THE NATIONAL ACADEMIES
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May 11, 2007

The Honorable Daniel K. Inouye, Chairman
The Honorable Ted Stevens, Ranking Member
Subcommittee on Defense
Senate Committee on Appropriations
Dirksen Senate Office Building, SD-119
Washington, DC 20510

Dear Senators Inouye and Stevens:

The conference report accompanying the 2007 Department of Defense (DOD) Appropriations Act (H.R. 5631/Public Law 109-289) requested that the National Academy of Sciences conduct a study to analyze the mission requirement for using existing Trident II (D5) missiles with conventional (i.e., non-nuclear) payloads to provide a prompt global strike capability and, where appropriate, consider and recommend alternatives that meet the prompt global strike mission in the near-, mid-, and long-term. The study requested analyses of the military, political, and international issues associated with each alternative and asked that the committee consider technology options for achieving desired objectives as well as mitigating policy concerns.[1]

Accordingly, the National Research Council (NRC) established the Committee on Conventional Prompt Global Strike Capability in February 2007.[2] The committee's statement of task charges it to produce two reports over a 15-month period: (1) a letter report, following the second full committee meeting, that summarizes the requirements and supporting enablers for a conventional prompt global strike capability and recommends a near-term option or options to provide this capability; and (2) a comprehensive report that addresses the issues as outlined above. This letter constitutes the committee's first report.[3]

The findings and recommendations in this interim letter report are based on the committee's collective knowledge as well as input from other experts, both internal and external to the DOD. The committee has received a number of very helpful briefings as well as information in other forms[4] that it believes constitute a sufficient basis for its initial findings and recommendations. As explained below, however, this initial information received has served to raise important questions concerning which the committee is not yet prepared to offer definitive views.

Accordingly, this first report is very much an interim letter report that neither addresses in its entirety any one element of the statement of task nor reaches final conclusions, but rather touches on aspects of immediate considerations associated with Fiscal Year 2008 (FY 08) funding. The purpose of this interim letter report is to provide advice to Congress that can be used during the FY 08 appropriations and authorization process as the committee continues to investigate the military, technical, political, and international issues associated with the Conventional Trident Modification (CTM) program and potential alternatives for providing a conventional prompt global strike (CPGS) capability. The committee will

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[1] The statement of task is provided in enclosure A.
[2] The committee roster is provided in enclosure B.
[3] Information about the independent review of the committee's report under the supervision of the NRC's Report Review Committee is provided in enclosure C.
[4] A summary of the data-gathering sessions to date is provided in enclosure D.

continue its work during the coming months and expects to finish drafting a final report by early 2008. The final report will address in detail all of the elements in the study's statement of task.

BACKGROUND ON CONVENTIONAL PROMPT GLOBAL STRIKE

As discussed below, there are a variety of circumstances in which it could serve U.S. national objectives to be able to strike targets very rapidly, with high accuracy and high confidence of reaching the target, and with necessary military effect, but without using nuclear weapons. Modern technology, in particular the Global Positioning System (GPS), makes it possible, in principle, to achieve high probabilities of success with a far more limited number of conventional weapons than in the past. In many circumstances, forward-deployed assets—such as tactical aircraft, cruise missiles, long-range bombers, and unmanned aerial vehicles—make it possible to strike targets with very high accuracy and in sufficiently short times (particularly taking into account the other factors that lengthen the timeline between detection of a target and weapon impact—including evaluation of intelligence, decision to attack, confirmation of geolocation, and input into guidance systems—many of which can occur concurrent to readying or prepositioning of a weapon system).

Taking the long view, however, it is clear that the United States cannot always rely on having forward-deployed forces in the right place at the right time. The question then becomes how timely conventional strikes must be in order to be effective. The time between a strike's launch and its impact on the target is, of course, only one of the many factors in the overall time needed. These factors—not all of which can be run in parallel—include intelligence collection, analysis, and dissemination; discussion of options by the appropriate decisionmakers; transmission and receipt of orders; precise geolocation of targets and transfer of this information to the weapons systems; and detailed mission planning and preparation of weapons systems for launch. A comprehensive effort to make speedier response possible should be a part of any effort to achieve CPGS. However, there is no doubt that the time from launch to impact on a target is also a factor, and the DOD has concluded—and the committee concurs—that situations might arise for which achieving promptness in that variable (launch to effective strike accomplished within an hour or so of an execution order) would add meaningfully to the nation's military capabilities. Among currently available delivery systems, only long-range ballistic missiles can reach targets in very remote areas with very high speed and little or no vulnerability to defense—and to date, long-range ballistic missiles have only been equipped with nuclear warheads.

As discussed in the 2006 Quadrennial Defense Review (QDR), the DOD has assessed potential conventional prompt global strike options, including sea- and land-based ballistic missiles and advanced technologies such as hypersonic glide vehicles. The QDR called for deployment, within 2 years, of an "initial capability to deliver precision-guided conventional warheads using long-range Trident Submarine-Launched Ballistic Missiles [SLBMs]."[5] The associated CTM program calls for the conversion of two Trident II (D5) missiles on each of the 12 deployed strategic ballistic missile submarines to non-nuclear warheads for conventional prompt global strike. Each converted Trident missile is expected to carry up to four warheads.[6]

Congress, however, has raised several concerns about CTM, specifically uncertainties as to whether (1) a CTM launch could be misinterpreted as the launch of a nuclear weapon, (2) possession of the capability might lead to unwarranted strikes by the United States, and (3) intelligence support is or would be sufficient to support the effective use of CTM. It has also raised technical questions regarding the characteristics of a conventional ballistic missile warhead and its effects against a range of targets, including ones that are mobile, hardened, or deeply buried. As a result, the FY 07 defense bill funded only a small portion of the President's budget request for CTM and limited use of the funding to efforts that are not unique to CTM as such but also support other options for CPGS.

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[5] Department of Defense. 2006. *2006 Quadrennial Defense Review*, Washington, D.C., February 6.

[6] CAPT Terry Benedict, USN, Technical Director, Navy Strategic Systems Programs, presentation to the committee, March 22, 2007.

KEY FINDINGS

Purpose of and Need for CPGS

The committee was asked to summarize in its letter report the requirements for CPGS. The Secretary of Defense and the Combatant Commander, U.S. Strategic Command (USSTRATCOM), have indicated clearly their belief in the requirement for CPGS (within an hour or so from launch), as soon as the United States can have it. Also, a report on CPGS recently submitted to Congress by the Secretary of Defense and the Secretary of State[7] and reviewed by the committee quite clearly articulates mission types that both Defense and State believe justify CTM as a needed near-term capability. That is, they agree that a valid requirement exists. The committee shares the view that CTM, if demonstrated to be effective, would be a valuable addition to U.S. military capabilities.

Most broadly, the CTM program should be seen as part of an evolutionary process in which the United States would develop long-range non-nuclear weapons with launch-to-impact times that previously were possible only for nuclear weapons. There are numerous potential missions for CPGS, but in the view of the committee, they can be separated into two distinct categories, as outlined below in the first finding.

Finding 1: There appear to be at least two, clearly distinguishable purposes for a CPGS capability:

a) **Very limited (e.g., use of one to four weapons), time-critical strike in a time of crisis or opportunity, such as to counter terrorist or rogue state activities or to attack a terrorist leader; and**
b) **A strike at distant, time-critical targets as the leading edge of major combat operations.**

These two purposes are quite different in their operational requirements and also in how the political environment affects the decision to use specific types of weapon delivery, especially ballistic missiles. Moreover, the supporting enablers for missions associated with these two purposes are quite different and put very different demands on command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) support.

Based on the information presented to the committee thus far, it appears that the supporting enablers for CPGS can be summarized as follows: intelligence support, mission planning, target development, and decisionmaking. Because of the depth and breadth of this topic, as well as the perceived levels of classification associated with it, a comprehensive analysis of the supporting enablers for CPGS, including prior and post intelligence of a strike, is not attempted here but will be addressed in the committee's final report.

For the reasons discussed below, it appears that CTM is most applicable for the very limited time-critical strike. The United States currently has no truly global non-nuclear capability for that purpose, promptness might be essential, and very few weapons are involved.

CPGS for Very Limited Strike in Time of Crisis or Opportunity

The committee was provided several briefings and references that cited either directly or inferentially the *Washington Post* editorial by former Defense Secretaries James Schlesinger and Harold Brown[8] describing a compelling scenario in which the need for CPGS is evident: the United States has learned of a terrorist group's plan to transport a nuclear weapon, and the opportunity to intercept the shipment is both urgent and fleeting. In this scenario, there are no U.S. military forces close to the expected shipping

[7] Secretary of Defense and Secretary of State. 2007. "Report to Congress on Conventional Trident Modification (CTM) (U)," February 1.

[8] Harold Brown and James Schlesinger. 2006. "A Missile Strike Option We Need," *Washington Post*, May 22.

point and one weapon type in the U.S. arsenal can reach the point in time—a nuclear-armed ballistic missile. Clearly, the nation would benefit from having a conventional option in this case. Another scenario involves a rogue state preparing to launch a ballistic missile with a nuclear warhead from a location that current conventional forces could not reach with sufficient speed. And yet another oft-cited and plausible scenario is one in which the United States has learned that a top terrorist leader will be at a certain place at a given time and again the nation has no conventional forces capable of striking that place at the right time.

As Congress has noted, the C4ISR architecture must be capable of supporting a CPGS weapon. In each of the above very limited strike scenarios, it is possible that detailed attack and targeting preparations will have been made—such as georegistration (determining the latitude, longitude, and elevation of the target), planning for minimization of collateral damage, assessment of the vulnerability of the target to the warhead-type, and the triple checking of intelligence. In these cases, it is plausible that it would be important to be able to strike very quickly so that—while decisionmaking and preparations would always take some time—when the triggering event or opportunity arose, execution of the strike would be as rapid as technology could support. Moreover, there might be instances, even with such targets, where pre-planning could be such that flight time would become the critical element in the ability to respond quickly enough.

It is also quite possible—perhaps more probable—that preparations would not have been made ahead of time, in which case the need for rapid georegistration would be as great as the need for rapid weapon delivery. Achieving sufficiently accurate and reliable georegistration within minutes is a daunting challenge. Similarly, rapid decisionmaking (presumably by the President) would require expedited abilities to assess the risk of collateral damage and other risks peculiar to the use of a CPGS weapon. The committee has not yet had adequate opportunity to understand fully the DOD's or the White House's capabilities in this regard.

Given the pace of terrorism's spread and the consequent uncertainty about where terrorist operations will occur, coupled with the proliferation of weapons of mass destruction, a truly global capability may soon be required, if it is not required today.

Inventory requirements for a CPGS weapon would depend on the range of the weapon, the number of warheads needed to accomplish a militarily effective strike, and the concomitant basing plan required to achieve prompt global coverage. The committee suspects that very limited strikes using a CPGS weapon in, say, the first decade after its fielding would likely number at most a few dozen. For example, only a few terrorist leaders would merit use of such a weapon. In any case, the committee concluded that the very limited strike mission would require a smaller weapon inventory, and also calls for an earlier initial operational capability, than would be needed for uses leading into major combat operations (MCO).

The Ambiguity Issue

The possibility that a very limited strike in a time of crisis or opportunity could be mistaken as a nuclear attack, especially with use of a ballistic missile for strike delivery, must be soberly assessed as decisions are made with respect to both fielding a weapon and using it. While ambiguity issues may be mitigated by cooperative measures, any CPGS option, including CTM, should be designed in both hardware and operational terms to minimize the possibility of misinterpreting intent, specifically taking into consideration detection and tracking capabilities anticipated in the world over the next 10 to 15 years. Although the ambiguity problem may not be as significant as some believe, the committee thinks that it merits serious consideration. Indeed, the ambiguity between nuclear and conventional payloads can never be totally resolved, in that any of the means for delivery of a conventional warhead could be used to deliver a nuclear warhead. It remains to be seen whether nuclear-related security or cooperative measures might ease the problem.

Continuing study and analysis of tradeoffs will be necessary during CTM development. As an example of an issue meriting further study, it is possible that a different concept of deployment could improve strike effectiveness and further reduce ambiguities. The committee has not yet had the

opportunity to engage DOD on these issues, to examine the operational tradeoffs in any detail, or to consider fully the opportunities and pitfalls of consultations and negotiations with the Russians and others to eliminate the ambiguity problem, but it plans to do so in the coming months.

The political environment determining what may be at stake can vary for a very limited strike. It is the committee's understanding that the administration has discussed with other nations the ambiguity concerns and is addressing the ambiguity problem in other aspects of its consideration of the CPGS issue. In its further work, the committee will address this issue in detail. Since the immediate issue is what further development work is appropriate in the coming year, the ambiguity issue does not have to be finally resolved at this time.

CPGS for Leading Edge of Major Combat Operations

The leading edge of more substantial operations (i.e., MCO) is the second, distinguishable purpose for a CPGS capability. DOD representatives presented scenarios where the use of CPGS weapons in the first hours of what might become major combat operations to attack distant target sets could be of great operational importance. In some cases, it might be necessary to reach far inland very quickly to cripple an adversary's essential warfighting capabilities before they could be used with potentially decisive effect against U.S. or allied forces. Also, new systems would have an advantage over airbreathing platforms and weapons (e.g., tactical aircraft, cruise missiles, long-range bombers, and unmanned aerial vehicles) for reaching even less-time-urgent distant targets in that they would not be vulnerable to the sophisticated air defenses that might be faced in the future. New systems would also not require the same defense suppression, tanking, and other support, which increases the total force's exposure and vulnerability, limits tactical surprise, and can take days to prepare.

The committee notes, however, that the required inventory for a leading-edge strike would certainly be far larger than for a very limited strike mission. It follows that the committee sees a potential role for CPGS for the former class of operations but is much less convinced that CTM would go far in addressing it.

Further, there is some question as to the basic requirement for a CPGS capability for a leading-edge mission. Almost by definition, many operations requiring this type of capability would have been anticipated with strategic warning and a buildup of regional forces. Moreover, the tense political environment associated with the advent of MCO would increase the risk that a strike might be construed as a nuclear attack, or as a precursor to nuclear attack. This might be especially true for a CPGS weapon delivered by a ballistic missile.

CTM in Relation to a CPGS Capability

The committee has concluded that the CPGS option represented by the CTM is best assessed in terms of a very limited strike rather than as the leading edge of something larger.[9] Many of the scenarios involving CPGS as the leading edge of MCO are likely to require the use of many prompt conventional weapons, not just the one or two missiles' worth of kinetic-energy weapons to be implemented in CTM. Although it is not at all clear that continuous global coverage would be required, a moderately larger strike might not even be possible with only two missiles per submarine launched from normal strategic patrol areas. Even if it were, each submarine that fired a CTM could temporarily expose its location. This is a more significant factor in the context of the outbreak of a major war than in the context of a very limited strike. In the long run, a CPGS capability for a leading-edge attack might be quite important, but the CTM is best suited for the very limited strike.

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[9] This observation applies even more strongly to a third class of scenarios sometimes seen as supporting a CPGS capability—use of conventional weapons to cover some, but far from all, of the targets now allocated to nuclear weapons in nuclear war plans.

Finding 2: Other than forward-based systems, CTM appears to offer the only near-term option for a CPGS capability.

At least for the purpose of a very limited strike, the need for a CPGS capability could well arise before any new system can be made operational. For the next 3 years at least, the United States has no choice but to rely on existing forward-deployed forces for whatever they can provide toward a capability for CPGS. That could be a substantial contribution, because in many cases such forces can provide a quite-rapid response capability. To a considerable degree, it will be possible to identify the regions in which a need for launch is most likely, and the potentially targeted terrorist organizations would pose no air defense threat. A comprehensive policy for a prompt, if not initially literally global, strike capability should ensure that the United States has done all that is reasonable to assure that forces using conventional weapons—notably cruise missiles on aircraft, submarines, or surface ships, and attack aircraft with precision munitions (and, for some scenarios, stealth characteristics)—are appropriately deployed, trained, and supported for urgent, very limited strikes. Moreover, Congress should require that the DOD study carefully where very limited strikes are most likely over that time and how forces could be redeployed to conduct them. Furthermore, analysis and decisionmaking processes should be examined and exercised to ensure that the processes are fully understood and responsive, and that they routinely provide sound decision support reflecting likely outcomes, upside possibilities, and downside risks. If missions requiring a CPGS capability are as important as DOD has argued—and the committee agrees that they are—it is worthwhile to do whatever is necessary to fill the near-term gap as much as is reasonably possible.

In 3 years or so, however, the United States could have a new, and truly global, CPGS capability based on conversion of the Trident II (D5) missile carried aboard nuclear ballistic missile submarines (SSBNs). Some D5 re-entry vehicles (RVs) with nuclear warheads would be replaced with RVs armed with kinetic-energy weapons. These missiles would replace nuclear-armed D5s in two tubes on each SSBN. No alternative option for a CPGS capability can be made operational with comparable capabilities in so short a time. In addition to being the earliest CPGS option that could be deployed, SLBMs offer some unique advantages, chief among them the ability to remain covertly within range of potential targets for extended periods without dependence on foreign bases. The patrol locations can be chosen to allow striking most targets of interest without flying over other countries of concern.

Moreover, the committee was impressed by the deep thought and technical analysis that have gone into the Navy's proposed command and control system for conventional strike with the CTM: it would have the same extreme security and reliability as that of nuclear missiles and would be distinct in a way that would preclude the possibility of an accidental launch of a nuclear-armed Trident in a mixed load. The committee explored the matter of accidental launch and concluded that this problem has been dealt with adequately. The Navy and USSTRATCOM described safeguards that have been designed and, in most cases, integrated into the weapon system and the supporting command and control that would prevent accidental launch of the "wrong" type of missile. The committee has confidence in these measures because they are extensions of measures already used to positively prevent such an event during current operational tests.[10] The committee recognizes that other countries may not share the same high confidence with regard to proposed safeguards for preventing an accidental launch, but it is presumed that CTM would be subject to the same rigorous testing and validation procedures associated with current Trident missiles and that the proposed command and control would be sufficiently demonstrated prior to CTM becoming operational.

On the scale of such matters, the committee regards CTM development risks as low—in large part because the development would be incremental, building on the long and successful systems development history of the Navy's Strategic Systems Programs (SSP). The development and testing would resolve residual issues about terminal navigation in a complex environment; these are nontrivial, but the

[10] Commander's evaluation tests have been conducted periodically since Polaris was initially deployed. In these tests, launches have routinely been conducted under operational conditions from submarines with mixed loads.

committee anticipates success based on the agreement to date between engineering analysis and experimentation. The challenges are much smaller than those for the longer-term systems described below.

Longer-term Options

Finding 3: Longer-term CPGS options offer potentially attractive capabilities but in some cases appear to involve high technical risk.

The committee has not yet had adequate opportunity to compare longer-term options for a CPGS capability, but its initial impression is that the Sea-Launched Global Strike Missile (SLGSM) approach presents less technical risk than the others being proposed. In perhaps 6 years or more, the SLGSM could be developed, as proposed by the Navy SSP. SLGSM is projected to carry, as one option, a large version of the bent nose lifting body already flight-tested once under conditions equivalent to those for attacking targets at ranges in excess of 2000 nautical miles. Based on information presented to the committee, that payload is designed to deliver larger munitions such as an earth penetrator for attacking deeply buried facilities. Development of the RV for the SLGSM would benefit significantly from development of the CTM RV. The committee's own analysis indicates that an SLGSM within the same volume and with a third stage added could deliver to the same range as CTM one of the smaller kinetic-energy warheads initially planned for CTM.

Less matured, longer-term CPGS delivery concepts proposed by the U.S. Army and U.S. Air Force include hypersonic boost-glide vehicles launched from the continental United States (CONUS) or forward-deployed assets and higher-speed cruise missiles launched from bombers. Although these concepts appear to have high technical risk, it has been argued that they have the potential to provide favorable system characteristics such as being less likely to be mistaken for a nuclear-armed ballistic missile, being capable of trajectory flexibility for avoiding sensitive overflights, having significant cross-range divert capability for inflight retargeting, and tailoring the end-game approach angle to a target for improved weapon system effectiveness.

The boost glide and high-speed cruise missile concepts as CPGS options require advanced technologies, especially in the areas of thermal protection and management; guidance, navigation, and control (GN&C); and submunition dispensing mechanisms. For vehicles operating in the oxidative hypersonic environment for flight times approaching an hour, advanced thermal protection and management systems will be required to insulate all internal components to below their maximum allowable temperature constraints. Advanced GN&C systems will be required for vehicles operating on global scales with portions of the trajectory potentially in GPS-denied areas. And an improved understanding of submunition dispensing mechanisms will be needed to develop high confidence in the highly dynamic processes that occur as multiple vehicles interact with each other during a high-speed deployment sequence.

The committee believes it is preferable to consider all proposed CPGS weapons as elements of a portfolio, one that needs balancing in terms of technical risk and time to deployment. The search for a single optimal system is not the best way to proceed given all of the uncertainties in the strategic environment. During the remainder of this study, the committee will complete a more detailed investigation of CPGS options together with a more complete assessment of their technology needs.

KEY RECOMMENDATIONS

At the present time, the committee provides the following key recommendation for the near-term regarding CTM, as well as one aimed at enabling attractive CPGS options for the longer term.

Recommendation 1: In FY 08, fund research, development, testing, and evaluation (RDT&E) efforts associated with CTM at a level sufficient to determine its effectiveness, but in FY 08 withhold funding for full-scale production and deployment (except any that is necessary for testing).

Although the committee has not examined the CTM program budget in detail, it is the committee's understanding that approximately $120 million in FY 08 RDT&E funds[11] would be required to maintain CTM on a near-term schedule. It believes that it is prudent to make the investment in FY 08 RDT&E needed to mature and validate the CTM capability, as well as to protect an initial operating capability (IOC) of 3 years and an option to deploy an effective CPGS capability in 3 to 5 years.

While it is not the optimal solution for the longer term, CTM offers the only viable truly global CPGS capability within the next 6 years, and it can be achieved, with military mission capabilities still to be quantified, at a relatively modest initial and life-cycle cost because of the minimal changes required in most components of the delivery system and its infrastructure. The ability of the Navy's SSP to respond to USSTRATCOM (and DOD more broadly) with this approach is possible in large part because SSP has a long history of evolutionary development of highly successful systems, which has included contractor discretionary funded work in exploring the technologies for such a capability on future SLBMs. CTM RDT&E is also a sound interim course because it provides the opportunity to address issues of military effectiveness and is a key growth path to the SLGSM, discussed above.

If a CPGS capability is desired without forward deployment in the longer term, options (other than the more mature SLGSM) presented to the committee depend on technology advances that in its judgment are more challenging and will take at least 8 years to achieve, assuming that work on those technologies is funded beginning now. Technologies developed in the CTM program should also be applicable to some CONUS-based intercontinental ballistic missile (ICBM) delivery concepts if overflight avoidance maneuvers are not required.

Funding CTM development and end-to-end testing provides the earliest and most viable opportunity to meet the initial CPGS capability. Although there are issues about how—and indeed whether—CTM should be deployed and used that have not yet been adequately addressed, the technical feasibility of CTM has been demonstrated and the design is sound and well thought out. Accordingly, a funding path that keeps the program essentially on schedule for an IOC in 3 years and also supports the SLGSM alternative is a prudent interim step.

The committee does not, however, endorse funding for full-scale CTM production and deployment. There remain policy issues—including dealing with the ambiguity issue and consideration of alternative (albeit less-developed) systems that should be fully addressed before committing to CTM deployment. Moreover, the CTM program itself is not without technical issues that merit careful study. For example, the committee has concerns about the proposed mixed-load deployment configuration and the payload options relative to their ability to address the military needs for the target types of interest. The committee believes that alternative concepts of operation may be needed to more effectively use the capability of the system (e.g., providing larger numbers of deliverable weapons on station) while also minimizing ambiguity concerns. Given that the Trident's primary mission is nuclear deterrence, the committee also has concerns about how the CTM can be deployed most effectively for CPGS missions while avoiding crisis ambiguities.

Another example of a matter that merits continuing study relates to the bent nose payload designed for the SLGSM that has been flight-tested once under intermediate-range conditions. This payload could offer important and necessary capabilities for attacking certain existing and anticipated targets in steep terrain. The committee suggests that this configuration, beefed up for use at longer ranges, should be evaluated as part of any near-term deployed CTM capability as well. Since the tested configuration requires a thicker heat shield to reach the longer range, additional development and testing will be

[11] CAPT Terry Benedict, USN, Technical Director, Navy Strategic Systems Programs, presentation to the committee, March 22, 2007.

required to validate its performance and munitions compatibility. The committee estimates that such development and testing will require an additional year to accomplish, but emphasizes that it should be part of the ongoing CTM development effort. If successfully developed and tested, this technology would also be applicable to a three-stage SLGSM, and possibly some ICBM conventional delivery options.

In the course of CTM RDT&E (but not as a prerequisite), the Navy should investigate further some of the concerns about ambiguity, operational effectiveness, and unintended side effects on current SSBN operations. Until such issues are fully investigated, it is premature to commit to deployment or production of CTM beyond that required to build an appropriate number of full systems and conduct the tests needed to validate the design, develop different warhead capabilities, and preserve a near-term deployment option.

Recommendation 2: In FY 08, fund technology development at a level to fully support the longer-term CPGS options described in this letter report.

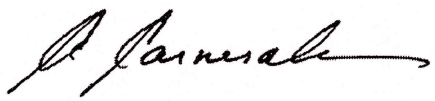
The committee also recommends providing a modest amount of applied research (6.2) funding toward maturing the more challenging hypersonic flight technologies needed for other longer-term CPGS options envisioned by the Air Force and the Army. This investment will permit a far sounder foundation for consideration of longer-term alternatives because it will help identify the scale of the technical challenges involved and the timelines associated with these and other alternatives.

ACKNOWLEDGMENTS

The committee thanks the following DOD officials for their help in providing and coordinating much of the committee's data-gathering during the course of the past few months: CAPT Terry Benedict, USN, Technical Director, Navy Strategic Systems Programs; Mr. James Colasacco, Division Chief, Global Strike Capability, U.S. Strategic Command; Mr. Brian Green, Deputy Assistant Secretary of Defense for Strategic Capabilities, Office of the Deputy Under Secretary of Defense (Policy); and Mr. Greg Hulcher, Director for Special Projects, Office of the Deputy Under Secretary of Defense (Acquisition, Technology, & Logistics). In addition, the committee thanks members of your staff for meeting with the committee in order to highlight some of the congressional motivations behind this study request and issues of particular concern to Congress.

We would be pleased to brief you and your staff regarding the views expressed in this letter. We remain committed to completing our final report in an expedited fashion.

Sincerely,



Albert Carnesale, *Chair*
Committee on Conventional Prompt Global Strike Capability

Enclosures:
A Statement of Task
B Committee on Conventional Prompt Global Strike Capability (as of May 2007)
C Acknowledgment of Reviewers
D Summary of Data-Gathering Sessions

cc:
Sidney Ashworth, Clerk, Subcommittee on Defense, Senate Committee on Appropriations
Charlie Huoy, Clerk, Subcommittee on Defense, Senate Committee on Appropriations

Enclosure A
Statement of Task

The conference report accompanying the FY 2007 Department of Defense Appropriations Act (H.R. 5631/Public Law 109-289) directed the National Academy of Sciences to conduct a study to analyze the mission requirement for using existing Trident II (D5) missiles with conventional payloads to provide a prompt global strike capability and, where appropriate, consider and recommend alternatives that meet the prompt global strike mission in the near term (1-2 years), mid-term (3-5 years), and the long term. The study should include analyses of the military, political, and international issues associated with each alternative. The study should consider technology options for achieving desired objectives as well as mitigating policy concerns.

This 15-month study will produce two reports: (1) a letter report following the second full committee meeting that summarizes the requirements and supporting enablers for a conventional prompt global strike capability and recommends a near-term option or options to provide this capability; and (2) a comprehensive report that addresses the full terms of reference as outlined above.

Enclosure B
Committee on Conventional Prompt Global Strike Capability (as of May 2007)

Members
Albert Carnesale, University of California, Los Angeles, *Chair*
Paul Bracken, Yale University
Paul K. Davis, The RAND Corporation
Steve Fetter, University of Maryland, College Park
John S. Foster, Jr., Rancho Palos Verdes, California
Eugene Fox, USA (Ret.), McLean, Virginia
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Eugene Habiger, USAF (Ret.), University of Georgia
David V. Kalbaugh, Centreville, Maryland
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David M. Van Wie, Johns Hopkins University, Applied Physics Laboratory
Robert H. Wertheim, USN (Ret.), San Diego, California
Ellen D. Williams, University of Maryland, College Park
R. James Woolsey, Jr., Booz Allen Hamilton

Staff
Charles Draper, Director, Naval Studies Board, *Study Director*
Ian Cameron, Associate Program Officer, Naval Studies Board

Enclosure C
Acknowledgment of Reviewers

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report:

John F. Ahearne, Sigma Xi,
Edward G. Anderson III, USA (Ret.), Booz Allen Hamilton,
Owen R. Cote, Jr., Massachusetts Institute of Technology,
Lawrence J. Delaney, The Titan Corporation,
Sidney D. Drell, Stanford University,
Richard W. Mies, USN (Ret.), Hicks & Associates, Inc., and
Larry D. Welch, USAF (Ret.), Institute for Defense Analyses.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by Stephen Berry of the University of Chicago. Appointed by the National Research Council, he was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Enclosure D
Summary of Data-Gathering Sessions

The Committee on Conventional Prompt Global Strike Capability first convened in February 2007 and held two full committee meetings and two subcommittee meetings prior to issuing this letter report. In addition to deliberating on and preparing its letter report, the committee also participated in the data-gathering sessions at these meetings, which are summarized below.

- *February 22-23, 2007, in Washington, D.C.* First full committee meeting: Briefings on policy, requirements, supporting enablers, and technology plans for conventional prompt global strike from the Office of the Under Secretary of Defense for Policy; U.S. Strategic Command; Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics; U.S. Navy Strategic Systems Programs; U.S. Air Force Space Command; and Defense Intelligence Agency.
- *March 15, 2007, in Washington, D.C.* First subcommittee meeting (a makeup of the first full committee meeting for members not in attendance): Briefings on policy, requirements, supporting enablers, and technology plans for conventional prompt global strike from the Office of the Under Secretary of Defense for Policy; U.S. Strategic Command; Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics; U.S. Navy Strategic Systems Programs; and U.S. Air Force Space Command.
- *March 16, 2007, in Washington, D.C.* Second subcommittee meeting. Briefings on intelligence capabilities for conventional prompt global strike from the Office of the Under Secretary of Defense for Policy and U.S. Strategic Command.
- *March 22-23, 2007, in Washington, D.C.* Second full committee meeting: Briefings on short-, mid-, and long-term options for conventional prompt global strike, as well as policy and technical concerns associated with each, from congressional staff, U.S. Senate Defense Appropriations Subcommittee; Congressional Research Service; U.S. Strategic Command; U.S. Air Force Space Command; U.S. Navy Strategic Systems Programs; Office of the Under Secretary of Defense for Policy; and U.S. Army Space and Missile Defense Technical Center. In addition, Dr. Pavel Podvig, Center for International Security and Cooperation, Stanford University; Dr. Theodore Postol, Security Studies Program, Massachusetts Institute of Technology; and Dr. Jeffrey Lewis, New America Foundation, provided in a data-gathering session open to the public their views on international security, arms control, and technical issues related to conventional prompt global strike.