, USAFE members note that congested airspace is becoming an issue for joint training and operational missions. Utilizing a CONUS-based platform for some missions would enable other legacy platforms to perform more high-demand missions for the major and combatant commanders.⁶⁵

USAFE team members also note that a Rapid Global Effects Capability could impact force structure. An example of current force structure challenges at USAFE is the alert posture of two C-130 aircraft at Ramstein AB in the “New Normal Now” structure.⁶⁶ The alert posture allows USAFE to respond to contingency operations in USAFE and AFAFRICA. Thus, two aircraft are unavailable for other daily missions in order to support the alert tasking. Depending on the requirement, a Rapid Global Effects Capability could deliver equipment and supplies to a remote location in Africa. A Rapid Global Effects Capability will allow greater operational agility while potentially returning two C-130’s, associated aircrews, maintenance, and support personnel to immediate needs within USAFE. USAFE members also note that it will also allow for a more immediate response to contingencies in which traditional assets may not even have the ability to support (due to large distances in Africa).⁶⁷

USAFE operations are always concerned with interoperability with NATO partners.⁶⁸ USAFE professionals caution to consider how a Rapid Global Effects Capability may

interoperate with NATO partners.⁶⁹ For instance, should a Rapid Global Effects Capability system base and operate from Lajes AB? What are the C2 implications in NATO for a Rapid Global Effects Capability? These are credible questions that the United States should consider when developing future concepts.

The areas that USAFE interviewees highlight are applicable to other commands and the Air Force at large. They particularly highlight how new and future technologies will test our current doctrine models while alleviating some challenges and providing support to warfighters and commanders. Additionally, they point to how these emerging technologies will impact domestic and international policy.

External Policy Implications of Development

Research points to external policy implications of the development of a Rapid Global Effects Capability. In particular, professionals have expressed their interest in treaty implications, such as the 1967 Outer Space Treaty, Strategic Arms Limitation Talks (SALT-II), and Strategic Arms Reduction Treaty.^{70 71} There are also international airspace questions that one should consider in development.

One-hundred and two countries are a party to the 1967 Outer Space Treaty. An additional twenty-seven have signed, but not ratified, the treaty. Most countries and industries use this as the international standard for conduct in and through space. It uses the Antarctic Treaty as a model and seeks to “prevent ‘a new form of colonial competition’ and the possible damage that self-seeking exploitation might cause.”⁷² It begins by stating:

“Inspired by the great prospects opening up before mankind as a result of man’s entry into outer space,

Recognizing the common interest of all mankind in the progress of the exploitation and use of outer space for peaceful purposes,

Believing that the exploitation and use of outer space should be carried on for the benefit of all peoples irrespective of the degree of their economic or scientific development,

Desiring to contribute to broad international co-operation in the scientific as well as legal aspects of the exploitation and use of outer space for peaceful purposes,

Believing that such co-operation will contribute to the development of mutual understanding and to the strengthening of friendly relations between States and peoples...⁷³

This introduction undeniably sets forth the understanding for all parties to the treaty that space should be for peaceful purposes for each nation and all mankind. The treaty references resolution 1884 which calls “upon States to refrain from placing in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction or from installing such weapons on celestial bodies.”⁷⁴ Article IV of the Outer Space Treaty goes on to outline this in detail by saying, “States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.”⁷⁵ Article IV has remarkable implications for the development of a Rapid Global Effects Capability.

The language that the signatories use in Article IV is lacking for the modern era. In 1967, the entities capable of space launch and exploration were clearly defined sovereign states. Currently, this model has reversed itself with private industry leading the space development and exploration efforts around the world. This is not surprising considering the treaty is close to fifty years old. This fact, however, is representative of how emerging technology will push external policy decisions and treaties to change in comparison to historical models.

Article IV also forbids states from placing nuclear weapons or other weapons of mass destruction in orbit. The intent of this article concerns the potential destabilizing effects that weapons of mass destruction could bring to the world from space. Conversations with wargame participants brought up this concern as well regarding a Rapid Global Effects Capability.

Participants in the wargame recommended against using such a concept for nuclear weapons, component, or material transportation or employment.⁷⁶ Their main justification was the destabilizing effects they believed such a step would take in the international policy arena. However, they did caution that the United States should continue to pursue such technology and have the capability to rapidly employ nuclear weapons with a Rapid Global Effects Capability if the national security of the United States required it. For instance, if a near-peer adversary were to show the intent to develop that capability, the United States could not afford to let the adversary develop the capability uncontested.

A Rapid Global Effects Capability is different from conventional Inter-Continental Ballistic Missiles and the Ground Based Strategic Deterrent under development. It has both conventional and nuclear mission applications. Also, depending on the choices made in development, it has the potential to be a highly mobile asset. Ultimately, if a Rapid Global Effects Capability is chosen to support a nuclear mission, it would offer the United States options in addition to the nuclear triad. In an era when the United States is investing heavily in the revitalization of its nuclear force, this warrants consideration.

Concerning Article IV, a Rapid Global Effects Capability is within the international norm for the delivery of nuclear weapons or weapons of mass destruction. This is due to the fact that the capability would transit space (low earth orbit) in order to deliver the munitions. It would not place a nuclear weapon or weapon of mass destruction into orbit. Further, Article IV “allows

fractional orbital bombardment systems (FOBS), a 1960s Soviet ICBM program that after launch would go into a low Earth orbit and would then de-orbit for an attack.”⁷⁷ Thus, a Rapid Global Effects Capability meets the obligations of the Outer Space Treaty.

Article VI states, “States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.”⁷⁸ This article impacts both external and internal policy of the United States.

The United States government is responsible for the actions of industry leaders such as SpaceX and Blue Origin in their pursuit of space exploration and development. For instance, if a private industry rocket launch damages a nation’s satellite after being launched the United States is responsible. If private companies begin asteroid mining, the United States government is responsible for their regulation and protection. If international treaties bound the United States to bear responsibility for their industries’ actions, it would be prudent to have the capability to do so. A Rapid Global Effects Capability and the technology related to it would help the United States meet their treaty obligations. The capability to rapidly launch into space ensures that the United States can protect and regulate interests in space.

Article VII further outlines international responsibility when it states, “Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the Moon and other celestial bodies.”⁷⁹ Clearly, the United States government

has a responsibility to be involved in the governing of developing space-related technology as well as the regulation of space exploration in the industrial sector.

Article X states, “In order to promote international co-operation in the exploration and use of outer space, including the Moon and other celestial bodies, in conformity with the purposes of this Treaty, the States Parties to the Treaty shall consider on a basis of equality any requests by other States Parties to the Treaty to be afforded an opportunity to observe the flight of space objects launched by those States. The nature of such an opportunity for observation and the conditions under which it could be afforded shall be determined by agreement between the States concerned.”⁸⁰ Due to the fact that the Outer Space Treaty determines that states are responsible for their industries actions in space, this presents an interesting dilemma. Could adversaries to the United States require private United States companies to provide sensitive information to meet treaty obligations? What constitutes observing the flight of space objects? Could adversaries invoke Article X and request to observe the private industry launches of SpaceX or Blue Origin? By being able to observe space objects launched from the United States, adversaries are better able to target those objects. As space exploration and development continues, defense related systems will require maneuverability and speed in order to defeat adversary’s observations in accordance with Article X.

Article XI states, “In order to promote international co-operation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities.”⁸¹ This article has profound implications for external policy considerations. If a

private company discovers valuable minerals on a celestial body, the United States is bound by the Outer Space Treaty to make that information public, reporting it to both the United Nations and scientific community. This, in turn, will produce a rush in the international community to mine these minerals similar to gold rushes around the world throughout history. Again, the United States is bound by international treaty to regulate private industries based out of the United States. It would be prudent to have the space launch capability to enforce international treaties and laws in space.

A Rapid Global Effects Capability would have vast implications to access to space. Not only would it provide the capability to influence traditional military operations on Earth, it would also provide the United States with rapid access to space as well. As technologies emerge that can influence space operations, having the capability to rapidly deploy assets such as Cubesats would be highly beneficial. This allows for the reconstitution of compromised traditional satellites. Also, a Rapid Global Effects Capability would allow for the deployment of personnel to space or equipment for mining operations. The deployment of personnel would help enforce international treaties and laws in space.

The Outer Space Treaty allows for the development of a Rapid Global Effects Capability. The Outer Space Treaty even allows for weapons transport and delivery as long as those weapons are not nuclear or considered weapons of mass destruction. The broader external policy implications come with the development of emerging technologies that will push the United States and international community into space. The United States will be responsible for the industrial base within the United States and their actions. As a result, the United States will need the capability to rapidly respond to challenges within and through space. The Strategic Arms

Limitation Talks and Strategic Arms Reduction Treaty will also influence future United States policy.

The Strategic Arms Limitation Talks “banned FOBS or any significant advancement in ICBM key performance parameters, but was not ratified by the U.S. due to other Soviet treaty violations.”⁸² However, SALT-II was traditionally honored by both the United States and Soviet Union. SALT-II has been replaced with the “Strategic Arms Reduction Treaty (START), Comprehensive Nuclear-Test-Ban Treaty, and New START which has been ratified and is applicable through 2021.”⁸³ Currently, these treaties prevent both the United States and Russia from pursuing the development of FOBS systems. These treaties do not “address conventional weapons in space, orbital or suborbital; however, the range and capability of carrier systems such as cruise missiles that could carry nuclear arms are limited...but not the manned aircraft that carry them.”⁸⁴

The development of a Rapid Global Effects Capability is allowable according to the New START treaty and is in line with the historical framework of previous treaties such as SALT-II. According to the framework of the New START treaty, it is beneficial for a Rapid Global Effects Capability to be a manned platform if the United States is interested in having the option to have a nuclear capability. If the United States chooses to focus on conventional capabilities, this provides an opportunity for enhanced human-machine operations or remotely piloted options. Due to these current treaties, it is also important to understand at what altitude space begins.

A nation’s sovereign territory includes the airspace above it. However, it does not include the “space” above it. The Karman Line is at an altitude of 100 km above the Earth’s surface. It “represents the boundary between the Earth’s atmosphere and outer space according to the Federation Aeronautique Internationale (FAI), an international standard setting and record-

keeping body for aeronautics and astronautics.”⁸⁵ At this altitude, an aircraft or space vehicle has to “fly faster than orbital velocity to have enough lift to overcome drag.”⁸⁶ However, it is important to note that this is not international law, nor is it included in any international treaties.

The United States has “consistently maintained that discussions of delimitation between air and outer space are premature and advocates the removal of delimitation from the agenda of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space.”⁸⁷ The current international standard is that airspace below 100 km is a nation’s sovereign territory and above 100 km is international space.⁸⁸ This allows nations to place satellites, launch rockets, or space vehicles in any orbit. A Rapid Global Effects Capability that utilized low earth orbit meets the current international standards and would not violate other nation’s sovereign territory or airspace.

Policy Implications Concerning Near-Peer Adversaries—China and Russia

Recently, the Vice-Chairman of the Joint Chief of Staff said that Russia was the number one existential threat to the United States.⁸⁹ Many other strategists believe China to be the number one long-term threat to the United States.⁹⁰ Each country provides specific, yet sometimes similar, threats to the United States.

China is expanding its sphere of influence regionally. China is currently interested in expanding into the South China Sea. They are doing so because of a ballooning population that they need to support with natural resources. Also, China is interested in the military advantages that the South China Sea possesses.⁹¹

The South China Sea has important strategic implications. Robert Kaplan notes that “the South China Sea functions as the throat of the Western Pacific and Indian oceans—the mass of

connective economic tissue where global sea routes coalesce.”⁹² It also has substantial oil reserves that serve China’s economic development interests. Militarily, the South China Sea forms a geographic barrier to potential invasion of China.

China is creating an Anti-Access Area Denial environment in the South China Sea. Kaplan notes that “domination of the South China Sea would certainly clear the way for pivotal Chinese air and naval influence throughout the navigable rimland of Eurasia—the Indian and Pacific oceans both.”⁹³ Russia is also presenting strategic problems for the United States and putting stress on the national security objectives of the United States.

Russia is a prideful nation that is attempting to regain its international prestige. After the downfall of the Soviet Union, many former Soviet bloc states separated from the nation and declared their independence. The Soviet Union’s economy collapsed and with it so did its military capability. Today, Russia is pursuing international actions to reassert itself in the world.⁹⁴

Russia has shown recent military aggression in both Georgia and the Ukraine. In each instance, the international community condemned the actions but did little militarily to respond. Economic sanctions of Russian banks and key leaders were the major response that the international community imposed for each aggression. The international community believed its options were limited and took little to no military options, fearing conflict escalation.

Russia has also projected global power into the Middle East in the Syrian conflict and the fight against the Islamic State in Iraq and Syria.⁹⁵ Fareed Zakaria notes that “global power is, above all, dominance over ideas, agendas, and models.”⁹⁶ Russia is attempting to dominate the agenda in the Middle East and assert its influence. Again, the United States believes that it has few options to counter this power projection threat.

Emerging technology will allow the United States armed forces to achieve their future core missions with operational agility. In doing so, the armed forces will offer the U.S. leadership a more expansive list of options to choose from. Ultimately, the objective of investment in emerging technology is peace through deterrence while achieving the national security objectives of the United States. A Rapid Global Effects Capability will aid in this effort.

A Rapid Global Effects Capability will mitigate China's A2AD environment. It will offer an asymmetric advantage that the Chinese will have to consider in their strategic investments in the future. The Chinese attempt to create a defensive barrier with land-based missiles in the South China Sea is a moot point considering CONUS-based assets.

Figure 6-Coverage Expansion from S-400 SAM and J-10 Deployment to South China Sea Airfields⁹⁷



For instance, a Rapid Global Effects Capability system launched from CONUS delivers a swarm of autonomous CLEAVER drones and aids in negating specific areas of negates China's A2AD environment. The CLEAVER swarm will use operational agility and maneuver to overwhelm China's defenses.⁹⁸ There is a counter-argument that CLEAVER assets could be delivered by current conventional assets, such as a C-17 or B-52. Based on wargames that have been conducted, however, this severely limits the range and available targets.⁹⁹

These technologies will have the ability to achieve any of the Air Force core missions.¹⁰⁰ As a result, it will also achieve the United States national security objectives in promoting and ensuring global access to sea lines of communications and natural resources in the South China Sea. These technologies will deter aggression from Russia as well.

As noted previously, there were little to no options to stop Russian aggression in Ukraine and Georgia. Many feared escalating the situation, so the response from the United States militarily was to do nothing. The launch of a Rapid Global Effects Capability to deliver an autonomous swarm of CHAMP cruise missiles could have a stabilizing effect.¹⁰¹ They could use directed energy to eliminate any electronic capability that advancing Russian forces were using. The combination of these emerging technologies could make a Russian Surface-to-Air threat noted below virtually non-existent. (See current Russian SAM Capabilities and maps on next page.)

Table 1 - Russian SAM Capabilities¹⁰²

Missile Name	Range(nm)	Max Alt (ft)	Speed (Mach)	ABM (nm)	IOC	Notes
SA-2 Guideline	23.2	90,000	3.5	N/A	1959	
SA-3 Goa	15.7	60,000	3.5	N/A	1961	
SA-5 Gammon	162	115,000	3.5+	N/A	1967	
SA-6 Gainful	16	43,000	1.8	N/A	1979	
SA-7 Grail	3.5	15,000	1.7	N/A	1966	MANPAD
SA-8 Gecko	8.6	37,000	2.4	N/A	1975	
SA-9 Gaskin	4.3	26,000	1.8	N/A	1968	
SA-10 Grumble	49	82,000	5+	19	1980	ACM
SA-11 Gadfly	17.3	62,000	3	N/A	1983	
SA-12A Gladiator	40.5	82,000	5.75	UNK	1987	
SA-12B Giant	54	98,400	8	21.6	1992	AHV, ABM
SA-13 Gopher	2.7	12,000	2	N/A	1978	
SA-14 Gremlin	3.2	18,000	1.75	N/A	1978	MANPAD
SA-15 Gauntlet	6.5	20,000	3	UNK	1990	ACM, APM
SA-16 Gimlet	3.1	12,000	1.7	UNK	1986	MANPAD
SA-17 Grizzly	28	82,000	3.5	12.5	1998	
SA-18 Grouse	3.2	11,000	UNK	UNK	1983	MANPAD
SA-19 Grison	7.5	20,000	3.3	N/A	1998	
SA-20A Gargoyle	80	89,000	8.2	22	1993	ACM
SA-20B	124	89,000	8.8	22	1997	ABM
SA-21 Growler	216	115,000	UNK	UNK	2007	AHV, ABM

Figure 7 – Russian Surface-to-Air Missile Coverage¹⁰³



This could de-escalate a Russian advance and create a situation for the Russians to either escalate or retreat. Escalation may be a cost too high for the Russians. Perhaps nonlethal effects delivered outside Russia against Russian-supported forces would prevent an escalated response. Research has, however, exposed some policy questions concerning both China and Russia.

Many interviewees questioned basing a Rapid Global Effects Capability solely in the continental United States. It was widely agreed that this basing dynamic would drastically reduce overseas basing and logistics costs, as well as the personnel strain of members of the armed forces living overseas. However, a CONUS-based system leaves the only available target for adversaries within CONUS.¹⁰⁴ Interviewees consider this to be a destabilizing aspect of the system. They recommend considering the placement of a Rapid Global Effects Capability within allied countries such as Great Britain and Australia. Other sites recommended for basing included the Ascension Islands in the Atlantic Ocean, Guam Air Base in the Pacific Ocean, and Diego Garcia Air Base in the Indian Ocean, reducing the risk of an adversary striking CONUS. This also provides for operational agility through global presence. However, this would create additional logistics considerations that a CONUS-based system would not encounter. Signaling is also a concern that some mention in association with a Rapid Global Effects Concept.¹⁰⁵

In the Wargame that the Air Force conducted in June of 2015, tactical experts cited signaling as one of their main concerns for the operational use of a Rapid Global Effects Capability. Quite simply, would allies and adversaries detect the launch of this concept and misinterpret it as a nuclear intercontinental ballistic missile launch? This is a valid question and concern for a number of reasons.

Near-peer adversaries such as China and Russia would be able to distinguish between the launch of a Rapid Global Effects Capability and an ICBM.¹⁰⁶ Types of fuel used for propulsion, horizontal vs. vertical takeoff options, launch locations, and most importantly trajectory are factors that would distinguish between the two capabilities. A Rapid Global Effects Capability is being designed to launch into low earth orbit, while an ICBM goes into a much higher, elliptical ‘flight path’ in order to re-enter the atmosphere and strike its target.¹⁰⁷ Near-peer allies would also be able to distinguish between these launch factors as well as have the added benefit of potential intelligence sharing.

Adversaries that do not have the capabilities of China and Russia pose a separate challenge. Countries such as Iran and North Korea may not have the capability to distinguish between a Rapid Global Effects Capability and an ICBM launch. However, they do have considerable conventional military capabilities that they could utilize if they felt that they were a target of an ICBM.¹⁰⁸ The United States Air Force can address signaling concerns with horizontal takeoff capability, basing location decisions, doctrine that prevents the use of a Rapid Global Effects Concept with nuclear capabilities, and deception operations. Alternatively, the United States could opt to publically use a Rapid Global Effects Capability and the current ICBM fleet to diversify its nuclear capability and present adversaries with more expansive dilemmas on how to counter United States nuclear doctrine and operations. Interviewees and wargame participants also brought up the issue of creating a potential arms race.

The concern of an arms race is a valid concern and one that military strategists and United States policy makers must consider. The United States, in general, has not been concerned with arms races in the past due to a dominating economic presence and historical

success during the Cold War. However, these aspects are not guarantees for success in the future.

A Rapid Global Effects Capability would have considerable impact on the future core missions of the United States Air Force.¹⁰⁹ A discussion about the tradeoff between investments in this future concept, legacy systems currently in use, and how each would complement each other moving forward is appropriate. While outside the scope of this study, the economic factors include impact on personnel, basing, and investment in other emerging technology are all critical to the overall discussion. However, preliminary research supports the conclusion that a Rapid Global Effects Capability, while enabling the future core missions, would give the United States Air Force flexibility in personnel decisions, basing options, and complement legacy systems in their current operations. These aspects present a dilemma for China and Russia.

In terms of an arms race, China and Russia would face difficult investment decisions moving forward.¹¹⁰ Each have made considerable investments in creating A2/AD environments, particularly China. A capability that can manipulate distance and time like a Rapid Global Effects Capability would severely disrupt those efforts. Adversary decisions would have to be made of how to invest in order to counter that capability. The most likely option is to develop some kind of defensive capability to limit its effectiveness. Thus, a Rapid Global Effects Capability has the potential to become part of a greater cost-imposition strategy for the United States. Ultimately, the United States' goal is to maintain the peace, creating a situation in which it holds the military advantage and is better able to influence adversaries with other instruments of power.

Analysis

The research has found that a Rapid Global Effects Capability will have a significant impact on domestic and foreign policy as well the ability of the United States Air Force to accomplish its core missions in the Air Force Future Operating Concept. Domestically, it will highlight a new era in Air Force technological investment and acquisition strategy while inspiring the youth of tomorrow. Foreign policy will shift with the impact on current treaties, a wide range of deterrent effects, and impact on combatant commander operational plans. For the Air Force core missions, new dimensions in the vertical nature of warfare will change dramatically while igniting a new interest both in space and in service to the nation.¹¹¹ This research has also identified key areas in which a Rapid Global Effects Capability may impact future operations in Europe. This impact is possible through a new paradigm in commercial investment in technology while partnering with government and academic institutions.

Technological investment in capabilities like a Rapid Global Effects Capability could provide the President with more options through achieving operational agility. Operational agility allows for the armed forces to achieve their future core missions. An example of this is the Air Force's 2035 core missions of Adaptive Domain Control, Global Integrated ISR, Rapid Global Mobility, Global Precision Strike, and Multi-domain Command and Control. In achieving their core missions, the United States armed forces ensure that the nation's national security objectives are achievable.

Recommendations

- 1. Pursue a Rapid Global Effects Capability through a dedicated acquisition model outside of traditional government acquisitions modeling and timelines. Invest with the appropriate amount of risk in order to fail early and smartly, driving advancement in the technological fields that the United States Air Force needs.**
- 2. Enable and partner with commercial industry leaders to field a fully operational Rapid Global Effects Capability on a ten-year developmental timeline.¹¹²**
- 3. Dedicate an Air Force Major or Lieutenant General as the Program Manager who reports directly to the Secretary or Deputy Secretary of Defense. This level of commitment has historical precedence in the placement of General Bernard Schriever in Southern California to develop the United States Air Force's future Intercontinental Ballistic Missile program. Today, his success is seen in one pillar of the United States' nuclear triad.**
- 4. Establish a dedicated field office in Seattle, WA, San Francisco, CA, or Los Angeles, CA. This office should be for the sole purpose of a Rapid Global Effects Capability development and should not be co-located with other acquisition programs. The location will allow for daily interaction with the industries associated with development, while creating a necessary buffer between the development team and traditional military development protocols. This will allow the pursuit of the effort to fail early and smartly, creating agility in the process so that the program manager can redirect efforts easily.**
- 5. Assign leaders from various backgrounds (military, civilian, and academia), services, and year groups to the field office. The Program Manager (Major or**

Lieutenant General) should sign performance reports with the Additional Rater on performance reports being the Secretary or Under Secretary of Defense. This provides for program legitimacy throughout the United States Air Force and ensures that the best in each career field/year group are placed on the field office team. Make this a joint creditable assignment.

*** All recommendations are the opinion of the author and not Air University, United States Air Force, or Department of Defense opinion. Conclusions and recommendations are based on research and previous experience. The author realizes that many of the recommendations, if implemented, would be non-traditional in their application.**



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¹⁰⁵ LeMay Center Wargaming Directorate. *A Rapid Global Effects Capability Concept Wargame After Action Report*. Maxwell Air Force Base, AL, 22 October 2015.

¹⁰⁶ Sercel, Joel. *Sub-Orbital Transport, Air Force Guardian Program Concept Initial Feasibility Analysis*. ICS Associates Inc., 2016.

¹⁰⁷ Carsetter, Scott. Comments made at the Center for Strategic and Budgetary Analysis Space Workshop. Washington D.C., 9 and 10 Nov 15.

¹⁰⁸ Heritage Foundation. Multiple interviews. Washington D.C., 2 March 2016.

¹⁰⁹ LeMay Center Wargaming Directorate. *A Rapid Global Effects Capability Concept Wargame After Action Report*. Maxwell Air Force Base, AL, 22 October 2015.

¹¹⁰ Center for New American Security. Multiple interviews. Washington D.C., 2 March 2016.

¹¹¹ Meeks, Woodrow. (Ideas for this paragraph from a meeting on A Rapid Global Effects Capability, Air University, Maxwell AFB, AL, 21 October 2015).

¹¹² Timeline based on estimates from AFRL and SpaceWorks.

