PRESIDENT'S COMMISSION ON STRATEGIC FORCES

6 April 1983

The President
The White House
Washington, D. C. 20500

Dear Mr. President:

On January 3 of this year you asked us to review the strategic modernization program of the United States. In particular, you asked us to examine the future of our ICBM forces and to recommend basing alternatives.

In the ensuing three months we have held 28 full meetings and numerous smaller conferences, and have talked to over 200 technical experts as we have reviewed U.S. strategic policy and forces. We have also consulted closely with members of Congress, as you requested.

There are no simple solutions to the questions that must be answered in basing our forces, achieving equitable arms control agreements, and improving strategic stability. Our lengthy review and extended deliberations, however, have led us unanimously to conclusions and recommendations which we hope will provide the basis for a broad national consensus on these difficult issues. The Commission's Senior Counselors set forth below also support the recommendations of this report. Our recommendations and the reasoning behind them are set forth in the attached report.

We appreciate the opportunity to be of service. We hope our efforts will prove helpful in the Nation's pursuit of peace and security.

Respectfully yours,

Brent Scowcroft
Chairman

The Commission

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William Clements
John M. Deutch
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Report of the President's Commission On Strategic Forces

I. Deterrence and Arms Control

The responsibility given to this Commission is to review the purpose, character, size, and composition of the strategic forces of the United States. The members of the Commission fully understand not only the purposes for which this nation maintains its deterrent, but also the devastating nature of nuclear warfare, should deterrence fail. The Commission believes that effective arms control is an essential element in diminishing the risk of nuclear war—while preserving our liberties and those of like-minded nations. At the same time the Commission is persuaded that as we consider the threat of mass destruction we must consider simultaneously the threat of aggressive totalitarianism. Both are central to the political dilemmas of our age. For the United States and its allies the essential dual task of statecraft is, and must be, to avoid the first and contain the second.

It is only by addressing these two issues together that we can begin to understand how to preserve both liberty and peace. Although the United States and the Soviet Union hold fundamentally incompatible views of history, of the nature of society, and of the individual's place in it, the existence of nuclear weapons imbues that rivalry with peril unprecedented in human history. The temptation is sometimes great to simplify—or oversimplify—the difficult problems that result, either by blinking at the devastating nature of modern full-scale war or by refusing to acknowledge the emptiness of life under modern totalitarianism. But it is naive, false, and dangerous to assume that either of these, today, can be ignored and the other dealt with in isolation. We cannot cope with the efforts of the Soviet Union to extend its power without giving thought to the way nuclear weapons have sharply raised the stakes and changed the nature of warfare. Nor can we struggle against nuclear war or the arms race in some abstract sense without keeping before us the Soviet Union's drive to expand its power, which is what makes those struggles so difficult.

We should face both problems directly.

Our words, policies, and actions should all make clear the American conviction that nuclear war, involving few or many nuclear weapons, would be a tragedy of unparalleled scope for humanity. It is wrong to pretend or suggest otherwise. Neither the American people, our allies, nor the Soviets should doubt our abhorrence of nuclear war in any form.

By the same token, however, our task as a nation cannot be understood from a position of moral neutrality toward the differences between liberty and totalitarianism. These differences proceed from conflicting views regarding the rights of individuals and the nature of society. Only if Americans believe that it is worth a sustained effort over the years to preserve liberty in the face of challenge by a system that is the antithesis of liberal values can our task be seen as a just and worthy one in spite of its dangers.

We do have many strengths in such an effort. Over the long run, the strengths lent by liberty itself are our greatest ones—our abilities to adapt peacefully to political change, to improve social justice, to innovate with technology, to produce what our people need to live and prosper. What we have most to fear is that confusion and internal divisions—sometimes byproducts of the vigorous play of our free politics—will lead us to lose purpose, hope, and resolve.

We have good reason to maintain all three. Neither time nor history is on the side of large, centralized, autocratic systems that seek to achieve and maintain control over all aspects of the lives of many diverse peoples. We should, with calm persistence, limit the expansion of today's version of this sort of totalitarian state, the Soviet Union. We should persuade its leaders that they cannot successfully divert attention from internal problems by resorting to international blackmail, expansion, and militarism—rationalized by alleged threats posed by us or our allies. We should also be ready to encourage the Soviets to begin to settle differences between us, through equitable arms control agreements and other measures. But moral neutrality and indifference or acquiescence in the face of Soviet efforts to expand their military and political power do not hasten such settlements—they delay them, make them less likely, and ultimately increase the risk of war.

Deterrence is central to the calm persistence we must demonstrate in order to reduce these risks. American strategic forces exist to deter attack on the United States or its allies—and the coercion that would be possible if the public or decisionmakers believed that the Soviets might be able to launch a successful attack. Such a policy of deterrence, like the security policy of the West itself, is essentially defensive in nature. The strategic forces that are necessary in order to support such a policy by their very existence help to convince the Soviet Union's leaders: that the West has the military strength and political will to resist aggression; and that, if they should ever choose to attack, they should have no doubt that we can and would respond until we have so damaged the power of the Soviet state that they will unmistakably be far worse off than if they had never begun.

There can be no doubt that the very scope of the possible tragedy of modern nuclear war, and the increased destruction made possible even by modern non-nuclear technology, have changed the nature of war itself. This is not only because massive conventional war with modern weapons could be horrendously destructive—some fifty million people died in "conventional" World War II before the advent of nuclear weapons—but also because *conventional* war between the world's major power blocs is the most likely way for *nuclear* war to develop. The problem of deterring the threat of nuclear war, in short, cannot be isolated from the overall power balance between East and West. Simply put, it is war that must concern us, not nuclear war alone. Thus we must maintain a balance between our nuclear and conventional forces and we must demonstrate to the Soviets our cohesion and our will. And we must understand that weakness in any one of these areas puts a dangerous burden on the others as well as on overall deterrence.

Deterrence is not, and cannot be, bluff. In order for deterrence to be effective we must not merely have weapons, we must be perceived to be able, and prepared, if

necessary, to use them effectively against the key elements of Soviet power. Deterrence is not an abstract notion amenable to simple quantification. Still less is it a mirror image of what would deter ourselves. Deterrence is the set of beliefs in the minds of the Soviet leaders, given their own values and attitudes, about our capabilities and our will. It requires us to determine, as best we can, what would deter them from considering aggression, even in a crisis—not to determine what would deter us.

Our military forces must be able to deter war even if the Soviets are unwilling to participate with us in equitable and reasonable arms control agreements. But various types of agreements can, when the Soviets prove willing, accomplish critical objectives. Arms control can: reduce the risk of war; help limit the spread of nuclear weapons; remove or reduce the risk of misunderstanding of particular events or accidents; seal off wasteful, dangerous, or unhelpful lines of technical development before either side gets too committed to them; help channel modernization into stabilizing rather than destabilizing paths; reduce misunderstanding about the purpose of weapons developments and thus reduce the need to over-insure against worst-case projections; and help make arsenals less destructive and costly. To achieve part or all of these positive and useful goals, we must keep in mind the importance of compliance and adequate verification—difficult problems in light of the nature of the Soviet state—and the consequent importance of patience in order to reach fair and reasonable agreements.

This is a vital and challenging agenda. In some of these areas of arms control our interests coincide closely with those of the Soviets. In others, their efforts to undermine the effectiveness of our deterrent and to use negotiations to split us from our allies will make negotiations difficult.

But whether the Soviets prove willing or not, stability should be the primary objective both of the modernization of our strategic forces and of our arms control proposals. Our arms control proposals and our strategic arms programs should thus be integrated and be mutually reinforcing. They should work together to permit us, and encourage the Soviets, to move in directions that reduce or eliminate the advantage of aggression and also reduce the risk of war by accident or miscalculation. As we try to enhance stability in this sense, the Commission believes that other objectives should be subordinated to the overall goal of permitting the United States to move—over time—toward more stable strategic deployments, and giving the Soviets the strong incentive to do the same. Consequently it believes, for the reasons set forth below, that it is important to move toward reducing the value and importance of individual strategic targets.

II. Soviet Objectives and Programs

Effective deterrence and effective arms control have both been made significantly more difficult by Soviet conduct and Soviet weapons progams in recent years. The overall military balance, including the nuclear balance, provides the backdrop for Soviet decisions about the manner in which they will try to advance their interests. This is central to our understanding of how to deter war, how to frustrate Soviet efforts at blackmail, and how to deal with the Soviets' day-to-day conduct of international affairs. The Soviets have shown by word and deed that they regard military power, including nuclear

weapons, as a useful tool in the projection of their national influence. In the Soviet strategic view, nuclear weapons are closely related to, and are integrated with, their other military and political instruments as a means of advancing their interests. The Soviets have concentrated enormous effort on the development and modernization of nuclear weapons, obviously seeking to achieve what they regard as important advantages in certain areas of nuclear weaponry.

Historically the Soviets have not been noted for taking large risks. But one need not take the view that their leaders are eager to launch a nuclear war in order to understand the political advantages that a massive nuclear weapons buildup can hold for a nation seeking to expand its power and influence, or to comprehend the dangers that such a motivation and such a buildup hold for the rest of the world.

Although there is legitimate debate about the exact scope of Soviet military spending in recent years, it is nonetheless clear that the Soviet leaders have embarked upon a determined, steady increase in nuclear (and conventional) weapons programs over the last two decades—a buildup well in excess of any military requirement for defense.

For example, as a result of this determined investment the Soviet ICBM force has grown to nearly 1,400 launchers carrying over 5,000 warheads, with a throw-weight about four times that of the U.S. ICBM force. The U.S. ICBM force has 1,047 launchers and about 2,150 warheads. More than half of the Soviet ICBMs—the SS-17, SS-18, and SS-19 missiles—have been deployed since the last U.S. ICBM was deployed. These new Soviet ICBMs are equipped with multiple, independently targetable reentry vehicles (MIRVs). Over 600 of these recently-deployed missiles, the SS-18s and SS-19s, have payloads as large or larger than the MX and have excellent accuracy. Many Soviet launchers can be reloaded. The Soviets are now pushing forward with tests of two even newer ICBMs.

While Soviet operational missile performance in wartime may be somewhat less accurate than performance on the test range, the Soviets nevertheless now probably possess the necessary combination of ICBM numbers, reliability, accuracy, and warhead yield to destroy almost all of the 1,047 U.S. ICBM silos, using only a portion of their own ICBM force. The U.S. ICBM force now deployed cannot inflict similar damage, even using the entire force. Only the 550 MIRVed Minuteman III missiles in the U.S. ICBM force have relatively good accuracy, but the combination of accuracy and yield of their 3 warheads is inadequate to put at serious risk more than a small share of the many hardened targets in the Soviet Union. Most Soviet hardened targets—of which ICBM silos are only a portion—could withstand attacks by our other strategic missiles.

The Soviet ballistic missile submarine force currently consists of 62 modern submarines; these are armed with 950 missiles, with a total of almost 2,000 nuclear warheads. The U.S. has fewer such submarines (34) and missiles (568), but more warheads (about 5,000), in its submarine force. Our submarines, moreover, are quieter than those of the Soviets. Recent Soviet ballistic missile submarine building programs have been vigorous: four times that of the U.S. rate. While the U.S. has a substantial present advantage in the overall capability of its ballistic missile submarine force, this gap is narrowing. The U.S. also has a present advantage in anti-submarine warfare and submarine quietness, but the Soviets appear to be giving high priority to these areas.

Soviet heavy strategic bombers (not including the Backfire) now number about 150, around half equipped with air-to-surface missiles. This force is considerably less capable than the total active U.S. bomber force, which numbers about 270 B52 G and H bombers and about 60 FB-111 bombers. The U.S. bomber force has just begun to be equipped with long-range cruise missiles. Both U.S. and Soviet bombers have carried short-range missiles for many years. A new Soviet intercontinental bomber (the Blackjack) is now being flight-tested. It is similar in appearance to, but larger than, the U.S. B-1B now in production. The Blackjack will probably begin to enter service during the mid-to-late 1980s.

Soviet strategic defenses are extensive, consisting of a dense nationwide air defense network and a limited ballistic missile defense at Moscow. Both are undergoing modernization. Their vigorous research and development programs on ballistic missile defense provide a potential, however, for a rapid expansion of Soviet ABM defenses, should they choose to withdraw from or violate the ABM treaty. Such a potential is enhanced by the continued deployment of modern and capable Soviet air defense missile systems. At least one new Soviet defensive system is designed to have capability against short-range ballistic missiles; it could perhaps be upgraded for use against the re-entry vehicles of some submarine-launched missiles and even ICBMs. Proliferation of such Soviet air defense missile systems thus creates a need for us to have enough throw-weight to carry sufficient numbers of warheads, and penetration aids such as decoys, in order to be assured of maintaining a deterrent. The U.S. has dismantled its ABM system and has minimal continental air defenses.

These Soviet programs do not, in and of themselves, indicate plans to initiate nuclear attacks. But they do confirm the value that Soviet leaders place on military programs across the board, both to provide an essential backdrop for their political purposes and—should circumstances dictate—to give them the capability to fight effectively. They also understand that the success of their efforts depends upon the outside world's perception. If comparative military trends were to point toward their becoming superior to the West in each of a number of military areas, they might consider themselves able to raise the risks in a crisis in a manner that could not be matched.

In a world in which the balance of strategic nuclear forces could be isolated and kept distinctly set apart from all other calculations about relations between nations and the credibility of conventional military power, a nuclear imbalance would have little importance unless it were so massive as to tempt an aggressor to launch nuclear war. But the world in which we must live with the Soviets is, sadly, one in which their own assessments of these trends, and hence their calculations of overall advantage, influence heavily the vigor with which they exercise their power.

III. Preventing Soviet Exploitation of Their Military Programs

In our effort to make a strategy of deterrence and arms control effective in preventing the Soviets from political or military use of their strategic forces, we must keep several points in mind.

The Soviets must continue to believe what has been NATO's doctrine for three

decades: that if we or our allies should be attacked—by massive conventional means or otherwise—the United States has the will and the means to defend with the full range of American power. This by no means excludes the need to make improvements in our conventional forces in order to have increased confidence in our ability to defend effectively at the conventional level in many more situations, and thus to raise the nuclear threshold. Certainly mutual arms control agreements to reduce both sides' reliance on nuclear weapons should be pursued. But effective deterrence requires that early in any Soviet consideration of attack, or threat of attack, with conventional forces or chemical or biological weapons, Soviet leaders must understand that they risk an American nuclear response.

Similarly, effective deterrence requires that the Soviets be convinced that they could not credibly threaten us or our allies with a limited use of nuclear weapons against military targets, in one country or many. Such a course of action by them would be even more likely to result in full-scale nuclear war than would a massive conventional attack. But we cannot discount the possibility that the Soviets would implicitly or explicitly threaten such a step in some future crisis if they believed that we were unprepared or unwilling to respond. Indeed lack of preparation or resolve on our part would make such blackmail distinctly more probable.

In order to deter such Soviet threats we must be able to put at risk those types of Soviet targets—including hardened ones such as military command bunkers and facilities, missile silos, nuclear weapons and other storage, and the rest—which the Soviet leaders have given every indication by their actions they value most, and which constitute their tools of control and power. We cannot afford the delusion that Soviet leaders—human though they are and cautious though we hope they will be—are going to be deterred by exactly the same concerns that would dissuade us. Effective deterrence of the Soviet leaders requires them to be convinced in their own minds that there could be no case in which they could benefit by initiating war.

Effective deterrence of any Soviet temptation to threaten or launch a massive conventional or a limited nuclear war thus requires us to have a comparable ability to destroy Soviet military targets, hardened and otherwise. If there were ever a case to be made that the Soviets would unilaterally stop their strategic deployments at a level short of the ability seriously to threaten our forces, that argument vanished with the deployment of their SS-18 and SS-19 ICBMs. A one-sided strategic condition in which the Soviet Union could effectively destroy the whole range of strategic targets in the United States, but we could not effectively destroy a similar range of targets in the Soviet Union, would be extremely unstable over the long run. Such a situation could tempt the Soviets, in a crisis, to feel they could successfully threaten or even undertake conventional or limited nuclear aggression in the hope that the United States would lack a fully effective response. A one-sided condition of this sort would clearly not serve the cause of peace.

In order, then, to pursue successfully a policy of deterrence and verifiable, stabilizing arms control we must have a strong and militarily effective nuclear deterrent. Consequently our strategic forces must be modernized, as necessary, to enhance to an adequate degree their overall survivability and to enable them to engage effectively the targets that Soviet leaders most value.

Also, as described below, we should seek to use arms control agreements to reduce instabilities and to channel both sides' strategic modernization toward stabilizing developments, deployments, and reductions. Regardless of what we are able to accomplish with arms control agreements, however, two aspects of deterrence are crucial. The problems of maintaining an effective deterrent and of reaching stabilizing and verifiable arms control agreements cannot be addressed coherently without keeping in mind the nature of Soviet expansionism. Second, the deterrent effect of our strategic forces is not something separate and apart from the ability of those forces to be used against the tools by which the Soviet leaders maintain their power. Deterrence, on the contrary, requires military effectiveness.

IV. U.S. Strategic Forces and Trends

A. Strategic Forces As A Whole

The development of the components of our strategic forces—the multiplicity of intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and bombers—was in part the result of an historical evolution. This triad of forces, however, serves several important purposes.

First, the existence of several strategic forces requires the Soviets to solve a number of different problems in their efforts to plan how they might try to overcome them. Our objective, after all, is to make their planning of any such attack as difficult as we can. If it were possible for the Soviets to concentrate their research and development efforts on putting only one or two components of U.S. strategic forces at risk—e.g., by an intensive effort at anti-submarine warfare to attempt to threaten our ballistic missile submarines—both their incentive to do so and their potential gains would be sharply increased. Thus the existence of several components of our strategic forces permits each to function as a hedge against possible Soviet successes in endangering any of the others. For example, at earlier times uncertainties about the vulnerability of our bomber force were alleviated by our confidence in the survivability of our ICBMs. And although the survivability of our ICBMs is today a matter of concern (especially when that problem is viewed in isolation) it would be far more serious if we did not have a force of ballistic missile submarines at sea and a bomber force. By the same token, over the long run it would be unwise to rely so heavily on submarines as our only ballistic missile force that a Soviet breakthrough in anti-submarine warfare could not be offset by other strategic systems.

Second, the different components of our strategic forces would force the Soviets, if they were to contemplate an all-out attack, to make choices which would lead them to reduce significantly their effectiveness against one component in order to attack another. For example, if Soviet war planners should decide to attack our bomber and submarine bases and our ICBM silos with simultaneous detonations—by delaying missile launches from close-in submarines so that such missiles would *arrive* at our bomber bases at the same time the Soviet ICBM warheads (with their longer time of flight) would arrive at our ICBM silos—then a very high proportion of our alert bombers would have

escaped before their bases were struck. This is because we would have been able to, and would have, ordered our bombers to take off from their bases within moments after the launch of the first Soviet ICBMs. If the Soviets, on the other hand, chose rather to *launch* their ICBM and SLBM attacks at the same moment (hoping to destroy a higher proportion of our bombers with SLBMs having a short time of flight), there would be a period of over a quarter of an hour after nuclear detonations had occurred on U.S. bomber bases but before our ICBMs had been struck. In such a case the Soviets should have no confidence that we would refrain from launching our ICBMs during that interval after we had been hit. It is important to appreciate that this would not be a "launch-on-warning," or even a "launch under attack," but rather a launch *after* attack—after massive nuclear detonations had already occurred on U.S. soil.

Thus our bombers and ICBMs are more survivable together against Soviet attack than either would be alone. This illustrates that the different components of our strategic forces should be assessed collectively and not in isolation. It also suggests that whereas it is highly desirable that a component of the strategic forces be survivable when it is viewed separately, it makes a major contribution to deterrence even if its survivability depends in substantial measure on the existence of one of the other components of the force.

The third purpose served by having multiple components in our strategic forces is that each component has unique properties not present in the others. Nuclear submarines have the advantage of being able to stay submerged and hidden for months at a time, and thus the missiles they carry may reasonably be held in reserve rather than being used early in the event of attack. Bombers may be launched from their bases on warning without irretrievably committing them to an attack; also, their weapons, though they arrive in hours, not minutes, have excellent accuracy against a range of possible targets. ICBMs have advantages in command and control, in the ability to be retargeted readily, and in accuracy. This means that ICBMs are especially effective in deterring Soviet threats of massive conventional or limited nuclear attacks, because they could most credibly respond promptly and controllably against specific military targets and thereby promptly disrupt an attack on us or our allies.

B. Technological Trends for Strategic Forces

1. Accuracy

The accuracy of strategic weapons in the foreseeable future will continue to increase. There are lower limits, perhaps a few hundred feet, to the accuracy of strategic weapons that do not rely on some kind of terminal guidance. For weapons using terminal guidance, accuracy should be even better. Accuracy is most advanced today in the ICBM forces, but in the 1990s SLBMs should have sufficient accuracy seriously to threaten hardened targets. Nevertheless, ICBM accuracy should remain somewhat better than that for submarine-launched missiles.

These accuracy developments and the ability of an attacker to use more than one warhead to attack each fixed target on the other side increasingly put at risk targets

of high value such as fixed launchers for MIRVed ICBMs. Although such fixed targets may retain some survivability for a number of years—because of problems of operational accuracies, planning uncertainties (as discussed at Section V.E. below), and the previously described need to co-ordinate ICBM and SLBM attacks—their survivability will nevertheless continue to decline over time. Thus reasonable survivability of fixed targets, such as ICBM silos, may not outlast this century, even when one considers them together with the rest of our strategic forces. In time, even non-nuclear weapons with excellent accuracy may be able to attack effectively some fixed targets previously thought to be vulnerable only to nuclear weapons.

2. Superhardening

New concepts and developments in hardening are quite promising. They could lead to the capability to harden such targets as ICBM silos far in excess of what was thought possible only a short time ago. Eventually the survival of even the hardest such targets would be doubtful in light of the accuracy improvements described above. Nonetheless increased hardness would raise the weapons requirements and the risk of attack for some years. Hardening will also be able to postpone vulnerability to, and therefore the probability of, attack by submarine-launched ballistic missiles.

3. Mobility

New techniques in guidance, miniaturization of electronic components, hardening against nuclear effects, and solid fuels will continue to make mobile strategic systems more feasible. Strategically useful hardening of land-based mobile launchers appears more feasible than in the past.

4. Anti-submarine Warfare

The problem of conducting open-ocean search for submarines is likely to continue to be sufficiently difficult that ballistic missile submarine forces will have a high degree of survivability for a long time. Nevertheless, the prospect of concentrating all of the submarine-launched missiles at sea in a few very large submarines raises some concern. Communication links with submarines, while likely to improve, will still offer problems not present for land-based systems.

5. Ballistic Missile Defense

Substantial progress has been made in the last decade in the development of both endo-atmospheric and exo-atmospheric ABM defenses. However, applications of current technology offer no real promise of being able to defend the United States against massive nuclear attack in this century. An easier task is to provide ABM defense for fixed hardened targets, such as ICBM silos. However even this will be a difficult feat if an attacker can use a large number of warheads against each defended target. The

effectiveness of such a defense could be enhanced by some types of bunching and close spacing of the defended targets, in order to reduce the number of ABM systems required. It could also be enhanced by having multiple shelters for each missile and preferentially defending only the shelter containing the missile while facing an attacker with the need to attack all shelters.

Improvements in Soviet air defense systems—to give them some capability against some submarine-launched ballistic missile warheads, and even against some warheads fired by ICBMs—are likely to continue as such air defenses are made capable of dealing with modern aircraft, cruise missiles, and shorter-range ballistic missiles. The 1972 ABM treaty, however, has provisions prohibiting the testing of air defense systems as ABMs.

V. Strategic Modernization Programs

Although there is room for improvement and adjustments in the several strategic programs discussed below, the Commission noted that these programs are—in the main—proceeding reasonably well. Therefore this report concentrates on the current issues presented by the ICBM force (Section E below) and its relation to arms control (Section VI). The current and recommended programs, taken as a package, should give us high confidence in maintaining an effective deterrent in the years to come.

A. Command, Control, and Communications

Our first defense priority should be to ensure that there is continuing, constitutionally legitimate, and full control of our strategic forces under conditions of stress or actual attack. No attacker should be able to have any reasonable confidence that he could destroy the link between the President and our strategic forces.

The Commission urges that this program continue to have the highest priority and urges the investigation of ways in which the planned improvements could be augmented by low-cost back-up systems.

B. Sea-based Missile Programs

1. Deployment

The Commission supports the continuation of the Trident submarine construction program. It also supports the continued development and the deployment of the Trident II (D-5) missile as rapidly as its objectives of range, accuracy, and reliability can be attained. The Trident submarine's significantly reduced noise level and the D-5 missile's greater full-payload range will add importantly to the already high degree of survivability of the ballistic missile submarine force. Given the increased importance of that force, both programs are essential. The D-5 missile's greater accuracy will also enable it to be used to put some portion of Soviet hard targets at risk, a task for which the current Trident I (C-4) missile is not sufficiently accurate. The Commission also

stresses the importance of the command, control, and communication improvements of particular relevance to the submarine force—namely the ELF communication system, the ECX aircraft, and the MILSTAR satellite.

The Commission does not recommend the development and deployment of a system for the launch of ballistic missiles from surface ships. Such a system appears to have no net advantage over submarine basing and would have vulnerabilities that submarines do not possess.

For the reasons stated in section IV.A., above, the Commission recommends strongly against adopting a strategic force posture relying solely on submarines and bombers to the exclusion of ICBM modernization; it recognizes, however, the increasing importance of the ballistic missile submarine force.

2. Research

The Commission notes that—although it believes that the ballistic missile submarine force will have a high degree of survivability for a long time—a submarine force ultimately consisting solely of a relatively few large submarines at sea, each carrying on the order of 200 warheads, presents a small number of valuable targets to the Soviets. Vigorous pursuit of the longstanding program to avoid technological surprise by the Soviets in anti-submarine warfare is thus of vital importance.

Consistent with the long-term program recommended for the ICBM force, below, to reduce the value of individual targets, the Commission recommends that research begin now on smaller ballistic-missile carrying submarines, each carrying fewer missiles than the Trident, as a potential follow-on to the Trident submarine force. The objective of such research should be to design a submarine and missile system that would, as much as possible, reduce the value of each platform and also present radically different problems to a Soviet attacker than does the Trident submarine force. This work should proceed in such a way that a decision to construct and deploy such a submarine force could be rapidly implemented should Soviet progress in anti-submarine warfare so dictate.

C. Bomber and Air-Launched Cruise Missile Programs

Our bomber and air-launched cruise missile force is of vital importance to the maintenance of an effective deterrent. As long as its ability to survive and penetrate Soviet defenses can be maintained, it provides unique advantages of its own as a strategic system. It also provides mutual support to the survivability of the ICBM force, as discussed in Section IV.A., above. Furthermore the Commission bases its other recommendations on the assumption that a strong bomber and cruise missile program is continued. The Commission is unanimous in these views although it recognizes that there are legitimate differences about the best and least expensive way to provide for the necessary modernization of the bomber and cruise missile force. Since these modernization decisions, although not wholly independent of other strategic force decisions, may reasonably be considered within their own framework, the Commission—having concentrated its

efforts on the ballistic missile forces and related issues—has no changes to recommend in these bomber and cruise missile programs.

D. Ballistic Missile Defense

Vigorous research and development on ABM technologies—including, in particular, ways to sharpen the effectiveness of treaty-limited ABM systems with new types of nuclear systems and also ways to use non-nuclear systems—are imperative to avoid technological surprise from the Soviets. Such a vigorous program on our part also decreases any Soviet incentive—based on an attempt to achieve unilateral advantage—to abrogate the ABM treaty. At this time, however, the Commission believes that no ABM technologies appear to combine practicality, survivability, low cost, and technical effectiveness sufficiently to justify proceeding beyond the stage of technology development.

Of particular importance, however, is the ability to counter any improvement in Soviet ABM capability by being able to maintain the effectiveness of our offensive systems. The possibility of either a sudden breakthrough in ABM technology, a rapid Soviet breakout from the ABM treaty by a quick further deployment of their current ABM systems, or the deployment of air defense systems also having some capability against strategic ballistic missiles all point to the need for us to be able to penetrate some level of ABM defense. This dictates continued attention to having sufficient throw-weight for adequate numbers of warheads and of decoys and other penetration aids.

E. ICBM Programs.

The problem that led to the establishment of this Commission is the same one that has been at the heart of much of the controversy concerning strategic forces and arms control for over a decade—the future of our ICBM force. As described above (Section IV.A.) our ICBM force has three main strategic purposes: (1) serving as a hedge against possible vulnerabilities in our submarine force; (2) introducing complexity and uncertainty into any plan of Soviet attack, because of the different types of attacks that would have to be launched against our ICBMs and our bombers; and (3) helping to deter Soviet threats of massive conventional or limited nuclear attacks by the ability to respond promptly and controllably against hardened military targets.

ICBM modernization is also particularly important now in order to encourage the Soviets to reach stabilizing arms control agreements and to redress perceived U.S. disadvantages in strategic capability.

The Commission believes that, because of changing technology, arms control negotiations, and our own domestic political process, this issue—the future of our ICBM force—has come to be miscast in recent years.

To many the problem has become: "How can a force consisting of relatively large, accurate land-based ICBMs be deployed quickly and be made survivable, even when it is viewed in isolation from the rest of our strategic forces, in the face of increasingly accurate threatened attacks by large numbers of warheads—and how can this be done under arms control agreements that limit or reduce launcher numbers?" It is this com-

plex problem that many, inside and outside the government, have sought to solve for a variety of reasons. These reasons fall into five main groups.

First, in order to serve one of the necessary purposes of a strategic force—namely to hedge against possible failure by the others, such as would be caused by a Soviet breakthrough in anti-submarine warfare—many have felt that any new ICBM deployment should be almost totally survivable even when viewed in isolation from our bomber force and the rest of our strategic forces. The threat now posed by accurate Soviet ICBMs to the Minuteman force, viewed in isolation, has also led many to argue that this particular survivability problem has to be solved quickly.

Second, the overall perception of strategic imbalance caused by the Soviets' ability to destroy hardened land-based targets—with more than 600 newly-deployed SS-18 and SS-19 ICBMs—while the U.S. is clearly not able to do so with its existing ballistic missile force, has been reasonably regarded as destabilizing and as a weakness in the overall fabric of deterrence. In particular, since the ICBM force helps to deter massive conventional or limited nuclear attack against us or our allies, this has led many to believe that the serious imbalance between U.S. and Soviet capabilities should be rectified quickly in the overall interest of the alliance.

Third, arms control agreements—in part to be verifiable without resort to the sorts of co-operative measures such as on-site inspection typically opposed by the Soviets—have concentrated to a significant degree on limiting or reducing strategic missile launchers rather than warheads. This is in some measure because launchers are more easily counted by satellite reconnaissance than are other ICBM characteristics and because launcher numbers provide relatively unambiguous terms for a treaty. Launcher or missile limits have the indirect effect, however, of encouraging both sides to build large ICBMs with many warheads.

Fourth, if one sets aside survivability, basing, and other cost considerations and looks solely at the cost of the missiles themselves, it is cheaper to deploy a given number of warheads in a few relatively large missiles than to deploy the same number of warheads on a larger number of smaller missiles. Fewer expensive guidance systems need to be purchased, for example.

Fifth, for almost two decades our minuteman ICBM force had virtually all of the positive characteristics desirable for any strategic system. It was survivable, even when an attack on it was viewed in isolation, because Soviet accuracies were not good enough to threaten silos. Command and control was comparatively easy. ICBMs were more accurate than submarine-based missiles and could reach their targets faster than bombers. And, when compared to either submarine-based missiles or bombers, silo-based ICBMs, once purchased, had strikingly low annual operating costs. This history has led many to continue to seek to replicate those two decades of Minuteman history, and in so doing to try not only to meet these objectives, but to do so with a single way of basing a single type of ICBM that would have all of these desirable characteristics.

These five sets of considerations, different ones of them of greater importance to different decision-makers at different times, have led us as a nation in recent years to try to re-create all of the desirable characteristics that Minuteman possessed during the sixties and much of the seventies. We have tried to do so by deploying a few relatively

large missiles as quickly as possible, in a single basing mode, on land, under arms control agreements limiting or reducing launcher numbers, in the face of a threat of attack by increasingly accurate and numerous warheads—and to do so in a manner that seeks to preserve ICBM survivability for the long term, even when the ICBM force is viewed in isolation. But by trying to solve all ICBM tasks with a single weapon and a single basing mode in the face of the trends in technology, we have made the problem of modernizing the ICBM force so complex as to be virtually insoluble.

In arriving at its recommendations regarding ICBM programs, the Commission was mindful of the following criteria. For the near term, it would concentrate on possible deployments and basing modes that appeared to have straightforward and achievable technical and military value. For the long term, compatibility of ICBM programs with the need for flexibility and innovation in responding to possible Soviet actions would be of great importance. Economic cost would be considered carefully. The Commission would not insist on seeking a single solution to all the problems—near-term and long-term—with which the ICBM force must cope. Finally, and of great importance, our ICBM programs should support pursuit of a stable regime of arms control agreements.

The Commission has concluded that the preferred approach for modernizing our ICBM force seems to have three components: initiating engineering design of a single-warhead small ICBM, to reduce target value and permit flexibility in basing for better long-term survivability; seeking arms control agreements designed to enhance strategic stability; and deploying MX missiles in existing silos now to satisfy the immediate needs of our ICBM force and to aid that transition.

A more stable structure of ICBM deployments would exist if both sides moved toward more survivable methods of basing than is possible when there is primary dependence on large launchers and missiles. Thus from the point of view of enhancing such stability, the Commission believes that there is considerable merit in moving toward an ICBM force structure in which potential targets are of comparatively low value—missiles containing only one warhead. A single-warhead ICBM, suitably based, inherently denies an attacker the opportunity to destroy more than one warhead with one attacking warhead. The need to have basing flexibility, and particularly the need to keep open the option for different types of mobile basing, also suggests a missile of small size. If force survivability can be additionally increased by arms control agreements which lead both sides toward more survivable modes of basing than is possible with large launchers and missiles, the increase in stability would be further enhanced.

In the meantime, however, deployment of MX is essential in order to remove the Soviet advantage in ICBM capability and to help deter the threat of conventional or limited nuclear attacks on the alliance. Such deployment is also necessary to encourage the Soviets to move toward the more stable regime of deployments and arms control outlined above.

The Commission stresses that these two aspects of ICBM modernization and this approach toward arms control are integrally related. They point toward the same objective—permitting the U.S. and encouraging the Soviets to move toward more stable ICBM deployments over time in a way that is consistent with arms control agreements

having the objective of reducing the risk of war. The Commission is unanimous that no one part of the proposed program can accomplish this alone.

1. ICBM Long-term Survivability: Toward the Small, Single-Warhead ICBM

The Commission believes that a single-warhead missile weighing about fifteen tons (rather than the nearly 100 tons of MX) may offer greater flexibility in the long-run effort to obtain an ICBM force that is highly survivable, even when viewed in isolation, and that can consequently serve as a hedge against potential threats to the submarine force.

The Commission thus recommends beginning engineering design of such an ICBM, leading to the initiation of full-scale development in 1987 and an initial operating capability in the early 1990s. The design of such a missile, hardened against nuclear effects, can be achieved with current technology. It should have sufficient accuracy and yield to put Soviet hardened military targets at risk. During that period an approach toward arms control, consistent with such deployments, should also seek to encourage the Soviets to move toward a more stable ICBM force structure at levels which would obviate the need to deploy very large numbers of such missiles. The development effort for such a missile need not and should not be burdened with the uncertainties accompanying a crash program; thus its timing can be such that competitive development is feasible.

Decisions about such a small missile and its basing will be influenced by several potential developments: the evolution of Soviet strategic programs, the path of arms control negotiations and agreements, general trends in technology, the cost of the program, operational considerations, and the results of our own research on specific basing modes. Although the small missile program should be pursued vigorously, the way these uncertainties are resolved will inevitably influence the size and nature of the program. We should keep in mind, however, that having several different modes of deployment may serve our objective of stability. The objective for the United States should be to have an overall program that will so confound, complicate, and frustrate the efforts of Soviet strategic war planners that, even in moments of stress, they could not believe that they could attack our ICBM forces effectively.

Different ICBM deployment modes by the U.S. would require different types of planned Soviet attacks. Deployment in hardened silos would require the Soviets to plan to use warheads that are large, accurate, or both. Moreover, for those silos or shelters holding a missile with only one warhead, each would present a far less attractive target than would be the case for a silo containing a large missile with many MIRVs. Mobile deployments of U.S. missiles would require the Soviets to try to barrage large areas using a number of warheads for each of our warheads at risk, to develop very sophisticated intelligence systems, or both. In this context, deployment of a small single-warhead ICBM in hardened mobile launchers is of particular interest because it could permit deployment in peacetime in limited areas such as military reservations. Land-mobile deployments without hard launchers could be threatened by a relatively small attack—in the absence of an appropriate arms control agreement—unless our own missiles were

distributed widely across the country in peacetime. The key advantages of a small single-warhead missile are that it would reduce the value of each strategic target and that it is also compatible with either fixed or mobile deployments, or with combinations of the two.

As discussed below (Section VI), deployment of such small missiles would be compatible with arms control agreements reducing the number of warheads, in which case only a small number of such missiles would probably need to be deployed. If the Soviets proved unwilling to reach such agreements, however, the U.S. could deploy whatever number of small missiles were required—in whatever mix of basing modes—to maintain an adequate overall deterrent.

2. Immediate ICBM Modernization: Limited Deployment of the MX Missile

a. The MX in Minuteman Silos

There are important needs on several grounds for ICBM modernization that cannot be met by the small, single-warhead ICBM.

First, arms control negotiations—in particular the Soviets' willingness to enter agreements that will enhance stability—are heavily influenced by ongoing programs. The ABM Treaty of 1972, for example, came about only because the United States maintained an ongoing ABM program and indeed made a decision to make a limited deployment. It is illusory to believe that we could obtain a satisfactory agreement with the Soviets limiting ICBM deployments if we unilaterally terminated the only new U.S. ICBM program that could lead to deployment in this decade. Such a termination would effectively communicate to the Soviets that we were unable to neutralize their advantage in multiple-warhead ICBMs. Abandoning the MX at this time in search of a substitute would jeopardize, not enhance, the likelihood of reaching a stabilizing and equitable agreement. It would also undermine the incentives to the Soviets to change the nature of their own ICBM force and thus the environment most conducive to the deployment of a small missile.

Second, effective deterrence is in no small measure a question of the Soviets' perception of our national will and cohesion. Cancelling the MX, when it is ready for flight testing, when over $5 billion have already been spent on it, and when its importance has been stressed by the last four Presidents, does not communicate to the Soviets that we have the will essential to effective deterrence. Quite the opposite.

Third, the serious imbalance between the Soviets' massive ability to destroy hardened land-based military targets with their ballistic missile force and our lack of such a capability must be redressed promptly. Our ability to assure our allies that we have the capability and will to stand with them, with whatever forces are necessary, if the alliance is threatened by massive conventional, chemical or biological, or limited nuclear attack is in question as long as this imbalance exists. Even before the Soviet leaders, in a grave crisis, considered using the first tank regiment or the first SS-20 missile against NATO, they must be required to face what war would mean to them. In order to augment what we would hope would be an inherent sense of conservatism and caution on their part, we must have a credible capability for controlled, prompt, limited attack

on hard targets ourselves. This capability casts a shadow over the calculus of Soviet risk-taking at any level of confrontation with the West. Consequently, in the interest of the alliance as a whole, we cannot safely permit a situation to continue wherein the Soviets have the capability promptly to destroy a range of hardened military targets and we do not.

Fourth, our current ICBM force is aging significantly. The Titan II force is being retired for this reason and extensive Minuteman rehabilitation programs are planned to keep those missiles operational.

The existence of a production program for an ICBM of approximately 100 tons[1] is important for two additional reasons. As Soviet ABM modernization and modern surface-to-air missile development and deployment proceed—even within the limitations of the ABM treaty—it is important to be able to match any possible Soviet breakout from that treaty with strategic forces that have the throw-weight to carry sufficient numbers of decoys and other penetration aids; these may be necessary in order to penetrate the Soviet defenses which such a breakout could provide before other compensating steps could be taken. Having in production a missile that could effectively counter such a Soviet step should help deter them from taking it. Moreover, in view of our coming sole reliance on space shuttle orbiters, it would be prudent to have in production a booster, such as MX, that is of sufficient size to place in orbit at least some of our most strategically important satellites.

These objectives can all be accomplished, at reasonable cost, by deploying MX missiles in current Minuteman silos.

In the judgment of the Commission, the vulnerability of such silos in the near term, viewed in isolation, is not a sufficiently dominant part of the overall problem of ICBM modernization to warrant other immediate steps being taken such as closely-spacing new silos or ABM defense of those silos. This is because of the mutual survivability shared by the ICBM force and the bomber force in view of the different types of attacks that would need to be launched at each, as explained above (Section IV.A.). In any circumstances other than that of a particular kind of massive surprise attack[2] on the U.S. by the Soviet Union, Soviet planners would have to account for the possibility that MX missiles in Minuteman silos would be available for use, and thus they would help deter such attacks. To deter such surprise attacks we can reasonably rely both on our other strategic forces and on the range of operational uncertainties that the Soviets would have to consider in planning such aggression—as long as we have underway a program for long-term ICBM survivability such as that for the small, single warhead ICBM to hedge against long-term vulnerability for the rest of our forces.

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[1] *MX weights 195,000 pounds. Thus it is a "light ICBM" under the terminology of SALT II, approximately the same size as the 330 newly-deployed Soviet SS-19 ICBMs. The MX is well under half the dimensions of the much larger 308 newly-deployed SS-18s; the latter are designated as "modern heavy ICBMs" under SALT II.*

[2] *An attack in which thousands of warheads were targeted at our ICBM fields but there were no early detonations on our bomber bases from attacks by Soviet submarines.*

None of the short-term needs for ICBM force modernization set forth above would be met by deploying any missile other than the MX.

The Commission examined the concept of a common missile to serve the function of both the Trident II (D-5) missile, now under development for the Trident submarine, and of MX. At this point such a common missile would essentially be a modified Trident II. But deployment of that missile as an ICBM would not only lag several years behind the MX, its payload at the full ICBM range would be reduced. Since a larger number of Trident II missiles would need to be deployed in order to have the same number of warheads as the MX force, there would be no cost savings.

The Commission also assessed the possibility of improving the guidance on the Minuteman ICBM to the level of accuracy being developed for the MX. Such a step, however, would take some two to three years longer than production of the MX and would not redress the perceived imbalance between U.S. and Soviet capabilities. The wisdom of placing new guidance systems on the front ends of aging 1960s-era missiles is highly questionable. Moreover, shifting to such a program at this point would not provide the increased throw-weight needed to hedge either against Soviet ABM improvements or against the need to launch satellites in an emergency. Most importantly, a Minuteman modification program would not provide the incentive to the Soviets to negotiate that would be provided by production of the MX.

A program of deploying on the order of 100 MX missiles in existing Minuteman silos would, on the other hand, accomplish the objectives set forth in this section and it would do so without threatening stability. The throw-weight and megatonnage carried by the 100 MX missiles is about the same as that of the 54 large Titan missiles now being retired plus that of the 100 Minuteman III missiles that the MXs would replace. Such a deployment would thus represent a replacement and modernization of part of our ICBM force. It would provide a means of controlled limited attack on hardened targets but not a sufficient number of warheads to be able to attack all hardened Soviet ICBMs, much less all of the many command posts and other hardened military targets in the Soviet Union. Thus it would not match the overall capability of the recent Soviet deployment of over 600 modern ICBMs of MX size or larger. But a large deployment of several hundred MX missiles should be unnecessary for the limited but very important purposes set forth above. Should the Soviets refuse to engage in stabilizing arms control and engage instead in major new deployments, reconsideration of this and other conclusions would be necessary.

b. Other Possible MX Basing Modes

The Commission assessed several basing modes for the MX missile as a way of solving the problem of long-term ICBM survivability.

Deploying the MX missile in Multiple Protective Shelters (MPS) meets the need of long-term survivability reasonably well. It would have a similar advantage to the deployment of small, single-warhead missiles in silos or shelters—namely it would force an attacker to plan to deal with a multiplicity of targets. It would not, however, have the advantages of the missile's being able to move, in the event of an attack, outside its

basing complex—a capability that is potentially available in some types of small missile deployments. The basing complex required for MPS necessarily affects a land area sufficiently large that local political opposition to it has been significant. There is also a possibility that, over the long run, even if the SALT II Agreement were ratified, a Soviet abrogation or refusal to renew the limits on ICBM launchers or on the number of warheads per missile contained therein could create difficulties for MPS basing. It could lead to the need either to add shelters (and not clearly at a lower cost than the Soviets' cost of adding warheads) or the need to defend the MPS basing complex with an ABM deployment in excess of that permitted under the ABM treaty.

Another alternative MX deployment that has some attractiveness for long-run survivability is closely-spaced basing (CSB). Such a deployment—e.g. 100 missiles in 100 new closely-spaced silos—would sharply reduce the land area required by the MPS system and could cause significant difficulties for some types of planned Soviet attacks by forcing the attacker to take account of the circumstances under which one of his attacking warheads would destroy others (''fratricide''). This basing scheme would require newly-developed techniques for hardening silos in order to avoid the possibility that one attacking warhead could destroy more than one silo. It would also, by its close spacing, make several potential types of ABM defense of the ICBM deployment more feasible. Some of these ABM defenses, countering some potential types of Soviet attacks, could be deployed within the numerical limits of the 1972 ABM treaty, but other more generally effective ones could not. The effectiveness of a CSB deployment in preserving the survivability of the ICBM force over the long run would depend significantly upon advances in hardening silos; the effectiveness of this is yet to be demonstrated and the cost is as yet uncertain. It also would depend upon fratricide effects that are not fully understood.

These uncertainties would not be eliminated by adding multiple hardened shelters for each missile to a CSB deployment to permit deceptive basing—a combination of MPS and CSB. Beginning a hardened shelter deployment immediately would be a concurrent program, involving a commitment to construction before new hardening techniques are fully understood or developed. In addition, although a greater number of shelters could improve survivability, constructing a number of very hard shelters would be expensive. Each shelter would be considerably more costly than the shelters in the original MPS system. Since more shelters would be needed than in the original CSB proposal, the total program would also be more costly than CSB basing.

Other basing modes for a large missile involve longer delays than those for MPS or CSB deployment (or a hybrid of the two). Thus, the improvement in survivability that might be offered by, for example, basing MX in continuous patrol aircraft or in deep underground deployments—given the time it would now require to design and develop these basing modes—would not permit deployment in this decade. Moreover, the large size of the MX missile could complicate these and other longer-term deployments.

c. Research and Development Work on ICBM Basing

The Commission recognizes that a series of phased decisions involving both the Executive branch and the Congress will be necessary in order to determine the future shape of our ICBM force. Not all decisions can or should be made in 1983. The Commission believes, however, that it is important to pursue the following research and development programs now in order to allow the U.S. government to make intelligent future decisions about ICBM basing.

The Commission believes that the work done to date (much of it in connection with designing CSB) is impressive on the technology for dramatic improvements in hardening ICBM silos or shelters. It thus recommends that vigorous research should proceed on new techniques for hardening silos and shelters generally. A specific program to resolve the uncertainties regarding hardness should be undertaken under the leadership of the Defense Nuclear Agency, and with the cooperation of the Air Force and of those Department of Energy laboratories with expertise in the relevant technology. In the event that such hardening proves sufficiently effective and affordable it may later prove useful for some or all of the silos containing MX to be hardened appropriately. In any case, such hardening techniques could prove useful for small missile deployments in the 1990s. Research on the circumstances in which there could be mutual destruction of one attacking warhead by another (fratricide) should be continued.

Vigorous investigation should proceed on different types of land-based vehicles and launchers, including hardened vehicles, for mobile deployment of small ICBMs. Depending on the hardening level achievable for such mobile launchers, it may be possible, for example, to obtain adequate survivability by deploying small ICBMs on military facilities in vehicles alone or in vehicles in simple shelters, with the added advantages of wider mobility if there is warning of an attack. This would avoid the need to disperse the missiles beyond such areas in normal peacetime conditions. For the longer run, other types of mobile basing should also be explored.

The above ICBM programs should contribute to stability and point toward—and be compatible with—a responsible set of arms control principles that can be sustained over the years during negotiations and new agreements.

F. Summary of Modernization Recommendations

1. Strategic Forces other than ICBMs

a. As first priority, vigorous programs should continue to improve the ability of the President to command, control, and communicate with the strategic forces under conditions of severe stress or actual attack.

b. The Trident submarine construction program and the Trident II (D-5) ballistic missile development program should continue with high priority; the work recommended on small submarines to avoid technological surprise in anti-submarine warfare should begin now.

c. No changes are recommended in the bomber and air-launched cruise missile programs.

d. Vigorous research and technology development on ABM should be pursued. The development of decoys and other penetration aids for our ballistic missiles is also recommended.

2. ICBM Programs

a. Engineering design should be initiated, now, of a single-warhead ICBM weighing about fifteen tons; this program should lead to the initiation of full-scale development in 1987 and an initial operating capability in the early 1990s. Deploying such a missile in more than one mode would serve stability. Hardened silos or shelters and hardened mobile launchers should be investigated now.

b. One hundred MX missiles should be deployed promptly in existing Minuteman silos as a replacement for those 100 Minutemen and the Titan II ICBMs now being decommissioned and as a modernization of the force.

c. A specific program to resolve the uncertainties regarding silo or shelter hardness should be undertaken, leading to later decisions about hardening MX in silos and deploying a small single-warhead ICBM in hardened silos or shelters. Vigorous investigation should proceed on different types of land-based vehicles and launchers, including particularly hardened vehicles.

d. Costs

The long-term costs of major programs are necessarily subject to uncertainty. Moreover, the standard of comparison is not clear in this case because, in order to compare costs, one should assess programs of equal effectiveness. Effectiveness of various types of ICBM deployments, especially with regard to long-term survivability, is precisely the issue which is most in controversy. For comparative purposes, the Commission has considered only evolutionary expansions of CSB basing of MX under which there would be some effort, in light of possible Soviet reactions, to preserve long-term ICBM force survivability.

The Commission compared the costs of the program that it recommends to the current program and to other possible strategic programs over the years of the Department of Defense's Five Year Defense Program (FY 1984-88).

The comparison, displayed in the following table, shows that the recommended program is about $1 billion per year less than the CSB program for each of the next four years, and that the total net savings during the five-year period is about $3 billion.

There will be significant costs incurred by the Commission's recommended program beyond these five years, but the exact amount would depend heavily on: the type of basing modes chosen for the small, single-warhead ICBM; the number of U.S. ICBMs deployed; whether the silos in which MX missiles are deployed are hardened, and to what degree; the evolution of the Soviet threat; and the terms of any arms control agreement at that time. For those programs which the Commission considered as reasonable alternatives, such as the further evolution of ABM defenses or multiple shelters for CSB of MX, there would similarly be significant additional costs beyond the five-year period; the magnitude of these would be affected by similar uncertainties.

Costs in Billions of Fiscal Year 1982 Dollars[1]

Alternatives:	1984	1985	1986	1987	1988	Total 5-Year
100 MX in CSB (current program)	5.6	6.0	4.9	4.1	2.3	22.9
100 MX in CSB/MPS (300 shelters)	5.6	6.0	4.9	4.1	2.3	22.9[2]
100 MX in CSB/MPS, with treaty-limited ABM defense, for initial operating capability in 1993	5.9	6.5	5.7	5.6	4.2	27.9[2]
Commission recommendations:						
100 MX in Minuteman Silos	3.9	4.1	3.0	2.2	1.4	14.6
Development of small, single-warhead ICBM and basing R&D, for initial operating capability in 1993	0.5	0.5	0.5	1.0	2.8	5.3[2]
Total	**4.4**	**4.6**	**3.5**	**3.2**	**4.2**	**19.9**

VI. Arms Control.

It is a legitimate, ambitious, and realistic objective of arms control agreements to channel the modernization of strategic forces, over the long term, in more stable directions than would be the case without such agreements. Such stability supports deterrence by making aggression less likely and by reducing the risk of war by accident or miscalculation. The strategic modernization program recommended herein and the arms control considerations contained in this report are consistent with an important aspect of such stability. In light of the developments in technology set forth at in Section IV.B. above, they seek to enhance survivability by moving both sides, in the long term, toward strategic deployments in which individual targets are of lower value. The recommended strategic program thus proposes an evolution for the U.S. ICBM force in which a given number of ballistic missile warheads would, over time, be spread over a larger number of launchers than would otherwise be the case.

This evolution is important for long-term strategic stability, but it is not without its costs. Spreading a given number of ICBM warheads, whatever the number, over greater numbers of ICBM launchers would normally mean added operating costs, for

[1] *Constant FY 1982 dollars are used in this comparison, since these were the units used in December 1982 to present CSB costs to the Congress. Using either constant dollars of a later fiscal year or "then-year" dollars would show higher numbers for all alternatives. Figures were provided by the Department of Defense. FY 1983 costs are not included.*

[2] *All involve significant costs beyond the five-year period.*

example. But in the judgment of the Commission, permitting our forces to evolve in this direction and encouraging the Soviets to do likewise is worth such costs. Moreover, if such programs can lead to mutually agreed lower levels of warhead deployments in time, then ultimately the net cost may be less.

Such an evolution marks a sound principle to guide our own long-term strategic force modernization and arms control proposals, but it is neither necessary nor wise to move precipitously in that direction. In part this is because time is required to develop such new systems properly, in part it is because continued efforts on our current strategic programs are needed to encourage the Soviets to move in a stabilizing direction. Absent such encouragement there is no realistic hope that the Soviets will join such an evolution and forego the current advantages they have in the ability to attack hard targets and to barrage large areas with their preponderance in throw-weight.

Over the long run, stability would be fostered by a dual approach toward arms control and ICBM deployments which moves toward encouraging small, single-warhead ICBMs. This requires that arms control limitations and reductions be couched, not in terms of launchers, but in terms of equal levels of warheads of roughly equivalent yield. Such an approach could permit relatively simple agreements, using appropriate counting rules, that exert pressure to reduce the overall number and destructive power of nuclear weapons and at the same time give each side an incentive to move toward more stable and less vulnerable deployments.

Arms control agreements of this sort—simple and flexible enough to permit stabilizing development and modernization programs, while imposing quantitative limits and reductions—can make an important contribution to the stability of the strategic balance. An agreement that permitted modernization of forces and also provided an incentive to reduce while modernizing, in ways that would enhance stability, would be highly desirable. It would have the considerable benefit of capping both sides' strategic forces at levels that would be considerably lower than they would otherwise reach over time. It would also recognize, realistically, that each side will naturally desire to configure its own strategic forces. Simple aggregate limits of this sort are likely to be more practical, stabilizing, and lasting than elaborate, detailed limitations on force structure and modernization whose ultimate consequences cannot be confidently anticipated.

Encouraging stability by giving incentives to move toward less vulnerable deployments is more important than reducing quickly the absolute number of warheads deployed. Reductions in warhead numbers, while desirable for long-term reasons of limiting the cost of strategic systems, should not be undertaken at the expense of influencing the characteristics of strategic deployments. For example, warhead reductions, while desirable, should not be proposed or undertaken at a rate that leads us to limit the number of launching platforms to such low levels that their survivability is made more questionable.

For a variety of historical, technical, and verification reasons, both the SALT II unratified treaty and the current START proposal contain proposals to limit or reduce the number of ICBM launchers or missiles. Unfortunately this has helped produce the tendency to identify arms control with launcher or missile limits, and to lead some to identify successful arms control with low or reduced launcher or missile limits. This

has, in turn, led to an incentive to build launchers and missiles as large as possible and to put as many warheads as possible into each missile. Such an incentive has been augmented by the cost savings involved in putting a given number of warheads on a few large missiles rather than on a number of smaller ones. Although reasonable efforts have been made to constrain warheads through arms control (e.g. by the payloadfractionation limits in the negotiated SALT II treaty), these types of limits have still not produced an incentive mutually to move away from large land-based missiles. They will not do so as long as launcher or missile limitations are seen, in and of themselves, as primary arms control objectives.

We will have for some time strategic forces in which the number of launchers on one side are outnumbered many times over by the number of warheads on the other. Under such circumstances, it is not stabilizing to use arms control to require mutual reductions in the number of launching platforms (e.g. submarines or ICBM launchers) or missiles. Such a requirement further increases the ratio of warheads to targets. It does not promote deterrence and reduce the risk of war for the Soviets to have many more times the number of accurate warheads capable of destroying hard targets than the U.S. has ICBM launchers.

In time we should try to promote an evolution toward forces in which—with an equal number of warheads—each side is encouraged to see to the survivability of its own forces in a way that does not threaten the other. But if the Soviet Union chooses to retain a large force of large missiles, each with many warheads, the U.S. must be free to match this by the sort of deployment it chooses. Any arms control agreement equating SS-18s and small single-warhead ICBMs because each is one missile or because each is on one launcher would be destabilizing in the extreme.

The approach toward arms control suggested by the Commission, moreover, is compatible with the basic objectives and direction of several other current arms control proposals.

For example, the negotiated SALT II treaty indirectly limited warheads by its limits on launchers and on the fractionation of payloads. It also barred deployments of new large ICBMs or the construction of additional fixed launchers. And it pointed toward further reductions in a follow-on SALT III agreement. These broad purposes of SALT II are wholly compatible with the arms control approach suggested here.

However, it should be noted that, as a method of restricting ICBM modernization, the negotiated SALT II Treaty, which would have expired in 1985, would have prohibited testing of more than one new ICBM. The two-part ICBM modernization program suggested by the Commission would not violate that negotiated agreement because testing of a small, single-warhead ICBM could not begin before this expiration date. Of more long-term importance, however, the approach toward arms control and force modernization suggested here is fundamentally compatible with the sort of stability that SALT II sought to achieve. SALT II specificaly contemplated the negotiation of extension agrements with improved terms, and there is no reason to doubt that future extension agreements would have allowed the testing and deployment of a second new ICBM missile with the stabilizing potential of a small, single-warhead ICBM. Moreover, the Soviets have tested two new ICBMs since October 1982.

The current Administration's START proposal is centered on warhead limitations and reductions, with some attention to throw-weight limitations. These are consistent with the Commission's recommended program. It also contains a proposed limit on launchers that the Commission believes should be reassessed since it is not compatible with a desirable evolution toward small, single-warhead ICBMs.

Some current arms control proposals in Congress concentrate on warhead limitations in which reductions are forced in warhead numbers as a price of modernization; others seek explicitly to encourage movement toward small, single-warhead ICBMs on both sides. These general directions are also consistent with the approach suggested in this report.

The Commission urges the continuation of vigorous pursuit of arms control; it is beyond the scope of this report, however, for the Commission to recommend specific arms control proposals, the size of numerical limits, or the pace and scope of reductions. Of course any arms control proposal must be carefully designed with a view to compliance and verification—often particularly difficult questions in agreements with the Soviets. Some proposals may require innovation in verification techniques.

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Finally, the Commission is particularly mindful of the importance of achieving a greater degree of national consensus with respect to our strategic deployments and arms control. For the last decade, each successive Administration has made proposals for arms control of strategic offensive systems that have become embroiled in political controversy between the Executive branch and Congress and between political parties. None has produced a ratified treaty covering such systems or a politically sustainable strategic modernization program for the U.S. ICBM force. Such a performance, as a nation, has produced neither agreement among ourselves, restraint by the Soviets, nor lasting mutual limitations on strategic offensive weapons.

The Commission realizes that its recommendations will probably not fully satisfy any one of the many contending groups and individuals, inside and outside government, that have staked out claims to particular approaches to strategic modernization or arms control—much less all of them. In the interest of producing a national consensus on these two large issues, however, the Commission has developed an approach that is different in kind from what has gone before.

The Commission believes that all of the difficult issues discussed in this report—including the devastating nature of modern war and the totalitarian and expansive character of the Soviet system—must be considered fairly in trying to reach a national consensus about a broad approach to strategic force modernization and arms control that can set a general direction for a number of years. Clearly there will be, and should be, many different views about specific elements in that approach. But the Commission unanimously believes that such a new consensus—requiring a spirit of compromise by all of us—is essential if we are to move toward greater stability and toward reducing the risk of war. If we can begin to see ourselves, in dealing with these issues, not as political partisans or as crusaders for one specific solution to a part of this complex set

of problems, but rather as citizens of a great nation with the humbling obligation to persevere in the long-run task of preserving both peace and liberty for the world, a common perspective may finally be found.

GLOSSARY

(NOTE: These explanations of some technical terms used in strategic analysis are provided for quick reference and they do not have legal or official standing.)

Anti-Ballistic Missile (ABM) - See Ballistic Missile Defense.

Arms Control - The process of limiting or reducing arms to lessen the risk of conflict and to reduce the consequences of a conflict should it occur. The purpose of arms control is to increase security.

Ballistic Missile - A missile whose propulsion system consists of rockets which burn early in the flight of the missile. After the rockets burn out, the payload coasts on to the target on a "ballistic trajectory" like a bullet fired from a rifle.

Ballistic Missile Defense (BMD) - A defensive system which destroys incoming ballistic missiles or their warheads. Up to this time, the greatest amount of work has been done on BMD approaches which use interceptor missiles armed with small nuclear warheads. The Soviets actually have such a system deployed in limited numbers around Moscow. BMD developments in the future could center around very different concepts such as non-nuclear homing warheads or lasers. The term "Anti-Ballistic Missile System" or "ABM" is often used interchangeably.

Command, Control, and Communications (C^3) - The complete set of hardware, people, and procedures used by the national leadership and commanders at all levels to direct and monitor the operation of military forces in the conduct of their day-to-day activities and wartime missions.

Cruise Missiles - Small, unmanned airplanes carrying nuclear or high explosive warheads. They can be launched from airplanes, trucks, ships, or submarines.

Deterrence - A condition in which a strategic power is dissuaded from attack because he believes the potential victim could retaliate effectively.

Fractionation - Replacing the warheads on a MIRV missile (See Multiple Independent Reentry Vehicle) with a larger number of smaller warheads.

Guidance - The equipment on board a missile (or other piece of moving equipment) which measures the position, speed, and direction and directs the missile toward its desired destination. Two types of guidance equipment of particular relevance to this report are:

Inertial Guidance, in which gyroscopes and other instruments guide the missile without any communication between missile and ground in either direction after the moment of launch. Inertial guidance is in virtually universal use on ICBMs and SLBMs at this time.

Terminal Guidance, in which the missile or its reentry vehicle "looks" at the ground near the target and homes in. Terminal guidance is used on cruise missiles and the Pershing II medium- range missile, but its application to long-range ballistic missiles will be a challenging problem.

Hardness - The resistance of a possible target to the effects of enemy nuclear weapons. The often-discussed hardness of missile silos is usually measured in pounds-per-square-inch (psi) of blast pressure.

Intercontinental Ballistic Missile (ICBM) - A long-range missile based on the continental United States which has sufficient range to attack most or all of the Soviet Union, or a Soviet missile with corresponding capability. See also Submarine-Launched Ballistic Missile (SLBM).

Launcher - The equipment required to launch a missile. ICBM launchers can be either fixed or mobile.

Launch on Warning - This phrase is now usually, but not universally, used to mean launch of missiles after one side received electrical signals from radars, infra-red satellites, or other sensors that enemy missiles are on the way, but before there have been nuclear detonations on its territory. "Launch under attack" is sometimes used interchangeably with "launch on warning" and sometimes used to designate a launch after more confirmation has been received, such as indications that detonations have occurred.

Launch Under Attack - See "Launch on Warning."

Multiple Independent Reentry Vehicle (MIRV) System - A missile capable of carrying two or more reentry vehicles which can be directed individually toward separate targets. The targets for a single missile can be spread over a wide area which is often called the "footprint" of the missile, depending on the range to which the missile is targeted. The SALT II agreement limits the number of reentry vehicles on ICBMs to ten.

Payload - The total weight of the reentry vehicles carried by a single missile. See also throw-weight.

Penetration Aids - Equipment, such as decoys, carried along as part of a missile's throw-weight, specifically to assist the reentry vehicle to get through ballistic missile defenses.

PBV - Post Boost Vehicle (often called "bus") - the section of a MIRV ballistic missile which fits between the main rocket stages and the reentry vehicles. It carries the reentry vehicles and directs each one toward its individual target.

Reentry Vehicle (RV) - The shell around a warhead, generally in the shape of a cone or modified cone, which protects the missile warhead during its reentry through the earth's atmosphere. When the weight of a reentry vehicle is discussed, it usually means the total weight of the warhead, protective shell, and any other equipment carried inside that shell.

Stability - The condition which exists when no strategic power believes it can significantly improve its situation by attacking first in a crisis or when it does not feel compelled to launch its strategic weapons in order to avoid losing them.

Submarine-Launched Ballistic Missile (SLBM) - A ballistic missile launched from a nuclear submarine. While they fundamentally operate in a similar manner, in practice ICBMs and SLBMs have many features that are different in important ways because of the different engineering problems in land and sea basing. Until the advent of our new Trident SLBM system (and a roughly similar Soviet system), SLBMs also had substantially shorter ranges than ICBMs.

Throw-weight - The useful weight which a ballistic missile can place on a trajectory toward its target by the boost or main propulsion stages of the missile. It includes such items as reentry vehicles, post-boost vehicles or similar targeting devices, and penetration aids and their release devices.

Triad - A shorthand expression often used to express the concept that the U.S. has three separate, and in some ways roughly equal, types of strategic nuclear forces—land-based ICBMs, sea-based SLBMs, and bombers.

Verification - The total process of determining compliance with treaty obligations in the context of safeguarding national security. The word "monitoring" is often used to mean the technical process of determining, for example, how many ICBM silos the Soviets have built.

Warhead - The part of a missile system that explodes and causes damage to the target.

Warning - Indications from any of a wide variety of sources that another nation intends to start hostilities. The term "strategic warning" is often used to mean indications hours or days in advance that attack is definitely planned, while "tactical warning" means evidence (usually from radar or other electronic systems) that enemy warheads are actually on the way and will arrive in a matter of minutes. Military historians have pointed out many instances, including Pearl Harbor, when a nation had strategic warning but for a variety of reasons failed to take appropriate action.