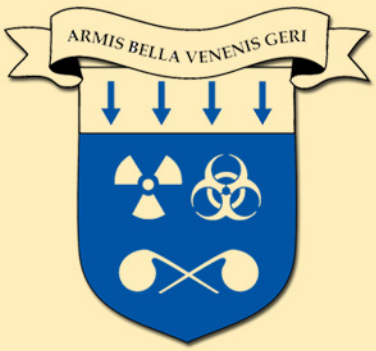
Precision Global Strike: Is There a Role for the Navy Conventional Trident Modification or the Air Force Conventional Strike Missille?

Colonel Jonathan M. Owens, USAF



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by

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The Author

Colonel Jonathan M. Owens was previously assigned to the Future Operations Division in the J3 Directorate at United States Pacific Command (PACOM) where he served as Chief of PACOM Targeting and Global Strike. He was commissioned through the Reserve Officer Training Corps (ROTC) in 1985. Colonel Owens earned a Bachelor of Science degree in physics and mathematics from the University of Kentucky and a Master of Aeronautical Science degree from Embry-Riddle Aeronautical University in 1996. Colonel Owens has also served as an F-16 Operations Officer, a Commander of an Operations Support Squadron, and a Deputy Operations Group Commander.

Precision Global Strike:

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Jonathan M. Owens

I. Introduction

> We are strengthening our deterrence by developing a New Triad composed of offensive strike systems (both nuclear and improved conventional capabilities)...When the consequences of an attack with WMD are potentially so devastating, we cannot afford to stand by as grave dangers materialize.[1]
>
> –President George W. Bush

> The media and expert circles are already discussing plans to use intercontinental ballistic missiles to carry non-nuclear warheads. The launch of such a missile could...provoke a full-scale counterattack using strategic nuclear forces.[2]
>
> –Russian President Vladimir Putin

In 2006, the Navy requested $503 million to fund the Conventional Trident II (D) Modification (CTM) program which would utilize existing Navy Trident II (D5) missiles retrofitted with conventional warheads.[3] The CTM program would be a near-term solution to enhance the United States (U.S.) range of options available for dealing with emerging threats and take advantage of the high readiness levels and short duration flight times inherent in a Submarine Launched Ballistic Missiles (SLBM). The same year, the Air Force requested $27 million to fund a similar Conventional Strike Missile (CSM) as part of a larger Conventional

Ballistic Missile (CBM) program which would retrofit retired Minuteman II and Peacekeeper Intercontinental Ballistic Missiles (ICBMs) and provide a mid-term solution.[4] Both plans were born out of the 2006 Quadrennial Defense Review (QDR) request for the fielding of a rapid, precision strike weapons capability within two years of funding.[5] In 2007, the strategic and operational concerns of fielding the CTM and CSM were called into question by the Government Accounting Office (GAO) and various members of Congress. Funding for both programs was cut; a total of $100 million was appropriated for "defense-wide research and development funding...propulsion and guidance systems, mission planning, re-entry vehicle design, modeling and simulation efforts, and launch system infrastructure."[6] Congress mandated future funding would be contingent upon further review and Congressionally-funded studies of the concepts.

Citing a capability gap in dealing with potential long-range, "high-regret-type" threats, the Department of Defense (DoD) is continuing to pursue its quest for the fielding of a short-term alternative.[7] In its FY 2008 budget, the DoD is requesting an additional $175 million to continue with development of the Navy Conventional Trident II (D) Modification program as well as $32.8 million in funding for the Air Force Common Aero Vehicle re-entry vehicle.[8] The requirement for the United States to rapidly engage and defeat potential threats posed by the use of Weapons of Mass Destruction (WMD) by state and non-state actors is highlighted in joint doctrine as one of the greatest challenges faced by the United States.[9]

Likewise, U.S. Air Force doctrine addresses the weapons of mass destruction counterproliferation efforts through, among other things, the use of counterforce. "Counterforce refers to offensive operations to strike adversary Chemical, Biological, Radiological, and Nuclear (CBRN) weapons and associated production, transportation, and storage facilities prior to use."[10] One key aspect of the Air Force counterforce operations is the pre-emptive nature of its targeting process. Counterforce targeting may be executed pre-emptively assuming the effort is well coordinated with allied partners and relies heavily on accurate intelligence and exact target location.[11]

From a tactical perspective, U.S. intelligence suspecting the future use of weapons of mass destruction by terrorist groups or rogue nations all but drives senior decision makers into this pre-emptive strategy. As has been witnessed in North Korea, Iran, and perhaps Iraq, the U.S.

containment strategy does not ensure rogue states and terrorist groups will not be able to acquire and ultimately use weapons of mass destruction.[12]

The 2002 U.S. National Security Strategy set an historical precedent in the way policy makers and the military would deal with these potential threats. After 9/11, United States focus shifted from a reliance on deterrence as an effective means of defense to the need to find and deal with would-be attackers before they had a chance to do harm to the United States again. The 2002 NSS stated the United States reserved the right to react pre-emptively when faced with evidence of an imminent threat posed by rogue states and terrorists groups.[13] This U.S. proclamation laid the foundation for the initiation of hostile actions during Operation Enduring Freedom and Operation Iraqi Freedom.

This paper will analyze and address the developmental, operational, and political concerns associated with the use of the Navy Conventional Trident II Modification and Air Force Conventional Strike Missile for Prompt Global Strike missions and establish why the United States should fully fund the near-term Conventional Trident II Modification program. It will examine the Navy justification for the Trident II (D) modification as well as the Air Force justification for a land-based alternative and discuss the proposed concept of operations for each of their use. The paper will then provide analysis of likely scenarios involving the use of either a conventional ICBM or SLBM and discuss the applicability and potential concerns of employment. Finally, the paper will conclude with some recommendations on how the DoD might mitigate the current concerns associated with the development, employment, and funding of the Navy Conventional Trident II Modification.

II. The Prompt Global Strike Construct

The ongoing debate over pre-emptive actions against hostile forces has led to a wide range of ideas and changes in how the United States must best posture itself to face its future challenges. In order to support the U.S. pre-emptive option, the 2002 National Security Strategy highlights three areas of emphasis, "build better, more integrated intelligence capabilities to provide timely, accurate information on threats wherever they may emerge; coordinate closely with allies to form a

common assessment of the most dangerous threats; and continue to transform our military forces to ensure our ability to conduct rapid and precise operations to achieve decisive results."[14] In essence, the Director of National Intelligence, the Department of State, and the DoD were tasked to plan for and improve the United States capability to find, fix, track, and target terrorist groups and/or rogue states sponsoring or providing safe havens to terrorist activities.

Prior to the 2002 National Security Strategy, the Department of Defense published its 2001 Quadrennial Defense Review and similarly recognized the threat posed by WMD and the importance U.S. offensive deterrence capability (both nuclear and non-nuclear) would have on damage limitations and escalation control. The increased chance of a U.S. offensive attack would place an aggressor's key nodes of operation at risk and question their ability to successfully launch an attack.[15]

The following year, the U.S. Air Force issued a Mission Needs Statement requesting the Air Force establish the precision global strike mission set.

> This statement indicated the [United States] needs to be able to strike globally and rapidly with joint conventional forces against high payoff targets. The [United States] should be able to plan and execute these attacks in a matter of minutes or hours, as opposed to days or weeks needed for planning...it should be able to execute these attacks even when it had no permanent military presence in the region.[16]

With the new Secretary of Defense Donald Rumsfeld in charge, the Department of Defense set about "transforming" itself into a more technology focused fighting force, leveraging gains in lethality and speed against reductions in force structure and funding.[17] The recent emergence of modern weapon systems in addition to advances in the integration of net-centric data management systems has undeniably produced a unique military advantage for U.S. forces. Enhanced intelligence, surveillance, and reconnaissance and improved command and control have greatly improved the commander's decision-making cycle.

The ability of commanders to rapidly position forces, anticipate enemy movements, and react with sufficient lethality stems from these

various advances in modern technology. Technology has in large part driven military leaders to pursue the perfect "ready, aim, fire" solution cycle. A long-range precision strike weapon such as the Conventional Trident II Modification or Conventional Strike Missile would allow the United States to "attack targets thousands of miles away with precision-guided, conventional high explosives in minutes…Because of the missiles speed, [it] would be able to pierce enemy air defense and avoid putting American pilots at risk."[18] As part of the new U.S. nuclear triad, the Conventional Trident II Modification or Conventional Strike Missile launch timelines and authorities will look very similar to the requirements for other U.S. nuclear ballistic missile launches except they will carry a non-nuclear weapon payload.

III. The "New" Nuclear Triad

In 2001, Congress directed the Department of Defense to conduct a thorough review of its nuclear posture to ensure the United States was prepared for the type of future wars it anticipated to fight. The old strategy of Soviet containment during the Cold War would not be as applicable to the threats posed by terrorist groups or rouge states today. Terrorist groups can operate with impunity, attacking U.S. interests without fear of reprisal short of an improbable nuclear attack. As such, weapons of mass destruction in the hands of hostile states and terrorist groups poses one of our gravest threats to U.S. national security.[19] Building on the published 2001 Quadrennial Defense Review, the Department of Defense began redesigning the nation's nuclear posture in terms of a capabilities-based versus threat-based requirements approach.[20]

Although the idea of nuclear deterrence has not gone away, the transformed nuclear triad would be capable of handling a much wider range of potential threats. Historically called upon for strictly offensive operations, advances in missile defense technologies make it possible for the first time to develop unique defensive measures to thwart an enemy attack. The previous Cold War nuclear triad referred "to the three legs of the U.S. strategic nuclear force: submarine-launched ballistic missiles, land-based intercontinental ballistic missiles, and long-range bombers."[21] The new 2001 Nuclear Posture Review, submitted by the Department of

Defense, relied upon a triad of three distinct capabilities: Offensive strike operations (both nuclear and non-nuclear), defensive systems (both active and passive), and a more responsive defensive infrastructure.[22] See Figure 1.

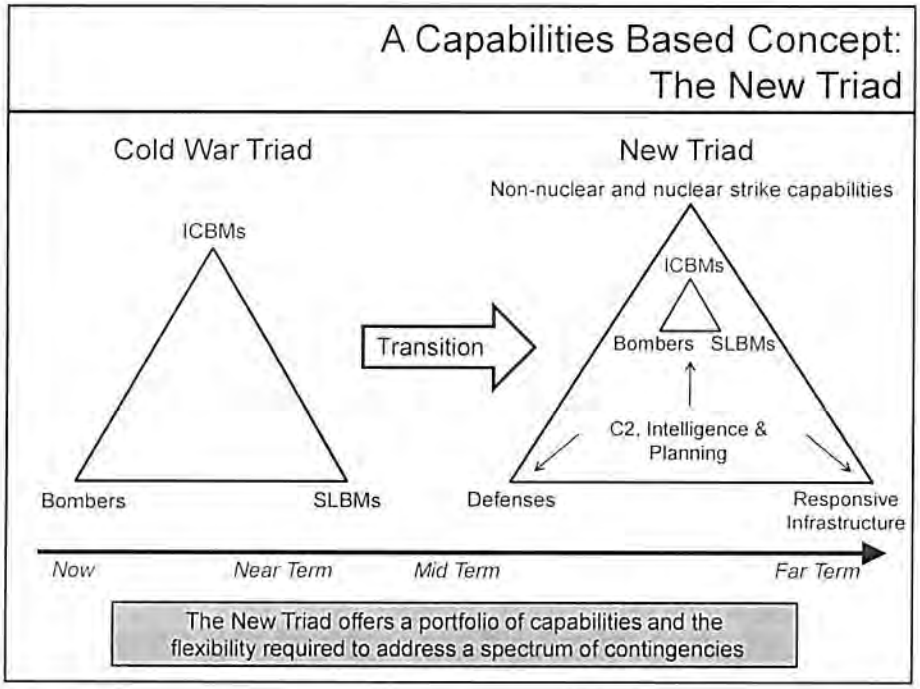

Figure 1. A Capabilities Based Concept: The New Triad[23]

Offensive Strike Operations

The first leg of the new U.S. Nuclear Triad consists of offensive strike operations to include nuclear and non-nuclear weapons such as the Conventional Trident II Modification or Conventional Strike Missile. The United States plan set out to complement the nuclear force with non-nuclear conventional weapons capabilities in addition to the traditional nuclear platforms such as intercontinental ballistic missiles, submarine-launched ballistic missiles, and long-range bombers like the B-1, B-2, and

B-52.[24] Given reductions in force structure and the challenges associated with deploying forces forward to respond to a remote threat, a long-range conventional option would provide the ability for the United States to respond globally within a short time. The first leg of the new triad provides senior decision makers with a wider range of nuclear and non-nuclear courses of action to deal with the wide range of threats of tomorrow.[25]

Defensive Systems

The second leg of the new U.S. Nuclear Triad relies on the use of defensive systems to deter and counter the threat of a ballistic missile launch. The U.S. ballistic missile defense program relies on a layered defense of short, medium, and long-range engagement capabilities.[26] The ballistic missile defense program, noted in the Nuclear Posture Review, is intended to provide coverage over "all 50 states, our deployed forces, and our friends and allies against ballistic missile attacks."[27] Although not the panacea for all launch possibilities, it offers a first line of defense for short-notice launch scenarios. Current parts of the ballistic missile defense program include both short and long-range interceptors, command and control systems, as well as early warning acquisition and tracking radars.

Defensive (Responsive) Infrastructure

The third leg of the new U.S. Nuclear Triad consists of the defensive infrastructure to include the timely development, maintenance, and utilization of the triad. Consolidation of weapons systems and a more responsive development and fielding process for new technologies will ensure a viable deterrence option for U.S. threats.

"[M]aintaining our ability to respond to large strategic changes can permit us to reduce our nuclear arsenal and, at the same time, dissuade adversaries from starting a competition in nuclear armaments."[28] The ability to respond quickly to emerging threats relies heavily on the effective use of intelligence, command and control, and planning capabilities. As an enabler to command and control and planning efforts, the most vital part of

managing the new Nuclear Triad is the ability of the United States to provide relevant and accurate intelligence in a timely manner.

In 2004, the Congress enacted the Intelligence Reform and Terrorism Prevention Act which consolidated all the functions of the Intelligence Community under one single office. As stated in the legislation, the Director of National Intelligence will strive to be, "timely, objective, independent of political considerations, and based upon all sources available to the Intelligence Community and other appropriate entities."[29] The goal of establishing a single focal point for intelligence activities was to facilitate the sharing of intelligence information across multiple intelligence bodies to enable consistency and timeliness of analysis and reporting.

Additionally, improvements in U.S. command and control and planning include upgrading the current command and control architecture which was previously reliant upon the geographical deployment of the E-4B National Airborne Operations Center aircraft. The new system will utilize a network-based approach to information sharing and collaboration.[30] As such, recent U.S. Strategic Command initiatives include the development of the Global Operations Center-Collaborative Environment for real time planning and coordination among disjointed participants and operational regional combatant commands. Global Operations Center-Collaborative Environment was developed to support the real time, net-centric, collaborative planning required for a global strike scenario.[31]

IV. Nuclear Offensive Strike: ICBMs and SLBMs

As the backbone of nuclear offensive strike operations, intercontinental ballistic missiles and submarine-launched ballistic missiles have been a part of the U.S. triad of nuclear deterrence for over 40 years.[32] Land-based intercontinental ballistic missiles constitute a range of variants such as the Minuteman II, Minuteman III, and the Peacekeeper missiles. Currently, the United States has no remaining Minuteman II or Peacekeeper missiles on nuclear alert. As of October 1, 2007, according to the current Strategic Arms Reduction Treaty (START) aggregate numbers, the United States possessed 500 Minuteman III, 120 Trident I, and 312 Trident II missiles.[33]

Additionally, the United States has approximately 1,200 ICBM and 3,216 SLBM warheads for a total of 4,416 nuclear warheads spread among land and naval forces (excluding the bomber force). In the Nuclear Posture Review, the United States stated a goal of "an operationally deployed force [that will] optimally consist of between 1,700-2,200 strategic nuclear warheads by 2012…[and will] support U.S. deterrence policy to hold at risk what opponents value, including their instruments of political control and military power, and to deny opponents their war aims."[34]

United States ICBM Inventory

As part of the nation's arsenal of nuclear weapons, the Air Force maintains approximately 500 intercontinental ballistic missiles at various locations in the United States. In the past, the main variants of the missile included the Peacekeeper and Minuteman II and III. Following the June 2002 U.S./Soviet START II agreement, the United States began a slow draw down in its nuclear inventory and decommissioned its remaining Peacekeeper and Minuteman II missiles leaving the Minutemen III for current operational use. Both Peacemaker and Minuteman II and III variants have a range of 6,000 miles but the Peacekeeper missile is a larger missile with increased carriage capacity.

The newest of the U.S. intercontinental ballistic missiles, the Peacekeeper missile entered the inventory in 1986 at a cost of $70 million per missile. The Peacekeeper is a four-stage ICBM and can carry up to 10 independently-targetable vehicles allowing for multi-targeting capability. The oldest of the two variants, the Minuteman II missile entered service in 1965 followed by the upgraded Minuteman III version in 1970. Both versions are three-stage, solid propellant intercontinental ballistic missiles. The newer Minuteman III model provides additional thrust and carriage capacity at a cost of approximately $7 million each.[35]

United States SLBM Inventory

The Navy first deployed the Trident II (D5) missile aboard Ohio-class submarines in 1990, and the missile is planned to remain in the Navy's arsenal until past 2020.[36] The Trident missile is an inertial guided, three-stage, solid-propellant ballistic missile and is currently deployed on Ohio-

class Trident submarines. The two variants of the Trident SLBM are the Trident I (C4) and the Trident II (D5). Each Trident-class submarine is capable of carrying 24 Trident (D5) missiles within its hull. The Trident (D5) was first deployed in 1990 at a cost of approximately $30M per missile.

Both the Trident I and II are capable of target ranges up to 4,000-6,000 miles. However, the older versions of the Trident I (C4) missile are somewhat smaller than the more advanced Trident II (D5) version. In addition to size differences, the Trident II (D) has a much larger payload capacity and more accurate targeting capabilities. The payload on each Trident (D5) contains Multiple Independently Targetable Re-entry Vehicles (MIRVs).[37]

V. Conventional Offensive Strike: The Conventional Strike Missile

In 2006, the Air Force proposed the use of its decommissioned Peacekeeper and Minuteman II missiles as potential platforms for a long-range, conventional strike scenario. The Air Force advocated a mid-term solution which could be fielded in the 2013-2015 timeframe.[38] The Conventional Strike Missile program would include the retrofitting of the Minuteman II and Peacekeeper missiles and designating them as Minotaur II and Minotaur III missiles. Proponents of the program have also recommended the use of the Air Force's Common Aero Vehicle as a hypersonic glide re-entry vehicle modified to fit into the nose section of the CSM and capable of carrying approximately 1,000 pounds of munitions. The Common Aero Vehicle was the result of a joint program between the Air Force and the Defense Advanced Research Projects Agency programs to develop a hypersonic vehicle capable of taking satellites into space or acting as re-entry vehicle for deploying weapons.[39] The Common Aero Vehicle would aerodynamically "glide" to the target making course correction with the use of flaperons. The Common Aero Vehicle would be capable of ranges of upwards of 3,000 miles once released, greatly improving the overall range capability of the payload. The Air Force has proposed numerous types of warheads for the Common Aero Vehicle based on the type of target requiring servicing. One option

calls for a "fuzed penetrator" for hard, deeply buried targets or smart bombs for targeting facilities and structures.[40]

The flight profile of the Conventional Strike Missile would not differ substantially from that of any land-based nuclear launch. Similar to a Minuteman II launch, the Peacekeeper missile fires its three stages of solid propellant to guide it along its flight path. The first three stages of the rocket propel the missile up to 700,000 feet. The fourth stage, which is a liquid propellant rocket, provides speed and course corrections while maneuvering the missile into the correct position for the re-entry vehicle to deploy.[41]

VI. Conventional Offensive Strike: The Conventional Trident Missile

In order to achieve the conventional offensive strike capability as envisioned in the 2001 Nuclear Posture Review, the Navy has proposed the modification of the Trident II (D) platform. As a workhorse for the Navy nuclear fleet, the Trident II (D) missile was selected as the best candidate for the CTM program. As part of the U.S. Nuclear deterrent force, Ohio-class submarines carrying Trident (D5) missiles provide stealth and rapid reaction capability for any global scenario. The Conventional Trident II Modification program would replace the current Trident II (D) Multiple Independently Targetable Re-entry Vehicle payload with a new re-entry vehicle and payload package.

The Navy enhanced effectiveness (E2) re-entry vehicle is proposed as the best candidate for the CTM payload body. The enhanced effectiveness re-entry vehicle would be equipped with Global Positioning System (GPS) capability and a new guidance control which promises to provide increased accuracy of the warhead.[42] The E2 would contain a strap-on flap system capable of steering the vehicle to its desired location. The conventional warhead would be designed as either a series of rods or cluster-type munition, and fit within the new re-entry vehicle. Accuracy of the weapon will approximate the accuracy of a precision guided weapon, about 10 meters.[43] When retrofitted with the E2, the new Trident II (D) CTM would be capable of the long-range, precision strike capability desired by the Department of Defense.

Like the nuclear Trident version, the Conventional Trident II Modification follows an identical flight profile as its nuclear cousin.

> The launch from the submarine occurs below the ocean surface. The missiles are ejected from their tubes by gas pressure created by a 'gas generator,' a solid-fuel rocket motor attached to the bottom of the missile tube which heats a pool of water creating steam. After the missile leaves the tube and rises through the water over the submarine, the first stage of motor ignites, the aero-spike extends, and the boost stage begins. Ideally, the missile is 'sheathed' in gas bubbles for its entire time in the water, so liquid never touches its fuselage. Within about two minutes, after the third stage motor fires, the missile is traveling faster that 20,000ft/s.[44]

VII. Conventional Strike Missile Employment Concept of Operations

The Conventional Strike Missile could be placed in an existing nuclear missile silo or on a mobile rail launcher until launch time. In order to achieve the rapid time response desired of a long-range strike weapon, the Common Aero Vehicle and the modified ICBM would have to be placed on a continual alert status. This alert status would allow the CSM to launch and arrive at the target within the desired one-hour time limit.[45] One unique aspect of the Common Aero Vehicle would be its ability to maneuver after rocket separation. This would affectively allow the Common Aero Vehicle to obtain mid-course corrections off of inertial and global positioning system updates. The Common Aero Vehicle would glide at approximately five times the speed of sound or approximately 4,000 ft/s.

Due to its ability to maneuver in flight, the Common Aero Vehicle would additionally have the ability to track a moving target. Projected accuracy of the Common Aero Vehicle would be approximately three meters.[46] The range of the Conventional Strike Missile would be in excess of 6,000 miles given the added ability of the Common Aero Vehicle to glide un-aided to the target. The Air Force plan for employment of the

Conventional Strike Missile would be along the coast of the United States to preclude confusion over a possible nuclear launch at historically nuclear launch facilities.

VIII. Conventional Trident II Modification Employment Concept of Operations

The launch of a Conventional Trident II Modification would be similar to the launch of other Navy conventional strike missiles. Like the submarine launch of a land attack version of Tomahawk Land Attack Missile, the CTM would have the capability to be launched from any of the 14 Ohio-class submarines. The Conventional Trident II Modification would use a combination of inertial, global positioning system, and spacial navigation to fly to and acquire the target. Each Ohio-class submarine would be fitted with two Conventional Trident II Modification missiles which would replace two of its onboard nuclear equivalents.[47]

Once launched, the missile would receive midcourse guidance and corrections while proceeding to the target. The estimated range of the weapon would be from 4,000 to 6,000 miles, and with a strap-on kit under consideration by lead contractor, the weapon could achieve "near-GPS" accuracy.[48] Ohio-class submarines containing the Conventional Trident II Modification would be placed in both the Pacific and Atlantic oceans providing flexible targeting options to either hemisphere. The Trident submarines would be on constant patrol and extremely difficult for an adversary to detect.[49]

IX. Conventional Targeting Scenarios

A wide range of benefits can be assumed from the ability of the United States to attack global targets quickly, precisely, and with the right amount of force without committing high-value assets or forces to a region. The United States will increasingly be asked to respond to a wide variety of regional conflicts stretching our forces thin and forcing a prioritization of time and resources. The ability of the United States to

hold a target at risk without the requirement to be deployed forward in the region would strengthen the nation's deterrence capabilities and hold hostile nations or non-state actors accountable for their actions.

The current U.S. nuclear strategy requires a threshold to be crossed before the United States would respond in kind. The ability to conventionally target lowers the response threshold and permits a reasonable alternative to nuclear conflict. This lower United States response threshold highlights the current dilemma the United States has in regards to the proliferation and potential use of weapons of mass destruction. Given a future nuclear conflict with a near-peer competitor is unlikely,[50] two possible causes remain for the United States to use a conventional long-range strike option: a time-critical attack against a known or suspected terrorist group planning to harm U.S. interests or the use of a long-range strike at the start of a larger combat operation.[51]

Time-Critical Strike

Events in Iraq highlight a likely target requiring a rapid, long-range strike capability. The timing of the kickoff to the Iraq War was in part due to the suspected known whereabouts of Saddam Hussein. The United States assembled its response forces and attempted unsuccessfully to target his location. One reason for the failure has been blamed on the four hours it took for U.S. forces to respond to the request, perhaps sufficient time for a fleeting target to move.[52]

An additional example was witnessed in 1998 when the United States located the whereabouts of Ayman Al-Zawahiri, bin Laden's number two man. Following a phone call to a Pakistani reporter, the United States launched a cruise missile attack at the location. Launch authority to bomb on target took one hour. By that time, Al-Zawahiri was gone.[53]

The same year, the United States attempted another Tomahawk Land Attack Missile attack on an Al Qaeda training camp in eastern Afghanistan where Osama bin Laden was suspected to be located. In the time it took the missile to travel the two hours to his location, bin Laden was gone.[54] A United States capability to launch within 30 minutes and have effects on targets worldwide would increase the U.S. range of options when dealing with time-critical, high-value targets.

An additional scenario could involve the transport of a nuclear weapon by a known terrorist group. Through intelligence and overhead imagery, the location of the weapon is determined to be inside a warehouse in a remote region of the Middle East. The weapon is expected to be at the location for less than an hour. Launching an aircraft to attack the target may not be an option due to time, distance, and political concerns. In addition, a Tomahawk Land Attack Missile may not be an option due to its slower speed (550 knots) and limited range (1,500 miles).

Finally, one possible scenario might involve a rogue state preparing to launch a long-range missile with a nuclear device on it. Once overhead imagery correlates missile type, payload, and subsequent liquid-refueling, the time available to attack could be too late. Targeting the missile while it is still on the launch platform would render the missile and launch platform ineffective in addition to deterring the aggressor from contemplating another attack.[55]

Pre-Planned Strike

One potential pre-planned scenario involving the use of a long-range, conventional strike munitions might be as part of the kick-off to a theater operational plan.[56] Targets which cannot be attacked by conventional forces due to forward basing, distance, or over-flight issues could be taken out as a precursor to the beginning of hostilities. This first wave of attacks could attack deep interior targets and soften up defenses for follow-on forces to attack. For certain theaters where area denial is of particular concern, a long-range standoff option would preclude the need to deploy the full complement of combat forces and would render ineffective an adversary's Integrated Air Defense System.[57]

Similarly, the United States could choose to launch a retaliatory strike against an adversary who was linked to an attack on U.S. interests. Such an attack may be planned for a time and location of our choosing, permitting intelligence to confirm culpability and an appropriate retaliatory target. Although unlikely, unless the target was incapable of being serviced by a Tomahawk Land Attack Missile or other theater asset, this targeting option does provide senior leaders with more options from which to choose from.

Given the political, strategic, and financial costs associated with utilizing a long-range strike missile, the United States would most likely

choose to use the weapon only for time-critical, high-value targets. Reserving the missiles for potential time-critical scenarios would require fewer missiles to be procured and maintained versus using them as a first-wave strike weapon prior to the beginning of major hostilities.[58]

X. CTM and CSM Comparative Analysis

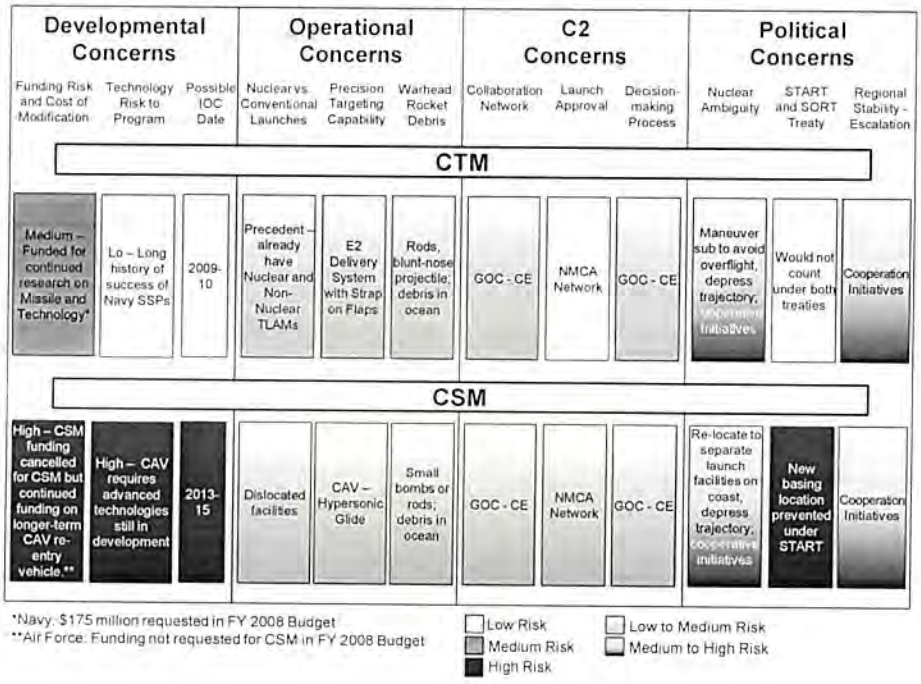

Figure 2. CTM and CSM Comparison

Developmental Concerns

Funding

Both the Conventional Trident II Modification and Conventional Strike Missile programs are competing with each other for Congressional

spending for a new precision global strike weapon. In 2007, the Navy's ambitious $127 million request for the Conventional Trident II Modification program was cut in the 2007 Defense Appropriations bill pending further study into the operational requirements of the missile.[59] The Navy received $30 million for continuation of the Conventional Trident II Modification program. The Air Force failed to receive funding for its Conventional Strike Missile program and, instead, received $33.4 million in funding for continued research on the Common Aero Vehicle. However, with the Congressional appropriations came the caveat that the Common Aero Vehicle would not be used in weapons carriage capacity.

In the FY 2008 budget, the Navy requested an additional $175 million to keep the CTM program on track.[60] However, concerns in Congress have yet to convince the electorate to fully support the program. Pending further Congressionally-mandated reports on the Conventional Trident II Modification, approval for FY 2008 has so far been withheld.

The Air Force, in its FY 2008 budget request, did not request further funding of the Conventional Strike Missile program and, instead, is focusing on its Common Aero Vehicle program. The Air Force requested $32.8 million for Common Aero Vehicle to continue research and development of the technology.[61] Lack of Congressional and funding support for the Air Force's mid-term Conventional Strike Missile program has put the program in jeopardy. It appears Congress has placed more support behind the Navy Conventional Trident II Modification program, given its earlier projected delivery date and, therefore, given the Air Force the lead for continued research and development of its hypersonic glide technology. With no other near-term precision global strike competitor, the Navy has the only precision global strike weapon that can be fielded in the 2009 timeframe.

Technology Risk

The Navy Conventional Trident II Modification program will utilize current technology to modify its current Trident II (D5) missiles. Although several technical challenges in regards to its enhanced effectiveness delivery vehicle must be resolved, the Navy's Strategic Systems Program has a long track record of delivering weapons systems to the Navy on time.[62] The Air Force Conventional Strike Missile would

require significant risk given the immature hypersonic glide technology of the Common Aero Vehicle. In addition, the Conventional Strike Missile must continue to develop its range of proposed warheads for hard and soft targets. Given the technological risk of the Air Force program, the Navy Conventional Trident II Modification program provides the best chance of achieving a capable weapon without incurring significant technical and developmental risks.

Initial Operating Capability (IOC) Date

Only the Navy Conventional Trident II Modification program is capable of meeting the 2006 Quadrennial Defense Review goal of two years from funding, to development, to employment of a viable precision global strike weapon system. With continued funding of the Conventional Trident II Modification program in the FY 2008 Defense Appropriations Bill, the Navy would be able to field the weapon within the designated timeframe. In contrast, the cancelling of the Air Force Conventional Strike Missile program and lack of a funding request by the Air Force in its FY 2008 submission makes it unlikely the Conventional Strike Missile program would be able to meet the Quadrennial Defense Review request. However, the $12 million Common Aero Vehicle funding in the FY 2007 Defense Appropriations, and additional funding for the Air Force Conventional Ballistic Missile program, could provide the Air Force with a possible mid-term solution in terms of a launch platform and delivery vehicle.

Operational Concerns

Nuclear versus Conventional Launch

The operational distinction between the launch of a nuclear missile and the launch of a conventional variant of the same missile requires discipline and a clear and distinct set of operating procedures. The Navy and Air Force routinely operate and train in an environment containing both nuclear and conventional weapons. The Navy has traditionally operated with both nuclear and conventional variants of the Tomahawk Land Attack Missile. During combat operations, the Navy may be called upon to respond to either a nuclear or non-nuclear crisis. To date, an operational

misunderstanding over the launch of a nuclear weapon versus a conventional weapon has never occurred.

Likewise, the Air Force continues to operate its bomber fleet with nuclear and conventional versions of the same weapon. Routinely, Air Force ground and air crews are called upon to exercise and train for the potential launch of a nuclear weapon. The accidental launching of an ICBM has never occurred. Given the Navy and Air Force's long track record of carrying and managing launch decisions of nuclear and conventional weapons, both are well postured to maintain confidence building measures and procedures against an accidental nuclear launch.

Precision Targeting Capability

Both the Navy enhanced effectiveness and Air Force Common Aero Vehicle re-entry vehicles promise GPS-level accuracy with the ability to make mid-course corrections in flight prior to weapon release. The proposed Navy enhanced effectiveness delivery system on the Conventional Trident II Modification would utilize a simple strap-on flap system to guide the re-entry vehicle near to the target whereas the Common Aero Vehicle would utilize a combination of ailerons and flaperons to guide to the target. The enhanced ability of the Common Aero Vehicle to maneuver provides an extended range advantage of approximately 3,000 miles after re-entry vehicle release.

However, given the 4,000 to 6,000 mile range of the Trident II, Minuteman II, and Peacekeeper missiles, achieving the desired range to the target would probably not be necessary. The unique advantage of the Common Aero Vehicle would be its ability to target moving targets after missile launch. Mid-course updates could be provided to the vehicle if the target had moved after launch. It should be pointed out, however, Air Force development of this capability is still a long way out and most likely will not occur before the preferred fielding of a near-term Conventional Trident II Modification weapon.

Warhead and Rocket Debris

In addition to the launch and precision targeting issues, the type of warhead and associated rocket debris are also of concern. The various types of warheads proposed for the Conventional Trident II Modification

and Conventional Strike Missile fall into two basic categories: rod/unitary and multiple bomb/sub-munitions. The rod-type warhead would enable the penetration of hardened targets while the unitary warhead would allow for hard and deeply buried targets. The small bombs or sub-munitions would primarily be used for the targeting an area of soft targets above the ground. The high rate of velocity of the projectiles at impact (20,000 ft/s for the E2 or 4,000 m/s for the Common Aero Vehicle) would provide for sufficient penetration capability and target destruction assuming the accuracy of the guidance package. Both the Conventional Trident II Modification and Conventional Strike Missile propose a similar set of weapons capabilities based on target selection.

Another major factor which should be considered is the debris field caused by the launch of an ICBM. After booster separation, the third and fourth stage of the rocket motor will continue to travel to the Earth ballistically. In order to alleviate concerns of non-combatant casualties, the Conventional Trident II Modification has a distinct advantage in its ability to alter its loitering location to ensure the debris field falls within the surrounding waters. In the deployment concept of operations for Conventional Strike Missile, the launch locations would be on both the east and west coasts of the United States. Launch debris in this case would similarly remain well clear of any inhabited areas.

Command and Control Concerns

Collaboration Networks

In 2006, U.S. Strategic Command began the development and funding of the Global Operations Center-Collaborative Environment program. As a tool for its Global Strike mission area set, Global Operations Center-Collaborative Environment provides federated members with the ability to collaborate in a net-centric environment. Global Operations Center-Collaborative Environment permits real-time planning and coordination on precision global strike mission scenarios. Keeping with the precision global strike construct of a one-hour decision-making cycle, crisis action/time-sensitive planning is conducted across Theater Air Operations Centers and Combatant Command planners via the Global Operations Center-Collaborative Environment. This tool allows U.S. Strategic Command joint

functional component command planners, in conjunction with supported commander staff's to produce a mission analysis and course of action proposal to senior leaders in a time compressed manner. See Figure 3.

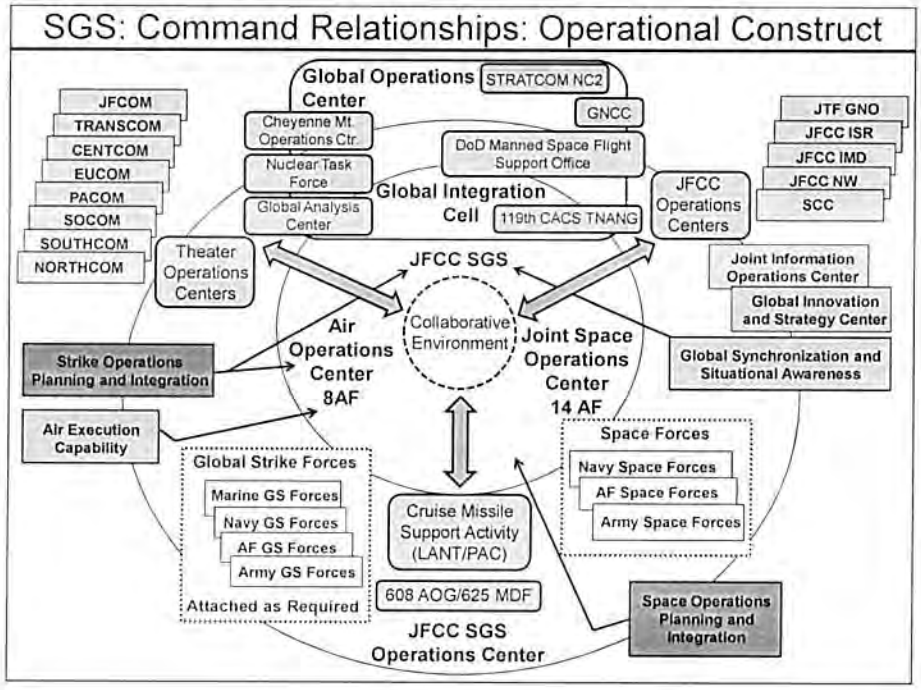

Figure 3. SGS Command Relationships, Operational Construct[63]

One shortfall of the Global Operations Center-Collaborative Environment program is its inability to provide Voice over Internet Protocol (VoIP) capability. In addition to its ability to provide shared data and mission planning capability, Global Operations Center-Collaborative Environment should contain a secure, real-time exchange of information and ideas from participating Combatant Command Joint Operations Centers and Component Headquarter Air Operations Centers.

Launch Approval

Similar to the approval authority given by the National Military Command Authority for nuclear launches, the approval for precision global strike missions would rest with the President or his designated representative. Launch authority occurs at the conclusion of the Strategic Command-led collaborative planning process. Once a long-range conventional strike missile has been selected for use as the preferred course of action, an alert order is issued to whichever Combatant Command has been assigned primary responsibility for the asset. Following verbal guidance, the joint staff would issue an execute order for the supported Combatant Command involved. The process would remain the same regardless of it being a Navy or Air Force asset.

Decision-Making Process

With a United States desire for a rapid precision global strike capability comes the requirement for a rapid decision-making process. The ability of senior-level decision makers to provide launch authority within one hour is not unprecedented. As previously pointed out, compelling intelligence and target information can lead to a rapid decision to launch an attack. The continued, future funding and development of the U.S. Strategic Command Global Operations Center-Collaborative Environment provides senior decision makers with the necessary tools to achieve coordinated planning and decision-making within minutes instead of hours or days. The ability to place planners, senior Combatant Command commanders, subordinate commanders, and senior Pentagon and White House officials in the same collaborative environment can prevent needless delays and ensure all sides of the argument (pros and cons) are voiced.

Political Concerns

Nuclear Ambiguity

Undoubtedly, the most significant stigma to overcome with the use of an ICBM for precision global strike is the issue of nuclear ambiguity.

After all, the idea of using an ICBM in a role traditionally reserved for nuclear warfare is new. However, it seems unreasonable to think the type of missile platform used for delivering a conventional weapon onto a weapons of mass destruction target or at a terrorist group aiming to cause harm to the United States should be dictated by public perceptions. The precision global strike mission need statement categorizes the need to be able to quickly defeat targets considered to be time-critical, high-value, fleeting targets of opportunity. In the event a known or suspected threat is plotting to do harm to the United States and its people, the nation's leaders have a solemn obligation to do whatever it takes to save American lives and protect our vital interest. As such, the use of a longer-range, globally-capable weapon offers the next step in the evolution of warfare. The United States must ensure this progression is well understood and implements all measures necessary to pacify concerned nations, but this must not be allowed to prevent the United States from being prepared.

The first measure the United States must address is the issue of launch visibility. The only nation capable of recognizing, tracking, and determining the trajectory of an ICBM launched from the United States or from a Trident submarine is Russia. In all likely cases, the intended target of a precision global strike missile would not be located in Russia nor would the flight profile continue in a manner consistent with a launch profile directed at Russian territory. However, the United States must be prepared on short notice to notify Russian authorities of an imminent U.S. launch of a precision global strike missile, the location of the intended target, and the launch point of the weapon. One could argue the United States could further mitigate Russian concerns by avoiding the launch of an ICBM from the U.S. mainland. A United States mainland ICBM launch would look more provocative to the Soviets than a submarine-launched missile somewhere in the south Pacific or Atlantic Ocean. This makes the case for a Navy Conventional Trident II Modification version of the precision global strike missile even more appealing.

Likewise, the United States could take measures to alter the location and flight trajectory of a launched precision global strike missile to ensure it does not overfly a particular country or region of concern. A depressed trajectory could be accomplished short of achieving the desired range and azimuth (or angle) to the target. The repositioning of a Conventional Strike Missile is problematic given U.S. treaty concerns discussed later.

but the repositioning of a Trident submarine is an option. With multiple submarines on either coast, the United States could maneuver its submarines to achieve the proper flight profile and minimize potential over-flight issues. The ability of submarines to maneuver undetected, in order to achieve the reaction time and flight profile necessary, makes the Conventional Trident II Modification particularly attractive.

Finally, the United States could take steps to renegotiate agreements with Russia and willing nations on procedures for the advanced notification of a precision global strike launch. Current agreements and procedures for the timely distribution of information and data regarding a missile launch already exist between the United States and Russia on issues of ICBM and SLBM launches.[64] Further agreements could be reached to include weapon inspections and open disclosure of number and types of non-conventional, long-range strike weapons as well as their intended locations of employment and flight profiles. This open and frank dialogue between United States and Russian counterparts would greatly assist in smoothly transitioning the United States to this new weapon system.

START and SORT

The United States has taken extensive measures over the last twenty years to reduce its nuclear stockpile and reduce the threat posed by nuclear weapons. Two such treaties, the Strategic Arms Reduction Treaty (START) and the Strategic Offensive Reduction Treaty (SORT) are of particular interest. START I and START II laid the foundation for United States and Russian disarmament. In March 1997, the United States and Russia agreed to a framework for a START III which laid out the framework for a United States reduction to 2,000 to 2,500 warheads by December 31, 2007. However, negotiations on START III never continued, so the treaty never was agreed upon by either side.

In 2003, the United States and Russia signed the Strategic Offensive Reduction Treaty which laid out the current goal of 1,700 to 2,200 warheads. The Strategic Offensive Reduction Treaty did not specify exact counting rules for the active warheads and launch vehicles, but the current administration considers only those warheads on operationally-active, strategic delivery vehicles.[65] Under the agreements, the additional

deployment of the Conventional Strike Missile using mobile launchers at alternate coastal locations would count toward the total aggregate and not be permitted.[66] However, due to the Strategic Offensive Reduction Treaty's failure to define the term "operationally deployed" missiles and given the U.S. interpretation of the definition, the United States would most likely not count the Conventional Trident II Modification toward its treaty limits.[67]

Regional Stability and Escalation

The use of a Conventional Strike Missile or Conventional Trident II Modification in a theater of operations would require a cooperative approach to ease tensions and prevent an escalation of military activity by regional states. Specific measures to alleviate concerns would include education and open dialogue. However, regional leaders will most likely not know of an attack until after the fact. As a preventive measure, the United States could train and exercise with alliance and coalition partners in the region, including scenario building requiring the use of a precision global strike weapon. Of prime concern for the United States would be its ability to acclimate the civilian and military leadership on the differences and unique circumstances required for a launch. This, in turn, would provide a better foundation to judge the appropriate regional reaction to such an event.

The potential for an arms race or the development of defensive measures to counter the United States use of a precision global strike weapon would likely involve current United States near-peer competitors. However, the financial cost in the development of such a program would be high. The only nations capable of such an escalation would involve China and Russia. Current Chinese development and procurement of such a system is beyond reach at this time. Likewise, the chances of a missile launch against Russia seem remote given its weapons arsenal and retaliatory capability. Even without the introduction of a precision global strike weapon to a region, increasingly the United States will be faced with the further proliferation of missile technology. As such, the United States must take the lead in developing technology which will thwart attempts of rogue states or terrorist factions to achieve first-strike capability.

XI. Recommendations

As directed in Rumsfeld's Nuclear Posture Review, the United States must take steps to implement its new Nuclear Triad.[68] However, the United States currently lacks a credible offensive weapons deterrent capability which can rapidly target and destroy individual, group, and state threats plotting to do harm against us. Without the ability to always forward deploy conventional forces and high-value assets to all regions of the globe, the United States must rely on its diplomatic, informational, and economic elements of national power to deter the possession and spread of weapons of mass destruction.

However, the United States must also have a credible military option short of nuclear war to rapidly target and destroy aggressors in the event the previous deterrence options fail to work. A United States long-range precision global strike weapons capability provides senior decision makers with a credible conventional weapon option. Concerns over the development, deployment, and use of a precision global strike weapon can be mitigated by instituting several measures meant to ensure the smooth transition and fielding of the weapon.

Developmental Actions

The U.S. Congress must fully fund, in the FY 2008 U.S. Defense Budget, the Navy's request for $175 million for the Conventional Trident II Modification program and $32.8 million for the Air Force Common Aero Vehicle program. The Navy Conventional Trident II Modification program has distinct advantages over the Air Force Conventional Strike Missile program. Of the two programs, the Conventional Trident II Modification program is the only near-term precision global strike weapon system with low technology risk and high probability of fielding within two years of funding approval.

The Conventional Trident II Modification fulfills the requirements in the U.S. Nuclear Posture Review, Quadrennial Defense Review, National Security Strategy, National Defense Strategy, and the National Strategy to Combat WMD. The Conventional Trident II Modification utilizes existing Trident II (D5) launch vehicles and a proven Navy nuclear and

conventional command and control architecture. The Conventional Trident II Modification is also more versatile given its capability to alter its launch location and trajectory to avoid over-flight and debris issues. Likewise, the Conventional Trident II Modification avoids many of the nuclear armament restrictions directed in U.S./Russia START I/II and the Strategic Offensive Reduction Treaty. In addition to the Navy Conventional Trident II Modification program, the future Air Force hypersonic glide technology provides promise for a range of defense applications to include its use as a space and weapons delivery platform. The Air Force should continue to invest in hypersonic technology and migrate the technology to its range of delivery platforms. As part of the effort, the Air Force should continue to request developmental funding for its Conventional Ballistic Missile program to develop a potential mid-term follow-on solution to the Conventional Trident II Modification.

Operational Actions

The Navy must begin the development and training of processes and procedures necessary for the dual use of Trident II (D5) missile on Ohio-class submarines. The Navy must continue development of a distinct fire-control computer for use in the targeting and employment of the Conventional Trident II Modification. Confidence-building measures should be developed to ensure the ability of the Navy to ascertain a nuclear launch from a conventional launch. The Navy must also publish its version of the Strategic Command Conventional Trident II Modification concept of operations. The Navy Conventional Trident II Modification concept of operations should include Standard Operating Procedures and Tactics, Techniques, and Procedures for employment of the Conventional Trident II Modification. In conjunction with Strategic Command, the Navy should also develop an exercise training program highlighting the use of the Conventional Trident II Modification during contingency operations. Lessons Learned from the precision global strike exercises should be applied to operational procedures to ensure the Navy is prepared by the initial operating capability date.

The Navy must continue with its operational testing and development of the Conventional Trident II Modification, enhanced effectiveness, and warheads. An aggressive operational testing plan should be implemented

by the Navy to ensure Conventional Trident II Modification, enhanced effectiveness, and rod/unitary warhead milestones are met and initial operating capability date is achieved. Flight test profiles should include the demonstrated capability of the Conventional Trident II Modification to alter (depress) its flight trajectory profile to address over-flight and debris issues.

In addition, operational testing should include the demonstrated capability of the E2 re-entry vehicle to receive global positioning system signaling en route to the target with a required near-precision Circular Error Probable. Warhead selections must include the ability to target soft and hard, deeply buried targets. The proposed combination of rod, blunt nose, and area munitions should be tested against a variety of simulated WMD launch, storage, and underground communications networks.

Also, the Air Force must continue development of its Common Aero Vehicle program and address the technological risks to the program. The Common Aero Vehicle has unique capabilities over the Conventional Trident II Modification E2 re-entry vehicle in terms of maneuverability and additional payload capacity. Assuming current technology issues are overcome, the Common Aero Vehicle re-entry vehicle could provide a mid-term solution for a follow-on precision global strike weapon delivery system in the 2013-2015 timeframe. Hypersonic technology could be used for long-term, space-based alternatives to current precision global strike weapon system alternatives.

Command and Control Actions

The Department of Defense must continue with its investment in the U.S. Strategic Command Global Operations Center-Collaborative Environment program. This provides the venue for policy makers to achieve the decision cycle requirements of the precision global strike construct. U.S. Strategic Command and regional combatant commands should continue to exercise joint operations with the inclusion of likely time-critical, precision global strike scenarios. Multi-Combatant Command issues in regards to supported and supporting commanders should be exercised and trained to on a wide range of scenarios. As part of Global Operations Center-Collaborative Environment, U.S. Strategic Command must seek funding for and develop technology for a secure Voice over

Internet Protocol capability. A Voice over Internet Protocol capability distinct to Global Operations Center-Collaborative Environment will enhance collaborative planning and discussions. In the short term, training should continue to focus on a condensed timeline of less than one hour for planning and decisions making with the ultimate goal of less than 30 minutes from decision to launch. Likewise, senior leaders must be actively involved in the planning and decision-making cycle. During crisis situation, combatant commanders and senior leaders must become comfortable with a net-centric method of receiving and presenting mission analysis data and a Combatant Command course of action. Decisions will need to be in a matter of minutes for emerging targets, not days or weeks. Achieving the desired timelines require leadership awareness of the time-sensitive nature of likely scenarios involving weapons of mass destruction.

Political Actions

The United States must take the lead in establishing an open dialogue with partner nations on the use of the Conventional Trident II Modification. A cooperative approach with other nations on the use of Conventional Trident II Modification will alleviate some fears and misperception about the use of previous nuclear warfare technology for conventional purposes. Likewise, the United States should incorporate partner nations in the planning and execution of simulated precision global strike training exercises. Open disclosure of the concept of operations for the use of Conventional Trident II Modification as well as the associated Standard Operating Procedures and Tactics, Techniques, and Procedures would provide transparency to the precision global strike process and dispel fears the United States is launching a possible nuclear attack.

In addition, the United States must also develop mutual agreements between Russia and the United States on a notification process for the imminent launch of a Conventional Trident II Modification. Based on previous agreements, the United States would provide Russia with launch location, anticipated target, and flight trajectory of the missile. Similarly, in anticipation of China's future capability to track a U.S. launch of a Conventional Trident II Modification, the United States could extend current agreements between China and Russia on launch warning.[69] Such agreements could lay the foundation for mutual security and

understanding of the weapon system. Open transparency over the process would dispel concerns over U.S. intentions and help stabilize regional reactions to a Conventional Trident II Modification launch.

XII. Conclusion

The United States should fully fund the Navy Conventional Trident II Modification program over consideration of the Air Force Conventional Strike Missile program. The Navy Conventional Trident II Modification program provides the only near-term solution for a current gap in the U.S. long-range precision global strike capabilities. The Navy Conventional Trident II Modification program provides the best chance of achieving a capable weapon without incurring significant developmental, operational, command and control, and political risk. Associated concerns regarding the use of the Navy Conventional Trident II Modification can be sufficiently mitigated by various diplomatic and military assurance measures. The United States must act now in order to prepare itself for the full range of likely future contingency operations including defense against the further proliferation of weapons of mass destruction and anti-western ideology and the eventual use of WMD on United States personnel and forces.

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