STATEMENT OF

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before the
Committee on Armed Services
Subcommittee on Research and Development
United States Senate
April 2, 1980

Mr. Chairman, it is a pleasure to appear before the Subcommittee to summarize the results of the Congressional Budget Office study, "The U.S. Sea-Based Strategic Force: Costs of the Trident Submarine and Missile Programs and Alternatives." The study was prepared at the Subcommittee's request, and published in February of this year.

At present, 41 nuclear-powered ballistic missile submarines (SSBNs) make up the sea-based portion of the U.S. strategic nuclear "triad." These ships--10 Polaris-class and 31 Poseidon-class--are aging, and the Navy intends to replace them within the next 10 to 15 years.

The Congress has already taken action to begin replacing this fleet by authorizing procurement of eight Trident submarines. More than twice the size of Polaris or Poseidon ships, each Trident SSBN has 24 launch tubes, eight more than either of the older SSBNs. The Trident's tubes are designed to carry a new, large submarine-launched ballistic missile (SLBM)--the Trident II--which has not yet been developed. For the interim, the Congress has authorized procurement of 312 of the existing Trident I missiles, which will be deployed both on new Trident SSBNs and on some of the Poseidon submarines now in operation. The Trident I missile carries a larger nuclear payload to a greater range than either the Polaris or the Poseidon missile.

Significant cost increases and major delays in the Trident shipbuilding program have prompted both the Congress and the Navy to look into the possibility of constructing smaller, cheaper submarines than the Trident. Doubts have also arisen about the need to develop the Trident II missile, in part because of its high near-term costs. The Trident II SLBM, however, would take full advantage of the Trident ship's large launch tubes, carrying a greater nuclear payload than the Trident I missile and probably incorporating greater accuracy.

Thus, in authorizing ships and missiles to succeed the Polaris/Poseidon fleet, the Congress faces two major decisions:

- Should development of the Trident II missile proceed?

- Should the Congress authorize design and procurement of a smaller, less expensive submarine rather than continue to authorize procurement of Trident ships?

These two questions relate closely to one another. A decision to develop the Trident II missile would logically preclude selection of any submarine alternative too small to carry a missile that size, and construction of smaller submarines could likewise preclude future development of the Trident II missile.

MAJOR FINDINGS OF THE CBO STUDY

Answers to the questions stated above will depend in part on what level of sea-based nuclear retaliatory capability is desired. For purposes of analysis, this study considered three possible levels of capability: 2,000, 3,000, and 4,000 MK-4 warhead equivalents maintained at sea. (The MK-4 warhead was chosen as a common measure because it could be carried on either Trident I or Trident II missiles; its exact explosive power is classified.) The level of capability at sea in today's SSBN force is roughly equivalent to 2,000 MK-4 warheads.

Should the Trident II Missile Be Deployed?

If a need to increase significantly the United States' sea-based retaliatory capability were determined, deploying the Trident II missile could result in lowest total program costs. At double today's capability level (that is, to keep 4,000 warheads at sea), a submarine force armed with Trident II missiles might be roughly 6 to 7 percent less expensive than a Trident I-equipped fleet, a savings of $4 billion to $5 billion over the next 30 years. This conclusion rests on an assumption that U.S. SSBNs at sea are now and would remain invulnerable to Soviet attack. Even against a possible future Soviet antisubmarine (ASW) threat, deployment of the Trident II missile would in most cases represent a cheaper hedge than a Trident I-equipped force at this high capability level.

A. need to increase the U.S. sea-based deterrent could occur if the MX missile system were to be delayed or cancelled. In such a case, the Trident II SLEM system would offer advantages other than cost. If design objectives for greater accuracy are met, deployment of the Trident II missile would greatly increase the ability of the SSBN force to destroy targets "hardened" against nuclear blast, such as missile silos and command bunkers, though the ability would still be less than that of an MX missile system. Deployment of the Trident II missile would also maximize retaliatory capability for a given number of missile launchers in the

SSBN fleet. This could be especially important if expanding the sea-based deterrent, coupled with possible future SALT limitations, dictated holding down numbers of launchers.

On cost grounds, deploying the Trident II missile would appear relatively less appropriate if the United States is not going to expand its current level of sea-based retaliatory capability. At today's level (2,000 warheads), a Trident II-equipped fleet could cost 6 percent more in total program costs (or $2 billion over 30 years) than an SSBN force armed with Trident I missiles. In most cases at the 2,000-warhead level, the Trident I force would also be a cheaper way to insure against a possible Soviet ASW threat than would a Trident II-equipped force.

In addition, near-term budgetary constraints might militate against developing the Trident II missile over the next few years. Its development could cost some $8 billion over a period of eight to ten years.

Should a Smaller SSBN Be Designed If the Trident II Missile Is Deployed?

Whether to build a new, small submarine depends largely on the status of the Trident II SLBM. If the missile is deployed, a small submarine would yield little if any savings in total program costs. Development of a smaller SSBN that could still carry the Trident II missile might lower total costs by less than 2 percent (less than $1 billion over 30 years) at twice today's capability level. No smaller SSBNs would even be deployed at today's level of capability, since only nine Trident ships (one more than the eight already authorized) armed with Trident II missiles are required to maintain 2,000 warheads at sea.

These conclusions rest on an assumption that all SSBNs at sea could survive an attack. If, in anticipation of future ASW threats, extra submarines were procured, construction of a smaller ship that could carry Trident II missiles would reduce total program costs at most by 5 percent at the 4,000-warhead level.

Because the potential cost savings appear small, continuing to authorize current Trident SSBNs might seem prudent if the Trident II missile is deployed. Doing so would avoid the risks of cost escalation and delay that could affect a new development program. It would also help alleviate the need for the multiple training programs and logistics systems required to maintain several submarine types in one fleet.

Should a Smaller SSBN Be Designed If Trident II Missile Development Is Cancelled?

If the Trident II SLBM is not to be deployed, construction of small submarines able to carry only Trident I missiles might appear desirable, particularly at capability levels higher than the present one. To be practical from a cost standpoint, such ships would need more than the 16 launch tubes built into today's SSBNs. At the present capability level, a force of such newly designed SSBNs--smaller than the Trident SSBN and able to carry 24 Trident I SLBMs--might save about 3 percent ($1 billion) of total program costs. If capability at sea were increased to 3,000 warheads, this force could prove about 9 percent ($5 billion) cheaper than a Trident submarine fleet, however, and about 13 percent ($10 billion) less expensive at double today's level. In addition, were the United States to procure extra SSBNs in anticipation of a future Soviet ASW threat, a new submarine type would appear the least costly alternative at any of the three capability levels examined if the Trident II SLBM is not deployed.

Introducing a new submarine type into the fleet, however, would involve additional training and logistics support. Also, cost escalation could consume some of the savings from a new submarine, particularly should the average procurement cost for a new SSBN type prove 25 percent greater than originally estimated, as happened in the mid-1970s to the Trident SSBN program. These potential problems might argue for continued procurement of the current Trident SSBN, especially at today's capability level, from which potential savings appear smallest.

Continued procurement of the Trident SSBN would also serve as a hedge against future requirements. A decision to construct a smaller ship capable of carrying only the Trident I missile might effectively preclude deployment of a larger SLBM at any time over the next three decades, the probable lifetime of a new, small SSBN. Although a large missile could be deployed on all Trident submarines built, developing a missile that could not be carried by a large fraction of the fleet might be impractical. Continuing authorization of Trident ships, on the other hand, would keep open the option of deploying a large Trident II missile at a later date, though doing so would lead to higher force costs if the Trident II missile were never deployed.

THE FORCE ALTERNATIVES CONSIDERED BY THE CBO STUDY

The above findings were reached by examining five options consisting of submarines and missiles that might succeed today's force. (The submarines and missiles are described in detail in Appendix A.) Two options would deploy the Trident II missile:

- Option I. Current Trident SSBNs, each armed with 24 Trident II missiles.

- Option II. New "Necked-down" Trident-class SSBNs, each armed with 24 Trident II missiles. (Now under study, this SSBN alternative would probably be proposed by the Administration if a decision is made to halt authorization of Trident submarines.)

Force alternatives armed with Trident I missiles include:

- Option III. Current Trident SSBNs, each armed with 24 Trident I missiles.

- Option IV. New "Long" Poseidon-class SSBNs, each armed with 24 Trident I missiles. (Their harrow diameter would prohibit deployment of the Trident II missile.)

- Option V. New Poseidon-class SSBNs, each carrying 16 Trident I missiles. (These ships would also be unable to carry Trident II missiles.)

The study was based on an assumption that any force containing a new SSBN type would also contain ten Trident submarines. Since procurement of a newly designed submarine would probably not be authorized before 1984, it is assumed that at least two additional Trident submarines would be authorized in the interim.

COST RANKING OF FORCE ALTERNATIVES

The total cost of a force includes not only near-term development and procurement expenditures but also operation and maintenance costs over the submarines' lifetime. To take account of all these factors, total program cost was defined in this study as all spending required to develop, procure, and operate an SSBN force from fiscal year 1981 through fiscal year 2011 (when the first Trident SSBN would reach the end of its anticipated lifetime). Costs to operate Poseidon submarines until their phased retirement from the fleet were also included.

To ensure that costs apply to comparable force options, each force was required to maintain a constant number of warheads at sea on a day-to-day basis over a period of 25 years. As mentioned above, three capability levels were considered. The lowest level--2,000 warheads at sea--roughly approximates the retaliatory capability in today's force. Escalation to higher levels might be of interest if the United States chose to rely more heavily on its sea-based deterrent force.

While the five force alternatives could maintain similar numbers of warheads at sea, they would not be comparable in all respects. They would vary, for example, in their ability to destroy certain targets. Options involving the Trident II missile could have a significantly greater likelihood of destroying hard targets than would forces carrying the Trident I missile. This increased capability would stem from both expected improvements in accuracy and the ability to carry warheads with a higher explosive yield. This greater capability, although not included in the measure, remains an important criterion in choosing among the force options.

Costs Assuming No Vulnerability

The table below shows the approximate costs of the force alternatives at each level of retaliatory capability examined. (The figures are calculated on the assumption that all U.S. SSBNs at sea will remain invulnerable to detection and destruction.) Uncertainty about procurement and operating costs and other cost factors suggests that small differences in estimated costs should not be regarded as significant.

The costs shown in the table lead to the major conclusions reported above. The table also indicates that a force of new ships built with only 16 missile tubes--Option V--would clearly represent the most expensive option, costing from 12 to 31 percent more than the cheapest force alternative, depending on the level of capability desired.

The table also shows that, assuming the Trident II missile is deployed, a decision to procure the new, "Necked-down" Trident-class SSBN implies a decision to expand U.S. retaliatory capability at sea. This is so because, at the 2,000-warhead level, no "Necked-down" Trident-class submarines need be procured; if all submarines at sea survived an attack, only nine Trident SSBNs (one more than the eight already authorized) armed with Trident II SLBMs would be needed to provide 2,000 surviving warheads.

SUMMARY TABLE. COSTS OF BALLISTIC MISSILE SUBMARINE FORCE ALTERNATIVES AT THREE LEVELS OF RETALIATORY CAPABILITY: IN BILLIONS OF FISCAL YEAR 1980 DOLLARS a/

Force Options	Force Levels Expressed in Numbers of Warheads Maintained at Sea		
	2,000	3,000	4,000
Option I: Trident SSBNs Carrying 24 Trident II Missiles	36	53	66
Option II: New "Necked-Down" Trident-Class SSBNs Carrying 24 Trident II Missiles	b/	53	65
Option III: Trident SSBNs Carrying 24 Trident I Missiles	35	58	80
Option IV: New "Long" Poseidon-Class SSBNs Carrying 24 Trident I Missiles	34	53	70
Option V: New Poseidon-Class SSBNs Carrying 16 Trident I Missiles	38	63	85

SOURCE: Congressional Budget Office.

a/ All costs are expressed in fiscal year 1980 dollars.

b/ No "Necked-down" Trident-class SSBNs would be procured at the 2,000-warhead level.

Future SSBN Vulnerability and the Effects on Cost Ranking of Force Alternatives

Although U.S. SSBNs at sea are currently considered invulnerable to attack, it is uncertain whether they will remain so for the next 20 to 30 years. The nature of a future Soviet ASW threat is unknown, and different types of threat--either "area search" or "trailing"--could lead to different choices among the force alternatives. The Soviets might, for example, become able to search large ocean areas and attack U.S. SSBNs as they are detected. In theory, if SSBNs are randomly distributed over all potential operating areas, the fraction of the force destroyed would be in proportion to the fraction of operating area searched. Thus, distributing a fixed amount of retaliatory capability among more ships should have no effect against an area-search threat. And accordingly, fewer ships armed with greater-capacity missiles (Trident Us) would be at no disadvantage.

On the other hand, the Soviets might develop the ability to trail U.S. submarines as they leave port and destroy them at will. Given a fixed inventory of Soviet ASW assets, this implies that a specific number of U.S. SSBNs might be in jeopardy. If two forces carried the same number of warheads, the one with the greater number of ships might ensure the survival of more retaliatory capability when faced with a trailing threat.

If one assumes that U.S. SSBNs at sea will become vulnerable in future, the United States could deploy additional ships to ensure that the desired amount of nuclear retaliatory capability would survive an attack. The study therefore recalculated the total program costs for the force options under this assumption and examined how changes in both type and severity of the ASW threat would affect the cost rankings of the options.

In general, the analysis tended to confirm the conclusions stated above. At the 4,000-warhead level, a Trident II-equipped force would seem the cheapest hedge against an unknown Soviet threat. Only if one thought that a trailing threat jeopardizing more than seven U.S. submarines were likely to arise might a Trident I-equipped force appear less expensive. At the 2,000-warhead level, a "Long" Poseidon-class force might appear the least costly hedge against an unknown ASW threat. Only if an area-search threat able to locate and destroy more than 25 percent of the force seemed likely might a Trident Il-equipped force become less costly.

APPENDIX A. SUBMARINE AND MISSILE COMPONENTS OF ALTERNATIVE FORCES

The analysis in the CBO study discussed four types of submarines and two types of missiles; the possible force components are described here.

Trident SSBN: A submarine already in production, the Trident SSBN measures 560 feet in length, has a diameter of 42 feet, and displaces 18,700 tons when submerged. It can carry 24 Trident I or II missiles.

New "Necked-Down" Trident-Class SSBN: A proposed modification of the Trident submarine, this ship's principal difference is a hull narrowing to 33 feet aft of the missile compartment, lessening the submerged displacement to 15,000 tons. This ship could carry 24 Trident II missiles.

New "Long" Poseidon-Class SSBN: A hypothetical modification of the Poseidon submarine in operation today, this ship might measure nearly 500 feet in length, have a 33-foot diameter, and a displacement of roughly 10,000 tons when submerged. It could carry 24 Trident I missiles.

New Poseidon-Class SSBN: A hypothetical modernization of the Poseidon submarine designed to allow for some new equipment, this ship might measure about 450 feet in length, have a 33-foot diameter, and a submerged displacement close to 9,000 tons. It could carry 16 Trident I missiles.

Trident I SLBM: A missile now in production, the Trident I is roughly 34 feet long and could be carried by the Trident SSBN, the new "Long" Poseidon-class SSBN, or the new Poseidon-class SSBN. It can deliver a reported payload of eight MK-4 warheads to a range of 4,000 nautical miles.

Trident II SLBM: A planned missile not yet developed, the Trident II might be 44 feet long and could therefore be carried only by the Trident SSBN or a new, "Necked-down" Trident-class SSBN. It might be able to deliver a payload of up to 14 MK-4 warheads and could be designed to achieve greater accuracy than the Trident I SLBM. It could also deliver a reported payload of seven MK-12A warheads, each with greater explosive power than the MK-4.