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BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Countervailing Strategy Demands Revision Of Strategic Force Acquisition Plans

To meet the requirements of deterrence in the 1980s, U.S. strategic nuclear forces will need capabilities not envisioned in the design of existing weapon and support systems. These requirements result from the threat posed by large numbers of effective Soviet nuclear forces and air defenses and from the deterrent strategy the United States adopted to neutralize the implications of that threat.



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This "countervailing strategy" includes the capability to survive a major Soviet nuclear attack, the capability to ensure destruction of the Soviet Union, and maintenance of a clearly evident capability to effectively engage in nuclear conflicts of a more limited nature.

If projected increases in DOD spending are to effectively meet strategic needs, changes are needed to ensure that programs conceived under previous approaches to strategic deterrence can meet new requirements. The Secretary of Defense should develop an acquisition strategy that clearly delineates the programs needed to meet the requirements of countervailing strategy and shows the time frames when these capabilities can be available. This acquisition plan should be submitted to the Congress as part of DOD's next budget presentation.



MASAD-81-35
AUGUST 5, 1981

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

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To the President of the Senate and the
Speaker of the House of Representatives

This report presents our views on the major issues concerning the effect of recent changes in U.S. deterrence strategy on the performance requirements of strategic nuclear weapons and strategic command, control, and communications systems. A version of this report containing specific classified information (C-MASAD-81-16) is also being issued.

This report is intended to assist the Congress by (1) describing the major performance characteristics needed by U.S. strategic forces, (2) evaluating the ability of existing and planned forces to provide these characteristics, and (3) highlighting the need for a balanced acquisition program to meet the requirements of our current deterrence strategy.

We are sending copies of this report to the Director, Office of Management and Budget; the Secretary of Defense; and each Member of the Congress.

A handwritten signature in cursive script that reads "Milton J. Fowler".

Acting Comptroller General
of the United States

D I G E S T

Maintaining deterrence in the 1980s by adopting a "countervailing strategy" will require improved capabilities in U.S. strategic forces. The concept of countervailing strategy, which first appeared in DOD's annual report in January 1979, requires that the United States not only maintain the capacity for assured destruction of the Soviet Union, but also plan for flexible, controlled use of strategic weapons against all appropriate targets for any level of conflict.

GAO believes that resources now in existence, and those planned, will not provide all the capabilities needed to fully carry out the strategy. While weapon systems need to be improved, improvements to the command, control, and communications network must be given a high priority if the United States is to implement countervailing strategy. (See pp. 26 and 44.)

The large, sustained Soviet program to enhance its strategic nuclear capabilities has, by many measures, succeeded in altering the strategic nuclear balance. Soviet forces have significant advantages that are not offset by U.S. forces. (See pp. 7 to 10.)

Because the altered nuclear balance could provide an opportunity or incentive for the Soviets to exploit their advantages in conventional and nuclear forces, the United States gradually shifted its deterrence strategy through the 1970s. In the late 1970s, a doctrine called countervailing strategy was introduced. That doctrine and the changes in strategy made through the 1970s were codified in Presidential Directive-59 in July 1980. (See pp. 10 to 12.)

GAO undertook this review to determine if existing and planned U.S. forces would be able to carry out the countervailing strategy doctrine.

DETERRENCE IN THE 1980s
WILL REQUIRE IMPROVED
CAPABILITIES IN U.S. FORCES

Although countervailing strategy appeared in the fiscal years 1980 and 1981 DOD annual reports, and Presidential Directive-59 was signed in July 1980, GAO found various interpretations within DOD of the objectives of countervailing strategy, and no agreement on the weapon systems performance characteristics or the command, control, and communications capabilities needed to carry out the strategy. (See p. 13.)

To meet the requirements of deterrence in the 1980s, U.S. strategic nuclear forces will require characteristics that were not envisioned in the design of existing weapon and support systems. These requirements result from the threat posed by large numbers of more effective Soviet nuclear forces and air defenses and from the deterrent strategy the United States adopted to neutralize the implications of that threat. (See p. 19.)

To effectively carry out the countervailing strategy, U. S. forces must not only be able to ensure the destruction of the Soviet Union following a major Soviet nuclear attack but must also have a clearly evident capability to effectively engage in nuclear conflicts of a more limited nature. (See p. 19.)

GAO believes the growing threat, changing strategy for deterrence, and revised policies for employment of strategic nuclear weapons across the entire spectrum of conflict require new perspectives for evaluating the contributions of the individual weapon systems and their relationship to other strategic weapon systems. GAO, therefore, identified weapon system performance characteristics needed to meet the requirements of countervailing strategy. To meet these objectives, U.S. forces must have appropriate combinations of characteristics, including

--survivable, endurable, and flexible command, control, and communications systems that permit effective control over the forces continuously throughout a conflict;

--weapon systems which can survive Soviet attacks;

- endurance or continued readiness over a protracted period;
- assured penetration of warheads to targets;
- precision strike capability, including a capability to destroy hardened and other targets and limit unwanted collateral damage while efficiently achieving the targeting objective; and
- timeliness or the capability to be launched and arrive on target in a short time frame, including a capability to be retargeted quickly. (See pp. 19 and 20.)

Not all weapon systems need to exhibit every characteristic.

COMMAND, CONTROL, AND
COMMUNICATIONS NETWORK
MUST BE IMPROVED

Even though the countervailing strategy has been evolving since the early 1970s, GAO believes existing command, control, and communications systems lack the proper combinations of characteristics needed to fully implement it.

If effective deterrence in the 1980s requires an ability to fight a limited, protracted nuclear war, then improvements of the existing strategic command, control, and communications network must be assigned a high priority. If the United States is to maintain deterrence until new weapons are deployed in significant numbers, the current network must be rapidly improved. (See p. 26.)

WEAPON SYSTEMS MUST BE
IMPROVED TO FULLY CARRY
OUT COUNTERVAILING STRATEGY

The current Triad forces were not designed to carry out the employment strategy that has evolved through the 1970s. Certain required characteristics are available in elements of the current Triad, but existing weapon systems do not have the proper combination of characteristics GAO believes is needed to ensure that an effective response can be carried out against the full range of targets under all the circumstances inherent in countervailing strategy. (See p. 27.)

For example, in terms of the required performance characteristics as defined by GAO and combinations of those characteristics, GAO believes

- none of the Triad components combine both timeliness and strong hard target capability;
- the most effective hard target kill capability is in the bomber force, but it would not be timely in many instances and the capability of existing aircraft to penetrate unsuppressed Soviet defenses is expected to decline;
- only the bomber force has the ability to destroy soft point targets while limiting unwanted collateral damage; and
- the only weapon systems exhibiting both strong survivability and endurance are in the sea-based force, but they have no precision strike capability and there are limits on their communication capabilities. (See p. 46.)

A BALANCED ACQUISITION
STRATEGY IS NEEDED

Maintaining deterrence in the 1980s through countervailing strategy will require improved capabilities in U.S. forces. Some programs approved through fiscal year 1980 for strategic force modernization will provide some of the characteristics GAO believes are needed, but others will remain unfulfilled. The following are the probable effects of current modernization programs. (See p. 45.)

- The MX missile could significantly enhance the capability of the intercontinental ballistic missile force in terms of hard target kill capability and endurance, but GAO believes the large number and size of warheads per missile make it inappropriate for an efficient response against soft point targets where limiting collateral damage is important. (See p. 32.)
- The survivability of the U.S. intercontinental ballistic missile force could be improved by deploying MX in a mode that ensures that adequate numbers of missiles will be available under any circumstances. (See p. 29.)
- The Trident submarine--while modernizing the sea-based force in the 1980s, hedging against

future Soviet threat development, and providing a larger capacity for missiles in terms of numbers and size--will not change the basic characteristics of the sea-based force or improve on its weaknesses. (See p. 35.)

--The C-4 missile maintains the high survivability of the sea-based force through its long range, but it does not provide a precision strike capability. (See p. 35.)

--The D-5 missile, if developed, could by the late 1980s begin providing the sea-based force an improved ability to destroy hardened targets. (See p. 36.)

--The air-launched cruise missile is intended to improve the penetration capability of the bomber force, but it does not improve its endurance or timeliness. (See p. 39.)

--The proposed multirole bomber, depending on its design and equipment, has the potential for improving the endurance and penetration capability of the bomber force. (See p. 39.)

--The programs that have been proposed for each component of the Triad would provide a capability against even the hardest targets. While several programs have been proposed to provide increased accuracy, there is limited emphasis on developing a capability to destroy soft targets with limited collateral damage. (See p. 44.)

While each component of the Triad provides certain needed performance characteristics, each has inherent limitations. Certain characteristics may be difficult or impossible to place in all or even some elements of the Triad. Future programs, therefore, must be designed to take full advantage of the strengths of the individual Triad elements to ensure that each element contributes as much as possible to the United States overall deterrent posture.

CONCLUSIONS AND RECOMMENDATIONS

Recommendation to the Secretary of Defense

The Secretary of Defense should develop an acquisition strategy that clearly delineates the

programs needed to meet the requirements of countervailing strategy and shows the time frames when these capabilities can be available. This strategy should be outlined in a plan and submitted to the Congress as part of DOD's next annual budget presentation. As a minimum, the plan should

- clearly establish the objectives of countervailing strategy; define the critical characteristics of command, control, and communications systems, and weapon systems; and establish performance requirements for those characteristics;
- identify the combinations of force characteristics needed to carry out current strategy and the time frame in which they are needed;
- identify specific acquisition programs to provide the needed combinations of characteristics and define the requirements for putting them in more than one component of the Triad; and
- provide an acquisition schedule showing when the needed characteristics can be available. (See pp. 50 and 51.)

The growing Soviet nuclear capability and a change in U.S. deterrent strategy and nuclear weapons employment plans have produced new performance requirements for U.S. strategic forces.

U.S. strategic acquisition programs need to be reassessed to ensure they produce, at the earliest time, the weapons needed to carry out the new strategy. This reassessment must be based on a clear and common understanding within the Department of Defense (DOD) and between DOD and the Congress concerning the objectives and intent of countervailing strategy and the characteristics of forces needed to implement it.

Recommendations to the Congress

As an aid to making informed judgments as to the extent to which DOD proposals for modification and acquisition of strategic offensive weapon systems meet the goals of countervailing strategy, GAO recommends that the Congress require the Secretary of Defense to prepare the plan cited above. GAO also recommends that the

Congress give special attention to the priorities and funding for command, control, and communications programs because of their vital role in carrying out countervailing strategy. (See p. 52.)

DOD COMMENTS AND
GAO EVALUATIONS

DOD concurred with GAO's findings and recommendations concerning the strategic command, control, and communications network. Regarding GAO's stated need for an acquisition strategy that meets the needs of a countervailing strategy, DOD stated that while there has been and continues to be an effort within DOD to develop such a strategy, DOD would prefer not to be committed to providing a specific plan with its next annual budget presentation.

GAO recognizes that the demands of countervailing strategy will not remain static and will require flexibility in DOD acquisition policy. However, DOD's unwillingness to prepare a specific long-term acquisition strategy to accompany its next budget request does not respond to either GAO's recommendations or the needs of the Congress. A comprehensive outline of a basic acquisition strategy that clearly delineates and explains the objectives and requirements of countervailing strategy need not be so restrictive that it prevents needed changes in the future. It must, however, ensure that the Congress, DOD policymakers, and DOD programers have a common understanding of future needs and a common basis for future program decisions. (See pp. 53 and 54 for the full text of DOD's comments.)

If projected increases in DOD spending are to effectively meet strategic needs, changes are needed to ensure that programs conceived under previous approaches to strategic deterrence can meet the requirements established by countervailing strategy. Clearly, there is a need for a reassessment of DOD's acquisition priorities concerning ongoing programs.



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ABBREVIATIONS

ABM	antiballistic missile
ALCM	air-launched cruise missile

ABBREVIATIONS

ALCS	Airborne Launch Control System
C3	command, control, and communications
DOD	Department of Defense
EAM	emergency action message
ECM	electronic countermeasures
EMP	electromagnetic pulse
ERCS	Emergency Rocket Communication System
GAO	General Accounting Office
ICBM	intercontinental ballistic missile
MESP	Minuteman Extended Survivable Power
MIRV	multiple independent reentry vehicle
NCA	National Command Authorities
NSC	National Security Council
PD-59	Presidential Directive-59
SAC	Strategic Air Command
SLBM	submarine-launched ballistic missile

GLOSSARY 1/

Airborne alert	Maintaining combat-equipped aircraft aloft on a continuing basis during time of tension.
Airborne warning and control system	An aircraft-mounted radar system designed to detect and track attacking enemy bombers and cruise missiles and direct defensive actions.
Assured destruction	A highly reliable ability to inflict unacceptable damage on any aggressor or combination of aggressors at any time during the course of a nuclear exchange, even after absorbing a surprise first strike.
Collateral casualties and damage	Physical harm done to persons or property collocated with or adjacent to targets; collateral effects may be welcome or unwanted, depending on the circumstances.
Command and control	An arrangement of facilities, equipment, personnel, and procedures used to acquire, process, and disseminate data needed by decisionmakers to plan, direct, and control operations.
Depressed trajectory	The flight path of a ballistic missile fired at an angle to the ground significantly lower than standard launches. Such shots have short flight times and are invisible to line-of-sight radars longer than attacks along conventional area.
Deterrence	Steps taken to prevent opponents from initiating aggressive actions and to inhibit escalation if such actions occur; promises of punishment or reward may both contribute.
Electronic countermeasure	A form of electronic warfare that prevents or degrades effective enemy uses of the electromagnetic spectrum; jamming is a typical tactic.

1/Definitions based on U.S. - Soviet Military Balance: Concepts and Capabilities 1960-1980 by John M. Collins, 1980.

Escalation	An increase, deliberate or unpremeditated, in the scope and/or intensity of a conflict.
Flexibility	Capabilities that afford countries and weapon systems a range of options and facilitate smooth adjustment when situations change.
Flexible response	A strategy predicated on meeting aggression at an appropriate level or place with the capability of escalating the level of conflict if required or desired.
Hard target	A point or area protected to some significant degree against the blast, heat, and radiation effects of nuclear explosions of particular yields.
Kiloton	The yield of a nuclear weapon equivalent to 1,000 tons of TNT.
Lookdown, shutdown capability	Airborne radars that discriminate aerial targets from ground clutter below combined with air-to-air weapon systems that can destroy supersonic targets. The system alleviates low-level air defense problems associated with ground surveillance and tracking radars.
Massive retaliation	The act of countering aggression of any type with tremendous destructive power, particularly a crushing nuclear response to any provocation deemed serious enough to warrant military action.
Megaton	The yield of a nuclear weapon equivalent to 1 million tons of TNT (1,000 kilotons).
Multiple independently targetable reentry vehicle	A missile payload comprising two or more warheads that can engage separate targets.
Nuclear yield	The explosive power of a nuclear bomb or warhead expressed in kilotons or megatons.
Radar cross section	The picture produced by recording radar waves reflected from a given target surface.

Show of force	The purposeful exhibition of armed might before an enemy or potential enemy, usually in a crises situation, to reinforce deterrent demands.
Single Integrated Operational Plan	The U.S. contingency plan for strategic retaliatory strikes in event of a nuclear war. Targets, timing, tactics, and force requirements are considered for a variety of responses. The plan is prepared by the Joint Strategic Target Planning Staff, which is collocated with Strategic Air Command Headquarters at Offutt Air Force Base outside Omaha, Nebraska.
Strategic offense	The strategy and forces designed primarily to destroy the enemy's warmaking capacity during general war or to so degrade it that the opposition collapses.
Strategic stability	A state of equilibrium which encourages prudence by opponents facing the possibility of general war; tendencies toward an arms race are restrained, since neither side has undue advantage.
Strategic warning	Notification that enemy offensive operations of any kind may be imminent. The alert may be received minutes, hours, days, or longer before hostilities commence.
Submarine/sea-launched ballistic missile	Any ballistic missile transported by and launched from a ship; may be short, medium, intermediate, or long range.
Technical reliability	The mechanical dependability of any delivery system without regard for its survivability or the proficiency of its crew before or after launch.
Theater nuclear forces, weapons, and operations	Nuclear combat power expressly designed for deterrent, offensive, and defensive purposes that contribute to the accomplishment of localized military missions. The threatened or actual application of such power may be employed in general as well as limited wars.

Threat	The capabilities, intentions, and actions of actual or potential enemies to prevent or interfere with the successful fulfillment of national security interests and/or objectives.
Time-sensitive target	Any counterforce target which is vulnerable only if it can be struck before it is launched (as with bombers and missiles) or redeploys (as with ground combat troops and ships).
Triad	The three-way combination of land-based, intercontinental ballistic missile, submarine-launched ballistic missile, and manned bomber systems with which the U.S. strategic forces are equipped.
Vulnerability	The susceptibility of any country, military force, or weapon system to any action by any means through which its effectiveness may be diminished.

CHAPTER 1

INTRODUCTION

The 1980s will be critical for U.S. national security. A continuously increasing Soviet nuclear capability has, by many measures, tilted the strategic force balance in favor of the Soviet Union, resulting in a gradually changing U.S. approach to strategic deterrence. The growing Soviet capabilities, coupled with evolving U.S. deterrence strategies, require that critical strategic force modernization decisions be made in 1981 and in the following years.

With growing Soviet capabilities over the past two decades, the basis for U.S. strategic deterrence has gradually shifted from an employment policy guaranteeing wholesale destruction of the Soviet urban industrial base to a policy providing for flexible responses at any level of warfare, while seeking to control escalation if nuclear war should begin. U.S. nuclear forces; their supporting command, control, and communications (C3); and nuclear weapon employment plans must be more capable of conducting limited nuclear war and striking targets the Soviet leadership values highly, while withholding a capability for wholesale destruction of the urban industrial base.

Some U.S. nuclear forces are approaching obsolescence and were designed to support a concept of deterrence that was less demanding than the concept to be in effect in the 1980s. Those forces and the systems which direct and control them must be replaced or modernized to keep pace with the growing Soviet threat and provide the full range of capabilities required by the changing deterrent strategy.

Because numerous uncertainties are involved in analyzing both U.S. and adversary force capabilities and in speculating about causes, objectives, and sequences of attacks, the total size and composition of U.S. forces necessary for deterrence cannot be precisely defined. A great deal of effort has gone into analyzing the capabilities and requirements of strategic forces, but no analysis provides a definitive answer as to how much is enough and which weapons should be procured to provide for deterrence in the future.

STRATEGIC NUCLEAR FORCES--THE TRIAD

Because of the many uncertainties, the United States has traditionally relied on a Triad of strategic offensive forces. Since the early 1960s, the Triad has consisted of land-based intercontinental ballistic missiles (ICBMs), sea-based submarine-launched ballistic missiles (SLBMs), and strategic manned bombers. Theater nuclear forces and conventional forces are also considered in defining deterrence strategy and in planning for employment of forces if deterrence fails.

The Department of Defense (DOD) has concluded over a period of years, and confirmed in 1979, that the diversity available to the United States in a Triad of strategic forces is effective in hedging against technological breakthroughs, complicating any planned attack on U.S. strategic forces, stressing Soviet defenses, and providing for the broadest range of employment options. Nevertheless, the relative survivability and effectiveness of each component of the Triad changes over time as U.S. and Soviet technology improves.

EVOLUTION OF DETERRENCE STRATEGY

A deterrent strategy includes a generalized concept of how the United States would use existing forces to discourage a potential adversary from an attack on the United States or its interests by making evident the potential retaliation for such an attack. The trend in U.S. employment policy, at least since the early 1970s, has been to seek an improved capability to respond more selectively.

In the 1960s the United States had nuclear superiority over Soviet forces, but both sides had large and growing nuclear capabilities. The U.S. deterrent strategy and employment policies stated that a Soviet nuclear attack on the United States or its interests would be answered with massive retaliation against Soviet urban industrial centers, resources, and institutions to prevent the Soviets from recovery in the aftermath of a massive nuclear exchange. While public statements of deterrent policy did not directly mention targeting of Soviet military forces (both conventional and nuclear), they were also considered appropriate for retaliatory attack. Since the Soviets also had a capability to largely destroy the United States, the United States perceived the basis for deterrence as the assured ability of both sides to destroy each other as national entities regardless of who attacked first.

Accordingly, U.S. nuclear employment policies were tailored to a massive response against all Soviet targets accompanied by acquisition of weapon systems compatible with the policies. In general, this policy involved the use of most U.S. strategic weapons in preplanned retaliation options which were to be available for execution on command.

Despite the improvements in U.S. strategic capabilities through the 1960s, the Soviets have devoted more resources to strategic nuclear systems than the United States since the mid-1960s. By the early 1970s, Soviet strategic nuclear capabilities equaled or exceeded those of the United States by many measures. The Soviet forces, although they also included SLBMs and strategic bombers, emphasized the deployment of huge ICBMs in silos. The Soviet ICBM warheads were large but not very accurate and were believed ineffective for destroying U.S. ICBM silos such as Minuteman III. They were, however, acknowledged to be capable of inflicting massive damage on U.S. cities and industry.

By the early 1970s, it had become evident that a policy of assured destruction was losing its credibility as a means of deterring more limited Soviet attacks. A limited Soviet attack, either conventional or nuclear, on the United States, its forces, or its allies could have confronted the United States with the choice of either responding with a massive nuclear retaliatory attack or doing nothing. For example, if conventional or theater nuclear weapons were inadequate to respond to conventional aggression, the use of nuclear weapons against targets in the Soviet homeland could not destroy a major part of the Soviet ICBMs, but could result in massive Soviet nuclear attack on the United States.

To maintain a credible deterrent against conventional aggression in Western Europe, U.S. troops were maintained in Europe and the United States made it clear that it would rely on theater nuclear weapons if necessary to defend against numerically superior Warsaw Pact and Soviet conventional forces. For the strategic nuclear forces, a concept of flexible employment was introduced in 1974 providing a series of smaller preplanned nuclear response options in addition to a massive option. The intent was to reinforce deterrence by reducing Soviet incentives to consider any level of attack or coercion.

As Soviet technology improved, the Soviets began to fractionate the payload on their ICBMs (make the payload consist of multiple independent reentry vehicles (MIRVs)). The large size of the Soviet launchers permitted them to put 8 to 10 (or more) large warheads on 1 ICBM. Coupled with significant increases in accuracy, this provided a growing capability to destroy U.S. ICBMs in their silos. As the Soviets continued to fractionate their ICBM payloads, it became clear that sometime in the 1980s the Soviets would not only enjoy conventional superiority, but would also be able to threaten an effective nuclear attack on the United States or its allies using only a small portion of its nuclear arsenal.

In 1979 the deterrence concept called "countervailing strategy" was introduced in the annual report of the Secretary of Defense. In Presidential Directive-59 (PD-59 July 1980), the President confirmed revisions to deterrent strategy that had been evolving since the mid-1970s. Countervailing strategy requires that U.S. forces not only maintain the capability for assured destruction of the Soviet Union, but also have the capability for flexible, controlled retaliation against a full range of targets for any attack at any level.

OBJECTIVES, SCOPE, AND METHODOLOGY

We undertook this review to determine if existing strategic forces have, and future planned forces would provide, the capabilities needed to fully carry out the countervailing strategy. We found that DOD had not yet established a means for assessing what was needed to implement the countervailing strategy. Further, we found various interpretations within DOD of the objectives of

countervailing strategy and of weapons capabilities needed to implement it.

To accomplish our objective we analyzed annual reports and statements of the Secretary of Defense and discussed countervailing strategy with responsible DOD officials and National Security Council (NSC) officials. Based on this work we (1) identified critical characteristics that are needed in varying combinations to provide the necessary capabilities, (2) established numerical criteria to measure the existence of those characteristics in the forces, and (3) determined to what extent existing and planned forces exhibit those characteristics.

The characteristics we established for weapon systems (pre-launch survivability, endurance, assured penetration, precision strike capability, and timeliness) were reviewed by DOD officials and by officials from the Congressional Budget Office and the Office of Technical Assessment. These officials agreed that these were the critical characteristics needed although other characteristics could be considered. For example, some DOD officials mentioned weapon system range and reusability as other important characteristics, but we did not attempt to evaluate those.

The numerical values assigned as criteria for measuring the existence of characteristics in the forces were based on extensive dialog with DOD officials about what provided a reasonable degree of capability. ^{1/} While some DOD analysts may define those values differently, until a consensus is reached in DOD, we believe the values we used are both reasonable and conservative. In commenting on our draft report DOD did not take issue with our criteria.

To determine the extent to which existing and planned strategic forces exhibited the characteristics we identified, we obtained information on these forces from DOD activities, particularly the Air Force and Navy. We compared the characteristics of these systems to the criteria we established to determine the extent to which each system possessed each characteristic.

During our review we discussed strategic policy and forces with those DOD agencies responsible for formulating defense policy and procuring the weapons needed to implement it. These officials also provided comments on our planned approach and participated in framing DOD's official comments on our draft report. We discussed these issues with the organizations listed below.

Office of the Secretary of Defense:

Deputy Undersecretary for Policy Planning
Undersecretary for Defense Research and Engineering
Assistant Secretary for Program Analysis and Evaluation

^{1/}Specific numerical criteria are contained in the classified version of this report (C-MASAD-81-16.)

Joint Chiefs of Staff:

Strategic Forces Analysis Branch (J-5)
C3 Systems Directorate
Joint Strategic Targeting and Planning Staff
Joint Strategic Connectivity Staff

Department of the Navy:

Chief of Naval Operations
Strategic Systems Project Office

Department of the Air Force:

Deputy Chief of Staff, Research and Development
Air Force Systems Command
Aeronautical Systems Division
Strategic Air Command (SAC)

The focus of our review was the impact of countervailing strategy on strategic weapons. We did not analyze the following.

Other implications of countervailing strategy

Countervailing strategy and PD-59 represent a codification of a change in U.S. doctrine that applies to all U.S. forces. Although these changes will have major implications for theater nuclear and conventional forces, we did not analyze these implications.

Overall effects of nuclear war

We did not attempt to define the overall effects of nuclear war either at the level of a limited exchange or a massive general nuclear war. Analyses in DOD deal primarily with destruction of targets and do not attempt to measure all aspects of nuclear war.

A report by the Office of Technology Assessment, "The Effects of Nuclear War," 1/ provides some insight into the effects of nuclear weapons and the conditions that might exist in the United States or the Soviet Union in the aftermath of a nuclear exchange. The effects of nuclear weapons go far beyond that of destroying targets and can be long lasting. An exchange involving even 300 to 500 warheads would be an unimaginable catastrophe, yet combined U.S. and Soviet nuclear arsenals now consist of about 16,000 warheads in the strategic forces alone.

U.S. strategic defense and civil defense

While we considered some relevant factors concerning strategic defense and civil defense, we did not attempt to define the requirements or measure U.S. capabilities.

1/Office of Technology Assessment "The Effects of Nuclear War"
(June 1979).

The Triad

DOD is committed to maintaining a Triad of strategic offensive forces. The concept of the Triad was reexamined and validated in 1979 by the Secretary of Defense. We did not study the merits of forces other than a Triad.

Threat information

We did not validate or verify any information on Soviet weapon capabilities published by DOD. We accepted the threat data as presented by DOD.

Nuclear employment plans

Officials of NSC and DOD did not provide for our review the applicable presidential directives, nuclear employment policies, capabilities plans, or operating plans. Officials at NSC and at several levels within DOD did, however, discuss those documents and plans with us.

Intelligence systems

We did not analyze the capabilities, limitations, or specific requirements of U.S. intelligence systems. Where intelligence data is particularly critical to the survival or function of strategic forces, we have so indicated without any attempt to judge the capability of the intelligence systems to provide the needed data in a timely fashion.

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We believe that the information available to us was sufficient to establish the requirements of countervailing strategy and assess the capability of strategic systems to meet these requirements.

We believe that our approach provides a common basis for comparing the relative capabilities of individual weapon systems. We also believe that, taken, in aggregate, this approach identifies overall strategic weaknesses and identifies areas where future efforts must be concentrated to provide the most effective force mix to carry out countervailing strategy.

CHAPTER 2

DETERRENCE IN THE 1980s WILL REQUIRE IMPROVED CAPABILITIES IN U.S. FORCES

To meet the requirements of deterrence in the 1980s, we believe that U.S. strategic nuclear forces will require characteristics that were not envisioned in the design of existing weapons and support systems. These requirements result from the threat posed by large numbers of more effective Soviet nuclear forces and air defenses and from the deterrent strategy the United States has adopted to neutralize the implications of that threat.

THE GROWING SOVIET THREAT

DOD believes that the buildup of Soviet strategic offensive and defensive forces has altered the strategic nuclear balance. It also believes the increasing capabilities of Soviet strategic offensive forces have already made some U.S. systems, primarily the land-based ICBM force, more vulnerable to a Soviet attack. The increasing capabilities of Soviet defenses are expected to reduce the effectiveness of U.S. forces, particularly manned bombers, in attacking Soviet targets. Thus, in the 1980s the effectiveness of two legs of the Triad is eroding.

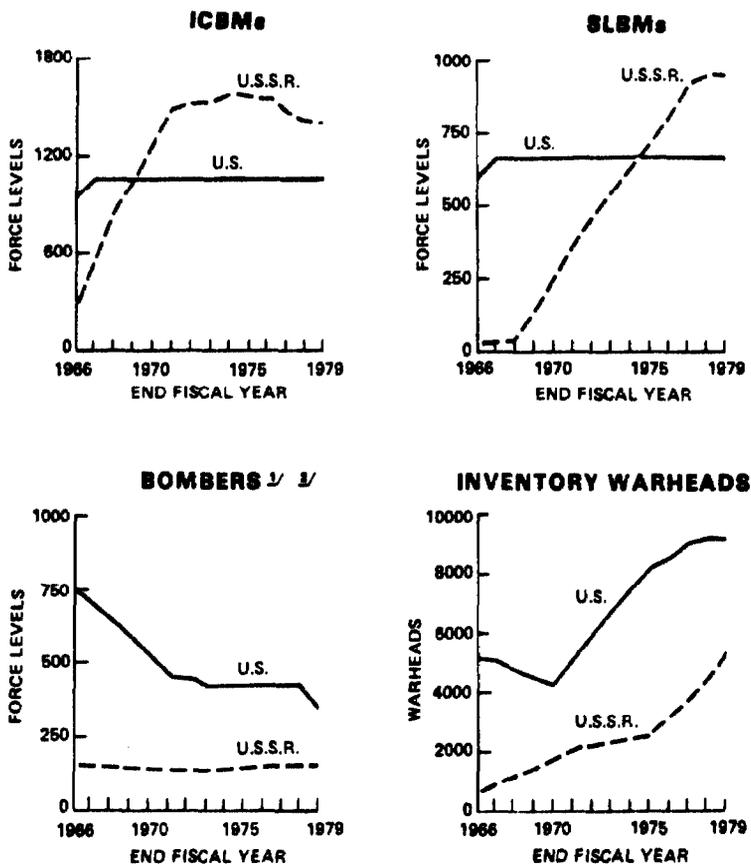
Soviet offensive forces

The Soviet offensive buildup is shown in the charts on page 8, which compare the size of U.S. and Soviet strategic forces from 1966 through 1979. These charts were included in the DOD Annual Report for Fiscal Year 1981. What the charts do not show is the improved capability of Soviet offensive forces and the implications for the strategic nuclear balance.

Accuracy improvements in Soviet ICBMs have given the Soviets an improved ability to destroy hardened U.S. targets, including underground command bunkers and U.S. ICBMs in silos. As the Soviet ICBM modernization continues, an attack against U.S. silos will require a decreasing percentage of available Soviet ICBM launchers.

Growing Soviet SLBM capability poses a threat to the survivability of the U.S. bomber forces. Modern Soviet SLBMs are believed capable of destroying most bombers and tankers that are not maintained on alert.

CHANGES IN U.S./U. S.S.R. STRATEGIC LEVELS



1/ FB-111 and BACKFIRE are excluded

2/ Excludes approximately 220 B-52s in deep storage

Soviet defensive programs

Concurrent with the improvements to the strategic offensive forces, the Soviets have pursued programs to limit the damage they would suffer from a U.S. attack. Improving Soviet air defenses are expected to reduce the ability of existing U.S. bombers to successfully penetrate to targets. The Soviets have also hardened many critical installations and certain industrial facilities to increase their ability to survive a retaliatory attack. Also, they have progressed with a civil defense program to protect Soviet leadership and parts of the skilled work force from the effects of a direct attack.

The Soviet programs to improve the already extensive air defense systems are expected to reduce the ability of existing U.S. bombers to penetrate to targets, even at low altitudes, by the mid-to-late 1980s. Soviet defenses are expected to include improved and internetted warning and control radar systems, manned interceptors with lookdown/shutdown capability, improved

air-to-air missiles, and highly capable surface-to-air missiles and antiaircraft artillery.

The Soviet program to make their ICBM silos, command bunkers, and communications facilities resistant to nuclear attack has reduced the effectiveness of U.S. weapons against these targets. Soviet facilities are hardened against direct nuclear attack and secondary nuclear effects to a greater degree than U.S. systems.

Although the effectiveness of the Soviet civil defense program is uncertain, it does provide thousands of blast resistant shelters which could protect up to 13 million people from the initial effects of a nuclear attack. The ability to survive the initial effects, however, does not ensure survival against radioactive fallout and other long term effects of a general nuclear war.

The danger in the 1980s

If the Soviet's improved offensive and defensive capabilities have changed Soviet perceptions of the outcome of a nuclear war, they may be less reluctant to initiate actions that could lead to war. If our allies perceive the United States as less able or less willing to effectively forestall or stop such actions, they may be less willing to support the United States, particularly in situations that do not directly threaten them.

The growing Soviet hard target kill capability introduces the possibility of an effective first strike against the U.S. forces. Although the threat of a surprise first strike against the U.S. ICBMs and/or other strategic forces may be the most demanding scenario for comparing U.S. and Soviet forces, DOD considers it an unlikely prospect. However, sufficient forces must be maintained to make a first strike implausible.

A Soviet first strike that destroyed or disabled U.S. forces could limit the ability of the United States to damage the Soviets in a U.S. retaliatory attack, but a large Soviet nuclear attack on the United States would still involve major risks to the Soviets. The probability of success in a first strike is not certain. Launching such an attack would require detailed operational planning and coordination, precision execution, and a higher degree of confidence in the reliability of the weapons than is thought to exist today. Also, if the United States was to launch ICBMs before Soviet warheads arrived, much of the advantage of a first strike by the Soviets would be lost.

Even if such an attack succeeded in destroying most U.S. ICBMs, submarines in port, and nonalert bombers, it would be risky for the Soviets to count on U.S. willingness to withhold a massive response in light of the damage and casualties resulting from such an attack. As long as sufficient U.S. SLBMs and bombers

can survive a postulated Soviet first strike, the United States will maintain the ability to devastate the Soviet industrial/economic base and much of its military capability.

The increased Soviet nuclear capability is likely to increase the difficulty in dealing with Soviet superiority in conventional forces. U.S. officials believe that improved Soviet capabilities would most likely be exploited in a limited fashion such as coercion or a conventional or nuclear attack on U.S. forces elsewhere in the world. Such a Soviet action would have a high potential for escalation to general nuclear war, but might not of itself demand a full-scale nuclear response by the United States. Nor would a U.S. strategy based only on full-scale retaliation be credible with the Soviets or U.S. allies.

The perception of U.S. friends and allies of the reduced ability or willingness of the United States to deal with such crises could affect the foundation of U.S. foreign policy. If the United States is perceived to be intimidated by Soviet capabilities in a large-scale nuclear exchange or seems unwilling to make the expenditures necessary to redress the issue, DOD officials believe the resolve of our allies might be weakened to the point that they may make accommodations with the Soviets.

DOD is currently engaged in a series of programs to modernize U.S. strategic forces. These modernization programs are discussed throughout chapter 4. In addition to the modernization programs, the United States has further refined its employment strategy to emphasize its willingness and ability to more flexibly employ nuclear forces to deter or respond to limited contingencies. This refinement has become known as the countervailing strategy.

COUNTERVAILING STRATEGY

The need for nuclear weapon employment flexibility and responsiveness has been part of U.S. deterrent strategy for some time, but the relationship of this flexibility to the overall strategy was more clearly stated with the emergence of countervailing strategy. This strategy explains evolving concepts of how the United States might use its strategic nuclear forces.

The concept of countervailing strategy, which first appeared in DOD's annual report in January 1979, requires that the United States not only maintain the capacity for assured destruction of the Soviet Union, but also plan for flexible, controlled use of strategic weapons against all appropriate targets for any attack at any level of conflict. Specifically, the objectives of countervailing strategy are

- to deter an attack at any level of conflict by maintaining the ability to retaliate at any level in a deliberate selective way to deny any possible advantage to the attacker;

--to control escalation, if attacked, by tailoring a specific response to the attack while withholding the capacity for assured destruction and a secure reserve force; and

--to terminate hostilities at the lowest level of conflict possible on terms acceptable to the United States.

Ideally, a countervailing strategy envisions U.S. plans and forces that will provide an unbroken continuum of military options, from conventional war to general nuclear war, to persuade a potential enemy that regardless of how or where it may choose to attack, it will not gain any meaningful advantage. If this strategy is to be credible, U.S. forces must have the characteristics needed to convince an adversary that it can and will carry out the declared strategy.

PD-59

PD-59, signed in July 1980, confirmed the changing direction in strategic doctrine that had evolved over a number of years. We discussed the background and purpose of the directive with NSC and DOD personnel. These conversations made it clear that PD-59 was intended to provide direction on how U.S. nuclear weapon employment policy and U.S. forces must change to support a countervailing strategy.

Improved Soviet nuclear capabilities will require that U.S. forces be employable in a more flexible manner to ensure deterrence across the entire spectrum of possible conflicts. An NSC official said that PD-59 places more emphasis on deterrence of all types of attacks than previous Presidential guidance, including the potential use of strategic nuclear weapons to deter conventional attacks. This could include the use of strategic nuclear weapons against attacking forces if theater nuclear weapons are not immediately available.

While PD-59 does not change the fundamental U.S. objective of deterrence, it does alter the U.S. approach toward meeting that objective. The principal changes in PD-59 are:

--The United States will prevent an attacker from attaining the objective of its attack, rather than punishing the enemy for attacking.

--U.S. forces, including strategic nuclear forces, will have the flexibility to respond against the military forces being used directly or indirectly to support a particular attack.

Public statements of U.S. policy previously emphasized that an adversary would incur unacceptable damage as retaliation for an attack against the United States or its vital interests. Under that policy, strategic nuclear forces could be used in a limited attack directed against valuable political or industrial targets

in addition to military targets not directly related to the objectives of the original attack. Under current policy, if strategic weapons were needed to deny to the enemy the objective of its attack, they could be directed against military forces directly supporting the attack. All U.S. forces--conventional, tactical nuclear, and strategic--are to be integrated to defeat the objectives of an enemy attack. The use of strategic nuclear weapons to achieve limited warfighting aims (such as attacks on battlefield support targets) rather than punitive attacks on targets of strategic political value has major implications for future U.S. strategic forces.

Implications of countervailing strategy

The possibility that the Soviets might exploit their nuclear advantage by a limited attack or coercion has caused an evolutionary change in U.S. nuclear employment plans. The primary effect of countervailing strategy will be the requirement for greater flexibility in employment in our strategic nuclear and theater nuclear forces. However, we believe the type of war fighting capability envisioned by PD-59 was neither built into the current strategic command and control network nor explicitly designed into current strategic weapon systems, although many of the necessary characteristics are inherently present.

Countervailing strategy will not change the basic U.S. requirement for deterrence of an all-out nuclear attack on the United States; however, it does require that U.S. strategic weapons in combination with theater nuclear be available, if needed, to deny the Soviets victory in more limited attacks. The ability to use strategic weapons in a limited, flexible manner to deny an attacker a specific military objective has far-reaching implications for strategic forces originally designed for assured destruction.

Under countervailing strategy, the U.S. forces must be able to

- absorb a limited Soviet nuclear attack without losing the ability to respond in a controlled and deliberate manner;
- analyze quickly and correctly the nature of the attack and plan a retaliatory attack that will eliminate any advantage to the attacker or increase the cost over the benefits it may expect to achieve;
- execute the retaliation in such a way that the enemy can reasonably be expected to perceive that it is a limited response, possibly discouraging further escalation;
- retain the ability to hold vital and valuable targets hostage while threatening their ultimate destruction also discouraging further escalation; and

--maintain forces at a high level of readiness for an extended period while attempts are made to limit escalation and reduce tensions.

It is not possible nor desirable to preplan the response for every possible contingency. An initial Soviet attack could range from an attack by conventional forces to a large counterforce attempt to eliminate U.S. strategic weapon systems and prevent U.S. retaliation by holding the U.S. population hostage to remaining Soviet weapons. A limited war could also result in a series of limited attacks against specific military objectives with protracted periods of high alert while efforts were made to control escalation.

Because the exact nature and sequence of a conflict cannot be predicted, no single scenario can be used to judge the adequacy of U.S. strategic forces. U.S. forces must have whatever capabilities are needed to respond in an appropriate and timely manner to any situation. Since every possible scenario cannot be defined and there are numerous uncertainties involved in all scenarios, new perspectives are required for evaluating the capabilities of strategic forces. We believe evaluation of systems' capabilities across the entire conflict spectrum is best accomplished by defining the characteristics required of the weapon systems and measuring the systems' capabilities against those characteristics. While this method of evaluation certainly does not answer all questions about strategic offensive systems, it does provide a logical basis for analysis of what capabilities exist and what capabilities must be acquired.

STRATEGIC SYSTEMS CHARACTERISTICS

U.S. strategic forces must have the performance characteristics needed to respond to a spectrum of conflicts ranging from general nuclear war to a limited, protracted war. Although countervailing strategy first appeared in the January 1979 DOD reports and PD-59 was signed in July 1980, we found no common understanding of the objectives of countervailing strategy, of weapon system characteristics needed to implement it, or goals or standards for those characteristics.

Since DOD officials could not provide a list of critical characteristics and standards for measuring the existence of these characteristics in the forces, we analyzed the explanations of countervailing strategy and discussed countervailing strategy with DOD officials to determine the critical characteristics of weapon systems and the systems that support their control and employment. The characteristics of weapon systems we believe most critical include prelaunch survivability, endurance, assured penetration, precision strike capability, and timeliness.

While we believe these are the most crucial characteristics, it is not necessary that all systems strongly display every characteristic. For example, all systems do not necessarily have to be

capable of accomplishing a precision strike. The DOD officials we discussed these criteria with generally agreed with our approach to analyzing the existence of critical characteristics in the strategic forces. They agreed that the critical characteristics we selected were appropriate and critical, although they do not necessarily encompass all the concerns faced by DOD when designing weapon systems.

C3 systems are discussed in chapter 3.

Prelaunch survivability

Sufficient strategic systems with the right capabilities must be able to survive Soviet nuclear attack and carry out their mission regardless of the size of the Soviet attack, the sequence, or the amount of warning. High prelaunch survivability can reduce the number of weapons that must be deployed to ensure that a sufficient number of warheads survive an attack. Prelaunch survivability is a critical factor in assessing the nuclear balance between the United States and the Soviets, but most comparisons such as total warheads, total megatons, and others do not reflect its importance.

A high prelaunch survivability of weapon systems is critical in all scenarios involving use of or threats to use nuclear weapons, since any such crisis could ultimately escalate to general nuclear war. In limited scenarios involving small attacks on the United States or initial use of nuclear weapons elsewhere in the world, prelaunch survivability is an important characteristic for maintaining stability in a crisis.

In a crisis that began with limited use of nuclear weapons, for example, the Soviets could have a substantial incentive to try and eliminate U.S. ICBMs and any other weapon systems that were vulnerable to attack. The probability that the Soviets could succeed in such an attack could pressure the United States to use vulnerable systems before they were lost. Such incentives and pressures detract from stability in a crisis.

The most demanding scenario is one in which the Soviets execute a well-planned first strike against U.S. forces with no advance (strategic) warning. Weapon systems that are not mobile, such as silo-based ICBMs, cannot be considered survivable against a full-scale attack by modern Soviet weapons. For mobile systems, such as bombers and submarines, the prelaunch survivability is related to the percentage of each force that is maintained in an alert status. Generally, it is assumed that most alert bombers and all submarines at sea can survive a Soviet strike even if it comes with no advance warning.

For our evaluation in chapter 4, we established a criteria against which to measure prelaunch survivability of strategic offensive weapon systems. The criteria centers on the capability of strategic offensive systems in an alert status to survive a

full-scale attack by Soviet forces, since that is the most demanding scenario.

We assumed that the Soviet attack is executed without strategic warning and that fixed, silo-based ICBMs ride out the attack. For this evaluation, sea-based forces and bomber forces attempt to survive through mobility or by maintaining location uncertainty.

Endurance

The requirements of the countervailing strategy are more demanding on weapon system endurance than prior policies. To carry out preplanned options, it was considered necessary for sufficient strategic forces to survive a first strike and shortly thereafter execute the preplanned options. For options of a more limited nature, the designated forces would be launched according to a directed plan.

Countervailing strategy presumes that a protracted period of nuclear exchanges could occur. Surviving strategic systems must be able to operate effectively in an environment involving small or large-scale nuclear exchanges and lengthy periods of high alert status. We found no consensus on how long a protracted period might be. Estimates ranged up to 180 days.

A conflict that has not escalated to the use of nuclear weapons might require that forces be placed on high alert status for weeks or months. Protracted high alert status could stress the capability of both U.S. and Soviet strategic forces. If U.S. capability began to degrade more severely than the Soviets as the high alert status continued, the lack of endurance could be destabilizing.

For our evaluation in chapter 4, we established criteria against which to measure the endurance of strategic offensive weapon systems. The criteria centers on the capability of weapon systems to endure in a nuclear environment with limited reliance on commercial power which could be disabled by sabotage or by nuclear effects, even if not attacked directly by nuclear weapons.

Assured penetration

Countervailing strategy places increased importance on the capability of individual weapon systems to launch as intended, penetrate defenses, and arrive on target. To ensure that the weapon will launch, penetrate, and arrive on target requires high weapon reliability and the ability to overcome defensive measures.

Assured penetration is particularly important in limited responses. In a large attack, the possibility that a particular weapon might not arrive and detonate as intended could be partially dealt with by cross targeting by different weapons or different components of the Triad. This type of targeting, however, could be undesirable in a limited attack.

Effective escalation control requires successful use of as few weapons as possible, while ensuring that the response meets its objective. Countervailing strategy, therefore, requires that a certain portion of the weapons available to respond to an attack have the proper combination of very high launch and in-flight reliability and high probability of arrival considering potential defenses to be encountered.

For our evaluation in chapter 4, we established a criteria against which to measure assured penetration capability of strategic offensive weapon systems in a limited nuclear exchange. The criteria centers on weapon system reliability and capability to penetrate defenses that have not been degraded by prior arriving nuclear weapons.

Precision strike capability

Countervailing strategy and the increasing Soviet efforts to protect their critical military and political targets against nuclear attack requires an improved precision strike capability in U.S. forces regardless of how use of nuclear weapons might be initiated. The primary factor involved in precision strike capability is accuracy. Because use of a weapon with a large number of MIRV warheads could be counterproductive to the demands for efficient smaller responses, the number of warheads per launch vehicle must also be considered.

Countervailing strategy requires a capability to destroy most targets. A capability to destroy hard targets is required if the United States is to challenge Soviet nuclear forces, political leadership, and military control targets. A capability to limit collateral damage is required to selectively destroy targets while providing a clear signal that the scope of the strike is limited. Such strikes require a high degree of accuracy.

DOD officials indicated that Soviet targets hardened against nuclear effects are built to withstand very high overpressures. The warhead yield needed to destroy those targets with a high degree of confidence depends largely on the accuracy. For example, if accuracy is about 400 feet, a yield of 300 kilotons (kt) provides a single shot damage probability of about 82 percent against a 4,000 pounds per square inch (psi) target. With accuracy of about 800 feet, the single shot probability of damage is less than 35 percent.

Hard target kill

For our evaluation, we established a criteria based on the single shot probability of damage against a 2,000 psi target and against a 4,000 psi target. While this criteria measures only two of many points in a spectrum of hard targets, it does permit distinguishing among the capabilities of weapon systems.

Limited collateral damage

For precision targeting in which limiting collateral damage could be important, high accuracy is necessary. Also, warhead yield must be appropriate to damage the target without unnecessarily damaging surrounding areas. For targets adjacent to urban areas or economic centers, very low yields could be appropriate.

We established a separate criteria for limited collateral damage, to measure capabilities to destroy soft or lightly hardened targets assumed to be near areas in which collateral damage is not desired. Obviously, high accuracy is desirable, but yields should not be excessive.

Timeliness

Following a massive Soviet attack on the United States, timeliness is not considered to be as important a factor as in a limited nuclear war, since escalation to general nuclear war would have already taken place. However, in more limited scenarios, timeliness of the response could be a critical factor. Both denial of Soviet victory and control of escalation could require a time urgent response. A response that takes a long time to complete may permit the Soviets to obtain their objective or fail to clearly signal U.S. intent to contain a conflict.

To evaluate the timeliness of weapon systems themselves, we assumed that the C3 needed to provide execution orders to weapon launch facilities would be available. The criteria is a measure of the postattack ability of the weapon and its launch facilities to receive the attack orders and deliver the weapons in a timely manner. We considered the basic capability of the system and the ability to retarget weapons in a timely fashion.

Weapon arrival time

For our evaluation we considered the postattack capability of the weapon system launch control facilities to execute a preplanned attack. We evaluated the time to receive the message and launch the weapon. Also, we evaluated the time for the weapon to travel to the target.

Retargeting

The ability to rapidly construct and execute a nuclear response specifically tailored to defeat the objectives of a particular attack may require rapid retargeting to not only preexisting known targets, but also to new targets generated by the situation. Limits on the availability of responses or the time lag before they are available could leave less than optimum response options, execution of which could increase rather than decrease the likelihood of escalation.

Although known strategic targets are preprogramed into U.S. strategic weapons as part of preplanned U.S. nuclear options, there is no guarantee that surviving weapons with the proper characteristics will be preprogramed and available to attack the targets judged appropriate for a particular response.

The increased vulnerability of U.S. ICBMs also increases the requirement for retargeting surviving weapons to known targets. ICBMs are the most appropriate weapons for assuring the timely destruction of certain critical Soviet targets. If an attack on the ICBM fields were to destroy the ICBMs programed to those targets, the ability to retarget surviving ICBMs could ensure that the most critical targets were destroyed.

Although attacking military forces and close logistics support are the type of targets that theater nuclear forces are designed to attack, these weapons are prepositioned in relatively few locations. If theater nuclear weapons were not readily available, defeating the objective of an attack could depend on U.S. ability to use strategic weapons against this type of target. 1/

The concept of an appropriate response to any attack requires a survivable and enduring capability to strike any target or set of targets that might be judged appropriate. The criteria is a measure of the postattack ability of the weapon and its launch control facilities to retarget within the time frame required for a time urgent response.

C3

The network of systems designed to allow the National Command Authorities (NCA) to effectively use U.S. strategic forces is known as the strategic C3 network. The network has evolved over the years to ensure execution of forces according to preplanned attack options.

The limitations of the C3 network limit the capabilities of the weapon systems it supports. To implement a countervailing strategy, C3 systems must be able to maintain the NCA operational control of strategic forces through all levels and phases of a conflict. If the C3 network fails to maintain that control, the United States may be put in a position of using the strategic forces under duress or losing them; thus, controlling escalation of the conflict may be impossible.

The required characteristics and capabilities of the C3 network are discussed in chapter 3.

1/Use of strategic weapons in this manner would require precise, timely intelligence information on the location of these targets.

CONCLUSIONS

To meet the requirements of deterrence in the 1980s, U.S. strategic nuclear forces will require characteristics that were not envisioned in the design of existing weapon and support systems. These requirements result from the threat posed by large numbers of more effective Soviet nuclear forces and air defenses and from the deterrent strategy the United States has adopted to neutralize the implications of that threat.

To effectively implement the countervailing strategy, survive a major Soviet nuclear attack, and ensure destruction of the Soviet Union, U.S. forces must have a clearly evident capability to effectively engage in nuclear conflicts of a more limited nature.

We believe the growing threat, changing strategy for deterrence, and revised policies for employment of strategic nuclear weapons across the entire spectrum of conflict require new perspectives for evaluating the contributions of the individual weapon systems and their relationship to other weapon systems and capabilities in the Triad. Therefore, we identified weapon system performance characteristics needed to meet the requirements of countervailing strategy. To meet these objectives, U.S. forces must have appropriate combinations of characteristics, including

- survivable, enduring, and flexible C3 systems that permit effective control over the forces continuously throughout a conflict;
- weapon systems survivable to Soviet attacks;
- endurance or continued readiness over a protracted period;
- assured penetration of warheads to targets;
- precision strike capability, including a capability to destroy hardened and other targets and limit unwanted collateral damage while achieving the targeting objective; and
- timeliness or the capability to be launched and arrive on target in a short time frame, including a capability to be retargeted quickly.

We believe, and many DOD officials generally agree, that the weapon systems' characteristics specified above provide a framework for such an evaluation, even though some analysts may define the characteristics somewhat differently or assign different values for measurement. Use of these characteristics will not only highlight problems with current forces, but should identify critical areas where future efforts must be concentrated to provide the most effective force mix to carry out the strategy.

CHAPTER 3

THE C3 NETWORK MUST BE IMPROVED

If effective deterrence in the 1980s requires an ability to fight a limited protracted nuclear war, then improvements of the existing strategic C3 network must be assigned a high priority. C3 is critical to effective deterrence and the control of escalation if deterrence fails. If the United States is to maintain deterrence until new weapons are deployed in significant numbers, the current C3 network must be rapidly improved.

In the DOD Annual Report for Fiscal Year 1981, the Secretary of Defense stated that the C3 network must have a survivable and enduring capability through all phases of a protracted nuclear conflict to

- provide reliable tactical warning that an attack has been launched; 1/
- provide the information needed to command and control the execution of an appropriate response; and
- provide reliable, two-way communications with U.S. strategic forces.

Also, the C3 network must maintain operational control over remaining U.S. forces after a response has been executed.

In that same report the Secretary stated that the strategic C3 network must be as survivable, enduring, and flexible as the strategic forces it supports. The Secretary also said that the C3 network capabilities fall considerably short of these objectives.

Today's C3 systems were conceived in the late 1950s and most became operational in the 1960s. They are essentially peacetime systems and dependant on vulnerable ground communication networks. While our C3 systems were adequate to support the deterrent concept of massive retaliation, the countervailing strategy places additional demands on C3.

This chapter presents a brief overview of the U.S. strategic C3 system in light of the increased requirements for survivability, flexibility, and endurance under countervailing strategy. A recent

1/Information that such an attack may be launched is called strategic warning and is basically an intelligence function. Reliable strategic warning could result in higher alert status and better survivability when attacked.

report by the Congressional Budget Office ^{1/} provides detailed information on the function, requirements, and deficiencies of the C3 network. That report also contains detailed information on available C3 improvement programs and the cost of various improvement options.

VULNERABILITY OF THE C3 NETWORK

The components of the existing C3 network are vulnerable to large-scale direct attack, jamming, sabotage, and secondary nuclear effects. The vulnerability of the C3 network represents a threat to U.S. deterrent capability.

A large-scale direct attack on all the U.S. C3 installations would require hundreds of nuclear detonations in the United States, resulting in many casualties and large amounts of fallout and collateral damage. However, an attempt could be made to disrupt U.S. strategic C3 systems by a limited attack that involved no nuclear detonations on U.S. soil and little, if any, collateral damage. Jamming and electronic countermeasures (ECM), for example, can disrupt communications systems. Sabotage of unmanned communications sites and systems tied to commercial networks is also a DOD concern.

The C3 network is vulnerable to secondary nuclear effects, particularly from high altitude nuclear detonations. The effects of such detonations can disrupt the atmosphere and cause blackout and disruption of radio frequencies. Electromagnetic pulse (EMP), an intense electrical field that radiates rapidly from a nuclear blast, is collected and channeled by radio antennas, powerlines, and other unintended collectors. EMP could damage components of civilian and military communications systems and could scramble digital computers and other electronic equipment. High altitude blasts can spread EMP and other nuclear effects over hundreds of miles with little or no collateral damage. A summary of Defense Nuclear Agency fiscal year 1981 activities stated that high altitude nuclear detonations:

"* * * can cause electromagnetic pulse (EMP) and radio propagation blackout over wide areas of the earth from only a few suitably located explosions, not necessarily relatable to an act of war." (Underscoring supplied.)

The possibility of high altitude nuclear blasts coupled with communications jamming and possibly even sabotage of key facilities poses a threat to U.S. strategic C3. Although such

^{1/}Strategic Command, Control and Communications: Budgetary Implications of Alternative Modernization Approaches (February 1981).

an attack would not be without risk 1/ to the adversary, it might be less risky than an attack involving detonations on U.S. soil.

The survivability of the major C3 functions--warning systems, command and control elements, and communication systems--are discussed in the following sections.

Warning systems

The U.S. tactical warning network, designed to provide warning that an attack has been launched, consists mostly of fixed, ground-based radars which would be unlikely to survive a direct attack if they were targeted. Satellites, which would provide first warning of a ballistic missile attack on the United States, currently transmit warning information to fixed ground relay stations which are also not survivable to direct attack. Also, the Soviets have demonstrated a nonnuclear orbital interceptor which presents a threat to low altitude U.S. satellites.

The Air Force has proposed several programs to upgrade the warning network, including acquisition of mobile ground terminals for relay of satellite data. Mobile ground terminals are scheduled for initial operational capability in 1984, with full operational capability in 1987.

Command and control elements

Command and control of the forces is centered in ground-based facilities which are not survivable to direct attack. Backup airborne systems, though more survivable to direct attack, are less capable.

Command and control of the strategic forces is NCA's 2/ responsibility through the Joint Chiefs of Staff and commanders in chief of the nuclear commands (known as the nuclear CINCs) 3/. A large, heavily computerized system of interconnected, ground-based command facilities centered in the World Wide Military Command and Control System handles routine operations. Because the ground-based elements are in known fixed locations, they cannot be considered survivable to modern SLBMs and ICBMs.

1/DOD officials said that the Soviets could not be sure that the United States would consider an attempt to destroy NCA control over nuclear forces to be a limited attack.

2/NCA is the President and the Secretary of Defense or their successors.

3/These are the SAC, Atlantic Command, Pacific Command, and U.S. European Command.

If ground-based facilities are destroyed or can not operate, a series of airborne command posts, intended to survive a nuclear attack, are kept on alert. The airborne command posts consist of the National Emergency Airborne Command Post which is intended for NCA and the airborne command posts of the nuclear CINCs. The SAC airborne command post, operating from Omaha, maintains a 24-hour airborne alert. While the other command posts can be launched if strategic warning is available, they are normally on runway alert. SLBMs launched from close to the U.S. coast could strike bases harboring command posts in less than the time needed for these aircraft to escape.

Therefore, under day-to-day conditions, a surprise nuclear attack could, in the worse case, destroy the ground-based and airborne command and control network, except for the SAC airborne command post.

Emergency communications

A core of systems within the communications network called the Minimum Essential Emergency Communications Network was designed to communicate an emergency action message (EAM) to the forces to order execution of a preplanned nuclear retaliatory strike. The network consists of ground-based facilities, an airborne radio relay network, communication satellites, and an Emergency Rocket Communication System (ERCS). It is basically a one-way system designed to broadcast EAM to surviving forces.

Since ground-based facilities and satellites are generally considered vulnerable to destruction or disruption, the heart of the Minimum Essential Emergency Communication Network system is the airborne radio relay network. That network includes

- communications facilities of surviving airborne command posts,
- aircraft specifically intended to relay messages between the command posts and forces, and
- a Navy aircraft system called TACAMO that relays EAM to submerged SSBNs. 1/

Programs have begun to harden some of these aircraft against EMP. The capability of the postattack command and control system to disseminate EAM to all forces depends on survival of a number of aircraft.

If an attack has destroyed or disabled routine ground-based communications with U.S. submarines, TACAMO is the vital communication link between the airborne command posts and the SSBN fleet.

1/SSBN is a nuclear powered ballistic missile submarine.

TACAMO aircraft are propeller powered EC-130 aircraft which use a very low frequency radio to broadcast an EAM through the water to all SSBNs.

If airborne radio relays are unable to communicate with all surviving forces, the system of last resort is ERCS. ERCS is a SAC communications system mounted on silo-based Minuteman booster rockets. ERCS would broadcast EAM after being launched on a ballistic trajectory to reach each major Single Integrated Operational Plan force area. A recorded code can be taped into the payload to provide a broadcast to each Single Integrated Operational Plan force area.

The silo-based ERCS, like Minuteman missiles, are vulnerable to direct attack by Soviet ICBMs. SAC calculations indicate that if the Soviets attack the ERCS silos in the same way they would attack Minuteman silos, there is currently a good probability of ERCS' survival. This probability will decrease by 1985 as improved Soviet ICBMs are deployed. If the Soviets could intensify the attack on ERCS, the probability of ERCS surviving is lower.

FLEXIBILITY OF THE C3 NETWORK

To implement countervailing strategy, DOD is developing an ability to design nuclear weapon employment options other than preplanned options--in particular, smaller scale plans--on short notice in response to changing circumstances. Countervailing strategy will also require improved communications with the forces to allow tailoring a specific response to more precisely fit the situation.

As long as ground-based command and control centers survive and retain communications, some flexibility is available to devise a previously unplanned response. Ground-based command centers have extensive communication internetting and computers to handle vast amounts of incoming data. As long as these facilities remain in operation, the ability to modify existing preplanned options or create new options would be limited mostly by response time requirements.

If the ground-based centers are destroyed or cannot maintain communication with nuclear forces, a timely response would depend on airborne command and communications capabilities. The single greatest limitation of the airborne command and control elements is the need for time-consuming manual processing of data. The National Emergency Airborne Command Post aircraft, for example, currently has no computer capability and only a limited onboard data base. Information received in a crisis must be collected and processed manually. Data retrieval depends on the memory and speed of the staff onboard. This is a limitation because of the large amount of data that would be needed to effectively change a preplanned option or create a new one.

A limited computer capability is being installed on the SAC airborne command post to improve battle management capability. An enhanced version of this system is to be deployed on the National Emergency Airborne Command Post and future airborne command posts. Current schedules indicate a prototype computer capability will be deployed in early 1982.

ENDURANCE OF THE C3 NETWORK

The requirement for enduring control over surviving forces places new demands on a C3 network designed primarily for peacetime operation or a one-time spasm response. Strategic C3 systems must be able to effectively perform their mission in the event of a protracted conflict, possibly involving multiple nuclear exchanges and lengthy periods of high alert status. As a result, system endurance must be improved to provide weeks or months of enduring performance.

DOD requires that the C3 networks have a capability to endure at least as long as the weapon systems they support. If protracted nuclear conflict were to occur, the ability to reconstitute a C3 capability and control remaining forces might be the most important factor in determining the eventual outcome. If one side had a superior ability to maintain or restore control over surviving weapons, it would provide a significant postattack advantage.

In the event of a large-scale attack on the C3 network, only the airborne elements of the current C3 network are likely to survive. Enduring airborne mobility creates major support problems. Even with aerial refueling, surviving E-4 aircraft can remain continuously in the air for only a limited time. After that time, airborne elements must find a suitable landing strip for resupply and maintenance and maintain runway alert or relaunch in case of subsequent attack.

Enduring mission capability for airborne C3 systems does not necessarily require that the aircraft be continually in the air. It is necessary, however, that the aircraft be aloft or dispersed during an attack if they are to have a high probability of surviving. Depending on the condition of the environment and jamming threat, communications channels may be restricted to line-of-sight radio frequencies and the aircraft may have to be airborne to communicate.

DOD is currently working on methods to provide for long term endurance of C3 assets. Possible solutions include mobile ground-based command centers and mobile support facilities for airborne assets. The expensive and sophisticated equipment needed for survivable force management and the limited funds made available to procure them are the principal restraints on the future endurance of C3 systems.

IMPLICATIONS OF C3 LIMITATIONS

Disruption of the C3 network would limit the utility of U.S. strategic forces. In a large-scale attack, destruction of C3 systems could prevent the control and use of many surviving forces. In a limited attack or crisis situation, inadequate flexibility and endurance in a degraded C3 network could lead to unwanted escalation by restricting available response options.

The degree to which C3 systems can function in an attack or crisis may depend on the willingness of the Soviets to attack the C3 network. Soviet doctrine gives high priority to attacking an enemy's C3 systems. C3 vulnerabilities could allow an attacker to choose the degree of control it wants the United States to have over its forces in a crisis.

Because the attacker can choose the objective and nature of an attack most advantageous to it, there is doubt whether the desired response will precisely fit a preplanned U.S. option. Use of preplanned options with strategic objectives in limited situations could escalate the level of nuclear conflict.

CONCLUSIONS

If effective deterrence in the 1980s requires an ability to fight a limited protracted nuclear war, then improvements of the existing strategic C3 network must be assigned a high priority. C3 is critical to effective deterrence and control of escalation if deterrence fails. The survivability, flexibility, and endurance of C3 systems must be comparable to that of strategic forces. In the 1981 annual report, however, the Secretary of Defense said that U.S. ability to meet these objectives falls considerably short. If the United States is to maintain deterrence until new weapons are deployed in significant numbers, the current C3 network must be rapidly improved.

CHAPTER 4

WEAPON SYSTEMS MUST BE IMPROVED TO FULLY IMPLEMENT COUNTERVAILING STRATEGY

The current Triad forces were not designed to carry out the employment strategy that has evolved through the 1970s. In our opinion, certain of the required characteristics we believe are needed are available in elements of the current Triad, but existing weapon systems do not have the proper combination of characteristics needed to ensure that an effective response can be carried out against the full range of targets under all the circumstances inherent in countervailing strategy.

In terms of the required performance characteristics defined by us and combinations of those characteristics, we believe

- none of the Triad components combine both timeliness and strong hard target capability;
- the most effective hard target kill capability is in the bomber force, but it would not be timely in many instances and the capability of existing aircraft to penetrate unsuppressed Soviet defense is expected to decline;
- an ability to destroy soft point targets while limiting unwanted collateral damage also exists only in the bomber force; and
- the only weapon systems exhibiting both strong survivability and endurance are in the sea-based force, but they have no precision strike capability and there are limits on their communication capabilities.

The following sections evaluate the capabilities of the land-based, sea-based, and airbreathing components against the characteristics of survivability, endurance, assured penetration, precision strike, and timeliness (including retargeting capability) discussed in chapter 2. By this evaluation, we do not conclude that all weapon systems should have a complete combination of all the identified characteristics. The following sections describe the characteristics of the land-based, sea-based, and bomber forces.

CHARACTERISTICS OF THE LAND-BASED ICBM FORCE

The ICBM force has a strong capability in terms of time urgency that is vital to carrying out countervailing strategy. Yet, survivability of ICBMs to a disarming Soviet strike is eroded, endurance is short, many Soviet targets hardened against nuclear effects can not be destroyed with confidence, and accuracy and yield

combinations are not appropriate for destroying soft point targets while limiting unwanted collateral damage.

The table below describes the ICBM force in late 1980.

<u>Missile</u>	<u>Number</u>	<u>Date of deployment</u>	<u>Warheads</u>
Titan	a/52	1963	Single
Minuteman II	450	1965	Single
Minuteman III	550	1970	Three (MIRV)

a/Two nonoperable Titan IIs are not included.

DOD is developing a new missile which is to have significantly greater capabilities than existing ICBMs. The MX missile, currently scheduled for deployment in the mid-1980s will carry 10 MIRVs and is expected to have high accuracy. The MX missile is intended to provide better endurance, hard target kill capability, and retargeting capability than existing ICBMs. Plans also provide for a MX basing scheme to ensure the survivability of an adequate number of ICBM warheads.

Several programs are also underway or have been proposed to improve the Minuteman III system, particularly endurance, retargeting capability, and capability to destroy hard targets.

The following chart describes our evaluation of the characteristics of the ICBM force, including existing ICBMs, certain modification programs for the existing force, and the MX.

**CHARACTERISTICS OF STRATEGIC
WEAPON SYSTEMS EXISTING IN 1980
AND PROGRAMED FOR THE FUTURE
(LAND BASED)**

SYSTEM	PRELAUNCH SURVIVABILITY (SYSTEMS ON ALERT)	ENDURANCE	ASSURED PENETRATION	PRECISION STRIKE		TIMELINESS		ESTIMATED AVAILABILITY
				HARD TARGET KILL	LIMIT COLLATERAL DAMAGE	WEAPON TRAVEL TIME	RETARGETING	
EXISTING SYSTEMS								
TITAN	WEAK	WEAK	STRONG	WEAK	WEAK	STRONG	WEAK	1963
MM II	WEAK	WEAK	STRONG	WEAK	WEAK	STRONG	WEAK	1965
MM III	WEAK	WEAK	STRONG	WEAK	WEAK	STRONG	WEAK	1970
MM III/MK12A	WEAK	WEAK	STRONG	WEAK	WEAK	STRONG	WEAK	1980
PROGRAMED/PROPOSED								
M III/MK12A W/ ALCS III AND MESP	WEAK	MODERATE	STRONG	WEAK	WEAK	STRONG	STRONG	1984
MX WITH MAP BASING	MODERATE	STRONG	STRONG	STRONG	WEAK	STRONG	STRONG	1986-1989

MK-12A IS A LARGER YIELD WARHEAD BEING INSTALLED ON SOME MM III MISSILES.
ALCS III IS THE AIR LAUNCH CONTROL SYSTEM, PHASE III, WHICH IMPROVES RETARGETING.
MESP IS THE MK MINUTEMAN EXTENDED SURVIVABILITY PROGRAM DESIGNED TO INCREASE ENDURANCE.

Prelaunch survivability

As a result of improvements in the technology of Soviet ICBMs now being deployed, the U.S. land-based forces have become the least survivable component of the strategic Triad. Although Titan and Minuteman silos are hardened to withstand some nuclear effects, they are not sufficiently hardened to withstand the accuracy and yield combination of modern Soviet ICBMs. According to DOD, in the early 1980s the Soviets will have sufficient quantities of modern ICBMs (with sufficient accuracy and yield) to eliminate most of the U.S. silo-based forces or individual silos could be eliminated at will.

The current Soviet modernization program that threatens the U.S. ICBM force is expected to be completed in the early 1980s. The Soviets could have enough ICBM launchers capable of high yields and high accuracy to launch an effective two warhead per silo attack on the U.S. ICBM force using less than a third of its total ICBM force. SAC estimates survivability of existing ICBMs to a Soviet first strike to be low. Little can be done to improve the survivability of ICBMs in silos in the early-to-mid-1980s.

Current plans call for deployment of the MX missile on a mobile launcher that will allow each missile to be stored in any one of 23 horizontal shelters. If the location of the missile can be concealed, the Soviets would have to attack all 23 shelters to ensure destruction of the missile. By deploying 200 missiles in 4,600 shelters, the United States will produce an exchange ratio more favorable to the United States and significantly reduce the attractiveness of the land-based forces to a Soviet strike. The number of missiles and shelters is designed to provide an adequate number of surviving warheads after a Soviet first strike without warning.

Even with this basing, the MX will not restore equilibrium between U.S. and Soviet ICBM forces until the late 1980s at the earliest. Most of the 200 MX missiles planned will have to be deployed with the 4,600 shelters to ensure that the Soviets must use the majority of its ICBM force to eliminate the MX missiles. If the Soviets continue to increase the numbers of accurate warheads in their inventory beyond that expected by the United States, the number of MX shelters and missiles may have to be increased further to maintain a favorable exchange ratio. Significant schedule delays in MX deployment will extend this period of ICBM vulnerability regardless of future Soviet improvements.

A possibility for improving ICBM survivability against a first strike is development and deployment of an antiballistic missile (ABM) defense system. While a research and development program for an ABM system has been funded, no plans have been made for production or deployment. Under the current ABM treaty

provisions, the Soviet Union has maintained an active ABM site to protect Moscow. The United States built one ABM site to protect its missile fields, but it is no longer operational. Deployment of an ABM system has been considered as an aid to ICBM survivability and as a complement to MX if the Soviets continue an aggressive ICBM modernization program. We issued two reports which examined the potential for an ABM system as an aid to ICBM survivability. Our report, C-PSAD-81-2 issued on November 12, 1980, stated that the Low-Altitude Ballistic Missile Defense System appears to be an economical option for maintaining MX system survivability. Our report, C-MASAD-81-5 issued on February 28, 1981, stated that the need for designing the Low-Altitude Ballistic Missile Defense System to defend the Minuteman Missile is questionable.

We also recognize that proposals have been advanced to eliminate ICBMs in favor of a survivable missile with hard target kill capability in the sea-based force. Since elimination of the ICBM component would depart from the concept of the Triad, we have not evaluated the pros and cons of putting such a missile at sea as an alternative to MX.

Endurance

The endurance of ICBMs is limited by the continued availability of electrical power. Although human factors, maintenance, and supplies may pose endurance problems, electrical power to operate the silos (Titan and Minuteman missiles require a constant power supply) is the most limiting factor. Primary power for ICBM silos includes commercial power for day-to-day operations, with individual diesel generators for backup power. The diesel generators are not fully hardened and currently are vulnerable to both direct attack and other nuclear effects.

If an attack disrupts primary power, ICBM silos are intended to operate on internal emergency batteries until primary power can be restored. Depending on the size and type of attack, reconstitution of primary power could take days or even months. ICBM silos currently have limited emergency battery power to maintain the missile available for launch. Because the loss of ICBMs would eliminate the U.S. capability to even challenge hardened targets in a time-urgent manner, there could be pressure to strike those targets while the capability existed. The deliberation and control sought under countervailing strategy which is essential to crisis stability probably does not exist in the current ICBM force.

A Minuteman Extended Survivable Power (MESP) program has been proposed to provide lithium batteries in the silos to increase Minuteman endurance, but the improvement may not be sufficient to fully implement countervailing strategy. The Air Force estimates the batteries will increase the emergency power capability, but DOD has not established whether this increase, coupled with the possible restoration of primary power, is adequate. The cost

of MESP for 550 Minuteman III silos is estimated at \$283 million (1980 dollars).

MESP has been the subject of debate within DOD. There is a reluctance to spend a considerable amount of money to improve the endurance of what is perceived as a nonsurvivable system. On the other hand, some Minuteman missiles would likely survive even a full-scale Soviet strike. Since the Minuteman III provides a capability for a time-urgent response and with the MK-12A warhead, it is the best existing capability for destruction of many categories of Soviet targets; the Air Force argues that MESP is essential.

The endurance of the MX could be much greater than Minuteman because the MX missile, unlike the Titan and Minuteman missiles, is to be capable of going into a dormant state when commercial power is lost, thereby preserving available emergency power supplies. However, after the MX missile goes into a dormant state, it will take some time to bring the missile back to full capability. Thus, for that period of time the MX may be incapable of a timely response.

Assured penetration

There is a high degree of assurance that ICBMs that survive and endure will launch, penetrate, and arrive at the target area. The weapon system reliability of ICBMs is high. Minuteman missiles can be launched from ground-based launch control centers, and if those facilities are destroyed, from airborne launch control aircraft.

Long term research and development programs have been underway for years to develop penetration aids and techniques (such as maneuvering reentry vehicles) to retain the high probability of penetration if Soviet defensive capabilities improve.

The MX missile is expected to also have high launch reliability and a high degree of capability to penetrate Soviet defenses. While Soviet technological breakthroughs are possible, DOD officials expect penetration capabilities of U.S. ballistic missiles to remain high through the 1980s.

Precision strike capability

Precision strike capability is dependent on weapon yield and accuracy. The low accuracy in the Titan II makes its utility low for any precision capability. Similarly, the Minuteman II does not have the accuracy to be considered a precision strike weapon.

Minuteman III missiles, the most sophisticated and accurate ICBMs in inventory in 1980, have warhead yields that are relatively low and three warheads per missile. The probability of damage to a Soviet target hardened to 2,000 pounds per square inch (psi) with a single Minuteman III/MK-12 warhead is low.

Existing ICBMs have no meaningful single-shot capability for destroying Soviet targets that have been substantially hardened (possibly command bunkers and certain ICBM silos), even though countervailing strategy increased the emphasis on striking those targets. The low single-shot probability of damage of Minuteman III against these targets would require use of several warheads against each target. However, the limited number of U.S. ICBM warheads currently available effectively precludes multiple warhead attacks on the large number of hard or superhard Soviet targets (i.e., missile silos, nuclear storage sites, and C3 facilities).

Three hundred Minuteman III missiles are being equipped with three MK-12A warheads (the same warhead planned for use on the MX) which will increase the warhead yield, slightly improving the probability of damage against a 2,000 psi target. That program, involving only minimal accuracy improvement, is scheduled for completion in 1983.

The MX missile is planned to feature high accuracy as well as the larger warhead, considerably improving U.S. hard target kill capability. MX would have a strong capability against both hardened and superhardened targets.

MX missiles are expected to carry 10 MK-12A MIRVs targetable warheads. This warhead loading helps to offset the Soviet advantage in quick response hard target capability, but we believe the large number of relatively high yield warheads makes it inappropriate for efficient limited strikes on soft point targets where limiting collateral damage is important.

The accuracy of existing Minuteman missiles could possibly be improved before large-scale deployment of the MX system. SAC officials believe Minuteman III/MK-12A probability of damage against a 2,000 psi target could be improved with improvements to guidance software. Preliminary program estimates indicate these improvements could be completed by 1983 or 1984 at a cost of \$100 million (1980 dollars). SAC officials said there are several alternatives for improving the Minuteman II system. For example, they believe a high probability of damage for the single warhead, Minuteman II, could be achieved with a modified reentry vehicle and installation of the Minuteman III guidance system with software improvements. Preliminary estimates indicate this program could not be completed until the mid-1980s. It would cost about \$1.3 billion for the 450 missiles (1980 dollars).

The U.S. ICBM inventory lacks a low yield, high accuracy single warhead weapon that would provide a timely precision strike capability ideal for countervailing strategy.

Timeliness

The response time of the land-based ICBM force is the best available in U.S. strategic forces. The survivable real time

communication links between NCA, launch control centers, and missile silos and short flight time (about 30 minutes) of the missiles make land-based ICBMs the most timely weapons in the U.S. arsenal. Because the SAC airborne command post can launch Minuteman ICBMs, a short response time can be achieved by ICBMs, presuming silos have survived and missiles have power to operate.

Although existing ICBMs have some retargeting flexibility, there is little capability for rapidly entering new (previously unprogramed) targets in a postattack environment. Current ICBMs have a limited number of targets preprogramed into the missile. Preprogramed targets can be selected by either the ground launch control center or the airborne launch control aircraft (except for Titan II).

In a postattack environment, decisionmakers would probably be restricted to the preprogramed targets in the Titan and Minuteman II missiles. Entering new targets in these missiles requires preparation of new target tapes at SAC Headquarters and manual installation of the new tapes.

Minuteman III missiles can be remotely retargeted from the ground launch control centers, but these facilities would probably be destroyed in an attack. A program is underway to allow retargeting from airborne launch control aircraft and airborne command post aircraft. This program, known as Airborne Launch Control System (ALCS) Phase III (ALCS III) also will allow command authorities to identify ICBMs that have survived an attack and the targets or target sets that are preprogramed into those missiles. The command authorities can then remotely select a preprogramed target or retarget the missiles to new targets to ensure coverage of priority targets.

ALCS III capability is scheduled to be complete for 200 of the 550 Minuteman III missiles in 1985 at a cost of \$143.5 million. DOD requested funds for ALCS III in the fiscal year 1982 budget.

As the survivability of silo-based ICBMs decreases, the retargeting flexibility of surviving missiles becomes increasingly important. The Soviet capability to destroy ICBMs could eliminate U.S. ability to responsively strike certain Soviet targets, thereby providing an incentive for the Soviets to limit the damage the United States could inflict in a retaliatory strike. However, if the United States can ensure that important targets will be destroyed by whatever missiles survive (even if it is only a small part of the force), the incentive for the Soviets to attack could be lessened.

The MX system is being designed to permit retargeting of missiles from an airborne launch control aircraft. The Air Force established a requirement that MX missiles be capable of rapid retargeting to both preprogramed and new targets.

Observations

Survivability will continue to be the most significant weakness in the land-based ICBM force, at least until the late 1980s. While the capabilities of some Minuteman III missiles can be improved in terms of endurance, precision strike capability, and retargeting flexibility, they remain vulnerable to a Soviet strike; therefore, funding for some programs to improve the utility of Minuteman III missiles has been resisted. However, some scenarios involving limited nuclear strikes presume that Minuteman would not be attacked, at least initially, or that a Soviet strike would not be a surprise--therefore, some officials believe they should have the highest utility possible.

CHARACTERISTICS OF THE SEA-BASED FORCE

Submarines at sea equipped with SLBMs offer the highest pre-launch survivability of any component of the Triad. Most warheads are relatively small, and most missiles carry a number of MIRV warheads; thus, the utility of an SLBM is primarily for grouped urban industrial or nonhardened military targets. The yield and limited accuracy of the missiles available (A-3, C-3, and C-4) reduces the suitability of SLBMs in precision strikes when the objective is to destroy hard targets or selectively destroy targets while limiting collateral damage.

In late 1980 the sea-based force consisted of:

<u>Submarine</u>	<u>Number</u>	<u>Launch tubes</u>	<u>Missile type</u>	<u>Nominal range</u>
Polaris	5	16	A-3	2,500 nautical miles
Poseidon	26	16	C-3	2,250 nautical miles
Poseidon	5	16	C-4	4,000 nautical miles

Trident submarines with 24 launch tubes are in production, with the first delivery planned in 1981. They will be equipped initially with C-4 missiles. Twelve of the Poseidon submarines are being backfitted with the C-4 missile, with the last one to be completed in fiscal year 1982. Polaris submarines are to be assigned to tactical submarine roles or decommissioned in fiscal years 1980 through 1982. A larger missile, the Trident II or D-5, is in the early stages of development. Conceptually, that missile would have the same long range as the C-4 but carry larger warheads or a larger number of the C-4 warheads with higher accuracy.

The following chart summarizes our evaluation of the capabilities of the sea-based force and programs proposed to retain or improve the capabilities.

**CHARACTERISTICS OF STRATEGIC
WEAPON SYSTEMS EXISTING IN 1980
AND PROGRAMED FOR THE FUTURE
(SEA BASED)**

SYSTEM	PRELAUNCH SURVIVABILITY (SYSTEMS ON ALERT)	ENDURANCE	ASSURED PENETRATION	PRECISION STRIKE		TIMELINESS ¹		ESTIMATED AVAILABILITY (FOC)
				HARD TARGET KILL	LIMIT COLLATERAL DAMAGE	WEAPON TRAVEL TIME	RETARGETING	
EXISTING SYSTEMS								
POLARIS/A-3	STRONG	STRONG	MODERATE	WEAK	WEAK	MODERATE	WEAK	1960
POSEIDON/C-3	STRONG	STRONG	STRONG	WEAK	WEAK	MODERATE	WEAK	1965
POSEIDON/C-4	STRONG	STRONG	STRONG	WEAK	WEAK	MODERATE	WEAK	1980
PROGRAMED/PROPOSED								
TRIDENT/C-4	STRONG	STRONG	STRONG	WEAK	WEAK	MODERATE	WEAK	1981
TRIDENT/C-4 WITH IMPROVED ACCURACY	STRONG	STRONG	STRONG	WEAK	WEAK	MODERATE	WEAK	1989
TRIDENT/D-5	STRONG	STRONG	STRONG	MODERATE	STRONG	MODERATE	WEAK	1989

¹ CONSIDERS POTENTIAL COMMUNICATIONS DIFFICULTIES

Prelaunch survivability of SSBNs

Although SSBNs in port could be destroyed by a Soviet strike, Navy officials said SSBNs at sea are virtually invulnerable to Soviet antisubmarine warfare systems for the foreseeable future. Although not all SSBNs are maintained at sea, Navy officials said the percentage of submarines at sea can be increased rapidly.

The Navy considers the key to continued survivability to be an increase in the size of submarine patrol areas by procuring longer range missiles and reducing submarine noise levels. The area where SSBNs can routinely patrol is limited by the range of the missiles, the home port of submarines, and the location of their targets. The Poseidon submarine equipped with C-3 missiles with a nominal range of 2,250 miles has an average 2.5 million square miles of patrol area available. Backfitting Poseidon submarines with C-4 (Trident I) missiles with a nominal range of 4,000 miles extends the patrol area by a factor of 5 to 8 in the Atlantic and Pacific, respectively, thereby greatly complicating Soviet attempts to locate the submarines. The Trident submarines equipped with C-4 missiles will enjoy the same large patrol area.

Poseidon SSBNs with shorter range C-3 missiles are scheduled for retirement beginning in 1992. Poseidon submarines with long range C-4 missiles and Trident submarines (also with C-4 missiles or D-5 missiles) are expected to remain survivable well into the 1990s unless a major technological breakthrough in antisubmarine warfare is developed by the Soviets.

Endurance

The SSBN fleet is the most enduring leg of the strategic Triad. Polaris/Poseidon patrols are currently 68-day cycles with a capability to remain at sea even longer without resupply. Navy officials indicated that crew provisions were the limiting factor, but SSBNs could be resupplied at sea if necessary. The Navy contends the SSBNs can meet endurance requirements of an extended scenario.

Assured penetration of SLBMs

As with ICBMs there is a high probability that SLBM warheads will reach the targets. The principal restraint on SLBM probability of arrival is weapon system reliability. Neither the Polaris (A-3) weapon system nor the C-3 missile have estimated reliability as high as Minuteman ICBMs. Navy officials said that tests indicate the C-4 missile will have weapon system reliability as high as land-based ICBMs.

Precision strike capability

Currently available SLBMs, including C-4 missiles now being deployed, have relatively little precision strike capability. Designed to attack nonhardened targets, the yield and accuracy combination of the existing SLBMs seriously limit their effectiveness against hard targets. No operational missile approaches the accuracy and yield the Navy believes is needed to ensure that SLBMs can destroy all types of Soviet targets. The Trident II, or D-5 missile, is being considered for development. Navy officials said that the D-5 missile would probably have two types of warheads. One with a MK-12A class warhead, coupled with expected accuracies, would provide a moderate hard target kill capability. Other D-5s would be equipped with a warhead which could provide a strong capability for limiting collateral damage in attacks against soft point targets. The estimated availability of the missile is the late 1980s. The Trident submarine is sized to accommodate this missile which is larger than C-3 and C-4 missiles.

Another SLBM issue is the utility of deploying large numbers of warheads per missile. The MIRVs deployed are products of the pre-ABM treaty era when one of the considerations was to overwhelm Soviet defenses with a large number of warheads. The Navy's primary rationale for continued development and deployment of large numbers of MIRVs per missile is that MIRVs are cost effective in terms of the relative number of launchers required to hit a given number of targets.

Timeliness

In a nuclear war, communications to submerged submarines is less secure and more time consuming than communication links to ICBMs. In a wartime environment, SSBNs would have to remain

submerged to maintain survivability. If enemy action prevented the use of routine channels, communications with submerged SSBNs would depend on the Navy airborne relay aircraft called TACAMO. Relay of an EAM through TACAMO can be a time-consuming process. In addition to the time it takes to relay the message to the TACAMO aircraft, additional time is needed for effective broadcast of the message to the submerged submarines.

SSBN fire control computers have the capacity to store target information. The targets are divided into "packages" of prestored target assignments. Each package contains flight data for each of the missiles and its warheads from a specific launch area. Retargeting all missiles on an SSBN from one package to another preprogrammed package would require less time than programming new targets.

Retargeting the warheads on one SLBM to a set of targets not prestored in the fire control computer would probably prevent a timely response against this type of target. The submarine fire control system has the capability to reprogram the targets.

Observations

Current and approved SLBM forces provide an effective, survivable capability for assured destruction and soft target missions. They are relatively ineffective against hard targets, and their accuracy and yield may preclude use in selective targeting options in which low collateral damage is a requirement. We believe the number of warheads per missile may also require inefficient use of some weapons under certain circumstances.

CHARACTERISTICS OF THE BOMBER FORCE

Of the three Triad components, the bomber force is potentially the most flexible and controllable, yet it is the slowest and may provide the lowest assurance of penetration to the targets.

The following table shows the strategic bomber force in late 1980.

<u>System</u>	<u>Number</u>	<u>Average age</u> (years)
B-52D	75	25.3
B-52G	151	22.7
B-52H	90	20.7
FB-111A	60	11.9

The bomber force is currently supported by 577 KC-135 aerial refueling tankers having an average age of about 25 years.

B-52s were produced in the 1950s and early 1960s for long-range delivery of nuclear weapons. Improvements have been made to B-52s over the years and are continuing. During the late 1960s and 1970s, FB-111 medium bombers were added to the force and short-range attack missiles were deployed with the B-52s and FB-111s. FB-111s are smaller and faster than B-52s but have lower payload capabilities and are more dependent on aerial refueling.

During the 1970s DOD pursued a series of programs to modernize the bomber force with emphasis on the development of the B-1 bomber. In 1977 the President directed accelerated development and deployment of air-launched cruise missiles (ALCMs) and termination of production of the B-1.

ALCM is a small, long-range cruise missile armed with a nuclear warhead which is to fly at subsonic speeds and low altitude and be highly accurate over distances exceeding 1,350 nautical miles. ALCM's long range permits bombers to launch these weapons hundreds of miles from their intended targets, making deep penetration unnecessary. The expected high accuracy and the currently planned warhead would make ALCM suitable for destroying hardened targets or striking other point targets while limiting collateral damage. Current plans call for production of over 3,000 ALCMs and modification of the B-52Gs to carry them.

The need for a new strategic aircraft to supplement and/or replace the B-52 has been debated for a number of years. Several programs were proposed to modernize the bomber force in the 1980s, including acquisition of a new cruise missile carrier, the B-1 or a close derivative, a new multirole bomber, and major modification of F-111D and FB-111A.

The Congress directed the Secretary of Defense in the fiscal year 1981 DOD authorization act to

- vigorously pursue full-scale engineering development of a strategic multirole bomber which maximizes range, payload, and the ability to perform the missions of conventional bomber, cruise missile launch platform, and nuclear weapons delivery system in both the tactical and strategic role;
- achieve an initial operational capability of a multirole bomber aircraft, as soon as practicable, consistent with the aircraft selected but not later than 1987; and
- submit a status report to the Senate and House Committees on Armed Services by March 15, 1981, on the results of the development effort to date.

The future capability of the bomber force and the appropriate mix of aircraft and weapons will hinge on the decision concerning acquisition of a multirole bomber.

The following table presents our assessment of the bomber force with respect to the characteristics needed to carry out a countervailing strategy.

CHARACTERISTICS OF STRATEGIC
WEAPON SYSTEMS EXISTING IN 1980
AND PROGRAMED FOR THE FUTURE
(AIRBREATHING)

SYSTEM	PRELAUNCH SURVIVABILITY (SYSTEMS ON ALERT)	ENDURANCE	ASSURED PENETRATION	PRECISION STRIKE		TIMELINESS		ESTIMATED AVAILABILITY (FOC)
				HARD TARGET KILL	LIMIT COLLATERAL DAMAGE	WEAPON TRAVEL TIME	RETARGETING	
EXISTING SYSTEMS								
B-52D (GRAVITY)	STRONG	MODERATE	WEAK	WEAK	WEAK	WEAK	WEAK	1957
B-52G/H (GRAVITY)	STRONG	MODERATE	WEAK	WEAK	WEAK	WEAK	WEAK	1959/1962
B-52 (SRAM)	STRONG	MODERATE	WEAK	WEAK	WEAK	WEAK	WEAK	1962
FB-111A (SRAM)	STRONG	MODERATE	WEAK	WEAK	WEAK	WEAK	WEAK	1971
FB-111A (GRAVITY)	STRONG	MODERATE	WEAK	STRONG	STRONG	WEAK	WEAK	1971
PROGRAMED/PROPOSED								
B-52G/ALCM	STRONG	MODERATE	STRONG	STRONG	STRONG	WEAK	WEAK	1982
B-52H/OAS	STRONG	MODERATE	WEAK	STRONG	STRONG	WEAK	WEAK	1982
NEW BOMBER	STRONG	STRONG	?	STRONG	STRONG	WEAK	?	1987

SRAM-SHORT RANGE ATTACK MISSILE
ALCM-AIR LAUNCHED CRUISE MISSILE
OAS-OFFENSIVE AVIONICS SYSTEM

Survivability

To survive, U.S. bombers and tankers must escape from their bases before Soviet warheads arrive. The primary threat to bomber survivability is Soviet SLBMs, which could reach many U.S. bomber bases 12 to 15 minutes after launch. With timely tactical warning, DOD officials believe a high percent of the bombers and tankers on day-to-day alert (30 percent of the bombers and tankers) can be launched and escape destruction. Those not on alert are likely to be destroyed.

The Air Force has considered several methods of maintaining bomber survivability, including increasing the day-to-day alert rate, making improvements to existing bases, and relocating bombers and tankers from coastal to inland bases. SAC is prepared to increase the alert posture of the bomber force and/or disperse aircraft to more secure bases if the number or position of Soviet submarines jeopardizes alert aircraft.

The fiscal year 1981 DOD authorization act included an initiative for a multirole bomber to be fielded by 1987. Clearly, escape time, basing, and ability to use alternate bases will be important issues in designing such an aircraft. We presume the survivability will be at least as high as existing bombers.

Endurance

SAC has demonstrated the ability to keep 30 percent of the bomber force on constant ground alert and get a high percent of the force in an alert status in a relatively short period of time. How long the force could remain ready during a period of national crisis or chaos is unknown. An extended, limited nuclear war would severely stress the current bomber force. The endurance time of the existing bomber forces is unknown; however, we believe the collective effect of several factors make it unlikely that the total bomber force could endure for 30 days under some circumstances. Factors limiting the endurance of the bomber force under stressed conditions include reliability of aircraft systems and subsystems as well as maintenance requirements, aircrew availability, and sufficient tanker support.

Complex bomber systems and subsystems fail unexpectedly after only a few hours of use. Many of the current electronic systems are 20 years old, unreliable by today's standards, and costly to maintain. A sustained alert of the full force could stress maintenance and logistics capabilities. In time, mission-essential systems fail, reducing the likelihood that surviving aircraft will succeed in their mission.

The Air Force is modernizing B-52 offensive and defensive systems to improve reliability, reduce support costs, and provide capabilities needed to deliver cruise missiles during the 1980s and early 1990s. The reliability of the aircraft is thus likely to increase. However, support at alternate bases, experience of crews, and availability of tanker support are still concerns.

During periods of high international tension or when strategic warning of attack is received, some bombers would proceed to dispersal bases. Alternate bases, however, lack the logistics and maintenance support needed to sustain the bomber in an alert condition for more than several days.

The availability of qualified trained personnel could affect SAC's ability to sustain the bomber force in a high state of alert. Experienced aircrew and maintenance personnel have been leaving the Air Force in sizable numbers. As a result, the experience level of SAC flight and maintenance crews has fallen significantly. Unless these trends are reversed, a generated alert posture may be difficult to sustain.

Aerial refueling requirements have increased markedly since KC-135 tankers were produced in the late 1950s and early 1960s. Recent Air Force analyses show strategic and other requirements significantly exceed available tanker resources. For example, a 1980 SAC analysis of tanker force requirements shows 726 tankers are needed in 1980 to support the fully generated bomber force.

Today, SAC has 577 tankers to meet refueling requirements. Lacking sufficient refueling resources, SAC officials said they

would have to limit low altitude penetration time for some bomber missions even though this increases the risk of attrition. The Air Force has proposed reengining KC-135 tankers with modern fuel-efficient engines to provide additional strategic refueling capability. Also, it is acquiring KC-10A tankers to increase non-strategic (airlift and tactical) refueling capability.

We presume a new bomber would be designed to consider reliability maintenance and a lessened need for tanker support, making it a more endurable aircraft under stressed conditions.

Assured penetration

The ability of a manned bomber to penetrate to its targets depends on the number of aircraft engaged in the attack and the capability of the defenses. The need to execute limited attacks that is inherent in countervailing strategy requires that bomber penetration capability be considered against unsuppressed defenses. This analysis results in a low probability of penetration for existing bombers. Against suppressed defenses, penetration capability would be higher.

Some important factors affecting the ability of bombers to penetrate Soviet defenses include the size of the attacking force, the degree to which defenses are suppressed by preceding missile attacks, the quality of the defenses, and the effectiveness of ECM carried aboard the bomber.

In a general nuclear war scenario in the early 1980s, B-52s and FB-111s could probably penetrate Soviet defenses at low altitude with moderate success because of the size of the attacking force and probable suppression of defenses by preceding missiles.

As ALCMs enter the bomber force during the 1980s, the number of penetrating vehicles in a retaliatory attack could increase significantly, since each fully modified B-52/ALCM carrier could launch 20 ALCMs. ALCM's small size and low altitude flight capability are expected to make detection and interception more difficult than a manned bomber. Launched in large numbers, ALCMs are expected to dilute Soviet defenses, facilitating their penetration as well as that of manned penetrators.

While ALCM is being acquired to reduce bomber penetration requirements, it does not eliminate the need. Air Force and DOD studies confirm the need for a mix of ALCM carriers and penetrating bombers in the future airbreathing force. Complete reliance on ALCM could allow the Soviets to concentrate their defenses on defeating the missile and/or its carrier.

ECM effectiveness is another critical factor influencing bomber penetration in the future. SAC's comprehensive analysis of bomber defensive systems completed in 1978 shows that existing and then-planned ECM systems would not be sufficiently effective against the evolving Soviet threat. The study showed a low

probability of arrival in the mid-1980s when bombers with current and then-planned ECM penetrate without benefit of preceding ballistic missile attacks. The analysis recommends rapid development and incorporation of several ECM improvements. The highest priorities were assigned to an effective monopulse countermeasure to defeat the improved capabilities forecast for Soviet airborne interceptors and countermeasures to degrade Soviet long-range detection systems, including early warning, ground control intercept, and Soviet airborne warning and control systems.

In 1979 SAC issued a statement of operational need for development of required ECM improvements for the B-52. Although the Air Force did not approve a complete ECM improvement program, an urgent program was initiated to develop countermeasures to Soviet monopulse systems which are a potential threat to strategic as well as tactical aircraft. Whether an effective system can be developed and deployed by the mid-1980s is uncertain.

Existing bombers would have greater difficulty penetrating Soviet defenses in a limited nuclear response. Since limited attacks must clearly be perceived as limited, the size of the attacking force would be smaller and the defense degradation provided by preceding ballistic missiles might not be present. Under such circumstances we believe the penetration success would be low.

The addition of ALCM to the bomber force does not substantially improve current bomber capability in limited responses against Soviet targets. ALCM, though small and low flying, can also be detected by Soviet systems. By the late 1980s, the current generation of ALCM is also expected to be vulnerable to improved Soviet defenses. However, the capability of the bomber force to successfully carry out limited nuclear responses outside the heavily defended Soviet Union is considered to be strong.

DOD contends that aircraft of existing technology will not successfully penetrate unsuppressed Soviet defenses in the late 1980s and 1990s. Accordingly, unless a bomber capable of avoiding advanced Soviet defenses is produced, the utility of the bomber force for limited attacks against deep Soviet targets will decline further.

Precision strike capability

A limited nuclear response requires weapons which can destroy assigned targets with certainty while minimizing undesired damage to adjacent facilities or population centers. These requirements demand high aircraft navigation accuracy and weapons yields appropriate to target hardness. Of the strategic nuclear weapons available, those carried by bombers (gravity bombs and ALCM in the early 1980s) come closest to meeting these requirements. Today, only bomber-delivered weapons have yields that could be appropriate for soft point targets when it is desirable to limit collateral damage.

Delivery accuracy improvement expected from the B-52s new bombing and navigation system significantly increases bomber precision strike capability, including destruction of superhard targets. The introduction of ALCM into the bomber force, beginning in September 1981, is expected to provide even greater precision to the bomber force. This weapon is designed for a very high probability of damage against hard targets coupled with a lower yield warhead which is able, if needed, to destroy soft targets while limiting unwanted collateral damage.

Timeliness

While ICBMs and SLBMs can strike targets quickly after launch, bombers may take 12 to 14 hours to reach their targets. There is little that can be done, short of foreign basing, to improve the response time of bombers. However, there are many situations where response time might not be critical. Indeed, the long delay between bomber launch and arrival on target provides NCA the capability to demonstrate resolve without detonating a nuclear weapon. Also, for some situations, a response in 12 to 14 hours could be appropriate.

Bombers are the most controllable of strategic systems because they can be redirected or recalled while enroute provided communications can be maintained. If NCA were to reorder target priorities or change targets considerably, mission planning information would have to be transmitted to the bomber crew, received, authenticated, and acknowledged. Effective, long-range, secure C3 is necessary for NCA to exploit the bombers' retargeting flexibility. However, limitations in current C3 systems, particularly their limited survivability and range in a nuclear environment, make continuous communication with attacking bombers difficult.

The current ALCM must be programmed before launch with the precise route to its target. Programming an ALCM mission is a complex task requiring a sophisticated computer program and a geographic and threat data base. It cannot be done aboard a bomber. Consequently, one or more missions for each ALCM must be developed and provided to each bomber crew before takeoff. These constraints limit the use of ALCMs to the targets for which missions were prepared before bombers were launched.

Observations

Today, only bomber-delivered weapons (FB-111A) have the necessary combination of yield and accuracy to efficiently destroy both superhardened targets, such as Soviet ICBM silos and other point targets, while limiting collateral damage. The bomber force offers capabilities advantageous for limited nuclear warfare in which deliberation, control, and measured response are desirable. Yet, aging aircraft systems have low reliability and are costly to maintain, and improving Soviet defenses threaten to reduce the capability of existing bombers to penetrate to the targets.

CONCLUSIONS

We believe weapon systems in inventory in 1980 do not provide the appropriate combinations of characteristics necessary to fully carry out the countervailing strategy. Some programs approved through fiscal year 1980 for strategic force modernization will provide some of the characteristics we believe are needed, but others will remain unfulfilled.

The strengths and weaknesses of the Triad components in 1981 are summarized below.

<u>Characteristics</u>	<u>Triad components</u>		
	<u>Land-based</u>	<u>Sea-based</u>	<u>Bomber</u>
Prelaunch survivability (alert forces)	Weak	Strong	Strong
Endurance	Weak	Strong	Moderate
Assured penetration	Strong	Strong	Weak
Precision strike:			
Hard target kill	Weak	Weak	<u>a</u> /Weak
Limit collateral damage	Weak	Weak	<u>a</u> /Weak
Timeliness:			
Flight time	Strong	Moderate	Weak
Retargeting	Weak	Weak	Weak

a/Except for FB-111A which are considered strong.

CHAPTER 5

OVERALL CONCLUSIONS, RECOMMENDATIONS, DOD COMMENTS, AND OUR EVALUATION

OVERALL CONCLUSIONS

Maintaining deterrence in the 1980s by implementing the countervailing strategy will require improved capabilities in U.S. forces. However, strategic forces and C3 systems now in existence and those planned will not provide all the capabilities we believe are needed to fully implement the strategy. Also, the C3 network must be improved to better support a countervailing strategy.

In 1981 the administration and the Congress will be analyzing U.S. strategic force capabilities and the relationship of those capabilities to the growing Soviet threat and the evolving countervailing strategy for deterrence. We believe this assessment must take into full account the implications of countervailing strategy on performance characteristics required of strategic weapon systems and related C3 capabilities. Such a comprehensive analysis should produce a balanced acquisition strategy to meet those requirements.

Requirements for the 1980s

Countervailing strategy requires that strategic forces have a clearly evident capability to fight a limited nuclear war as well as ensure large-scale retaliation. If the current strategic balance provides opportunity or incentive for the Soviets to exploit their advantages in conventional and nuclear forces, then the United States could be vulnerable to coercion, limited aggression, and even limited nuclear attack until those advantages are offset.

To meet these objectives, U.S. forces must have appropriate combinations of characteristics, including

- survivable, enduring, and flexible C3 systems that permit deliberation and control over the forces continuously through a conflict;
- weapon systems survivable to Soviet attacks;
- endurance or continued readiness over a protracted period;
- assured penetration of warheads to targets;
- precision strike capability, including a capability to destroy hardened targets and a capability to limit unwanted collateral damage, while achieving the targeting objective; and

--timeliness or the capability to be launched and arrive on target in a short time frame, including a capability to be retargeted quickly.

Even though the countervailing strategy has been evolving since the early 1970s, we believe existing weapon systems do not have the proper combinations of characteristics we identified as needed to ensure that an effective response can be carried out against the full range of targets under all circumstances. For example, in terms of the required performance characteristics and combinations of those characteristics, we believe

--C3 must be improved if the United States is to effectively use existing weapon systems capabilities;

--none of the Triad components combine both timeliness and strong hard target capability;

--the most effective hard target kill capability is in the bomber force, but it would not be timely in many instances and its ability to penetrate unsuppressed Soviet defenses is expected to decline;

--an ability to destroy soft point targets while limiting unwanted collateral damage exists only in the bomber force; and

--the only weapon systems exhibiting both strong survivability and endurance are in the sea-based force, but they have no precision strike capability and there are limits on their communication capabilities.

While each component of the Triad provides certain needed performance characteristics, each has inherent limitations. Certain characteristics may be difficult or impossible to place in all or even some elements of the Triad. Future programs, therefore, must be designed to take full advantage of the strengths of the individual Triad elements to ensure that each element contributes as much as possible to our overall deterrent posture.

The land-based force

ICBMs offer many advantages. Known launch points make accuracy improvements less complicated than in SLBMs. Land basing in the continental United States facilitates two-way communication and flexibility even in a postattack environment. The high degree of flexibility, timeliness, and potential for precision strike capability makes ICBMs valuable strategic weapons.

The principal disadvantage of ICBMs is their vulnerability to a large-scale Soviet attack with no strategic warning. Combined with the high potential capability of ICBMs, the vulnerability could pose a significant incentive to the Soviets to attack them. Survivability will continue to be a problem until missiles are deployed in a basing mode that reduces the incentive to attack.

Minuteman III systems are being improved with higher yield warheads and proposals have been made to further improve their accuracy and endurance. Developing a point target capability where limited collateral damage is a consideration has not been emphasized in the ICBM force, yet the ICBM appears to be a suitable weapon for that capability, especially if time is also an important consideration.

The sea-based force

The sea-based force offers the highest survivability and endurance, and because of the large numbers of warheads, a significant capability for destruction of the Soviet urban/industrial complex. Timeliness could be a problem because its capability to receive communications in a stressed environment is limited. Accuracy is not adequate for hard targets and limited precision strikes.

The sea-based strategic nuclear force provides the backbone of U.S. deterrence against a large-scale attack. SSBNs have high survivability while on patrol due to Soviet inability to locate and attack them. To preserve the already high survivability of SSBNs, Trident submarines are being procured and Poseidon submarines are being backfitted with longer range C-4 missiles to increase their patrol area. The Navy expects the survivability of SSBNs at sea to remain high through the 1980s, even without the Trident submarine, unless the Soviets have a major technological breakthrough in antisubmarine warfare.

The utility of SLBMs in terms of countervailing strategy is limited by the lack of precision strike capability necessary to destroy hard targets or other targets while limiting collateral damage. The Soviet target base includes an increasing number of targets which would have to be attacked with precision. Even if SLBM accuracy were improved, we believe current warheads are too small to ensure hard target kill capability and too large for precision strikes where limited collateral damage is important. The number of warheads per missile could make a SLBM inappropriate for efficient limited targeting missions.

The airbreathing force

Potentially, manned bombers have excellent capabilities if timeliness is unimportant and defenses are suppressed. Although they would be slow to arrive, the mobility and precision strike capability provide a high degree of utility, particularly in more limited conflicts. Existing bombers, however, are expected to become increasingly vulnerable to Soviet defenses in the mid-to-late 1980s.

Because they are mobile, bombers offer high prelaunch survivability and a potential for adequate endurance. In the near future, the bomber force will be equipped with weapons and accuracy which would make them capable of destroying both hard targets

and soft point targets where limiting collateral damage is a consideration.

For striking targets other than in the Soviet Union, bombers are likely to be effective. Within the Soviet Union, the utility of the B-52s in the future depends on the speed with which the Soviets deploy advanced airborne defense systems, the extent to which Soviet defenses are suppressed before bombers begin to penetrate or launch cruise missiles, the size of the attacking force, and the effectiveness of ECM.

The future capability of the bomber force will depend, to a large extent, on the defenses being pursued by the Soviets and the U.S.' capability to develop aircraft, weapons, and ECM systems capable of defeating those defenses. Clearly, the multirole bomber to be defined in 1981 must be designed with attention to the characteristics required by countervailing strategy.

A balanced acquisition strategy is needed

Currently planned strategic modernization programs will enhance the capability for assured destruction but provide little improvement in the capability to deal with limited nuclear war. Important capability enhancements are concentrated in the MX, which will not be available in quantity until the late 1980s at the earliest. Inherent limitations of the airbreathing and sea-based components, however, limit their ability to provide critically needed combinations of characteristics. The thrust of current modernization programs are summarized below.

- The MX missile could significantly enhance the capability of the ICBM force in terms of hard target kill capability and endurance, but we believe the large number and size of warheads per missile could make it inappropriate for efficient use against soft point targets where limiting collateral damage is important.
- The survivability of the U.S. ICBM force could be improved by deploying MX in a mode that ensures that adequate numbers of MX missiles will be available under any circumstances.
- The Trident submarine, while modernizing the SSBN fleet in the 1980s, hedging against future Soviet threat developments, and providing a large capacity for missiles in terms of numbers and size, will not change the basic characteristics of the SSBN force or improve on its weaknesses in the 1980s.
- The C-4 missile maintains high survivability of SSBNs through its long range. It does not provide precision strike capability.

- The D-5 missile, if developed, could by the late 1980s begin providing the sea-based force with an improved ability to destroy hardened targets. Only the Trident submarine is designed to accommodate the larger missile.
- ALCM is intended to improve penetration capability of the bomber force but does not improve its endurance or timeliness.
- The proposed multirole bomber, depending on its design and equipment, has the potential for improving endurance and penetration capability of the bomber force.
- The programs that have been proposed would place a hard target kill capability against 4,000 psi targets in each component of the Triad. However, there has been limited emphasis on programs to provide a capability to destroy soft point targets with limited collateral damage.

Some opportunities are available

Some opportunities are available in existing systems and in new systems to improve their capability in terms of fighting limited nuclear war, but they have not been fully exploited. These programs include C3 improvements, improved endurance and retargeting capability in existing forces, and a capability for limiting unwanted collateral damage.

C3 improvements

If the United States is to maintain deterrence by developing a flexible employment capability until new weapons are deployed in significant numbers, the current C3 network must be improved to maximize that capability in existing weapons. Those improvements must be assigned a high priority.

The level of expenditure on strategic C3 systems appears inconsistent with the current U.S. deterrent strategy and nuclear weapon employment policy. The major difference between countervailing strategy and previous deterrent strategies--flexibility, responsiveness, and control--are primarily C3 functions. The survivability, flexibility, and endurance of the C3 network must be improved to better support a countervailing strategy.

Improved capability in ICBMs

Programs that could improve the capability of existing weapons to execute countervailing strategy have received limited support. Because needed improvements to the capability of existing bombers and SLBMs are also dependent on C3 improvements, the ICBM component of the Triad offers the best opportunity for rapid improvements. Uncertainty about the future role of Titan and Minuteman missiles, however, has hampered funding for these improvements.

A number of programs are underway or proposed to improve the capability of the Minuteman III force. The larger MK-12A warhead improves hard target kill capability. The ALCS III program, which would ensure retargeting capability in the event of a large-scale attack on the missile field, has been funded for a limited number of Minuteman III missiles. MESP, which would extend the endurance of Minuteman missiles, has been resisted by some DOD officials. Other programs are being devised to improve the accuracy of both Minuteman III and Minuteman II.

Although the long term mission of the Minuteman force is uncertain, it will be the mainstay of the land-based force through the mid-1980s. Under current schedules, large numbers of MX missiles will not be deployed until 1988. Even after full deployment, we believe MX utility against some targets will be limited by the large number of and size of MX warheads and will probably require retention of a portion of the Minuteman force.

Limiting collateral damage

High accuracy is a crucial element in destroying either hardened targets or other targets where it is desired to limit unnecessary collateral damage. We are not aware, however, of near term programs other than ALCM which combine high accuracy with a low yield. It appears that the slow arriving bomber force may have the only capability for certain situations requiring a limited precision strike with accuracy and warhead yields appropriate to target destruction with limitation of collateral damage.

RECOMMENDATIONS

Recommendation to the Secretary of Defense

We recommend that the Secretary of Defense develop an acquisition strategy that clearly delineates the programs needed to meet the requirements of countervailing strategy and shows the time frames when the capabilities can be available. This strategy should be outlined in a plan and submitted to the Congress as part of DOD's next annual budget presentation. At a minimum, this plan should

- clearly establish the objectives of countervailing strategy, define the critical characteristics of C3 and weapon systems, and establish performance requirements for those characteristics;
- identify the combinations of force characteristics needed to implement current strategy and the time frame in which they are needed;
- identify the specific programs designed to provide the needed characteristics and define the requirements for putting the characteristics in more than one component of the Triad; and

--provide an acquisition schedule showing when the needed characteristics can be available.

The growing Soviet nuclear capability and a change in U.S. deterrent strategy and nuclear weapons employment plans have produced new performance requirements for U.S. strategic forces. There is a need for reassessment of U.S. strategic acquisition programs to ensure they produce, at the earliest time, the weapons needed to implement the new strategy.

This reassessment must be based on a clear and common understanding within DOD and between DOD and the Congress concerning the objectives and intent of countervailing strategy and the characteristics of forces needed to implement it. Although countervailing strategy appeared in the fiscal year 1980 and 1981 DOD reports and PD-59 was announced in August 1980, we found no common understanding of the objectives of countervailing strategy, weapon system, and C3 characteristics needed to implement it or goals or standards for those characteristics. The critical characteristics discussed in chapter 2 and the goals or standards for their measurement were developed with the assistance of DOD officials. They generally agreed that the characteristics we evaluated were indeed critical, although they do not necessarily include all considerations of concern to DOD.

Recommendations to the Congress

As an aid to making informed judgments as to the extent to which DOD proposals for modification and acquisition of strategic offensive weapon systems meet the goals of countervailing strategy, we recommend that the Congress require the Secretary of Defense to carry out the recommendation cited above. We also recommend that the Congress give special attention to the priorities and funding for C3 programs because of their vital role in implementing countervailing strategy.

DOD COMMENTS AND OUR EVALUATION

DOD concurred with our findings concerning the strategic C3 network and supported our recommendation that special attention be given to the priorities and funding of these systems.

DOD stated that there has been and continues to be an effort within DOD to develop an acquisition strategy that meets the needs of a countervailing strategy. While DOD expects to report on their progress in this regard in its next annual report to the Congress, DOD would prefer not to commit to providing a specific plan at that time.

We recognize that the demands of countervailing strategy will not remain static and will require flexibility in DOD acquisition policy. However, DOD's unwillingness to prepare a specific long term acquisition strategy does not respond to either our recommendations or the requirements of the Congress. A comprehensive

outline of a basic acquisition strategy that clearly delineates and explains the objectives and requirements of countervailing strategy need not be so restrictive that it prevents needed changes in the future. It must, however, ensure that the Congress, DOD policymakers, and the services have a common understanding of future needs and a common basis for future program decisions.

If projected increases in DOD spending are to effectively meet strategic needs, changes are needed to ensure that programs conceived under previous approaches to strategic deterrence can meet the requirements established by countervailing strategy. Clearly, there is a need for a reassessment of DOD's acquisition priorities concerning ongoing programs.



COMPTROLLER

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

11 MAY 1981

W. H. Sheley, Jr.
 Director, Mission Analysis and Systems
 Acquisition Division
 United States General Accounting Office
 Washington, D.C. 20548

Dear Mr. Sheley:

(U) This is in reply to your letter to the Secretary of Defense requesting comments on a draft of your proposed report "Strategic Offensive Forces Need to be Strengthened to Meet the Challenge of Countervailing Strategy" (Code 951534). (OSD Case #5670)

(U) The authors of the proposed report are to be commended for the thoroughness and objectivity that they have brought to this investigation. The resulting report is both informative and balanced.

(C) The report states that "the existing command, control and communication network

The Department of Defense

supports the GAO recommendation that "the Congress give special attention to the priorities and funding for command, control and communication programs because of their vital role in implementing countervailing strategy." [See GAO note 1.]

(U) The report also recommends that:

The Secretary of Defense develop an acquisition strategy that clearly delineates the programs needed to meet the requirements of countervailing strategy, and shows the timeframes when the capabilities can be available. This strategy should be outlined in a plan and submitted to the Congress as part of DoD's next annual presentation before the appropriate committees.

(U) There has been and continues to be an effort within the Department of Defense to develop an acquisition strategy that meets the needs of a countervailing strategy. We recognize that no single system can satisfy every requirement associated with a successful countervailing strategy, nor do we expect the demands of such a strategy to remain static. Strategic force and C³ modernization programs proposed in the current

Classified by ASD(C)
 Declassify on 13 Apr 85

GAO note 1: Classified information deleted.

budget request are consistent with an evolving countervailing strategy. We would expect to report our progress in this regard in the next Annual Report to the Congress, but would prefer not to commit to providing a specific plan at that time.

(U) Detailed comments on the proposed report and classification review have been provided separately.

Sincerely,



Jack R. Borsting
Assistant Secretary of Defense
(Comptroller)

GAO note: These detailed comments were provided informally, and appropriate changes were made to the report.

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