

UNITED STATES COUNTERFORCE NUCLEAR WEAPON CAPABILITIES

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Preface

The purpose of this study is to provide in substantial detail the basis for understanding the counterforce capabilities of American nuclear weapon systems.

It begins with short introductory sections that describe

- the general precepts of counterforce;
- the strategic nuclear balance between the US and the USSR;
- nuclear-weapon effects in relation to counterforce capabilities;
- terms, definitions and static measures of nuclear forces.

This is followed by a detailed and thorough analysis of the US Single Integrated Operations Plan, the SIOP, and its history, the employment plans of the United States for its nuclear forces. Because these have been historically overlooked, the chapters that follow provide a study of the counterforce capabilities of US SLBM systems in particular, and a short note on the basis of the development decisions for MIRVs.

More analytical chapters follow, which discuss the uncertainties and constraints, both technical and tactical, against achieving a significant counterforce capability. On the one hand these constraints degrade US counterforce capabilities. On the other they have exactly the same effect on Soviet forces, suggesting that a larger portion of US counterforce capability would survive a Soviet attack on it. Another section briefly examines relevant events in the 1970's, Soviet counterforce capabilities, historically, and related arms control issues.

An appendix surveys over 40 major examples of US-USSR counterforce exchange models, estimates of the outcome of an exchange of US and USSR counterforce nuclear weapon systems.

There is an additional appendix of supplementary tables and figures.

This study is both detailed and technical but still does not attempt to survey all of the subjects that go into a consideration of counterforce weapons capability. The study is largely historical, and discussion of strategic bombers, strategic cruise missiles, the US M-X ICBM and new Soviet mobile ICBMs have essentially been omitted. An equally thorough survey of the history of Soviet counterforce capabilities has also not been presented here.

Chapter 1. The Precepts of Counterforce

It is relatively easy to establish levels that would a priori seem to be prohibitive to any nations policy makers considering war with an opposing nuclear power. Depending to some degree on assumptions about the levels of damage to a nations population and economic base that would be catastrophic to a society, stable number of fixed and vulnerable targets and matches these to deliverable weapons. Large urban population concentrations and one estimates a relatively infrastructure are essentially immobile, and in the absence of active defenses it is not difficult to arrive at the numbers in question. The target set is more or less a constant, and the results will depend on the characteristics of the attacker's arsenal. This is of course what the calculations for "assured economic destruction", or general deterrence attempted to do. The ability to carry out a nuclear attack reaching the required levels would of course also be affected by prior damage to one's own nuclear weapons systems, but both the US and the since passed the point where any plausibly expected losses to their existing delivery systems would reduce their force levels below the numbers USSR have long necessary to achieve the above objectives.

The considerations surrounding counterforce capabilities are much more problematical, however, and depend to an essential degree on the interactions of two opposing nuclear weapons forces in a nuclear weapon exchange or estimates of the outcomes of such exchanges short of their actual occurrence in wartime. The characteristics of the target set now play a very much more important role including whether or not they have already been used preemptively. One cannot just say "there is" or "there is not" a particular amount of counterforce capability. Whatever there is or not depends on a series of interacting factors. Among these are:

- whether one's own nuclear force has first suffered a counterforce attack, and the counterforce capabilities of the attacker: therefore, the hardening or dispersion of one's own forces, and the accuracy, yields, and targeting tactics of the attacker;
- whether the attacked side sits out such an attack, or institutes "launch on warning" (LOW) or "launch under attack" (LUA) policies for its own systems;
- the number of the opposing hardened counterforce targets;
- the yield and accuracy relations of one's own force, and the degree of hardening of the opposing targets.

Because it is an interaction of the two sides' strategic forces and because the properties of the target set and of the attacking weapons are not constant, US counterforce capability is not a constant. Thus, a counterforce capability which may have been present for many years against an unprotected surface-based missile disappears when that missile is put into a hardened silo. A US ICBM (or SLBM) with only moderate accuracy and yield may nevertheless have a substantial counterforce capability against a USSR ICBM silo built to withstand a pressure of 300 psi. If that silo is hardened to 2,000 psi, the counterforce capability with the same missile accuracy and yield probably disappears.

However, it seems possible to formulate something like a series of basic precepts of counterforce nuclear weapons capabilities, both in general and to describe the interaction of such capabilities held by the US and USSR. We will set them out briefly here, and they will be discussed in more detail in following portions of the paper:

- Counterforce targets must first be divided into two classes: "soft" military targets and "hard", "prompt" or "time urgent" targets. The first group are on the surface and include large airbases, naval bases and harbors, radar and early warning systems, satellite launching and control facilities, concentrations of land forces, etc. The second category essentially means ICBMs in silos but may also include hardened Command and Control (C³) facilities. SLBMs that have left ports, and bombers or tactical nuclear strike aircraft that have taken off from airbases (or at least are no longer in the airspace over their own country) are usually considered separately.
- The discussion concerning counterforce capabilities deals nearly entirely with attacks on silo-based ICBMs, and the relative chances of survival of such ICBMs against nuclear attack. Once particular accuracy/yield attributes are achieved it then does matter, overwhelmingly, as to which side ICBMs first, and whether the attacked ICBMs "ride out" by the attacking systems, attacks the opponents the attack.
- Using the most sophisticated of the static measures of nuclear weapons capability, and the ones that explicitly pertain to counterforce capabilities, CMP (Counter Military Potential) or pk (single shot or aggregated kill probabilities), the values for US nuclear weapons have until the 1980's consistently been estimated to be very much higher than those for USSR weapons. That means that US "on paper" counterforce capability has not only been sufficient but has been dominant. These calculations however also assume stationary targets, that is, they say nothing about launch scenarios, preemption, (by the opponent), or the complications of massive simultaneous attacks, etc.
- As one makes the first probe into the transition from static measures to dynamic exchange calculations, one immediately faces the apparent contradiction which results from the radically different US and USSR dispositions of deliverable warheads distributed among of accurate ICBMs, MIRVed warheads on ICBMs, SLBs, and bombers. In particular the number of accurate MIRVed warheads on ICBMs differs drastically between the two sides. This results in the following situation:
- assuming its forces sit still, and a first strike by the United States, the force appears proportionally more vulnerable than that of the US: A larger proportion of the USSR's total launchers are accounted for by its ICBMs, and an even larger number of its MIRVed warheads, and until relatively recently the kill capabilities of the kill capabilities of those US weapons were estimated to be higher than those of the USSR.
- However precisely the same imbalance of the number of ICBMs on each side, and the number of more accurate MIRVs in those ICBMs that produces the above assumption, (i.e. what would happen if the USSR lost that proportion), produces exactly the opposite situation if the USSR's ICBMs were to strike first at those of the US. While the US does not presently have (before the deployment of Trident and the M-X) a sufficient number of accurate warheads on its land based the systems to target every USSR ICBM launcher with two accurate warheads – the USSR has too many ICBMs, and the US too few accurate ICBM MIRVs – the USSR does have the necessary number of accurate MIRVs to target each US ICBM launcher with two such warheads.
- Aside from direct attack on counterforce delivery systems, there is another counterforce-related attack which in one version can be of very much smaller magnitude, and which can conceivably entirely undercut a nations ability to use its own forces for counterforce

purposes. This is an attack on Command and Control (C³) facilities. Such an attack could be directed against C³ facilities alone, or against them in conjunction with an overall attack against the opponent's nuclear weapon delivery systems.

- Insofar as the major concern of this study is counterforce capability, the historical situation can be briefly summarized. For very many years the US had such capability against the USSR strategic forces to a very great degree. Though not a direct measure of counterforce capability, General R.H. Ellis (Commander of the SAC) noted in a letter to Secretary of Defense Harold Brown, dated April 9, 1979, that as late as 1976—only three years previously—"...the United States (had) enjoyed a 3-to-1 advantage over the Soviet Union in strategic weapons."¹
- Interviewed in 1979, Henry Kissinger similarly pointed out that
- "... during the 1962 Cuban missile crisis the Soviet Union had something like 60 to 70 truly strategic weapons while we had something like 2,000 in missiles and bombs. As late as the American alert in 1973 we had something like 7,000 to 8,000 weapons for strategic forces and the Soviets had something like 1,600 ICBMs that were not yet very accurate and not yet very well protected."²
- Sufficient material has become declassified from official US archives in the last several years to provide strong evidence that the responsible military command had every intention of using its strategic nuclear forces against USSR counterforce targets, and to do so pre-emptively. It is also now unquestionably clear that from the early 1950s on, US nuclear targeting plans have been essentially counterforce in nature. Whether civilian political officials would have given the orders for the weapons to be used in that open question. Soviet nuclear weapon targeting doctrine at least through 1968-69, and apparently until 1975, also called for strategic nuclear preemption.
- However, from the mid-1970s on, US advantages and a large portion of its counterforce capability as well has essentially disappeared. This was not due to any in US strategic forces but to changes in those of the USSR: the large increases in their numbers—MIRVing and warhead fractionation— and their substantial hardening. In addition (as a consequence of the same changes), some fraction of the US land-based ICBM force is now definitely at risk, but exactly It seems very likely that due to oversimplification and how much is unclear. It seems very likely that due to oversimplification and the disregard of major uncertainties most reported estimates of the consequences of a USSR counterforce attack on US ICBMs give very exaggerated estimates of US losses. For the same reasons, the degree of success that would be achieved by a US counterforce strike against Soviet forces must be considered equally unclear.
- There is an enormous variability in the assessments of the degree to which attacks by either side attempting to destroy the opponents' counterforce capabilities— in particular his land-based ICBMs— would succeed. This is due to uncertainties in ICBM reliabilities and accuracies under conditions of massive simultaneous launch, policies of LOW or LUA by the opponent, etc. There is a secondary total disagreement as to what the effects of such an attempt would be on the attacked nations decisions regarding the use of the surviving portion of its nuclear forces against its attacker. This disagreement resolves itself into opposing judgements about whether a counterforce attack "is possible". The opposing judgements are dependent not only, or not so much on the degree of success of the initial counterforce attack itself, but on the assumptions regarding subsequent nuclear retaliation by the attacked party, and the damage the initial attacker would suffer as a

result of these. Both positions carry explicit implications beyond the calculation of the counterforce exchange itself.

- The first of these positions of Paul Nitze. It can be described as having three parts:
- Such a counterforce attack would be successful if it were carried out by the USSR against the USA.
- It argues that if the USSR could destroy a large portion of the US ICBM force by using only a small proportion of its own MIRVed ICBM warheads, the US would be inhibited from any counterstrike against the USSR at all. This would be so because the USSR would still retain the greater part of its total nuclear striking force, not only sufficient for additional counterforce exchanges but available for attack against US counter value target: cities, population, economy. The US would be inhibited from any attack for fear of suffering this additional damage.
- As a result, the expectation of such an outcome of a nuclear exchange, based is in itself an implied threat, destroys the rubric of deterrence, and is sufficient basis for “nuclear blackmail”—the utilization of superior counterforce nuclear weapons capability to on pre-initiation calculations extract political crisis.
- The opposing position is presented in the writing of such analysts as Richard Garwin, Paul Warnke, Herbert Scoville, Bernard Brodie and McGeorge Bundy. It is essentially composed of three propositions which counter those described above.
- A counterforce attack on either the US or the USSR by the other—given the present forces on either side (and perhaps under any circumstances)—not succeed.
- Irrespective of whether it did or not, it is impossible to assume that the nations leadership would not order a nuclear counterstrike. It is further impossible to assume that the leadership of the USSR would not expect such a counterstrike by the US to follow or would not consider it extremely likely.
- Therefore, the certain capacity to deliver sufficient nuclear force to meet assured destruction criteria is all that is necessary, though improvements of C³ and early warning systems is consistent with this purpose.¹

Chapter 2. The Nuclear Weapon Balance Between the US and the USSR

Counterforce nuclear weapon capabilities are embedded in the entire panoply of nuclear weapon delivery and support systems, all the more so because of their strong dependence on strategic

¹ One can point out that the summer months of 1983 brought an interesting, if perhaps only temporary, resolution to the “window of vulnerability” debate, the alleged danger of large-scale loss of the US ICBM force to Soviet missile attack. This potential danger has been suggested repeatedly for over ten years now, since the projections put forward by Wohlstetter and Foster in 1969 in the US Senate debate on the procurement of an A&M system, and renewed by Secretary of Defense Laird and Foster in 1971-1972. In the summer of 1983, the Reagan administration essentially tabled the question, saying in effect that vulnerability simply had to be lived with. The report of the Scowcroft commission did the same, taking the position that it does not really matter if one portion of the strategic offensive force is vulnerable as long as other parts remain invulnerable.

warning and timing of attack. Because public discussion focuses only on one or two systems, or one or two indicators, it would be useful to present at the outset a slightly more comprehensive picture of what this total matrix of systems is comprised of.

Direct delivery systems, their critical components, and counter weapon systems:

- IRBM's, MRBM's, ICBM's:
- readiness,
- accuracy,
- reliability,
- hardening,
- Anti-ballistic missile systems.
- Long range bombers, and aerial refueling tankers air defense; radar, OTH, SAM's, interceptors
- SLBM's (and SLCM's) and servicing vessels, strategic ASW; attack submarines, airborne, location arrays
- Nuclear capable tactical aircraft, land-based carrier-based, fleet logistics, forward basing structure

Other integral or supportive systems:

- Strategic reconnaissance: satellites target identification, target location, and geodetics. Elint; ground, airborne, space Satellite destruction systems; tracking, and intercept.
- Command and Control, operational behavior regarding routine disposition and handling of strategic forces, redundancy, hardening, ECM counter-countermeasures (ECCM)
- General base – nuclear weapon testing, stockpile, R & D.

Even as one appreciates a bit more properly the larger number of components that function together with the primary delivery systems of a nation's strategic nuclear forces, one must remember yet one more thing. A rendition of all of these components, or even a description of their size, capabilities or sophistication, still presents a relatively "static" picture. As a Soviet author noted, "the correlation of forces depends, first and foremost, on the plan of operation."³ Unfortunately, the corollary of this is that in most circumstances neither one's own nor an opponent's "plan of operation" can be described; in the first case so as not to inform the and in the second case since one does not know what it is. In addition, one does not know what sequence an actual strategic engagement would follow, even if the pre-war plans of the two sides were known. It is for this reason that in nearly all cases the overall strategic balance is expressed in simple tables of major delivery systems (the "triad") and their warheads. It is only very recently that there has been the additional presentation of pre- and post—nuclear strike estimates based on very simple assumptions applied to the forces of one or both sides. Several traditional "strategic balance" tables of the simple sort, describing the nuclear-weapon delivery systems of the US and the USSR, are presented in the tables which follow.

Chapter 3. Nuclear Weapon Effects in Relation to Counterforce Capabilities

The ability of nuclear weapons to destroy other nuclear weapons is determined effects produced by their explosion and the properties of the targets: launchers, the weapon's internal components, or any protective structure surrounding the weapons attacked. For the purposes of this study, it is sufficient to indicate that adequate detailed information exists in the public domain for researchers to estimate weapon-weapon interactions. These sources range from general descriptions of weapon effects to damage probability calculators, to calculations of individual weapon-kill probability and counter military potential (CMP).^{4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14} Some of the basic sources are provided in the reference. Several of the more detailed studies of CMP are examined in the Appendix of exchange models.

US-USSR Nuclear Weapon Exchange Models and Calculations of Counterforce Weapon Capabilities

The most explicit examination of US counterforce weapon capabilities lies in the long series of nuclear weapon exchange studies that are publicly available, it is apparent to anyone researching this field that an even larger body of classified nuclear exchange models exist which have been developed over the years by federal contract centers carrying out studies on behalf of different US defense agencies. Some of the publicly available studies seem to be comprehensive enough in taking account of different effects and aspects of a nuclear weapons exchange so that they seem to be adequate as general guides and even as reasonable approximations to more detailed and classified computer exchange models. Both the US Department of Defense and the US Arms Control & Disarmament Agency have officially released the results of such studies. In addition, a substantial number of papers have provided the—"kill probabilities"—for both US and USSR strategic missile systems, in some cases as a prelude to dynamic analysis or exchange models utilizing these values, and in other cases without going beyond presenting the values. A complete catalogue of the published counterforce exchange models might of course be of interest, but a less ambitious selection is presented in the Appendix. It contains:

- listing of the exchange models and related studies that were found in the open literature;
- synopses of a dozen of these, essentially the older studies;
- figures and graphs excerpted from the more recent and more important of these, displaying the estimated results of various counterforce exchanges.

These last all date from after 1975 and are of crucial importance to this study. (See Appendix)

Chapter 4. Terms, Definitions, and Static Measures

The assessment of nuclear weapon counterforce capabilities requires understanding the characteristics of the most powerful and destructive weapons that man has yet placed on the face of the earth. Therefore, before discussing the interactions of these systems and policy formulation regarding them it is useful to establish the meaning of the basic terms and quantities that one deals with in this field.¹⁵

"Value" and "Force" targets; and "Countervalue" and "Counterforce"

"Value" targets are cities, and other economic and industrial targets. Coincidentally, nearly all of these are "soft" targets. They include facilities that might not necessarily all be "civilian," or that could serve both mixed military and civilian purposes: powerplants, oil refineries, railroad networks, public health or water supply, or food storage facilities, etc. "Countervalue" denotes weapons aimed at such targets.

The term "countervalue" connotes active operations by offensive or retaliatory forces to destroy or degrade selected civilian population centers, industries, resources, and institutions which constitute the fabric of enemy society. No passive and few defensive features are evidence.¹⁶

"Force" targets are those weapon systems of the enemy that have the ability to destroy your own value targets or your own force targets, that is, your own nuclear weapon and delivery systems. This means the opponents military forces, though it frequently is used to pertain to his nuclear weapon systems in particular. But even in such a restrictive usage, not all counterforce targets are "hard." Air bases, naval bases, radars, etc. are all "soft" counterforce targets. Counterforce weapons are those aimed at "force" targets. Other subsets of counterforce targets, nearly always referring to opposing ballistic missiles are "point" targets and "time urgent" targets, both referring to the opponent's ICBM silos. More recently the phrase "prompt counterforce" capability has come into official use in the United States, with the same meaning as "time urgent." Command and control facilities, hardened or unhardened, would also be counterforce targets.

In its broadest sense, the term "counterforce" embraces all means, active and passive, offensive and defensive, which could degrade the enemy's military capabilities. Antiballistic missiles, interceptor aircraft and Fallout shelters are just as effective in that regard as ICBMs, submarine—launched. ballistic missiles (SLBM) or long-range bombers.¹⁷

When aspects of potential nuclear warfare such as "warfighting" capabilities, pre-emptive strikes, first strikes, or damage limitation capabilities are discussed, it is counterforce capabilities that are being considered. General deterrence theories are more likely to be concerned with value targets and countervalue capabilities.

Numbers of Delivery Systems ("launchers") and Warheads

This is the simplest quantity, as it is a direct measure of the number of nuclear weapon delivery vehicles or warheads. In the case of missile systems that are not MIRVed, the number of ICBM launchers or SLBM launch tubes will be equal to the number of warheads. For MIRVed missiles and for bombers, however where many warheads may be delivered by a single missile or airplane, it becomes much more important to know the total number of warheads, as well as warhead characteristics, than it is to know the number of launchers.

One aspect with significant impact on counterforce capabilities is the different disposition of US and USSR warhead numbers and yield characteristics between their various strategic delivery system: ground-based missiles (ICBM's), SLBM's, and long-range bombers.

Reliability is sometimes divided into two components:

- the fraction of one's total nuclear weapon force that is in operational readiness at any specified moment; this removes malfunctioning weapons on the ground prior to launch.
- the fraction of warheads that will reach their target once launched; this removes weapons malfunctioning after launch, due to booster failure, etc.

Hardness is a target characteristic, either of one's own missiles (or C³ facilities) or of the opponents. It nearly always refers to the resistance to blast effects from a nuclear explosion and is measured in the number of pounds per square inch over-pressure required to destroy an object. This will vary depending on the amount of concrete that is put around an object by way of protection. In less frequent usage hardening also refers to the protection built into nuclear warheads by the use of special materials or redundant circuitry to protect them from various forms of radiation emitted by another exploding nuclear weapon (EMP, X-ray, etc.), or any other adverse factors in the external environment.

Yield is the total energy released by a nuclear explosion, but is measured by the blast energy component, omitting heat, radiation, etc.

Accuracy; CEP

This measure of the accuracy of a nuclear warhead (by the use of its inverse, or inaccuracy) is often referred to as "Circular Error Probable," or "Circular Error Probability." More correctly it should be called the "circle of equal probability." It is the radius of a circle within which half the warheads of given type will fall. Half the warheads of that type would therefore actually land outside that circle.

Accuracy and yield interrelationships provide the basic elements of counterforce capability. Secondary to these are sequence of timing of attack and such warhead effects as fratricide, EMP, etc.

This paper will give little further attention to the R and D effort directed at obtaining accuracy improvements—and hence counterforce lethality—for re-entry vehicles. Improvements in accuracy are far more important than increases in yield. Excellent papers explaining the importance of accuracy have been available in the open literature for many years¹⁸ and the United States has pressed an enormous and consistent R and D effort for over 20 years to obtain increased missile reentry vehicle accuracy, under such continuous programs as ABRES (Advanced Ballistic Reentry Systems), geodetic satellite programs for precise launcher and target location, missile trajectory magnetic anomaly corrections, and many others. Accuracies achieved by the warheads of the most recent generation of Soviet ICBMs indicate that the USSR has been carrying out an equivalent R&D program dedicated to improving missile warhead accuracy.

The principal causes of error in ballistic missile trajectories are:

- Inertial Sensing – error in the system of acceleration meters which senses the booster rocket's location and direction of motion.
- Initial conditions – if launched from a moving platform, e.g., a submarine, error in informing the booster of the launcher's velocity.
- Thrust termination – any error in turning off the booster rocket and separating the warhead from it cannot at present be corrected for.
- Targeting – uncertainty in locating the exact position of the target in terms of the earth's gravitational field.
- Re-entry – deflection of the warhead, or re-entry vehicle, at the end of its course when it comes slanting in from space to the earth's atmosphere and is subjected to aerodynamic forces.

Throw weight and payload.

Throw weight is the weight in pounds of the front portion of the missile that remains after the last booster stage has burned out and has separated. It includes the re-entry vehicle, MIRV "bus," penetration aids, etc. Payload is the weight of the re-entry vehicle alone. In a non-MIRVed ICBM or SLBM that has no penetration aids, the throw weight and payload are identical. If present, MIRV's and penetration aids can account for one-third to one-half of throw weight, reducing payload by the same amount. These attributes are important only insofar as they indicate the ability to project a warhead with greater yield and/or one provided with additional guidance mechanisms to increase its accuracy.

Equivalent Megatonnage, (EMT, sometimes MTE), Area Destruction Capability

The "megaton-equivalent" is the unit of area destruction. It is the area destroyed equivalent to that caused by a one megaton weapon. It is calculated by taking the $2/3$ power of the weapons yield. This accounts for the fact that destruction at ground level does not increase proportionately with increase in yield, and that an exploding nuclear weapon's energy is applied equally in all directions, and the fraction going down into the earth and up into the sky is not utilized in soft area destruction taking place laterally along the earth's surface.

A further refinement of this quantity is the Adjusted Megaton Equivalent (AMTE) which requires scale and condition of attack for quantification. The following in which fractionation of a larger yield by MIRVing increases destructive capability.

Measures of Hard Target Destructive Capability

- Lethality (K)
- Lethality required for silo-destruction (K_n)
- Warhead hard target kill probability (P_k)
- Single Shot Kill Probability (SSKP)
- Counter-Military Potential (CMP)

This group of measures finally brings us to the main quantitative indicators. All are somewhat related. The simplest, k , or lethality, disregards reliability and measures destructive capability solely as a function of pressure effects. It does not account for greatly different effects depending on target hardness, as will be indicated below. However, it demonstrates why accuracy is a more critical value than yield in attaining counterforce capability, and it can be, and it can be calculated for a single re-entry vehicle, for a single MIRVed missile launcher, for an entire category of delivery system (missiles, bombers, etc.) or for the total weapon force. It is defined as the Equivalent Megatonnage (MTE) (the $2/3$ power of the yield) divided by the square of the accuracy (CEP).

- $k = [(y^{2/3} / (CEP)^2)] \times n$

Thus, Accuracy (CEP) is four times as important as yield; doubling the accuracy (i.e., halving the CEP) increases the k -value by eightfold. If warhead-per-target ratios are above unity, the measure is considered to provide a convenient summary of offensive capability for a large number of possible accuracy and yield combinations. The fact that accuracy is the governing variable also explains why different analysts (Tsipis, Leggett, Luttwak, Rummel) can arrive at different measures of k for US and for Soviet weapons—if they use different estimates of USSR and US weapon accuracies. As we will see, however, this measure probably overestimates counterforce capability substantially and has been consistent with the representation of large counterforce capabilities in both US and USSR land-based missile forces.

In using the measure K_n , one derives the value for k required to destroy a target of a particular hardness with a specific probability. Two points should be noted about K_n . The first is that it does not increase proportionally to increases in hardness. Hence, the K_n required to destroy silos with 95 percent probability are as follows: 300 psi = 39; 1,000 psi = 92; 2,000 psi = 150; 3,000 psi = 199; 5,000 psi = 238; 10,000 psi = 453.

Second, the K_n required increases dramatically as P_k is increased toward 1. Thus, to destroy a target hardened to withstand an overpressure of 1,000 psi, the K_n for various levels of P_k are: 50% = 21; 70% = 37; 75% = 43; 80% = 50; 85% = 58; 90% = 71; 91% = 92; 97% = 108; 98% = 120; 99% = 143; 99.9% = 213.

As silo hardening increases, the P_k falls, although not at a proportionate rate. For example, the P_k of the Minuteman Mk12A warhead varies as follows with selected degree of hardening: 300 psi = 96.8%; 1,000 psi = 76.6%; 2,000 psi = 59%; 3,000 psi = 49%; 5,000 psi = 38%; 10,000 psi = 26%.

Other indicators of counterforce capability that have been used by different researchers are throw weight of the combined total of ICBM warheads and bomber payload, and "2,500 psi kills", the number of point targets "super hardened" to 2,500 psi that can be destroyed by a given nuclear weapons force. Equivalent Weapons is a newly conceived aggregate measure aimed at incorporating both countervalue and counterforce targets within the calculation of aggregate damage potential. For various reasons, these three are all rather inappropriate and misleading measures.

All of these measures, such as the number of warheads or of delivery vehicles, throw weight, EMT, k, are referred to as "static" or "aggregate" measures. Perhaps the most inclusive compendium of static measures is the Santa Fe Corporation study of March 1978 prepared for the US Defense Nuclear Agency. It surveyed twelve general measures, and in many cases subsets of these measures, as follows:

- Strategic Nuclear Delivery Vehicles;
- Independently Targetable Warheads;
- ICBM Throw-Weight;
- SLBM Maximum Range;
- Gross Yield;
- Equivalent Megatons (EMT);
- Ballistic Missile Delivery Accuracy;
- Hard-Target Kill Capability;
- Counter Military Potential (CMP);
- Surviving ICBM Launchers After a First Strike;
- Retaliatory Equivalent Weapons;
- Strategic Defensive Systems.

However, the value of the entire compendium is destroyed by the omission of bomber payload from all but two of forty-one different measures, heavily biasing the results against US capabilities and in favor of those of the USSR.

The ease with which the simplest numbers, indices, and perceptions can be juggled—in Western sources quite often to US and Western disadvantage—can be demonstrated from the 1976—1977 Military Balance published by the International Institute for Strategic Studies, a source universally considered as authoritative.¹⁹ This issue of the Military Balance contained a section entitled "Measuring the Strategic Nuclear Balance". It provided three measures: Deliverable Warheads, Equivalent Megatonnage, Bomber Payload and Missile Throw-weight. Numerical values are provided for US and USSR weapons in these measures. All three are "static" measures which do not incorporate US missile advantages in accuracy, which would come into play if calculations for "k" (kill capability) or "CMP" (Counter Military Potential) had been included. In the table on "Deliverable Warheads", the numbers indicate a 2:1 warhead superiority for US bomber payload, although a footnote to the table informs the reader that US bombers could carry 4,000 additional warheads. That would raise the warhead ratio to 3:1 favoring the US. In the calculations for Equivalent Megatonnage, it is stated that the yield of US bombers has been omitted. This despite the fact that it is well-known that the US has always had and still has half of its total deliverable yield in its bombers, and despite the IISS's next table which provides a value for the extremely large US bomber payload. It is stated that US bomber yield was omitted since there is a variety of weapons that these aircraft could carry. If even the lowest possible values had been assumed, it would have made more sense than omitting all values for that segment of the US force structure which provided the major fraction of US deliverable yield from a measure purporting to compare US and from semi-official sources. In a short discussion of "other measures", it is stated that no attempt was made to estimate these, such as "k" or "CMP", because accuracy estimates were not reliable. The IISS has published yield estimates for

USSR weapons for years that were no more reliable, and, starting in 1974, a substantial number of missile accuracy values had appeared in the literature from semi-official sources.

Foster has written an extremely valuable critique of static, or aggregate, measures:

Current forms of aggregate measures suffer from the fact that they do not reflect the diversity of system capabilities within the strategic force posture. Totaling such attributes as megatonnage or throw-weight across all strategic forces obscures the fact that different force elements are intended to perform different missions, are subject to different types of operational constraints (e.g., command-control uncertainties for the SLBMs, or penetration uncertainties for the bombers), are available in uncertain quantities depending on scenario assumptions, and are optimally configured to attack different target types... aggregate measures, as currently formulated, fail to take account of any of these factors.²⁰

He sees the failings of these measures falling into four groupings:

- **Inappropriate Index.** The aggregate measure either does not reflect a force attribute that is a relevant index of one of the three categories of capabilities defined above or is subject to such large and nonsystematic estimation errors as not to be useful for comparing capabilities.
- **Biased Index.** The aggregate measure systematically over- or underestimates actual capabilities because of the particular method of calculation or because of the failure to take account of constraints on optimal weapons performance.
- **Misleading Index.** The aggregate measure may capture and appropriately measure a relevant attribute of the strategic forces but, because of asymmetries in the target bases of the United States and the Soviet Union or in the configuration and specialization of their respective force postures, the measure can suggest either equalities or inequalities between the two forces that don't exist in fact. That is because aggregate measures focus on one or a very few force parameters, they ignore the possibility of basic differences in other parameters that may be more significant in determining actual operational capabilities.
- **Nonscaling Index.** An aggregate measure may increase or decrease monotonically with the capability it is supposed to measure but may not scale as a linear function of the capability in question. That is, there may be decreasing marginal returns in adding an additional unit of a particular force capability, while aggregate measures, in general, treat each additional unit as having the same value as all other units.²¹

Stated very simply, different indices of nuclear weapon effectiveness are appropriate for different categories of targets: for soft area-targets, EMT is the appropriate index; for soft point-targets, the number of warheads is the fitting index; and for hard point-targets, kill probability is the best.

One can reorder Foster's criticisms into three more simply phrased groupings:

- First, when static or aggregate measures do attempt to measure counterforce capability, they arrive at values that are much higher than would be likely to pertain in the real world.
- Second, the reasons for this are that they omit a very large group of operational uncertainties relating to missile performance and warhead effects. These have been itemized in detail by Foster in the table shown on the following page. The section of the study deals with these uncertainties, the operational factors, both technical and tactical, that introduce major variability into any attempted estimate.
- Third, that one attempt to deal with this problem has been the development of "dynamic measures", nuclear weapon exchange counterforce models, that attempt to demonstrate the outcome of an exchange of attacks of two opposing nuclear-weapon forces. An overview and excerpts from some of these are presented in the Appendix.

Chapter 5. United States Nuclear Weapon Targeting Policy, The Single Integrated Operational Plan (SIOP)

There are two central questions regarding US counterforce nuclear weapon capabilities:

- What has actual US nuclear weapon targeting policy been?
- What are the capabilities of US nuclear weapons against the USSR's force targets?

Most of this study deals with various aspects of the second of these two questions. This chapter deals with the first. The essential document in US strategic nuclear weapon targeting policy is the Single Integrated Operations Plan (SIOP).

The NUWEP, Nuclear Weapons Employment Policy, which is based on the President's national policy guidance, is the Secretary of Defense's guidance to the Joint Chiefs of Staff for employing US Nuclear weapons. The Joint Chiefs of Staff in turn prepare a more detailed guidance for the Joint Strategic Target Planning Staff (JSTPS). In accordance with this guidance, the JSTPS then prepares operational plans, which include a series of options, for the employment of US nuclear weapons.

The SIOP, Single Integrated Operations Plan, is the preplanned operational plan for employing US nuclear weapons in the event of a nuclear conflict. This plan is derived from a prioritized list of identified targeting points (the National Strategic Target List) which, in turn, is based on a potential adversary identified National Target Base. The JSTPS then assigns weapons against the prioritized list, targeting the available weapons until the inventory is exhausted. Since the US does not possess sufficient weapons to cover all the identified targets, the SIOP reflects existing US strategic capabilities and not US strategic requirements.²²

Since 1960-1961 when the SIOP was first written, there have been no dramatic in actual targeting. Actual US war plans have always focused much of the available nuclear weapon delivery capability on counterforce targets. Evolutionary changes since 1960 have been a

function of new targets emerging in the USSR force structure, and more warheads becoming available with US forces, rather than due to any changes in doctrine. There have been at times relatively minor changes in emphasis among target sets, and on other occasions the addition of new target categories to the targeting list.

US nuclear weapons policy is complicated by consisting of several different components, and the relations between these has traditionally been extremely vague in public presentations. A very explicit clarification, however, by a former member of the US National Security Council was presented in 1975-76:

American nuclear policy consists of four different components: employment policy, acquisition policy, declaratory policy, and deployment policy. Employment policy describes the targets and how the United States plans to use the nuclear weapons which it possesses today. Acquisition policy establishes criteria for developing and procuring nuclear weapons systems for the future. Declaratory policy gives guidance to American officials on what they say publicly about the employment and acquisition policies. Deployment policy designates where nuclear weapons are to be stationed. (Emphasis in original.)²³

Before looking at the SIOP in detail, it is now possible to present definitive evidence on US nuclear targeting plans prior to 1960. This evidence was not publicly available before 1981-1982. In a remarkable series of papers published between mid-1979 and early 1983, a US historical scholar, David Alan Rosenberg, has succeeded in describing the essential details of US nuclear weapon targeting policy between 1945 and 1960, including the preparation and nature of the first SIOP at the end of that period. The papers are based virtually entirely on declassified US government documents. (It appears that Rosenberg carried out this research as early as 1974 in a classified study prepared for a US Dept. of Defense contractor.) The material provided below consists of several long excerpts extracted directly from these papers. They provide clear evidence on delegation of authority. In an introduction the editors of the journal International Security wrote:

"Historian David Rosenberg provides us here with a thorough account of nuclear war planning from 1945 to 1960. By focusing on operational issues rather than declaratory policy, he reveals the reality of nuclear policy that underlay the public rhetoric. The major trends and priorities of American nuclear weapons policy are uncovered, including the massive expansion of the US nuclear stockpile and the factors that caused it; the emphasis in US nuclear war plans on preemption of Soviet nuclear capability; the serious consideration at high levels of the US government of preventive nuclear war; the early advocacy of a "no cities" strategy by those concerned about the destruction that could be wrought by Soviet nuclear capabilities in the mid-1950s; the emergence as early as 1955 of the perception that the USSR had acquired sufficient nuclear forces to possess a limited but frightening retaliatory capability; and the operationalization of massive retaliation as a first-strike doctrine..."²⁴

Between 1947 and 1949 targets for US nuclear weapons were "governmental control centers and urban industrial concentrations. The first change came in 1949, when

...in conjunction with the North Atlantic treaty which committed the United States for the first time to defending Western Europe... the JCS tasked the Strategic Air Command in the fall of 1949 with "retardation of Soviet advances in Western Europe". The only retardation targets were petroleum refineries, electric power plants, submarine building yards, and synthetic ammonia plants, including some in Eastern Europe.

A third targeting category was soon added. On August 15, 1950, amid mounting anxiety over the ongoing conflict in Korea, the JCS formally assigned "first priority" to "the destruction of known targets affecting the Soviet capability to deliver atomic bombs." The retardation mission was given second priority "because of the fleeting nature of the majority of important retardation targets." Third priority was assigned to attacks on the Soviet liquid fuel, electric power, and atomic energy industries. These categories were subsequently codenamed BRAVO, ROMEO and DELTA, for blunting, retardation, and disruption/destruction of war-making capacity, respectively. With some changes, particularly a broadening of the industrial targets category, they formed a basic framework for US nuclear targeting for nearly a decade. (Targeting priority was as indicated: BRAVO, ROMEO, and DELTA. Author's note.)

Military planners had been worried about defending against an enemy armed with atomic weapons and long-range aircraft since September 1945. The first JCS postwar strategic concept had noted that the US must be ready "to strike the first blow if necessary, when it becomes evident that the forces of aggression are being arrayed against us." The 1947 final report of the JCS Evaluation Board on the Bikini tests had recommended that Congress be requested to redefine "acts of aggression" to include "the readying of atomic weapons against us," and to authorize the President, "after consultation with the Cabinet, to order atomic bomb retaliation" to prevent attack on the US. This proposal remained active until August 7, 1950, when it was dropped ...By then, advance allocations for production of nuclear weapons to be used in a "counter-offensive against anticipated Soviet atomic forces" were being made and attacks on Soviet nuclear capability were being written into draft war plans.

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Anxiety about the threat which the United States would soon be facing generated serious consideration of whether the nation might have to initiate war in its own defense. Although seldom explicitly discussed in writing, preventive war was implicit in some of the major policy deliberations of the time.

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In March 1954, a new statement of US objectives for general war was approved, to replace that in NSC-20/4. The first objective enunciated in the new document, NSC-5410/1, was to "achieve a victory which will insure the survival of the United States. Formal recognition that the survival of the US might be in doubt generated renewed pressures for consideration of preventive war.

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If preventive war was ruled out as a strategic option, preemption was not. In this era before ballistic missiles, preemption appeared to be both militarily and constitutionally feasible. Warning of a Soviet attack – even a surprise attack – was still being calculated by the CIA in terms of days or even weeks, because of the time needed to prepare Soviet forces and bases for strikes on the United States. It was estimated that even after the first wave struck there would be time to blunt an attack, since it would take up to thirty days for the Soviets to deliver all of the nuclear weapons.

.... If war broke out in Western Europe, Pres. Eisenhower told the JCS later that year, the United States would employ tactical nuclear weapons to hold the line, while "first priority" was given to launching SAC "to blunt the enemy's initial threat." After "averting disaster" in this initial phase, the US would go on to mobilize to win the war over a possibly extended period.

No change in JCS policy was required to implement this scenario. The blunting mission was maintained as the highest targeting priority, followed by retardation of Soviet troop advances and the destruction of the urban industrial base and government control centers.

The February 1955 report of the Technological Capabilities Panel... also reaffirmed the JCS BRAVO, ROMEO, and DELTA targeting priorities, while stressing the interrelationship between offensive and defensive forces: "Our striking forces must blunt the attack at its source: defense must protect our retaliatory power as well as our people and our cities. Together they provide overall strength and a substantial deterrent to war."

(Through 1957) ... Unhappy with the SAC war plan, but unable to propose any real alternative, Navy leaders assigned the expanding carrier-based nuclear delivery forces against targets directly or indirectly of naval interest, such as ports, shipbuilding facilities, submarine pens, and naval airfields, and despite counterproposals left the bulk of the national retaliatory mission to SAC.

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In March 1960, the Air Force Intelligence Directorate completed a detailed analysis of targeting requirements to support the 1960-1970 force objectives approved by General White the previous May. The target planners estimated that there would be a total of 3,560 targets in 1960, 6,300 in 1965, and 6,955 in 1970. These could be grouped into 1,450; 3,100; and 3,800 DGZs respectively. The three largest groups of targets in each case were related to suppressing Soviet air defenses and stopping atomic attacks on the United States and US allies. A fourth group, apparently earmarked for the tactical air forces which had taken over the retardation mission from SAC in 1956, was concerned with halting Soviet land and sea operations, while the fifth and smallest group related to the disruption of war support and recuperation capability of Soviet industry. The sharp increase in targets during the first half of the decade was attributed to a projected increase in Soviet offensive and defensive missile sites, each of which would require its own

DGZ. The emphasis on counterforce targets was explicitly justified. The Air Force rejects the argument put forward by the Army and Navy, the report explained, that "deterrence is the sole objective," and that counterforce had become too costly in the missile age. The Air Force position is "based on the fact that it (counterforce) is national policy and on the contention that there is no satisfactory alternative."

Twining's own preference was for the "optimum mix" targeting strategy, which combined counterforce targets with control centers, war-sustaining resources, and population centers. The Hickey committee endorsed this concept. Their February 1960 report recommended a target list for Fiscal Year 1962 consisting of 2,021 targets, including 121 ICBM sites, 140 air defense bases, 200 bomber bases, 218 military and governmental control centers, and 124 other military targets, such as naval bases and nuclear weapons facilities, with the remaining targets apparently located primarily within 131 urban centers. The list had been developed based on SAC methods of analysis and clearly endorsed SAC's basic strategy. The committee had implicitly rejected both no-cities counterforce and finite deterrence and had opted for combining a decisive blow against Soviet will and capability to make war with a blunting attack on Soviet nuclear delivery capability.

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Eisenhower could not conceive of second-strike counterforce as a feasible option and turned aside the Air Force plea for the B-70 on these grounds. It was "crazy" to think that a manned bomber could "search out and knock out mobile ICBMs on railroads" after a Soviet strike. "We are not going to be searching out mobile bases for ICBMs; we are going to be hitting the big industrial and control complexes. He similarly dismissed Navy arguments for using Polaris to provide a controlled, deliberate, and selective response to surprise attack. Polaris would be useful primarily "to disrupt and knock out organized defenses" in order to clear the way for SAC bombers, he stated in the spring of 1960.

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The Eisenhower Administration's top-secret review of "U.S. Policy in the Event of War," approved by the NSC in March 1959, appears to have kept open the option of preemptive response to an impending Soviet strike, without specifically endorsing it. NSC-5904/1 was considered so sensitive that even its title was classified. In December 1959, reflecting ambiguity in high policy, as well as increasing doubts as to the feasibility of preemption, the JCS split over whether JSCP guidance should provide for "the possibility of obtaining strategic warning of sufficient precision to impel the President to direct the initiation of operations by United States forces.

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(In the preparation of the first SIOP ...) Soviet strategic nuclear capability received first priority, followed by "primary military and government control centers of major importance." The NSTAP also called for a 90 percent probability of severe damage to at

least 50 percent of industrial floor space in urban-industrial targets. The assurance of delivery factor in each case was to be at least 75 percent.

By November (1960), the JSTPS had produced the first NSTL and SIOP. Recently declassified Navy papers outlined their grim parameters. The JSTPS selected 2600 separate installations for attack, out of a target data base of 4100. This translated into an NSTL of approximately 1050 Designated Ground Zeros (DGZs) for nuclear weapons, including 151 urban industrial targets. Given sufficient warning, the United States would launch its entire strategic force carrying 3500 nuclear weapons against the Soviet Union, Communist China, and the satellite nations. At the very least, an "alert force" composed of 880 bombers and missiles would attack some 650 DGZs (including 170 defense suppression targets) with over 1400 weapons having a total yield of 2100 megatons.

The SIOP aimed for an assurance of delivery factor of 97 percent for the first 200 DGZs, and 93 percent for the next 400, well above the goals established by the NSTAP. To achieve such levels, multiple strikes with high yield weapons were laid on against many individual targets. Little effort was made to develop an objectives plan based on what targets would have to be destroyed to achieve U.S. war aims. Instead, the SIOP was a capabilities plan, aimed at utilizing all available forces to achieve maximum destruction. As a result, although it eliminated duplication in targeting, it did not reduce the size of the target list. The plan made no distinction among different target systems, but called for simultaneous attacks on nuclear delivery forces, governmental control centers, and the urban-industrial base.

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Even more important, the SIOP was not tailored to either retaliation or preemption. From 1958 to 1960, the U.S. stockpile tripled in size, apparently growing from 6,000 to 18,000 weapons in only two years.

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By the time Eisenhower preparing and training left office, the Strategic Air Command had been for nearly a decade not only for massive retaliation, but for massive preemption. U.S. forces were routinely sized toward the objective of neutralizing Soviet nuclear forces, which were often grossly overestimated as a result of inadequate intelligence.

Despite growth of the planned U.S. nuclear offensive from a few dozen targets in 1948 to more than 2,500 in 1960, however, the secure achievement of the ability to disarm the Soviet Union appeared to remain just beyond reach.

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By September 1961, McNamara's definition of U.S. strategic posture was in place, incorporating second strike counterforce and the kind of "partial withholding" strategy

which RAND analysts had long been advocating. The nation must be able to respond to a surprise attack, McNamara stated, first by striking

Soviet bomber bases, missile sites, and other installations associated with long-range nuclear forces, in order to reduce Soviet power and limit the damage that can be done to us by vulnerable Soviet follow-on forces, while second, holding in protected reserve forces capable of destroying urban society, if necessary, in a controlled and deliberate way.

McNamara rejected finite deterrence, on the grounds that it did not provide for essential damage limiting and would not adequately deter Soviet attacks on U.S. allies. He likewise rejected the goal of a "full first strike capability."

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To adapt the SIOP to the new strategic posture, directives were developed during 1961 for SIOP -63, that mandated separation of the optimum mix target system into its major components. The three targeting categories selected were updated versions of the BRAVO, ROMEO, and DELTA priorities established in 1950: Soviet strategic nuclear capability, other military capability (including air defense and non-nuclear command installations), and the urban-industrial base. Arrangements were made to withhold attacks against one or more of these categories, depending on the circumstances, as well as against the Peoples' Republic of China and the satellite nations. These targeting options were complemented with a series of preemptive and retaliatory options, designed to permit flexibility in response to a variety of political and military condition and opportunities.

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Despite the Kennedy Administration's efforts to take control of the SIOP, the basic patterns of nuclear strategy it embodied proved resistant to change. From the time it was instituted, the SIOP became the highest priority mission of all its assigned forces, seriously limiting their availability for other military uses. The continued commitment to damage limiting laid the groundwork for continued upward pressure on force requirements, despite McNamara's efforts to impose restraints, especially since the Air Force remained convinced that the nation should strive for a first strike capability, in order "to limit damage to the United States and our Allies to levels acceptable in light of the circumstances and the alternatives available." Finally, although targeting and attack options were introduced, the SIOP remained capabilities plan rather than an objectives plan, invariably mandating that larger forces than necessary be applied to those targeting categories identified for attack, and never including fewer than "thousands" of weapons. For more than two decades, the SIOP has thus provided a floor beneath strategic force requirements and has dominated U.S. thinking about and planning for nuclear war.

As the Minutemen and Polaris systems entered the US strategic weapons stockpile during the 1960s, the relative distribution of warheads to target categories remained the same. Richard

Garwin disclosed in 1982 that when he served on a White House advisory panel on targeting in 1968, he found that only about 70 of 1000 Minutemen CBM warheads – 7 percent – were targeted against assured destruction targets (cities)".²⁵ Though this represented a reduction from the roughly 10 percent assigned to the urban-industrial target category that seemed to hold during the 1950-1960 period, may have represented an increase in the absolute number of warheads due to the substantial growth of the U.S. strategic stockpile in the period. Garwin's additional comment, that

"... there was no evidence of previous awareness at the White House or on the National Security Council that the Pentagon had continued to target primarily military facilities"

is difficult to understand in view of the history demonstrated in this study. Writing in 1982, Lambeth additionally pointed out that the 1961 change in administrations and the shift from the "optimum mix" to "flexible employment options" led to a significant change in targeting priorities

"... economic attacks were accorded a new status, that of a withheld 'reserve' force that that would not be executed unless this were deemed necessary in extremis.

...The nature of economic targeting in the overall strategic context has not changed appreciably over the past 20 years. It has been, and remains, a "final sanction" designed to deter total Soviet escalation if a nuclear war starts (and perhaps to coerce Soviet compliance with U.S. general war aims in limited nuclear and large-scale conventional fighting). In sum, key U.S. strategy developments of the past two decades have concerned military options despite the(se) declaratory peregrinations, no changes in basic economic targeting policy seem to have been implemented in the 1960s and early 1970s."²⁶

The "new status" of urban-industrial economic targets was thus a reduction in their priority.

The U.S. aim in an all-out economic retaliatory attack – if that should take place – would be to "destroy the attacker as a viable 20th century nation", in the words of Sec. McNamara. This "assured destruction" was a statement & place strategic deterrence; it was not the targeting priority, which actually was reduced, leaving the initial strike presumably even more counterforce than it had been before.

Literature on the SIOP is relatively sparse.²⁷ Most important are the book and papers by Desmond Ball,²⁸ and the surprisingly revealing Department of Defense testimony presented to the House Armed Services Committee in February 1979, months before the public release of PD-59.²⁹ Additional evidence is supplied by two useful book chapters by Enthoven and Smith³⁰ and by Henry Rowen,³¹ a review paper,³² several short papers in the military journal literature,^{33, 34, 35, 36} and some very brief remarks by Kistiakowsky.³⁷ This is virtually all that there is, little is scarcely known. Though many details remain unanswered, the information available is nevertheless sufficient to provide a coherent description, and one which is diametrically opposed to most public understanding of this issue. The absence of adequate discussion of actual US nuclear weapon targeting policies has led to virtual mountains of misunderstanding both at the

level of political discussion in the United States and in Europe, as well as in the academic analytic literature.

There are three authoritative descriptions of the target sets in the USSR that make up the SIOP. The first of these was presented in testimony to the US Congress by General Ryan, then Chief of Staff, US Air Force, in 1971.³⁸

In 1975 Rowen described the target categories more briefly as comprising three classes: "nuclear threat, other military and urban industrial".³⁹ In March 1980 the US Department of Defense presented a more detailed breakdown of targeted installations in testimony to the Senate Armed Services Committee.⁴⁰ The order of the groups has been transposed here (to indicate priority) to follow that of Ball:⁴¹

- Soviet nuclear forces. Including: ICBMs and IRBMs, together with their launch facilities (LFs) and launch command centers (LCCs); Nuclear weapons storage sites; Long range aviation bases (Airfields supporting nuclear-capable aircraft); SSBN (nuclear, missile-firing submarine) bases.
- Conventional military forces. Including: Casernes; Supply depots; Marshalling points; Conventional airfields; Ammunition storage facilities; Tank and vehicle storage yards
- Command and control (Military and political leadership). Including: Command posts; Key communications facilities.
- Economic and industrial targets. Including: (a) War-supporting industry – Ammunition factories; Tank and armored personnel carrier factories; Petroleum refineries; Railway yards and repair facilities; (b) Industry that contributes to economic recovery – Coal; Basic steel; Basic aluminum; cement; electric power.

It is also possible that during the tenure of Sec. Def. Schlesinger other post nuclear attack civilian recovery targets may have been included in category 4-b. In earlier years the US Air Force's Strategic Air Command (SAC) had also claimed for its strategic bomber force a "Hard Target Kill Capability" for "Command and Control Sites" and "Nuclear Storage Depots".⁴² It is important to point out that the Soviet "missiles" targeted included not only Soviet ICBM's but also Soviet IRBM's (intermediate-range ballistic missiles) aimed at West European targets. These are also targeted by NATO, together with "airfields, rail yards... and underground sites", as well as several other groups military targets.⁴³ Thus, the same counterforce orientation holds for NATO's weapons. The targets of US-NATO Long Range Theatre Nuclear weapons (now referred to as "Intermediate Range Nuclear Forces") include:

IRBM/MRBM sites, naval bases, nuclear and chemical storage sites, airbases Command, Control and Communications (C3) centers, headquarters complexes, SAM sites, ammunition and POL storage areas, ground force installations, choke points and bridges. Their military significance derives from the potential contribution of those targets to the support of sustained military operations by the Warsaw Pact.⁴⁴

It is also extremely important to point out that the priority order for which targets were to be attacked follows the order in which the target sets were listed by General Ryan in 1971: nuclear threat, C³, other military – and urban industrial last.⁴⁵ Whether this was revised, and to what

degree since 1974-75, is not known. Rowen, and more recently Richelson, have pointed out that the sequence of allocation of targets for assignment of weapons is not the same as the designation of sequence for the SIOP.

The policy also specified the priority to be given to each target class. From 1960 to 1974, the priority in the assignment of weapons was first, to the urban-industrial targets, and then to nuclear threat and other military forces. The capability of destroying urban industrial targets was to be assured even with inadequate warning of an attack on our strategic forces and the consequent loss of a sizable portion of them. In short, highest importance has been consistently given to assuring a stipulated level of damage to the Soviet civil society and not to attempting to limit damage to the U.S. or its allies. The basic planning process, once overall priorities have been established, is to assign weapons to specific targets.

For example, air defenses might be assigned to early missile attack because their destruction is important if bombers are to penetrate reliably... A high 'priority' in this context means 'most important.' It does not mean first in time. Presumably the most time urgent targets would be military forces, especially nuclear threat ones. Highest priority also does not mean that the greatest weight of efforts would have to be allocated against urban-industrial targets; rather that the confidence of being able to destroy these targets should be high.⁴⁶

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... sufficient weapons would be assigned first to those targets making up the Soviet economic recovery base to ensure destruction of that recovery base, and only then to military and political targets. There is a difference between weapons allocation priorities and execution priorities. Thus, while economic recovery targets may be the first targets to be assigned weapons, military targets might be assigned execution priority-that is, weapons assigned to military targets would be fired before those targeted against economic facilities. Such a tactic could be expected because many of the Soviet military targets, especially aircraft and missiles that might be used in a second wave, would be considered time urgent while economic facilities would not be. Additionally, the land-based weapons assigned to attack Soviet military targets are more vulnerable than the sea-based weapons assigned to economic targets.⁴⁷

Public estimates of the absolute numbers of targets in the various categories are confusing. A common estimate is roughly 70 percent of the total US strategic force is targeted against military targets. The figure quoted earlier provided by Richard Garwin is much higher: 93 percent. The estimate implied by the table below is very much lower, although the table indicates the list, growth of the potential target without specifying the number of targets within each category that may be actually targeted.

Ball explains further that

The SIOP is further divided into four general categories of options available for the employment of nuclear weapons: Major Attack Options (MAO); Selected Attack Options (SAO); Limited Nuclear Options (LNO), which are 'designed to permit the selective destruction of fixed enemy military or industrial targets'; and Regional Nuclear Options (RNO), which are 'intended, for example, to destroy the leading elements of an attacking enemy force'. Within each of these classes of options are a wide range of further options, including so-called 'withholds,' four general categories of which have been publicly identified: population centers; national command and control centers (exempted from attack at least in the initial phases of a nuclear exchange so as to enhance the prospects of escalation control); particular countries targeted in the SIOP (so that attacks on the Soviet Union would not necessarily involve simultaneous attacks on Eastern Europe, China, Cuba, Vietnam or other countries included in the SIOP); and 'allied and neutral territory.' Special categories of targets have also been delineated for pre-emptive attacks against the Soviet Union and for launch on-warning (LOW) or launch-under-attack (LUA) scenarios in the event of unequivocal warning of a Soviet attack.⁴⁸

The number of warheads in the US strategic stockpile surged during the 1950's. There were reportedly 50 nuclear weapons in May 1948, when the US Joint Chiefs of Staff approved the "Halfmoon" Joint Emergency War Plan.⁴⁹ By January 1951, the number was "less than 400."⁵⁰ During the 1960-65 period when the number of US nuclear weapons peaked, there were perhaps 4,000 strategic warheads and 35,000 to 40,000 tactical warheads. However, during this period a large number of "tactical" nuclear weapons carried by US forward based aircraft in Europe and by US carrier strike aircraft contributed to the SIOP. In other words, a strategic nuclear attack on the USSR at the time would have involved many more than the 4,000 "strategic" warheads. The 1963 description of the function of the Joint Strategic Target Planning Staff, prepared and distributed by the Strategic Air Command takes pains to repeatedly mention that the JSTPS also included the targeting of forward based fighter bombers and carrier based aircraft.⁵¹ In 1960-62 it was estimated that SAC and the Tactical Air Command (TAC) together could deliver 18,000 to 20,000 Megatons against the USSR in a 24-hour period.⁵² (See table regarding numbers and yields of US strategic weapons). It is not altogether clear whether some number of weapons set aside for a strategic reserve is counted into the SIOP, or whether it is held apart. The number of targets designated in the SIOP has always outrun the number of available weapons. The number of potential target installations was reportedly about 70 in 1949,⁵³ around 10,000 by 1966, 25,000 by 1974,⁵⁴ and 40,000 most recently.⁵⁵

In the earliest years of US possession of nuclear weapons SAC had sole responsibility for targeting and mission assignment. Even in this earliest period of very limited stocks of nuclear weapons and when city targeting predominated, military targets were also included. The war plan distinguished between ALPHA and DELTA, (large and soft), BRAVO and ROMEO target categories. Alpha and Delta were large and soft targets, essentially countervalue. Bravo targets were clearly identified as counterforce, and Bravo attacks were described as "blunting attacks".⁵⁶ Romeo were "targets to be destroyed to retard the advance of the Red Army into territory along the periphery of the Soviet Bloc" clearly also counterforce.⁵⁷ As noted previously, the priority for striking these targets BRAVO, ROMEO, and DELTA. These distinctions continued throughout the period of "massive retaliation." By the mid-1950s, as American stockpiles grew and as Soviet airpower came to be recognized as the chief threat to NATO, the emphasis of American targeting

policy shifted to counterforce targeting. A review of RAND papers of the mid- to late 1950s produced the following list of types of facilities that would be the expected targets of a Soviet nuclear attack on the United States, and one can unquestionably assume that the exact same set of Soviet targets obtained for SAC.

- military and civil air bases,
- naval bases, (including submarines and ASW forces,)
- ICBM installations,
- air defense installations, such as surface-to-air missiles (SAMs), air bases, and radar,
- ICBM early warning radar installations,
- satellite space tracking installations,
- military command, control and communications centers,
- military depots and stockpiles, particularly nuclear weapons,
- strategic (nuclear) production facilities,
- civilian port facilities,
- petroleum refineries and petroleum storage centers,
- electric power producing facilities,
- railroad marshalling yards,
- troop concentrations, concentrating points, troops in the field,
- urban areas and cities.

As the various military services obtained weapons these were assigned to the different unified and specified commands, and according to Rowen, "Before August 1960, each theatre commander made his own plans for the use of his commands nuclear weapons"⁵⁸ Air Force delivery systems were in SAC and TAC. The Army had "tactical" nuclear weapons. The Navy disposed of carrier strike forces and Regulus missile submarines, and Polaris was about to come into service. There was substantial duplication in the targeting, as well as competition among the services. It was realized that some order had to be imposed, particularly in view of the new US ICBM and SLBM systems that were soon to become available. The history of the SIOP began in the last year of the Eisenhower administration.

The resultant planning activity of the next two years has been described in the greatest detail to date by Ball:

In the fall of 1959, President Eisenhower requested the Net Evaluation Sub-Committee of the National Security Council, under General Hickey, to analyze the implications of alternative nuclear war-fighting strategies. The resultant study, NESC 2009, produced a Comprehensive Strategic Target List, developed a targeting policy of 'sequential options' (e.g., 'central strategic systems; other strategic systems; theater threats; countervalue'), and argued for an 'optimum mix' of counterforce targets and (so long as 'all known elements of Soviet nuclear capabilities and support systems' had been covered) countervalue targets. The study was accepted by Eisenhower and led to the establishment by Secretary Gates of the Joint Strategic Target Planning Staff (Joint Chiefs of Staff) at SAC headquarters at Offutt Air Force Base, Omaha, Nebraska, in August 1960, and the drawing up of the first National Strategic Target List (NSTL) and Single Integrated

Operations Plan (SIOP) by December 1960. The Joint Chiefs' current nuclear planning goal – the optimum mix – was spelled out in the NSTAP (National Strategic Targeting Attack Policy and Guidance for the Preparation of the Single Integrated Operations Plan for Strategic Attack).

At the same time as the NESC 2009 study was developing the strategy of optimum mix, a series of studies on counterforce and 'no-cities' strategies were underway at The Rand Corporation and the Air Staff's Directorate of Plans. At Rand, as early as 1956, Andrew W. Marshall had worked on an Air Force study which showed the advantages of hold attacks on cities and population to a minimum, and a large number of other Rand members were soon working on counterforce studies – among them Herbert Goldhamer, Nathan Leites, Joseph Loftus, William Kaufmann, Daniel Ellsberg, Albert Wohlstetter and Ed Barlow. From late 1959, work on counterforce at Rand continued under a major project headed by William Kaufmann. In 1960, Kaufmann worked closely with Brig. Gen. Noel F. Parrish and Lt. Col. Donald F. Martin of the Air Staff in designing a specifically no-cities posture... McNamara was introduced to counterforce and no-cities strategies in a formal briefing by Kaufmann within a week of taking office... On 6 March 1961 he ordered the preparation of a draft memorandum revising basic national security policies relating to nuclear weapons, including an examination of 'the assumptions relating to counterforce strikes.' The Joint Chiefs were also ordered to 'prepare a Doctrine which if accepted, would permit controlled response and negotiating pauses in the event of thermo-nuclear war.' ... The Joint Staff paper for Project No. 2 argued for strategic flexibility and graduated options. The substance of Project No. 2 was then embodied in the Pentagon's Guidelines for Planning, which included a draft Policy Guidance on Plans for Central War, which in turn became the basis of the 1961 revision of the SIOP.

The Joint Strategic Capabilities Plan (JSCP) which was inherited by the new Administration had contained only one plan, under which the United States would launch all its strategic nuclear delivery vehicles immediately upon the initiation of nuclear war with the Soviet Union. The single JSCP target list predominantly included Soviet and satellite cities; no strategic reserves were to be held, and there was no provision for the preservation of command and control. Expected Soviet Chinese, and satellite fatalities were placed by the Joint Chiefs at 360 to 525 million. In place of this single JSCP, a new strategic policy was drawn up with these major conditions:

- China and the satellite countries were separated from the Soviet Union for targeting purposes.
- Soviet strategic forces were separated from Soviet cities on U.S. target lists.
- Strategic reserves were to be held by the United States in accordance with the concept of intra-war deterrence.
- U.S. command and control systems were to be protected to allow 'controlled response.'
- Soviet command and control were to be preserved, at least in the initial stages of any nuclear exchange.

The U.S. SIOP was given five 'options,' plus various sub-options, with U.S. attacks to proceed along the following spectrum:

- (1) Soviet strategic retaliatory forces – e.g., missile sites, bomber bases, submarine tenders.
- (2) Soviet air defenses away from cities – for example, those covering U.S. bomber routes.
- (3) Soviet air defenses near cities.
- (4) Soviet command and control centers and systems.
- (5) If necessary, all-out 'spasm' attack.

Sub-options included such things as use of air/ground burst weapons; clean/dirty bombs; larger/smaller warheads; civil defense/evacuation.

Initial work on the revised SIOP, done mainly by Daniel Ellsberg and Frank Trinkle under the direction of Alain Enthoven (all Rand alumni) was completed by late summer of 1961. It was then taken up by Henry Rowen and General Maxwell Taylor and formalized that fall. The Joint Chiefs of Staff studied and approved the strategic change in late 1961, and the change was officially adopted in January 1962. To provide the Soviet Union with the option of fighting a controlled nuclear war, Moscow was taken off the initial U.S. target list in late 1961. The final U.S. nuclear war target list was adopted by the Joint Strategic Target Planning Staff in June 1962.

While U.S. targeting plans were being revised, work was also underway redesigning the U.S. strategic posture to make it compatible with the new nuclear war-fighting strategy. In the spring of 1961, the NESC was formally directed to 'determine the force levels necessary to accomplish to objectives of the NSTAP.' The NESC study (the Hickey study) concluded that the currently programmed strategic force was inadequate for that objective. It recommended a much expanded Minuteman force (2000-2150 missiles by 1971), the development of much improved CEPs and a very high warhead yields (over 50 megatons for advanced Titan missiles), a variety of yield options for SLBM warheads (from the multi-megaton range), and the procurement of a force of reconnaissance-strike bombers with 'fully reprogrammable' cruise missiles and 'very high Pk (single shot kill probabilities) against any target.'

In April 1961 a task force was set up to study the field of command and control. Later, September 1961, it was subsumed into a major committee headed by General Partridge. The Partridge report on presidential command and control, completed late in November 1961, contained plans for a national command and control system, designed to provide the President of the United States with a system that would survive nuclear attack and to give him instantaneous command over vital US military forces. This policy change from massive retaliation to the strategy of 'controlled flexible response' required major changes in the Minuteman missile system. In mid-1961, the Fletcher Committee was set up by the Secretary of the Air Force, Eugene Zuckert, and given verbal orders on 30 July 1961, for the purpose of reviewing the safety and the flexibility of the system. The recommendations of the Fletcher Committee, submitted on 27 September 1961, 'were thoroughly reviewed by the Air Force and schedules /were/ developed for their incorporation'; they were responsible for major 'ground rules changes in the Minuteman program.' The Fletcher Committee said the change in U.S. strategic posture from massive retaliation to controlled flexible response required changes in the command-and-control electronics so that the operational concept of the Minuteman force would enforce that national

policy. Force improvement such as selective launch and stop launch, increased target selection capability, lighter guidance and control packages, safety, refinements in propulsion, and a new re-entry system (Mark-II) should be developed.

The Minuteman I missile was given, in the summer of 1961, a target selection capability of eight targets; it previously had only one. Target selection, from basic data stored on a disc-type memory unit, could be completed in a very few seconds; complete change of the disc, however, had to be done manually in the Minuteman I if available target selection did not coincide with the overall military plans, and required several hours. And whereas previously the Minuteman force could only be launched in squadrons (of 50 missiles), it was now given a selective, individual missile launch capability. The Minuteman missile was also given a longer range. These changes increased the cost of the Minuteman program by some \$840 million. By the end of 1961 then, after about eight months' intensive work, the United States had developed a new nuclear war-fighting strategy and redesigned the U.S. strategic targeting plans (although the delineation of the specific targets was not completed until June 1962), and had begun redesigning the Minuteman missile, the Minuteman force program, and the national command and control system to fit into this strategy. In January 1962, McNamara's FY 1963 defense budget statement revealed, for the first time from an official in public, that the first steps toward the no-cities version of the counterforce strategy were being taken. On the question of counterforce, McNamara stated in his prepared statement that, 'A major mission of the strategic retaliatory forces is to deter war by their capability to destroy the enemy's war-making capabilities.'⁵⁹

For example, Attack Options I and II in the 1962 SIOP were aimed at 'the destruction or neutralization of /Soviet/ strategic nuclear delivery forces' and '/conventional/ military forces and military resources in being' respectively; the successful execution of Attack Option II would have reduced the 'Soviet-Satellite residual ground forces' to seven Soviet and 10 satellite divisions and neutralized the Eastern Bloc air forces as effective combat elements.⁶⁰

"Forward-based" US nuclear strike forces of the Tactical Air Command in Europe strike plan, were also included in the US strike plan, at least from 1961 on. In the wake of the SALT I agreement, Sec. of State Kissinger publicly acknowledged the fact, implying that about 330 aircraft had this strategic mission.⁶¹

On May 5, 1962, Sec. McNamara presented a short synopsis of the targeting policies and programs that the US was developing – along with a rendition of the surprising amount of the nuclear weaponry that was being assigned to NATO targets – for the NATO Ministerial in Athens.⁶² This was followed by the oft referred-to Ann Arbor, Michigan address on June 16, 1962. It was the reaction to these two speeches, combined with the problem of controlling internal bureaucratic strategic weapon acquisition policies in response to the 1960-62 policies that developed the situation which led to two decades of public confusion as to US nuclear weapon targeting policies Ball again sums up the factors that caused this development:

Almost immediately, however, McNamara apparently began backtracking from his Ann Arbor position. The second Draft Presidential Memorandum (DPM) on strategic forces,

for example, in late 1962, represented a distinct retreat from his earlier position. It stated, for example, 'We do not want a comprehensive damage limitation posture.'

The reasons for McNamara's apparent were several-fold.

First, within the United States there was much criticism of the first strike implications of the counterforce strategy. As one former McNamara aide is reported to have said: '... there could be no such thing as primary retaliation against military targets after an enemy attack. If you're going to shoot at missiles, you're talking about first strike.' This question was unnecessarily complicated because of the Administration's ambiguity on whether U.S. policy completely ruled out striking first. President Kennedy had said in March 1962, for example, that 'Khrushchev must NOT be certain that, where it's vital interests are threatened, the United States will never strike first.'

A second factor was the Soviet reaction. In their public statements at least, Soviet spokesmen denied the possibility of controlled counterforce warfare. Avowed Soviet strategy was to strike against military targets, governmental and administrative centers, and cities simultaneously and immediately on the outbreak of general hostilities. Whether in fact the Soviets would accept the U.S. strategy was an open question; McNamara himself actually believed that any nuclear attack by the Soviet Union on the United States would include an attack on the major urban areas of the United States. In any case, it was argued, while Soviet missiles were few and vulnerable and U.S. force numerically so superior, the Soviet Union could not afford to play 'games' of controlled 'tit-for-tat' with each other's missiles. And as the Soviet force grew larger and became hardened and dispersed, McNamara believed the destruction of any large number of missiles would be 'unfeasible.'

A third factor was the unfavorable reaction of West European allies. McNamara had first described the no-cities strategy to them at a secret session of NATO in Athens in May 1962; the audience was reportedly incredulous. Following McNamara's Ann Arbor speech, Secretary of State Rusk made a three-day tour of six Western capitals to explain to West Europe's leaders the new U.S. policy. But he met with frustration, the NATO allies were obviously unwilling to accept the implications of the no-cities strategy, especially for small, independent European nuclear capabilities. Not only did the Ann Arbor strategy deny the Europeans nuclear independence and fail to consider the different targeting priorities of the European governments; it also raised the specter of separating European security from that of the United States and, by removing the threat to Soviet cities, of removing pari passu the deterrent to a Soviet attack on Europe, and even of the possibility of fighting a nuclear war over European territory while leaving the Soviet and U.S. homelands unscathed.

But, most importantly, McNamara decided to withdraw from his Ann Arbor position for bureaucratic reasons. By the time of the development of the FY 1964 defense budget in late 1962, it was clear to McNamara that the Services, and particularly the Air Force, were using his declared policy of no-cities counterforce as a basis for requesting virtually open-ended both more Minuteman missiles and procurement of a force of supersonic

reconnaissance-strike (RS-70) bombers. He thus came to place more stress on assured destruction capabilities (although by strategic weapon programs defining the assured destruction criteria conservatively, he could still procure sufficient forces to allow a damage limiting mission), and in January 1963 he directed William Kaufmann to give a briefing to some dozen Air Force generals to the effect that they were no longer to take the avowed U.S. strategy as a criterion for strategic force proposals. In separating declaratory policy from actual policy, McNamara was to a large extent using strategic doctrine as a weapon in the continuous intramural bureaucratic battles over military programs and Defense (and Service) budgets

The third annual DPM on strategic forces, in August 1963, retreated even further from pure counterforce than had the second, and there was great agitation at the highest levels in the Pentagon about 'what was referred to as McNamara's backsliding.' There was particular concern within the Air Force that McNamara would even change the 1962 SIOP. In fact, few substantive changes have ever been made to the 1962 SIOP. Even during the depths of assured destruction, it weathered possible substantive change. The last Joint Strategic Operations Plan (JSOP to which SIOP is in effect an appendix) drawn up under Secretary McNamara, the JSOP 1969-77, February 1967, stressed such notions as options, control, flexibility, and sequential attacks. Its terminology pointedly indicated its direct descent from NESC 2009.⁶³

It was this combination of factors which produced the situation in which over 20 years of analytical and academic confusion reigned regarding US strategic targeting policies. A journal literature that contained literally many hundreds of papers dealing with the subjects of nuclear "deterrence," "mutual assured destruction," etc., demonstrated a pervasive and thorough ignorance of the actual state of planning regarding the potential use of nuclear weapons. Moreover, an added complication – and irony – was that the critics who sought a greater degree of hard target counterforce capability for the US force structure, and whose main critical vehicle was a thoroughly false parody of the acronym "MAD" – "Mutual Assured Destruction," as well as those who were most interested in arms control both fed the continued misrepresentation.

Nevertheless, sufficient information has been available over the years to have provided any interested researcher with the ability to make a more cohesive interpretation of the relation of US nuclear weapons capabilities and policies, and thus a more informed approximation of reality. As early as 1956 a former Deputy Sec. of Defense explained the necessity of distinguishing between the two related but different meanings of the word "policy." Paul Nitze pointed out, "In one sense (of the word 'policy'), the action sense, it refers to the general guidelines which we believe should and will in fact govern our actions in various contingencies. In the other sense, the declaratory sense, it refers to policy statements which have as their aim political and psychological effects...Our action policy has been, is, and I believe, will continue to be, one of graduated deterrence" – or, as he goes on to describe, "one of controlled counterforce damage limitation; but what should ever be declared about it is more complex."⁶⁴ In 1967, Dep. Sec. Defense Cyrus Vance, after indicating the numbers of casualties the US and USSR would sustain, with or without ABM systems, and in the case of US or USSR first strikes, stated,

I would point out that the data in this table are highly sensitive to small changes in the pattern of attack and small changes in the force levels.

For an example, the United States 'strike-first' case on the right assumes that we are striking only military targets. We could change those Soviet fatality figures very substantially if we chose to attack both military targets and cities in a "first strike", if we were indeed to strike first which we certainly do not plan to do.⁶⁵

In 1968, Asst. Sec. Defense Enthoven

Dr. Enthoven, First, I would like to emphasize that our targeting policy, as reflected in the guidance for the preparation of the targeting plan, has not changed. From 1961-62 on, the targeting plan has been based on the principle that we should have different options that target the strategic forces and cities. As US and Soviet forces have changed, naturally the targets have changed.

What has changed is our appreciation of how much damage we can do by targeting strategic forces. When the Soviets depended mainly on bombers and soft missiles, their forces were quite vulnerable, and we thought we could inflict considerable damage to them. Now that they are defended mainly by ICBMs in hardened silos, and submarines, we do not believe we can accomplish as much anymore.

...Let me discuss your points one at a time. For one thing, we now have and in our planned forces expect to keep substantially harder target killing capability than the Soviets, because we are well ahead of them (deleted). I am sure Dr. Foster discussed that point with you.

A second point is that we have found that MIRV's are advantageous for all kinds of targets.⁶⁶

In 1974, former Asst. Sec. of Defense Enthoven again.

Dr. Enthoven. Well, first of all, I am not sure what has changed. I read Secretary Schlesinger's recent remarks. Some of his remarks could be taken to imply that the previous strategic targeting doctrine associated with the concept of assured destruction was limited to attacks of Soviet cities. I can't speak for the years since January 1969, but that certainly would not be an accurate description of the thinking of the leaders of the Defense Department from 1961 to 1968.

One must distinguish criteria for measuring the adequacy of forces from targeting doctrine. As Secretary McNamara and others, including myself, stated repeatedly, assured destruction was a criterion for the adequacy of our strategic retaliatory forces, and not a statement of targeting doctrine.

For example, in June 1968 I told the Preparedness Investigating Subcommittee on Armed Services, our targeting policy, as reflected in the guidance for the preparation of the

targeting plan, has not changed. From 1961-1962 on, the targeting plan has been based on the principle that we should have different options that target the strategic forces and cities."⁶⁷

and in the same year, another Asst. Sec. of Defense during McNamara's tenure:

The SIOP remains essentially unchanged since then (McNamara's Ann Arbor speech of 16 June 1962). There have been two developments, however: (1) it has become more difficult to execute the pure—counterforce option, and its value is considered to be diminishing and, (2) all public officials have learned to talk in public only about deterrence and city attacks. No warfighting; no city-sparing. Too many critics can make too much trouble (no-cities talk weakens deterrence, the argument goes), so public officials have run for cover. That included me when I was one of them. But the options and the order of choice remain unchanged targeting philosophy, the from the McNamara speech.⁶⁸

Senior military officers provided the Congress with similar if somewhat less explicit testimony. In the same 1968 Senate Hearings on The Status of US Strategic Power, Chairman of the Joint Chiefs of Staff General Earle Wheeler testified as follows:

(JCS War Plans Allocate Weapons for Damage Limiting)

General Wheeler. That is Mr. McNamara speaking. Speaking for the Joint Chiefs of Staff, we still have adhered to our concept. Yes, you attack the urban industrial base, that is the population base and industry, but we also have always held to the view that we must attack those forces of the Soviet Union which are able to inflict destruction on ourselves and on our allies.

Mr. Kendall. What you are saying is that our war plans do allocate weapons for damage limiting or counterforce?

Mr. General Wheeler. They certainly do.

Mr. Kendall. Is the guidance that is furnished to the Joint Chiefs in this respect consistent with your understanding of what our national strategy is?

General Wheeler. Yes, sir; it is.

Mr. Kendall. With respect to the change in the strategy enunciated by Secretary McNamara, back in 1962 and 1963 and 1964 we had a rather clear superiority over the Russians, and that superiority has at least been decreased as of today. In your view has our policy or the new strategy resulted from the requirements of the situation now as compared with the relative capability of the forces in 1962, 1963, and 1964?

General Wheeler. I really don't think we have a new strategy, Mr. Kendall. In the instructions to the field commanders [deleted] and these are under several assumptions, as I believe you know, depending upon how the war starts. [Deleted.]

Mr. Kendall. I recognize that the military concept hasn't changes, but I think it is rather clear that the policy or concept as enunciated by Secretary McNamara has changed over this period.

I am wondering whether this resulted from a recognition of the proposition that whatever we do we can't do anything significantly in the damage limiting field, or whether there was some other reason?

General Wheeler. We can do certain things that are significant in the damage limiting field. [Deleted] and we have made no change in this targeting policy.

(Guidance Gives Priority to Assured Destruction Mission.)

Mr. Kendall. But isn't it true that the guidance furnished you by the Secretary of Defense says that the No. 1 priority for our forces is the mission of assured destruction of urban-industrial complexes?

General Wheeler. Oh, yes, this is true.

Mr. Kendall. And you use what you have left over for damage limiting or counterforce?

General Wheeler. Well, I don't believe he said use what is left over. He said first priority is the assured destruction role, and that the second priority would be that of limiting damage to this country, I must say that I can't disagree with that, the reason being the one I gave at the very outset of this series of questions; namely, you can only limit damage to this country to a certain degree. You cannot preclude damage to this country at the present state of the art, when you are dealing with missiles, flight times, and warnings that are available to the enemy.⁶⁹

It seems clear that on a substantial number of occasions senior civilian and uniformed officials in the Department of Defense attempted to correct at least some of the confusions that members of the US Congress, the press, and academic authors continued to maintain regarding US nuclear targeting policies with little or no success.⁷⁰ Such statements have continued. In 1984, Leon Sloss, who had directed the Dept. of Defense studies of nuclear targeting policy in the Carter administration that led to P.O.59 in 1980 wrote:

In reality, ever since the advent of intercontinental capabilities, US strategic forces and their supporting command structures, the essential evolution has been in US declaratory policy (authors emphases).⁷¹

In the same year an Asst. Deputy Sect. of Defense in the Reagan administration commented much to the same effect.

While we have had changes in our theoretical nuclear strategy – McNamara had his strategy, Schlesinger had his – the actual targeting of the weapons has never changed. That's under control of the military, and they have never paid much attention to strategic concepts.⁷²

Political guidance from the Secretary of Defense – and hence from the President has apparently always been sufficiently vague for the Joint Strategic Target Planning Staff (JSTPS) to assign priority to counterforce targets and "damage limitation".⁷³

The purpose of the SIOP was to specify for several options, nuclear weapons to be used, delivery systems, routes of attack, timing of attack, and the expected level of target damage to be attained. With the advent of MIRVs on one side the large numbers of warheads available and the problems of cross-targeting and targeting the multiple warheads from individual delivery systems – and on the other the large growth in the USSR target set, the planning and weapon allotment becomes an extremely intricate task. The principle of "cross-targeting", i.e. the assignment of weapons to the same target from forces that have very different vulnerabilities on the ground to Soviet attack and different problems of penetration to target, has been employed in order to have high confidence against possible failure. This process involves multiplying a series of estimated probabilities, e.g., of survival, reliable launch, penetration to target, and probability of target destruction (given a specific bomb or warhead yield and weapon delivery targets to achieve a given level of expected damage or a given level of damage with a certain level of confidence. In 1972 Mariska's paper described in some detail the organization and operations of the JSTPS planning staff.

Conceptual planning conducted by the SIOP Division is followed by force application which entails developing force planning factors, selecting optimum weapon systems for specific objectives, and mating the SIOP force with the precision essential to penetrate enemy defenses and assure target destruction. To complicate such planning, none of the modern nuclear weapons in the world today have ever been exposed to or tested in nuclear combat.

The SIOP Division must examine such things as the type of weapon that should be allocated against a particular target, how to route the aircraft, and how to prevent interferences between weapons. With the aid of the SAC computer framework, information is readily available on virtually every nuclear delivery vehicle and weapon in the United States inventory. Ability to survive an attack, system reliability and accuracy, as well as projected ability to penetrate defenses, are all combined by the JSTPS in terms of statistical probability at a point in time.

The SIOP Division develops the plan, covering the strategic target list with the forces available. In doing so, the SIOP Division must consider some other important factors, including the most likely conditions of plan initiation, forces and weapons available and their characteristics, and capability estimates of possible enemies. Significantly, the SIOP Division considers attack timing, tactics, and force postures as well as producing the Coordinated Reconnaissance Plan which is destined for use in the trans and post-SIOP time frames.

The SIOP is constantly updated to reflect those changes in targets and forces which require prompt adjustment to the operational plan. Should a new priority target appear, or a target priority be altered to reflect new conditions, modifications are introduced into the current plan. The SIOP is also changed to distribute the targets of a weapon's carrier which has undergone a change in operational status because of maintenance or modification—an example of which would be the addition of a short-range attack missile capability to the bomber force.

To compensate for new strategic developments, every six months the SIOP undergoes a major revision which incorporates all daily changes, future force projections, and the innumerable variables which require refinement to align military forces, assign targets and assess the outcome of periodic war games activity.

Two distinct study groups support the JSTPS—the Strategy Panel and the Scientific Advisory Group. The Strategy Panel, an in-house organization, concerns itself primarily with preplanning SIOP tactics and strategy one to two years in advance of its effective date. Through its subordinate working committees, the panel investigates future targets, the impact of new weapons systems and their optimum employment.⁷⁴

The Meaning of Assured Destruction and Damage Limitation

Aside from the SIOP itself, the subject which was given the least examination by strategic analysts was any attempt to grapple with the meaning of "damage limitation." A historical analysis of that is not attempted here either. However, Dept. of Defense sources did indicate quantitative indices for "assured destruction" at various times, and these can be described.

What did "damage limitation" and "assured destruction" in fact mean?

Reporting to Congress in January 1964, Sec. McNamara reported:

Over the last 2 1/2 years we have made many comprehensive studies of alternative U.S. strategic retaliatory force structures employed in a nuclear exchange with a wide range of possible Soviet forces and under a wide variety of assumptions pertaining to the outbreak of war and United States and Soviet operational factors. In every pertinent case we found that forces in excess of those needed simply to destroy Soviet cities would significantly reduce damage to the United States and Western Europe. And the extent to which damage to ourselves can be reduced depends importantly on the size and character of our own forces, particularly the surface-to-surface missiles such as MINUTEMAN that can reach their targets quickly.⁷⁵

In his Defense Department Report for 1969, for example, Secretary of Defense McNamara said, "I would judge that a capability on our part to destroy say, one-fifth to one-fourth of (the Soviet Union's) population and one-half of her industrial capacity would serve as an effective deterrent. Such a level of destruction would certainly represent intolerable punishment to any twentieth century industrial nation."⁷⁶ In the same year (and on the only such occasion) one of Sec.

McNamara's deputies presented a somewhat more detailed graphical presentation of the same estimates, and related them to nuclear warhead delivery requirements.⁷⁷ Maintaining an "assured destruction capability" meant being able to destroy between 20% and 30% of the population of the USSR and between 50% and 70% of its industry. This would require the delivery of between 150 and 400 nuclear warheads on target, and for formal estimates – as this meant after riding out a USSR first strike and accounting for reliability reductions in the remaining force – it meant the stockpiling of very many more. In addition, the calculated US remainder would decrease with time as USSR weapons capabilities improved, thus requiring constantly higher US initial levels. These values, or criteria, became in effect a definition of “deterrence.”

Several important points should be made regarding these values. First, as already indicated, they designated the number of US warheads necessary to arrive on Soviet value targets after US forces had absorbed a USSR first strike.

Therefore, the initial US procurement must be sizably larger. But as also indicated previously, the numbers actually procured, as well as their accuracies, went very substantially beyond the amounts needed to fulfill the assured destruction requirements. These extra capabilities provided the means for "damage limitation." Second, USAF criteria for the required degree of USSR – i.e., those of SAC and the JSTPS were double those of the population loss Office of the Secretary of Defense, and their criteria for industrial destruction were 15% higher. During the 1976-77 period, under Sec. of Def. Rumsfeld, a criterion of 70-80% destruction of USSR industrial production began to be used. But the JSTPS and the Office of Sec. of Defense are both guilty of the same drastic underestimate in the relation of USSR population casualties to number of warheads, by anywhere from 50 to 100%. An absolute value of fatalities is used, but the estimation process is inaccurate because the rural population fatalities, about 50% of the total in the case of the USSR, are not included. In addition, fatalities due to fallout and other secondary effects are not considered. The categories of effects that produce collateral damages are:

- Prompt civilian casualties.
- Delayed civilian casualties due to exposure to prompt radiation.
- Delayed civilian casualties due to exposure to fallout radiation (this would include ingesting contaminated food and/or water).
- Arable land area contaminated by fallout which produces a specified level of radiation.
- Water supplies contaminated by fallout which produces a specified level of radioactivity.
- All subsequent mortality due to disease, starvation, and other cascading effects.

The estimates of USSR population loss under nuclear attack, as do those of US population loss under USSR attack, take into account only the first of these effects, prompt urban mortality.

A final major caveat that was never publicly explained was that each "leg" of the US "triad." land-based missiles, submarine-launched missiles, and the manned bomber fleet, was to be able to independently maintain the "assured destruction" warhead criteria. In addition, US carrier-based strike aircraft also contributed to the SIOP for many years. From 1974-75 on, however, the requirement had apparently no longer been that each part of the triad be able to carry out the assured destruction mission alone, only that any two of the three be so able. In addition, some

number of weapons were assigned to a strategic reserve, and were assumedly not counted in the SIOP, and this still remains the case.

Kanzelberger summarized the McNamara policies very generally in a 1979 RAND historical analysis as follows:

In 1965, Secretary of Defense McNamara measured assured destruction of potential adversaries in terms of eliminated population and industrial capacity. The 200 largest urban areas in the Soviet Union would be targeted because they contained about three-fourths of the industrial capacity. Following a Soviet strike, the US strategic forces would destroy about 80 percent of Soviet industrial capacity and create up to 115 million fatalities assuming 400 one-megaton warheads were delivered on target.

The response time varied from rapid reaction measured in terms of minutes to more graduated options measured in days or months. Although only a portion of the ICBMs or SLBMs and no bombers would be required to achieve assured destruction, 'the remaining elements of the strategic offensive forces [were] procured because it [was] believed they, along with air defenses, [would] limit damage in the event deterrence failed.' Targeting of the remaining warheads would be directed therefore against enemy delivery vehicles at their launch sites to meet the supplemental objective of damage limitation.

....

Because the United States was not planning to strike first in this formulation, the efficacy of damage limitation for [U.S.] cities were critically dependent on the timing of enemy attacks on U.S. urban targets and the efficiency of U.S. strategic intelligence. If the military knew what Soviet missiles were yet to be fired, it might be possible to destroy some weapons on their launchers.

McNamara's 'damage-limiting' formula was justified on the basis of an abiding concern with deterrence failure. It mattered not whether deterrence broke down as a result of deliberate, miscalculated, or accidental transgression; he believed that an effort must be made to salvage what was possible from dire nuclear circumstances. If the worst happened, the objectives were clearcut: do not strike enemy cities; do hit as many unused enemy strategic weapons as possible.⁷⁸

However, as the sequences of nuclear strikes and counterstrikes that would initiate a nuclear war is not predictable in advance, the mutual ability of the US and USSR to degrade each other's counterforce weapons – accuracy, yield, hardness, and firing rate interactions – would all come into play. The ability of the US to maintain the weapon levels required to fulfill the assured destruction criteria was therefore critically dependent on various parameters of the USSR strategic weapon inventory as much as it was on numbers of US warheads:

- the numbers of Soviet strategic weapons (as well as of other aim points);
- the hardening of their ICBM silos;
- the degree of Soviet active defenses against US bomber penetration;

- the readiness of Soviet strategic weapons.

The remaining consideration regarding the "assured destruction criteria" is perhaps the most important of all and is of an entirely different nature. It is that these criteria served as the basis for the general sizing of the US strategic forces, both to the public and for the internal defense bureaucracy – despite the fact that they were uniformly exceeded via the interservice pressures for the triad, as well as the procurement of as much counterforce capability as the interaction of technology and budgets would permit. The complicated and ambiguous but substantial portion of the US forces procured for "damage limitation" escaped public analysis. In addition, as has already been made clear, the assured destruction criteria did not determine targeting choices or priorities once the weapons were procured.

1968 to 1976: Developments During the Republican Administration, NSDM-242 and Secretary of Defense Schlesinger

The new administration's interests in increased counterforce nuclear weapon capabilities were apparent very soon after President Nixon's assumption of the presidency. This was evident during the years of Laird's tenure as Sec. of Defense and long before James Schlesinger assumed that post after several years of the Republican presidency. The administration accelerated the Poseidon and Min. III MIRV deployment program and decided against seeking any conon MIRVs in the SALT negotiations. President Nixon's ambiguous and not very enlightening paragraphs on the need for an American President to "other options" than urban targeting in his 1970, 1971, and 1972 Foreign Policy Reports are well known. It less well known that after several years of claiming that it did not intend to develop weapons which would be "construed" as having first strike potential, the administration asked for funding for new MIRV packages with target yield/accuracy combinations in the early 1972 DOD budget requests for FY 1973.⁷⁹

Shortly after taking office President Nixon requested a review of US nuclear weapons policy. The study groups to revise US "war plans" were chaired by Henry Kissinger. The rationales for the modifications were several:

- Soviet ICBM numbers had grown drastically, some ICBM's had been hardened, and SLBM deployment was becoming substantial.
- A MARV warhead was being sought as a hedge against a USSR "break out" via upgrading of its SAM systems.
- It was suggested that the development of a US hard-target anti-silo capability would deter the USSR from going ahead and seeking the same capability
- It was also stated that the various alternatives in the SIOP were "... all on so massive a scale, officials say, that on Russian radar screens the approaching missiles and bombers" would probably appear headed for Soviet cities, whether they were or not.

Rather interestingly, it was indicated that "current war plans continue to list certain "hard" targets, that there are hundreds of such targets on the list... not counting silos," " and nuclear weapon storage bunkers were given as the example. It was also indicated that "the US might fire six to ten warheads at a single target under existing plans" to compensate for yield/accuracy deficiencies against hard targets. With increasing numbers of USSR ICBMs, and with more of

them being hardened, clearly greater efficiency of US counterforce warhead allotment was required. Hence the new plans for additional system upgrading. The suggestions for limited and selective attacks against smaller military target-sets that Sec. Schlesinger would announce 15 months later were already under consideration.

However, the administration's approach was wider than simply development of hard-target warheads. On May 26, 1972, the treaty on the limitation of antiballistic missile systems (ABM treaty), the Interim Agreement on the limitation of offensive weapons, and an additional protocol on the number of ballistic missiles submarines and launchers on submarines were signed in Moscow. Within a week U.S. Secretary of Defense Melvin Laird and John S. Foster, Jr., Director of Defense, Research and Engineering, had presented a series of "SALT related adjustments to strategic programs" in placing their budget requests for fiscal year 1973 before the U.S. Congress. These adjustments were, in various presentations, six or eight new or accelerated strategic weapons programs. Foster's position was that the United States must prepare to deploy weapon systems permitted by SALT and to procure strategic systems to give the United States a "timely and credible hedge" against abrogation or expiration of the SALT arms agreements:

Both Secretary Laird and Admiral Thomas H. Moorer have made clear that the full success of SALT depends on sustained U.S. strength and that programs necessary to sustain that strength must go forward if the viability of the agreements is to be assured. There are several reasons for that position:

First, the initial agreements have slowed but not stopped the increase in Soviet strategic strength. They embody as effective limitations as we could get the Soviets to accept at this time. Although they impose no limits on some threats such as ASW (anti-submarine warfare), air defense and qualitative improvement in ICBM and SLBM (submarine-launched ballistic missile) forces, the agreements do provide for the U.S. Our programs necessary to counter Soviet developments in these areas. security depends on continuing the programs necessary to counter the threats not limited by the agreement.⁸⁰

Secretary Laird and Admiral Moorer, head of the Joint Chiefs of Staff, went so far as to say that they could not support the SALT agreements unless these programs were approved. Foster listed eight programs:

- The Trident submarine and the ULMS (under sea long-range-missile system) submarine to replace the U.S. Polaris—Poseidon fleet.
- Satellite bomber basing, to disperse the U.S. strategic bomber force additional bases as a protective measure.
- The B-1 bomber, a supersonic replacement for the B-52 and FB-111 strategic bombers.
- Site Defense or "Hardpoint Defense" and ABM system: "The objective of the program is to develop and preserve the option to responsively deploy a strategically significant terminal defense of U.S. ICBMs".
- NCA (National Command Authority) Defense, an ABM system for Washington, DC.
- Command, Control and Communications; Advanced Airborne Command Post, and other aspects.
- Submarine-Launched Cruise Missiles.

- Augmented Verification Capabilities, to further improve the National Means of Verification through such methods as satellite reconnaissance.

Secretary Laird listed five of these eight (2, 4, 6, 7, 8) but added a rather important ninth program: "develop improved re-entry vehicles for ICBMs and SLBMs". In the subsequent Senate records this was identified as coming under the ABRES program (Advanced Ballistic Missile Re-entry Systems)⁸¹ and ICBM warhead development program going back over 10 years. Still other programs appeared as "hedges against future threats or requirements": mobile ICBMs, early warning radars for the SLBM "threat," and the Sanguine VLF (Very Low Frequency) communication system for the U.S. Polaris-Poseidon fleet.

The budget had also already contained substantial amounts development and for site-defense ABM and other advanced ABM technology. These recommendations prompted Herbert Scoville to remark that "Arms control negotiations are rapidly becoming the best excuse for escalating, rather than toning down the arms race... It is hard to understand how the results of SALT I could possibly justify these increases."⁸² Scoville was not alone in suggesting that the two-and-a-half-year SALT I discussions may have provoked and accelerated concurrent strategic weapon deployments on both government sides. George Rathgens was another former US official who came to the same judgement that systems that might not otherwise have been deployed at all, or not so fast, were a consequence. In addition, the military of at least one of the two sides was presenting a bill of particulars as a price for its support of the agreements. Precisely the same thing had happened in 1963 with the four "Safeguards" demanded by the U.S. Joint Chiefs of Staff in return for their support for the Partial Test Ban Treaty (PTBT)...The "Safeguards," four separate programs, were accepted.⁸³ It is a plausible assumption that analogous processes occurred on the Soviet side, but, of course, there is no open documentation for that.

In the case of the SALT agreements the Joint Chiefs condensed the nine specific programs described above into demands for three rhetorical "assurances," stating that they were "in accord" with the agreements "provided they are properly safeguarded..."⁸⁴ The most significant portions of the three "assurances" were as follows:

Assurance I – A broad range of intelligence capabilities and operations to verify Soviet compliance in a strategic arms limitations environment....

Assurance II – Aggressive improvements and modernization programs. Maximize strategic capabilities within the constraints established by the ABM treaty and the interim offensive agreement. Plan for rapid augmentation of strategic forces beyond the constraints of the treaty and agreement to be made in the event of abrogation, withdrawal, or collapse of negotiations.

Assurance III – Vigorous research and development programs. Maintain weapons systems' technological superiority. Continue testing to insure the effectiveness of new and existing nuclear weapons systems...

White House support of an acceleration of the Trident submarine program, according to Newhouse, was the quid pro quo for the Joint Chiefs' support for SLBM limitations.⁸⁵

It is interesting to step back for a moment and note some of the context of the US-USSR strategic interaction during this period of relative ferment, with SALT negotiations in process, the anticipation of new US systems such as the B-1, Trident, improved hard target capabilities, and the anticipation also of further improvements in accuracy and hardening on the USSR side, and the studies on US targeting going on in the Nixon administration. It is a confused and contradictory amalgam, and SALT considerations clearly were not the determining factors, all the more so since US policymakers knew the degree to which they intended to proceed with US systems. The announcement of the first Soviet MIRV test only came on August 17, 1973, three full years after the US deployment of MIRV's in June 1970. Henry Kissinger was later to say that

As late as the American (nuclear) alert in (October) 1973 we had something like 7,000 to 8,000 weapons for strategic forces and the Soviets had something like 1,600 ICBM's that were not yet very accurate and not yet very well protected.⁸⁶

The studies being carried out in the Nixon administration led to the approval of National Security Study Memorandum (NSSM)-169 in late 1973, and National Security Decision Memorandum (NSDM)-242 signed by the President on January 17, 1974. Some of the substance of the latter in a somewhat garbled form was announced by Secretary of Defense Schlesinger in December 1973 and January 1974.⁸⁷

It is interesting that many of the individuals that had worked on the original SIOP at RAND in the late 1950's, and then on the RAND study called NU-OPTS, or Nuclear Operations in the early 1960's, which advocated small scale nuclear strikes, held important defense policy making or advisory positions in the administration at this time. In addition to Schlesinger himself these included Andrew Marshall, W.W. Kaufman, and Fred Iklé. Roughly at the same time Schlesinger was also attempting to both reduce the number of tactical nuclear weapons that the US held in Europe and to make those that remained there more useable. He also initiated the development of what would become the M-X ICBM program, in the belief that the US had to possess the same kind of counterforce capability against ICBMs as the USSR obtained with its SS-18 missile.

The discussion which developed in 1974 was prompted by Sec. of Defense Schlesinger's remarks about changes in US policies. Despite his earliest public remarks in December 1973 and January 1974, which were essentially misleading, Schlesinger subsequently made clear under US Congressional examination in the months of February and March 1974, that US nuclear weapon targeting had always included military targets.

A targeting doctrine which stresses going only against cities is not an adequate deterrent for most purposes when the Soviet Union, as is the case today, has a counter deterrent which is beyond the capacity and, I believe, the desire of the United States to take away. In fact, this is not the way the forces were targeted, but the overt public doctrine stressed only going against cities.⁸⁸

A few weeks earlier he had said:

This is not the place to explore the full history and details of that longstanding strategic debate. However, there is one point to note about its results. Although several targeting options, including military only and military plus urban/industrial variations, have been a part of U.S. strategic doctrine for quite some time, the concept that has dominated our rhetoric for most of the era since World War II has been massive retaliation against cities, or what is called assured destruction.⁸⁹

When asked if "the United States actually retargeted some of its missiles, missiles which were once targeted for cities and are now targeted for other areas" Schlesinger answered: "I will not go into that. What I will say is that we have targeting options which are more selective..." On January 23, during a news conference Schlesinger was still mixing confusing verbal twists with greater explicitness:

The shift in targeting strategy, I should emphasize, does not mean that we are pointing missiles away from city targets to military targets. We have regularly targeted military targets. The emphasis is on the selection of targets under certain hypothetical events that might occur in the future.⁹⁰

In the March Senate hearings Senator Muskie quoted a sentence to Secretary Schlesinger which read: "Only a small fraction of the more than 25,000 targets contained in the strategic targeting plan are cities."⁹¹ Sec. Schlesinger was also asked in his March 1974 Senate testimony to indicate earlier official statements that indicated government interest in selective and flexible targeting capabilities. Schlesinger supplied a group of excerpts from previous defense posture statements which had been available to members of Congress and their staffs, but which had previously been classified, and hence unavailable to the general public. I have placed these in a footnote and additionally added selections from the statements of Sec. McNamara, FY 1965; Sec. Laird, FY 1971; and Sec. Rumsfeld, FY 1978.⁹²

Schlesinger's FY 1975 Annual Report included the following summary:

- large-scale pre-planned options other than attacking cities for many years, despite the rhetoric of assured destruction;
- adding more selective, relatively small-scale options is not necessarily synonymous with adding forces, even though we may wish to change their mix and improve our command, control, and communications.

However strong in principle the case for selective options, several questions about it remain. What kinds of options are feasible? To what extent would their collateral effects be distinguishable from those of attacks deliberately aimed at cities? And what are their implications for the future size and composition of our strategic forces and hence for our arms control objectives in this realm?

Many of the factors bearing on these questions will become more evident later in this statement. It is worth stressing at this point, however, that targets for nuclear weapons may include not only cities and silos, but also airfields, many other types of military installations, and a variety of other important assets that are not necessarily collocated with urban

populations. We already have a long list of such possible targets; now we are grouping them into operational plans which would be more responsive to the range of challenges that might face us. To the extent necessary, we are retargeting our forces accordingly.

Which among these options we might choose in a crisis would depend on the nature of an enemy's attack and on his objectives. Many types of targets can be pre-programmed as options cities, other targets of value, military installations of many different kinds, soft strategic targets, hard strategic targets. A number of so-called counterforce targets, such as airfields, are quite soft and can be destroyed without pinpoint accuracy. The fact that we are able to knock out these targets' counterforce does not appear to be the subject of much though it may be concern.

In some circumstances, however, a set of hard targets might be the most appropriate objective for our retaliation, and this I realize is a subject fraught with great emotion. Even so, several points about it need to be made.

- The destruction of a hardened target is not simply a function of accuracy; it results from the combined effects of accuracy, nuclear yield, and the number of warheads applied to the target.
- Both the United States and the Soviet Union already have the necessary combinations of accuracy, yield, and numbers in their missile forces to provide them with some hard target-kill capability, but it is not a particularly efficient capability.
- Neither the United States nor the Soviet Union now has a disarming first strike capability, nor are they in any position to acquire such a capability in the foreseeable future, since each side has large numbers of strategic offensive systems that remain untargetable by the other side. Moreover, the ABM Treaty forecloses a defense against missiles. As I have already noted in public: "The Soviets, under the Interim Offensive Agreement, are allowed 62 submarines and 950 SLBM launchers. In addition, they have many other nuclear forces. Any reasonable calculation would demonstrate, I believe, that it is not possible for us even to begin to eliminate the city-destruction potential embodied in their ICBMs, let alone their SLBM force."

The moral of all of this is that we should not single out accuracy as some of unilateral or key culprit in the hard target-kill controversy. To the extent that we want to minimize unintended civilian damage from attacks on even soft targets, as I believe we should, we will want to emphasize high accuracy, low yields, and airburst weapons. To enhance deterrence, we may also want a more efficient both to threaten specialized sets of targets (possibly of concern to allies) with a greater economy of force, and to make it clear to a potential enemy that he cannot proceed with impunity to jeopardize our own system of hard targets.

Thus, the real issue is how much hard-target-kill capability we need, rather than the development of new combinations of accuracy and yield per se. Resolution of the quantitative issue, as I will discuss later, depends directly on the further evolution of the Soviet strategic offensive forces and on progress in the current phase of the Strategic Arms Limitation Talks.

In the meantime, I would be remiss if I did not recommend further research and development on both better accuracy and improved yield-to-weight ratios in our warheads. Both are essential whether we decide primarily on high accuracy and low yields or whether we move toward an improved accuracy-yield combination for a more efficient hard-target-kill capability than we now deploy in our missiles and bombers. Whichever way we go, we have more need than the Soviets for increased accuracy because of our constrained payloads and low-yield MIRVs which have resulted from our lower missile throw-weights.

With a reserve capability for threatening urban-industrial targets, with offensive systems capable of increased flexibility and discrimination in targeting, and with concomitant improvements in sensors, surveillance, and command-control, we could implement response options that cause far less civilian damage than would now be the case. For those who consider such changes potentially destabilizing because of their fear that the options might be used, let me emphasize that without substantially more of an effort in other directions than we have any intention of proposing, there is simply no possibility of reducing civilian damage from a large-scale nuclear exchange sufficiently to make it a tempting prospect for any sane leader. But that is not what we are talking about here. At the present time, we are acquiring selective and discriminating options that are intended to deter another power from exercising any form of nuclear pressure.

The evolution in targeting doctrine is quite separable from and need not affect the sizing of the strategic forces.

To stress changes in targeting doctrine and new options does not mean radical departures from past practice. Nor does it imply any possibility of acquiring a first strike disarming capability. As I have repeatedly stated, both the United States and the Soviet Union now have and will continue to have large, invulnerable second-strike forces.

Until the late 1960s, U.S. superiority in launchers, warheads, equivalent megatonnage was so great that we could ignore or disparage the importance of such "static" measures in comparing our forces with those of the USSR. Now, however, our numerical superiority has disappeared in almost every category except that of warheads, and it could dwindle very rapidly there as well.

Whether the Soviets believe that with the shift in these indicators they have achieved any meaningful, exploitable, advantage is not clear. However, they have not been reticent in stressing to a variety of audiences their superiority over the United States in numbers of ICBMs and other strategic capabilities. Their words, at least, have suggested that they see these asymmetries as giving them diplomatic if not military leverage.

As far as we can judge, moreover, the Soviets now seem determined to exploit the asymmetries in ICBMs, SLBMs, and payload we conceded to them at Moscow. Apparently, they are considering the deployment of large numbers of heavy and possibly very accurate MIRVs. As I have already indicated, this kind of deployment could in time come to threaten both our bombers and our ICBMs. Admittedly, we would still retain immense residual power in our deployed SLBM force, and the Soviets would surely know it. But to many interested observers, the actual and potential asymmetries (as measured by these "static" criteria) would look even more pronounced in favor of the USSR.

In such circumstances we cannot exclude the possibility that future Soviet leaders might be misled into believing that such apparently favorable asymmetries could, at the very least, be exploited for diplomatic advantage. Pressure, confrontation, and crisis could easily follow from a miscalculation of this nature.

None of this should be taken to mean that exact symmetry must exist between the two offensive forces. The United States is willing to the existence of asymmetries provided that, in an era of alleged parity, they do not all favor one party. But we are not prepared to accept a situation in which all the visible from experience asymmetries point in one direction. And we know that the Soviets are not prepared to do so either. The potential for misunderstanding, miscalculation, and diplomatic error is too great to risk. A more equitable and stable arrangement would be one in which both sides maintain survivable second-strike reserves, in which there is symmetry in the ability of each side to threaten the other and in which there is a perceived equality between the offensive forces of both sides.

Accordingly, not only must our strategic force structure contain a reserve for threatening urban-industrial targets, the ability to execute a number of options, and the command-control necessary to evaluate attacks and order the appropriate responses; it must also exhibit sufficient and dynamic countervailing power so that no potential opponent or combination of opponents can labor under any illusion about the feasibility of gaining diplomatic or military advantage over the United States. Allied observers must be equally persuaded as well. In this sense, the sizing of our strategic arsenal, as distinct from our targeting doctrine, will depend on the outcome of SALT. In default of a satisfactory replacement for the Interim Agreement on strategic offensive forces, we will have to incorporate "static" measures and balancing criteria into the planning of our strategic offensive forces.

Principal Features of the Proposed Posture

This review of the factors that necessarily shape the planning and programming of the strategic nuclear forces should also indicate the principal features that we propose to maintain and improve in our strategic posture. They are:

- capability sufficiently large, diversified, and survivable so that it will provide us at all times with high confidence of riding out even a massive surprise attack and of

- penetrating enemy defenses, and with the ability to withhold assured destruction reserve for an extended period of time.
- sufficient warning to ensure the survival of our heavy bombers together with the bomb alarm systems and command-control capabilities required by our National Command Authorities to direct the employment of the strategic forces in a controlled, selective, and restrained fashion.
 - the forces to execute a wide range of options in response to potential actions by an enemy, including a capability for precise attacks on both soft and hard targets, while at the same time minimizing unintended collateral damage.
 - the avoidance of any combination of forces that could be taken as an effort to acquire the ability to execute a first-strike disarming attack against the USSR.
 - offensive capability of such size and composition that all will perceive it as in overall balance with the strategic forces of any potential opponent.
 - offensive and defensive capabilities and programs that conform with the provisions of current arms control agreements and at the same time facilitate the conclusion of more permanent treaties to control and, if possible, reduce the main nuclear arsenals.⁹³

Lynn Davis summarized the 1974 Schlesinger discussions as follows:

...the actual plans for the use of American nuclear forces have been kept secret. Most people assumed that the war plans simply incorporated the Assured Destruction criteria, but in fact, having relied on well hedged planning assumptions when acquiring strategic forces, the United States ended up with many more weapons than needed to carry out the Assured Destruction task. The actual war plans included large-scale attacks against enemy military targets (nuclear and conventional) as well as against military urban/industrial targets.

In January 1974 Schlesinger for the first time admitted that the United States had been targeting enemy military targets and then announced that the American Single Integrated Operations Plan (SIOP) would be revised to ensure that American policymakers had plans for the discriminate and controlled use of nuclear weapons.⁹⁴

In October 1980, in the discussion surrounding the Carter administrations PD-59, portions of NSDM-242 were leaked in the press. President Nixon's introduction reportedly stated:

I have reached the following decisions on United States policy regarding planning for nuclear weapons employment. These decisions do not constitute a major new departure in US nuclear strategy; rather, they are an elaboration of existing policy. The decisions reflect both existing political and military realities and my desire for a more flexible nuclear posture.⁹⁵

The memorandum went on to outline three general plans – one for deterrence, another for limited nuclear war, the third for a general war. “The fundamental mission of US nuclear forces is to deter nuclear war and plans for the employment of US nuclear forces should support this mission.” The absence of enemy use of nuclear weapons, would “not preclude US use of nuclear weapons in response to conventional aggression.”

The "deterrence" plan had three objectives:

- (1) to deter nuclear attacks against the United States, its forces, and its bases overseas;
- (2) to deter attacks ...against US allies and those other nations whose security is deemed important to US interests;
- (3) to inhibit [political and military] coercion of the United States by nuclear powers and help inhibit coercion of US allies by such powers.

In Sec. Schlesinger's 1976 DoD posture statement, "deterrence" comprises four components: a highly survivable force which can, if needed, be targeted against an enemy's political and economic assets; a capability for limited response options; parity with the Soviet Union in strategic offensive forces, both in friendly perceptions and those of adversaries; and essential equivalence (i.e., technological balance) in strategic forces. Only the first two of these directly pertain to military capabilities.

The threat of a surgical nuclear strike could be used "to seek early war termination on terms acceptable to the United States and its allies (nd) at the lowest level of conflict feasible. The second section of the memorandum calls for developing plans "for limited employment options which enable the United States to conduct selected nuclear operations," to show our "determination to resist aggression," though "coupled with a desire to exercise restraint." The United States had to have the potential to "hold some vital enemy targets hostage to subsequent destruction by survivable nuclear forces", and to control "the timing and pace of attack execution, in order to provide the enemy opportunities to reconsider his actions." The goal in the event of a general war was "to obtain the best possible outcome for the United States and its allies." This simple statement was then detailed with three subordinate objectives:

- (1) Maintenance of survivable strategic forces in reserve for protection and coercion during and after major nuclear conflict.
- (2) Destruction of the political, economic and military resources critical to the enemy's postwar power, influence and ability to recover ... as a major power.
- (3) Limitation of damage to those political, economic and military resources critical to the continued power and influence of the United States and its allies.

It is clear, as was explained in the earliest pages of this section, that as far as the phraseology of these policy statements at the presidential level go, they are extremely general and could in fact be interpreted through a wide assortment of different targeting plans. NSDM-242 authorized Sec. of Defense Schlesinger to prepare the Nuclear Weapons Employment Policy (NUWEP), which he signed on April 4, 1974. The NUWEP was developed through military and civilian cooperation and set out the planning assumptions, attack options, targeting objectives and the damage levels needed to satisfy the political guidance. For example, the NUWEP now contained the requirement that the U.S. strategic nuclear forces must in all circumstances be able to destroy 70 percent of the Soviet industrial base that would be needed to achieve economic recovery after a nuclear war. "Soviet population was not targeted per se, since it was assumed that collateral damage on population from US strikes on Soviet industry would be substantial."⁹⁶ A strategic reserve force was also established. The concepts and objectives set out in NSDM-242 and NUWEP provided the framework for the development of new strategic nuclear war plans. The

first SIOP prepared under the new guidance was SIOP-5, which was formally approved in December 1975 and took effect on 1 January 1976.

Desmond Ball's summary of NSDM-242 stresses three major aspects, including one which is not referred to in either Schlesinger's public statement or leaked material. The first is the re-emphasis on the targeting of a wide range of Soviet military forces and installations, from hardened command and control facilities and ICBM silos to airfields and army camps. The second is the requirement for 'escalation control,' whereby the National Command Authorities (NCA) should be provided with the ability to execute their selected options in a deliberate and controlled fashion throughout the progress of a strategic nuclear exchange. The notions of escalation dominance and control in the coming years, including a major role in the rationalization of the NATO LRTNF decisions in 1978-1979. The third would have increasing emphasis that:

NSDM-242 introduced the notion of 'withholds' or 'non-targets,' i.e. things that would be preserved from destruction. Some of these, such as "population per se," have now been exempted absolutely from targeting; others, such as the centers of political leadership and control are exempted only for the purposes of bargaining or deterring a resort to higher levels of violence during a war ('intra-war deterrence' and 'intra-war bargaining') and strategic reserve forces are to maintained to allow their eventual destruction if necessary."⁹⁷

The addition of "post-nuclear attack recovery" targets was something of an innovation, in particular if some of these targets were neither military or industrial. In addition, despite being less than altogether candid, Schlesinger's efforts clearly moved the "rhetoric" as he called it, or more officially "declaratory policy" nuclear weapon targeting about what to say to the public on US at least somewhat closer to actual, operational policy. But most important of all, rather than adding USSR military targets list, and certainly not its hardened missile force, which was to the target already routinely included, what Sec. Schlesinger wanted was the ability to select relatively small and discrete "packets" of targets for limited attack. These might be missiles or other military targets, or they might be industrial targets, such as a rail system, an electric power generating system, or an oil refinery system. All of these targets and their types would already have been in the target list; what Sec. Schlesinger sought was the planning for attacking them in separate, discrete, "limited" units rather than all at once. Whether such a policy was feasible or desirable was another question. Secretary of Defense Schlesinger believed that it was, and that it was made mandatory by increased USSR nuclear weapon capabilities. It was on this effort to obtain planning for smaller sized nuclear weapon strikes that Sec. Schlesinger placed his greatest emphasis. Schlesinger sought to provide small, pre-planned strikes against a variety of aiming points, including military assets, with the option of limiting nuclear application "down to a few weapons." Although the U.S. nuclear targeting plans had included alternatives to massive city destruction since the time of the Eisenhower administration, subsequent modifications still involved large numbers of weapons not optimized to minimize economic collateral damage and from the recipients' point of view would have been "virtually indistinguishable from an attack on cities." Rather strikingly, a former National Security Council staffer wrote in 1980 that "as late as 1974 the smallest so called 'limited' option other than warning strikes by several weapons would have sent several thousand American warheads against the Soviet Union."⁹⁸ The statement presumably referred to the period before the NSDM-242, the NUWEP, or SIOP-5 took effect.

Schlesinger sought accuracy and yield improvements designed to enhance the efficacy and discrimination of U.S. nuclear forces against both soft and hard targets for flexible use as U.S. political authorities saw fit, while claiming that such an effort was distinguishable from any effort to obtain first strike capabilities.

In March 1980 the Dept. of Defense described to Congress targets in four categories, which Desmond Ball later reported as being the categories of SIOP-5), in effect at the end of 1980.⁹⁹ The order was as follows: (1) Soviet nuclear weapons systems, bases and storage facilities; (2) Conventional military forces; (3) Military and political leadership; C³I Economic and industrial targets.

He also described four categories of nuclear attack: (1) Major Attack Option (MAO); (2) Selected Attack Option (SAO); Limited Nuclear Option (LNO); Regional Nuclear Option (RNO). Finally, there were four classes of targets from which attacks could be withheld under the various attack options: (1) Population centers; (2) National leadership; (3) Particular countries; (4) Allied and neutral territory.¹⁰⁰

Under Nixon and Schlesinger's successors, President Ford and Sec. of Defense Donald Rumsfeld, the "rhetoric" changed slightly again, but certainly nothing else. Criteria for the US retaliatory capability were to be measured

- by the size and composition of the enemy's military capability surviving for postwar use
- by his ability to recover politically and economically from the exchange.

If the Soviet Union could emerge from such an exchange with superior military power and could recuperate from the effects more rapidly than the United States, the U.S. capability for assured retaliation would be considered inadequate.

The present planning objective of the Defense Department is clear. We believe that a substantial number of military forces and critical industries in the Soviet Union should be directly targeted, and that an important objective of the assured retaliation mission should be to retard significantly the ability of the USSR to recover from a nuclear exchange and regain the status of a 20th century military and industrial power more rapidly than the United States.¹⁰¹

Despite the fact that Rumsfeld directly followed Schlesinger and a previous Republican administration, his Annual Report actually reintroduced the nonsense about these 'changes being ones "away from a policy of targeting the largest 200 cities only, etc.

In 1979, eleven years after Gen. Wheelers testimony another chairman of the Joint Chiefs of Staff, Gen. Jones testified again to Congress once again in the same vein.

Senator Tower. General Jones, what is your opinion of the theory of mutual assured destruction?

General Jones. I think it is a very dangerous strategy. It is not the strategy that we are implementing today within the military, but it is a dangerous strategy.

Senator Tower. Your professional military judgment is that it is a dangerous strategy and that it is not one that we should follow?

General Jones. I do not subscribe to the idea that we ever had it as our basic strategy. I have been involved with strategic forces since the early 1950s. We have always targeted military targets. There has been a lot of discussion it is interesting that, when I was out in the field, in Washington you would hear a lot of rhetoric about different strategies. We followed orders, but basically, the strategy stayed the same in implementation of targeting.

Senator Tower. Unfortunately, I am not sure that your opinion was always shared by your civilian superiors.

General Jones. I agree there have been some, including some in the government, who have felt that all that we required is a mutual assured destruction capability. I am separating that from our targeting instructions to the field, approved by civilian authorities, which always included targeting military targets.

Mutual assured destruction in its simplest form is trying to destroy the people and society of both sides. If you have that, the advocates of it say, that is all you need. I think that would be dangerous.¹⁰²

These policies have been known to European political leaders since the mid-1960s, when a military liaison from NATO was established with the US JSTPS targeting staff. Moreover, they were the point of the US Sec. of Defense McNamara's presentation to NATO in May 1962.¹⁰³ Sec. of Defense Brown's message to NATO during the public discussion of PD-59. They were repeated again by Defense Ministers on August 10, 1979,

The Carter-Brown Administration and PD-59

On taking office the Carter administration instituted a major general defense policy review under the jurisdiction of the National Security Council. After some months this led to PRM (Presidential Review Memorandum)-10, which did not however deal with nuclear targeting questions in great detail. Over an 18-month period between July 1976 and December 1978, a new large-scale review took place on this specific subject under an interagency study group the Nuclear Targeting Policy Review. The group was directed and its final report largely written by Leon Sloss, a deputy of Charles Iklé at the ACDA in the previous Nixon-Ford administrations. Three major studies were initiated: one on Nuclear Targeting Policy, a second on Modernization of the ICBM Force, and the third on Strategic Reserve Forces. In the interim, on 24 August 1977, President Carter issued PD-18, entitled U.S. National Strategy, which explicitly reaffirmed the

continued use of NSDM-242 and the NUWEP in "the absence of further guidance for structuring the U.S. strategic posture." During this period – just as in the case of NSPM 242 and its antecedent – there was a series of press reports which indicated something of what was in process.¹⁰⁴

By December 1978, a full year and a half before its eventual final approval and release on August 6-7, 1980, the draft of PD (Presidential Directive)-59 was completed. It is clear from Sec. of Defense Brown's address of August 20, 1980, that some decisions based on the studies were instituted as early as 1977 while the studies were still in progress.¹⁰⁵ During the interim period several other directives which were directly related in substance and which grew out of the same preparatory studies were approved. These were PD-53, (entitled National Security Telecommunications Policy) signed by President Carter on November 15, 1979, on the need to improve Command, Control and Communications to ensure the continuity of these systems over an extended period of nuclear strikes and counterstrikes, and PD-57 and 58 signed by President Carter on June 30, 1980, on measures to sustain the continuity of government and political leadership during nuclear war.

There are several major points that should be made regarding PD-59. The first regards targeting. The decisions made in previous years by Secretary of Defense Schlesinger on small-scale, limited strikes against USSR military facilities were maintained, re-emphasized and further refined. (The amount of misinformation printed on this occasion in the major press, for example in the articles of Richard Burt in the New York Times, once again alleging changes from countervalue targeting, can only be considered astounding.)¹⁰⁶ It was directed that relatively less emphasis would be given to the destruction of the Soviet economic industrial base and that greater emphasis would be directed toward improving the effectiveness of US attacks against military targets. Ball points out that the SIOP-5D which was in operation in 1980 (and possibly in 1979) contained some 40,000 potential targets in contrast to 25,000 in 1974 when the development of SIOP-5 was initiated and only 15,000 of these were economic-industrial.

Presumably some number of warheads was transferred to military, and as indicated below, also to "political" targets from the Schlesinger-Rumsfeld categories of USSR "economic recovery" targets.¹⁰⁷ And certainly now public "declaratory policy," would be more explicitly aligned with US "action policy," or actual targeting. In 1979 General Ellis explained the growth in the target list in the following way:

I expect that the target list will continue to grow in the future. The target list is used solely as a tool to ensure that the strategic capabilities plan is structured to meet the requirements and objectives stated in national guidance. To accomplish this task, we identify those installations whose destruction/neutralization would satisfy that guidance. Increases in the numbers of installations included in the target list are attributable to three factors: discovery of newly constructed installations or demographic changes, new intelligence that reveals previously existing but undiscovered installations or that identifies their functions, and finally changes in guidance that require additions due to expanded or changed attack objectives. These three factors have resulted in an annual average increase in the target list of approximately 10 percent over the past several years.¹⁰⁸

Second, it was claimed that targeting would now "... call for a capacity to imperil Soviet political leaders in their underground shelters in time of war." This too is not a new target category for the SIOP. The 1971 SIOP categories listed "primary Controls" as the second major category in priority order. The academic strategic literature has always spoken of the desirability of permitting the opponent's political leadership to remain, in order to enable a process of negotiation and nuclear war termination. However, Command-and-Control both military ones and political ones and the conditions assumed have always been targeted, theoretically desirable by academic analysts were apparently not reflected in targeting plans. What may again have been done in the latest instance was to select USSR political Command-and-Control facilities as target set for discrete attack, and perhaps to change the priority level for targeting them as well.

Thirdly, PD-53, and 58, as well as PD-59 itself indicated that increased expenditure would go into new redundant and hopefully survivable C³ and Intelligence systems. PD-59 required that the pre-planned target packages in the SIOP must be supplemented by the ability to find new targets and destroy them during the course of a nuclear exchange. This would also very likely mean new reconnaissance and other satellite systems. It also seemed to imply a context of total destruction of the Soviet nuclear delivery system structure – assuming that that was the character of the targets to be searched for during a nuclear exchange – rather than one of discrete and "limited" attacks.

One of the main arguments that Sec. of Defense Schlesinger had put forward on behalf of NSDM-242 was the value of limited options to NATO defense interests and "extended deterrence." Secretary of Defense Brown now repeated the same argument on behalf of PD-59.

A third point, emphasized by Secretary Brown in a message to the defense ministers of the NATO countries on 10 August 1980, is that greater attention has been accorded planning for the use of very limited and selective options in order to 'improve the contribution of our strategic nuclear forces to deterrence across the full spectrum of threats with which we must all be concerned.' Various packages of selected attack options (SAOs) limited nuclear options (LNOs) and regional nuclear options (RNOs) are being prepared for use in not just nuclear situations but also in what hitherto would have been purely conventional situations. According to testimony of the Commander of the Strategic Air Command (SAC), General R.H. Ellis, before the Senate Armed Services Committee in March 1980, 'Deterrence can no longer be neatly divided into subgroups, such as conventional and nuclear. It must be viewed as an interrelated, single entity. SAC is developing new options which provide to the National Command Authorities with additional flexibility to respond to future conflicts in a timely and controlled manner.'¹⁰⁹

Ball writes that

As an example of the use of RNOs and LNOs, General Ellis suggested that "combat missions could be launched from Anderson (Air Force Base in Guam) to the Middle East" in response to Soviet conventional military activity in that region. As an example of an SAO, plans for nuclear strikes against Soviet military facilities near Iran, including military bases and airfields inside the Soviet Union, have been prepared so as to

"significantly degrade Soviet capabilities to project military power in the Middle East-Persian Gulf region for a period of at least 30 days."¹¹⁰

There is one very significant aspect regarding PD-59 which was not reported in press accounts. Many of the public reports did draw attention to the procure- particularly for new auxiliary C³I systems. However, the more important point is that regarding subsequent US strategic nuclear weapons acquisition policymaking. Sec. Schlesinger had repeatedly tried to draw a distinction between the sizing of nuclear forces and their targeting assignments, and we have at least indirectly noted the interplay of these two aspects since the 1960 period and the McNamara years. Though they did not determine targeting priorities, the assured destruction criteria had played a major restraining role as weapons acquisition and force level criteria. That was apparently now to end entirely. If the demands of counterforce could now explicitly be put forward by the internal bureaucracy as a justification for procurement decisions, then there was no longer any control over either warhead numbers or accuracy. In the course of arguing against policies that promulgated attack on Soviet C³, Richard Garwin said in 1981

We've had flexible response for many years. What is new in PD-59 is that we are specifically building the capability to destroy Soviet missile silos, hardened command and control posts, and that we are going after the Soviet leadership personally.¹¹¹

One of the peculiarities accompanying the history of PD-59 was the report by Gen. Bernard Davis, Commander-in-Chief of SAC, in 1981 that Carter administration never forwarded PD-59 to the major air command level nor to the Joint Strategic Target Planning Staff. However, the dictates of PD-59 are reflected in both the Nuclear Weapon Employment Policy and the Joint Strategic Capabilities Plan.¹¹²

Many of the reports about PD-59 also emphasized the point that one of the factors that contributed to its development was the analysis that the USSR did not accept US ideas of "mutual deterrence." and rather was – in recent years – procuring a strategic nuclear missile force for its "war fighting" capabilities. The argument that the strategic writings of the USSR led to this conclusion was apparently put forward by analysts of the US National Security Council in the policy studies prepared to support PD-59, and a particular point was made of this argument in briefings to the press and in official statements. This is an interpretation that more "hardline" strategic analysts have been presenting since the early 1970s, and it was also a public view often put forward by US Department of Defense officials during the first term of the Nixon administration. It may or may not be the case. If it was not so in the first half of the 1970s, the warhead characteristics – numbers, yields, and accuracies – of USSR strategic systems deployed since mid-1978 certainly make the argument more plausible since then. Nevertheless Soviet writings were more complicated than the administrations analysis suggests, and the prime thesis of Michael McGwire's study Military Objectives in Soviet Foreign Policy published in 1987, is that that analysis was totally mistaken.¹¹³ He argues that although Soviet policy until the period 1968-1975 was unquestionably one of massive strategic nuclear preemption if war with the US was considered absolutely imminent, the policy after 1975 was to withhold nuclear weapon attack and use as long as possible. He thus argues that the correct interpretation of Soviet procurement policy and characteristics of their newer strategic weapon delivery systems, combined with a faulty understanding of its policy context led to incorrect conclusions.

Even if MccGwire's interpretation should turn out to be wrong, the important point is that the review of US nuclear weapon targeting policies makes clear that the same conclusion as was reached by the PD-59 supporting studies regarding Soviet intentions clearly applied to the US strategic weapon forces, and has always so applied. Deductions regarding the probable mission of US strategic forces which led to the same conclusions could have been made in earlier years by an examination of made by their numbers, characteristics, etc. They were no doubt Soviet military leaders and agreed to by Soviet politicians.

In the early 1980s, Soviet analysts could witness the projected US procurement of 11,000 hard target counterforce warheads: 6,000 in slow cruise missiles, and 6,000 in prompt M-X (1000) and Trident (5000) missiles. If the US subsequently procured a small mobile ICBM in the 1990's, that would add at least 3,000 more counterforce ICBM warheads. On the US side what is lacking, and what would have been far more functional among the preparatory papers for PD-59, is an officially generated analysis of the derivation of new USSR strategic systems that takes US or to surpass into account both the obvious Soviet intention to match strategic weapon capabilities to the last degree, as well as the routine procedures of Soviet weapons acquisition policies. And both these aspects must be mated to an analysis of the interaction of US and USSR strategic systems over time. The US Arms Control Impact Statements have hardly made any penetration at all into this requirement.

The official declarations regarding US nuclear weapon targeting policy, and those changes that were made –both those of 1973-74 and of 1977-1980 – are significant and have had several consequences. Most important, they will affect further strategic weapon design and procurement decisions, both in the US and in the USSR. They will accentuate the trends already in process in both forces since the mid-1960s to increased numbers of warheads, higher accuracy, and MIRVing of delivery vehicles. There can be little doubt that the USSR will respond in kind, as it has throughout the strategic weapon competition. There are other consequences for various aspects of both sides' forces. In aggregate, and over a period of years, these effects may be substantial. But what took place, will further take place, is not a shift from targeting USSR cities to targeting USSR military targets. The Carter administration did not "... and (adopt) a new nuclear war strategy that would give priority to striking military targets in the Soviet Union rather than destroying cities and industrial complexes, strategy is not ".... in stark contrast to the policies of the 1960s." Both those statements are false. US nuclear targeting priorities have always been for military targets. However, Soviet nuclear weapon capabilities have changed drastically in the past twenty years, both in number and in quality, and this has produced changes in US policies and planning for and the nuclear weapon use. The changes have not been to the target list, and only to a limited degree to its priorities. They have been to the development and emphasis on limited and discrete use, in contrast to large-scale use. In the short run, the most important change instituted by PD-59 is the degree to which counterforce criteria will replace assured destruction criteria – not in targeting – but in procurement policy, as the determinant of the sizing and characteristics of the US strategic nuclear weapon force. There was some evidence that the targeting priority schema presented by Gen. Ryan no longer was in force, and that the three major target groupings as of 1980-81 were: (1) C³; "leadership targets"; (2) military, including hard target, but also, as variously referred to, "other Military Targets or "counter projection conventional military forces". This is partly a function of the fact that US warhead

numbers have increased while the vulnerability of Soviet strategic forces (ICBM's) has declined very substantially; and (3) industrial-economic.

With first priority now on C³ targets – in marked distinction from the recommendations of a substantial population of theorists and analysts¹¹⁴ – the overall priority shift was to increase the relative proportion of military targets in the total target set.

The Reagan Administration

The brief summary of major developments in the Reagan administration provided below is taken from Bruce Blair's book Strategic Command and Control.

The Reagan administration framed the discussion of nuclear requirements in terms that further deemphasized assured destruction. NSDD-13 (November 1981) endorsed NSDM-242 and PD-59 and placed more emphasis on providing nuclear options during protracted war. The first complete guidance prepared by the Reagan Pentagon went even further. Fiscal Year 1984-1988 Defense Guidance (March 1982), a classified document leaked to the press in 1982, outlined a comprehensive strategy for fighting a nuclear war. According to press accounts, the guidance said that if the Soviet Union mounts a nuclear attack against the United States, its forces, or allies, then U.S. nuclear capabilities "must prevail even under the condition of a prolonged war." Should strategic nuclear war with the Soviet Union occur, the United States must "be able to force the Soviet termination of hostilities on terms favorable to Union to seek earliest termination of hostilities on terms favorable to the United States." The document spells out the following specific requirements:

- "Forces capable, under all conditions of war initiation, of attacking a wide range of targets, even when retaliating to a massive strike received without strategic warning..."
- "Employment plans that assure U.S. strategic nuclear forces can render ineffective the total Soviet, and Soviet allied, military and political power structure through attacks on political/military leadership and associated control facilities, nuclear and conventional forces and industry critical to military power..."
- "Forces that will maintain, throughout a protracted conflict period and afterward, the capability to inflict very high levels of damage against the industrial/economic base of the Soviet Union and her allies so that they have a strong incentive to seek conflict termination short of an all-out attack on our cities and economic assets." This offensive capability must ensure that the "United States would never emerge from a nuclear war without nuclear weapons while still threatened by enemy nuclear weapons.
- "Strategic forces and C³ systems capable of supporting "controlled over a protracted period while maintaining a reserve of nuclear forces sufficient for trans- and post—attack protection and coercion..." Communications systems "must provide the capability to execute ad hoc plans, even subsequent to repeated attacks.../and/ these systems should support the reconstitution and execution of strategic reserve forces, specifically full communications with our strategic submarines."

Although many such requirements existed in one form or another in the past and to some extents were met, they were not accorded the legitimacy that assured destruction enjoyed,

and they were satisfied only indirectly. Now that the pendulum of official and informed public opinion has swung toward concern for fighting a nuclear war, it will likely become much easier to advance programs meant to serve these purposes in the event that serious deficiencies develop.¹¹⁵

The tables prepared by Jeffrey Richelson again illustrated the assistance to weapons procurement initiatives – as in the case of PD-59 – that will be available to bureaucratic actors by the Reagan administration's guidance.¹¹⁶

There are several additional points that can be briefly made about developments during the Reagan administration.

- There was a substantial to-and-fro on the question of Launch Under Attack and Launch on Warning, and as to whether the administration had such a policy.¹¹⁷ Political discussion of this subject was actually begun by Sec. of Defense Harold Brown during the Carter administration in one of his Annual Reports. Assistant Secretary Defense Richard Perle testified to Congress that "... it is not now and has never been US policy to rely on such a policy as a means of assuring ICBM survivability."¹¹⁸ At the same time there was substantial comment by some of the same critics of administration policies alleging that the administration was "moving toward first strike capability".¹¹⁹ These comments usually included the suggestion that such policies would force the USSR to adopt a launch-on warning policy although Raymond Garthoff has written that the USSR had adopted such policies as early as 1963.
- There was one report that a new version of the SIOP, SIOP-6 had been developed by the JSTPS in 1983.¹²⁰
- Targeting of Soviet C³ facilities unquestionably remained in the targeting priorities.
- Strategic land attack cruise missiles deployed on US attack submarines were held outside the SIOP as part of the strategic reserve.¹²¹ There were reports that the newly planned US mobile ICBM was also intended to be a portion of a strategic reserve.¹²²
- Contrary to the common perception caused by the major increases in US military expenditure during the Reagan administration, US strategic weapon capabilities actually dropped for several years in the early 1980's.¹²³ Cruise missile programs, the Trident, and the B-1 were all behind schedule, and Poseidon submarines were being demobilized. US tactical nuclear weapons were also being reduced in numbers. US Equivalent Megatonnage (EMT) had been decreasing since its peak in 1959-60 and in 1972 had fallen to half its peak level. (I published such an estimate in the SIPRI Yearbook in 1972; see table Chapter 2). This does not mean that other values of US nuclear destructive capability were also falling, but for a period, overall launcher and warhead numbers, as well as EMT, dropped.
- Lastly, statements by senior military officers in testimony to Congress explicit concerning "prompt" or "time-urgent" US counterforce capabilities, particularly during testimony on behalf of became more and more the M-X ICBM system.¹²⁴ When Gen Davis, Commander of SAC, was asked in Senate testimony "what is our strategic policy called now, in place of mutually assured destruction" he replied "Counterforce, or 'war fighting', the two are synonymous."

Chapter 6. The Counterforce Potential of American SLBM Systems

Another important question is the counterforce potential of the past, present and future US systems, US SLBM systems, and in particular their hard-target counterforce capability. One source, apparently referring to missile warheads only, and the situation could pertain following a pre-emptive USSR counterforce strike, estimated that "By the 1980s five out of every six nuclear re-entry vehicles that could reach the Soviet Union would be launched US submarines."¹²⁵ The phrase "that could reach the Soviet Union" presumably, refers to the situation following a Soviet counterforce attack, and may originally have been made by Secretary of Defense Harold Brown. Another source, this time apparently including bomber warheads in its estimate, stated "According to some Pentagon studies, the SLBM force will make up 70-85% of the surviving strategic retaliatory warheads after a Soviet counterforce strike in the mid-1980s, and virtually all of its prompt retaliatory systems".¹²⁶ In 1980 the fact that 400 Poseidon warheads were assigned to NATO for targeting purposes was also made public. It had previously been considered that the number of US FBM submarines assigned to NATO might be five, an arrangement going back to 1962 and the earlier Polaris vessels. Perhaps more remarkable still was the disclosure in Sec. of Defense McNamara's May 1962 address to the NATO Ministerial Meeting in Athens – which was declassified in 1979 – that the entire Polaris fleet operational by the end of 1963, 12 vessels, would be committed to NATO targets, and that in subsequent years all Polaris submarines which operated in NATO waters, i.e., the bulk of the Polaris fleet, were to be committed to NATO targets.¹²⁷

The Navy has always had nuclear counterforce missions.¹²⁸ In 1948, the Key West agreement granted it the use of nuclear weapons against 'specifically naval targets.' However, no effort was made to define what constituted a 'naval' target, or to distinguish the use of nuclear weapons against port facilities from strategic bombing. During the planning of the Polaris system, submarine pens and port facilities were persistently mentioned in statements as probable FBM targets, and the phrase 'striking targets of naval opportunity' was often used to describe the FBM objective.¹²⁹ According to Admiral Arleigh Burke, then the Chief of Naval Operations, the calculations which determined the eventual size of the Polaris fleet were based 'entirely on military targets', though a large number of these were within urban areas.

At least since the Johnson Administration, the United States has pursued a significant counterforce capability for its FBM system. The Navy had been reluctant to take on a counterforce mission for the SLBM system, because of the difficulties resulting from its clash with the Air Force in 1953-54 over strategic missions. The overall service position was challenged only by the Polaris-Poseidon Navy's Office of Special Projects, its agency system development. The Navy position was overruled and ordered to develop a counterforce weapon, but only when Sec. of Defense McNamara personally intervened and ordered that accuracy improvements as well as warhead design improvements into the new missile under development.¹³⁰ Specifically the Special Projects Office was directed in November 1964 to include the MIRV be incorporated concept and advanced guidance systems in its B-3 (Poseidon) designs, with a hard-target counterforce capability as a development goal. According to Sapolsky

The Poseidon is not simply an extrapolation of the Polaris technology, a bigger and better missile system. The Poseidon will, if the development objectives are achieved, possess strategic capabilities in terms of targeting options that are different from those of the Polaris. In November 1963, the Special Projects Office was authorized to proceed with the definition of a Polaris follow-on (known initially as the B-3) that would enhance FBM penetration of defended urban-industrial targets. Just as work along these lines was beginning in the summer of 1964, the concept of multiple individually targeted warheads (MIRVs) launched from a single missile was proposed by an Air Force contractor. MIRVs, by their number and spacing, increase significantly the ABM penetration capability of incoming warheads. Combined with possible improvements in guidance systems, MIRVs offer the potential for attacking hard military targets (for example, missile launchers) as well as soft city targets. Faced with continued strategic uncertainties, defense officials directed the Special Projects Office in November 1964, to include the MIRV concept and advanced guidance systems in its B-3 designs, giving the next generation FBM the potential for both a hard-target (described often as 'time urgent') and soft-target capability. This change in strategic emphasis for the B-3 (designated by the President in January 1965 as the Poseidon) was said at the time to be an insurance measure, though precisely what the insurance would buy in strategic terms was not extensively discussed with or among Special Projects Office personnel. Although the President's Poseidon announcement did, in fact, mention increased target flexibility for the missile, and subsequent statements of the Secretary of Defense discussed a damage limiting role (necessarily a capacity to attack hard or time urgent targets) for the FBM force, apparently only a few persons involved in the FBM program and even fewer in the general public were fully aware of the possible alteration of the original B-3 mission.... The hard-target counterforce capability was added to the B-3 proposal (in) quasi-secrecy.¹³¹

The projected B-3 FBM missile was redesignated the C-3 after being given MIRV capability, in contrast to its previous ability to attack only a single target.

Sapolsky's description was authenticated and some further details added in an official Lockheed history of the Fleet Ballistic Missile Program released in 1978.¹³² According to this rendition the Chief of Naval Operations had expressed interest in a potential hard-target FBM capability in November 1962 and designs for a multiple body, single target capability were evaluated for both hard and soft target coverage, with and without penetration aids. However, the hard-target mission was deleted. In 1962 the Air Force generated the requirement for the future Mk 12 warhead, and in March 1964 its development was authorized for both Minuteman and Polaris. Fuhrman somewhat grandiosely – and not altogether correctly – claims that "This revolutionary multiple targets per missile concept changed the course of national policy, strategic force structures, targeting doctrines, and operational planning."¹³³ In conjunction with considering potential hard-target role initial evaluations of a stellar-inertial guidance system were conducted in early 1966. Advanced development of a Mk 4 stellar-inertial guidance systems were started in 1968 but were subsequently dropped in 1970. However, in September 1971 the new ULMS (Underwater Long-Range Missile System) program was approved, its advanced development began in December 1971, and it was redesignated the Trident I (C-4) containing a new stellar-

inertial guidance concept and improved target accuracy. Improved navigation and fire control systems also led to increases in accuracy.

Innumerable sources over the years have repeated the glib rhetoric that SLBM's and the Polaris/Poseidon missiles, had been too inaccurate to hit "military or its yield/accuracy combination too low for the hard target targets" – and that the weapon was therefore necessarily relegated counterforce role. This is absolutely wrong for a large number of different and very elementary reasons:

- First, it overlooks the counterforce role against numerous USSR military targets aside from hard silos.
- Second, the very large number of warheads in the SLBM fleet – over 5,000 once the MIRVed Poseidon missile became operational in 1970 – made the notion that such a number of warheads could be solely for urban or even industrial/economic targets extremely unlikely.
- Thirdly, the estimate (which is apparently much too low) that 70% of the SIOP targets are military again meant that a substantial number of SLBM warheads had to be assigned counterforce roles.
- Fourthly, both these previous conclusions are circumstantially reinforced by the indication of the very large proportion of the Polaris/Poseidon force that was assigned to NATO targeting. The counterforce nature of that targeting has already been indicated is again noted below.
- Fifth, it is often said that the inability of the Polaris/Poseidon submarines and earlier in this study in the chapter on the SIOP to know their precise location was the major factor leading to their "poor accuracy," and hence to their inability to strike counterforce targets. This too seems to be very much overstated, if not to be an entire fiction. The US Transit SLBM Navigational satellite system provides position location to FBM submarines to within a few meters.¹³⁴ The difference between such position location and that for land-based missiles can hardly be very significant.
- Sixth, one sees that Poseidon accuracy is not much different from that of Min. IT; (and Trident accuracy not much different from Min. III) although yields were much lower.
- Seventh, the fact that US bomber bases, early warning radars, etc., are routinely presumed to be the target of USSR SLBM's.
- Finally, the counterforce capability of Polaris/Poseidon warheads would have varied in different years depending on which USSR IRBM's and ICBMs had or had not already been put underground in silos, and on what the hardness of such silos were. A substantial number of Soviet ICBMs remained unhardened, or hardened to only 300 PSI into the mid-1970's. In addition, cross targeting and the number of warheads that were targeted on USSR silos in the years before the effects of fratricide were properly appreciated would also have been factors in SLBM counterforce capabilities. The fact that fewer redundant attacking warheads might survive, particularly if timed to arrive in close proximity to each other, is not an indication that they may not have been targeted that way in certain years.

These considerations are borne out in part by the following calculations presented in Ball's paper.¹³⁵

Ball states his general position as follows:

Certainly, the concomitant shift of emphasis towards sea-based missile systems in the American strategic nuclear arsenal and towards counterforce and selective response capabilities in the American basic national strategic policy suggests that SLBM systems are capable of this quite different role.

Such a capability has apparently been achieved in recent years through a combination of improved ballistic missile inertial guidance systems (which are essentially equivalent in both the land-based Minuteman and the SLBMs) MIRVing and increases in the navigational accuracy of the FBM submarines.¹³⁶

Administration testimony during the late 1960's and early 1970's is ambiguous and contradictory on this point. Repeated descriptions of the Poseidon system stated that each missile would have double the payload of the Polaris A-3, and twice the accuracy, producing an eightfold increase in effectiveness against hard targets. The famous example provided in Congressional testimony in 1967 by Paul Nitze for the increased counterforce capability of MIRV's compared the damage inflicted by a 'hypothetical' MIRV package of ten fifty-kiloton warheads i.e., the Poseidon warhead package at that time – with that from a single ten-megaton warhead. The MIRVs would destroy: (1) 10 times the number of airfields, soft missile sites, or other soft military targets; and (2) 1.2 to 1.7 times the number of hardened missile silos.¹³⁷

If CEPs can approach an eighth of a mile, Ball's table indicates that the kill probability of a single 50 KT warhead against a 300 PSI target becomes about 627, three 50 KT warheads raise the probability to 95%. It is therefore clear that Polaris-Poseidon warheads were effective against many Soviet ICBMs until the USSR initiated a major rehardening program in the mid-1970's. (See Bruce Blair's table) with improvements in accuracy MIRVs raise the kill probabilities against a single hard target as compared with a single larger warhead. But MIRVing also increases the counterforce capability of a missile force against a given set of targets through the technique of 'cross-targeting.'

In contrast to the above figures, Dep. Sec. of Defense Packard testified in 1970 that the Poseidon SLBM represented a 67 increase over the Polaris A-3 missile (with either one 1 MT. warhead or three 200 KT. warheads) in effectiveness against hard targets. A 67 increase is trivial, and if the previous value were low to start with, it would be totally meaningless. Nevertheless, writing some later, Adm. Zumwalt wrote that

"... US Navy Poseidon missiles, not a tactical system...had to be taken off Soviet strategic targets in the early 1970's, and directed against Warsaw Pact targets..."¹³⁸

The November 1964 directive to the Navy's Special Project Office, cited earlier, specifically connected the MIRVing of the Poseidon re-entry system with a hard target counterforce capability. In the spring of 1968, Dr. John S. Foster, Jr., Director of DDR & E, testified that

Recently ... we found ways of improving the accuracy of Poseidon so as to be able to get much greater kill capabilities even though the warhead yields were reduced, and so in fact we are beginning to get a rather effective damage limiting capability.

In April 1969, three months after the new Nixon administration assumed office Sec. Def. Laird requested funds to "significantly improve the accuracy of Poseidon missiles." The request was withdrawn later in the year under pressure from the Senate. The Administration nevertheless repeated this request in the FY 1971 defense budget, but this time the funds were eliminated by Congress. However, by mid-1973 Sec. Defense Schlesinger initiated additional programs to enhance missile accuracy. Information supplied to the Senate Foreign Relations Committee by the Defense Department in March 1974 listed "technology development (deleted) of Poseidon warheads to give SLBMs an increased flexibility" as a principal claimant on the \$98m. in the FY 1975 Defense Budget for the implementation of Schlesinger's 'new' nuclear targeting policies. In the same Hearings Sec. Schlesinger himself testified before the Committee on 4 March 1974 that the SLBMs were adaptable to his "selective strategy," and that the SLBM was no longer primarily "an anti-city missile."¹³⁹ By mid-1975 the Navy was pursuing a wide range projects designed to improve overall accuracy of its SLBM missile.¹⁴⁰

Much of this analysis, based on inference, was confirmed in large part by Dr. Perry's (DOD-DDR & E) Senate testimony in 1981 after PD-59 focused Congressional attention on US nuclear weapon targeting. The following excerpt makes this perfectly clear.

Senator Cohen. Could you stop that at all levels, because if you assume the total destruction of the ICBM force and you now talk about the submarines or the cruise, don't you really have to inflict damage upon their industrial/urban base? That is what Secretary Brown said last year. Industrial/urban complex. I said the word city: he said no. I assume it does involve cities.

Dr. Perry. No. A substantial part of our response even in that case would be directed to military targets. There are many military targets which are reasonably hard targets that are not ICBM silos. The whole class of military targets, for example, that would be confronting us in NATO. The air bases and the military bases all around the Soviet Union, those would be important targets and some of them would be attacked by bomber forces and some by the SLBM forces. As I indicated, even silos might be attacked by the submarine launched missiles to deny them an ability to have a reload capability.¹⁴¹

Interestingly enough, when the US Department of Defense commented in 1980 on the capabilities of Soviet SLBMs in Congressional testimony there was no ambiguity about its role: "The Soviet force developments that have occurred over the last years or so, which include the deployment of MIRVed ICBMs of high accuracy and MIRVed SLBM's, the latter of which provide them with an enduring, survivable strategic offensive capability..."¹⁴²

The Trident C-4 missile also settled the SLBM stellar guidance question. The 4,400-mile range missile contains eight MK4 100 KT warheads, and further accuracy improvements are possible if funded before the D-5 missile will be ready. The C-4 has two applications; it will be used in the new Trident submarine, and it will be backfitted into twelve Poseidon submarines. The first of these was refitted and deployed in the Atlantic on October 20, 1979, and completed its first

operational cruise in December. Three more were refitted in 1980 and the backfitting of the 12 submarines is to be completed by 1984. There are no present plans to produce the already developed MK 500 Evader MARV warhead, but if produced it could be backfitted into the C-4 missile. The accuracy of the C-4, nominally at one-quarter nautical mile C.E.P. is only slightly better than that of the Poseidon; however, it is over a 4,000-n.m. range rather than 2,500 n.m., and the yield has been doubled. The Trident (C-4) test program included the use of Navstar Global Positioning Satellites to increase accuracy. If this equipment were installed on all Trident missiles, it would provide them with a CEP of 100 meters. The table below indicates the SLBM's in the present and anticipated US FBM force structure and greater details are provided in the tables which follow the chapter.

By February 1980, former Sec. Def. Brown had decided could eventually be produced, and that the D-5 missile it would at the least have a more accurate guidance system.¹⁴³ It remained to be decided whether the missile size and/or payload would also be increased, and whether the guidance system stellar inertial only, or complemented by terminal correcting systems such as satellite link schemes or terrain sensing. These various alternatives were all being investigated in the Navy's Improved Accuracy Program.¹⁴⁴ Both the Trident and the D-5 programs have been behind schedule, but when produced and deployed the D-5 missile will unquestionably have complete hard target counterforce capability.¹⁴⁵

In 1980 the accuracy of the Trident I (C-4) armed with 8 MK 4 reentry MIRV's per missile was to be reduced from .247 NM to .123 NM.¹⁴⁶ Against targets of 1000 psi hardness the MK4 with a yield of 100 KT would have an SSKP of .368 compared to an SSKP for the Soviet SS-N-18 (with a much higher yield) of between .035 and .131. Given US and Soviet silo hardness in 1980 and after most judgements were again that neither nation SLBMs possessed a significant hard-target capability, and in the words of one author (largely perpetuating of the earlier misconceptions despite the calculations) "... and thus these weapons continue to fulfil the requirements of a reliable and stable second-strike force."

The Trident II (0-5) would go far beyond this. The SSKP of its MIRV warheads against a 1000 psi target as anticipated as early as 1981, was .738, and of two such warheads against a 5000-psi target was .557. In 1984 the entire US SLBM warhead complement had a yield of 350 MT. Each individual Trident II warhead however will have a yield of 500 KT., and the entire Trident II force will have a yield of roughly 2,000 MT. At the same time the number of submarines and missiles will decrease. By 1992, assuming that planned retirement rates of Poseidon are maintained, and) production rates of Trident are met, there will be only 384 SLBM missiles, compared to 656 in 1980, a reduction of 41 percent. The implications will be discussed in a moment below.

By 1991 the Chief of Naval Operations stated "... we believe you could have four or five D-5 equipped Trident submarines, which is more than the equivalent of an MX-field in terms of hard target kill capability".¹⁴⁷ The capability of the U.S. Trident II force will also depend on the mix of Trident II missiles deployed or with the smaller Mark 4 warheads rather than Mark 5 warheads. The ratio of the two that will be chosen will have a significant effect on the capability of the Trident II missile force, The Trident II is more effective against soft targets if deployed with the larger number of Mark 4 warheads but is more effective against very hard targets if

deployed with Mark 5 warheads. The Navy's final plan for the mix of Trident II missiles with Mark 4 warheads and Trident II missiles with Mark 5 warheads will probably depend on the missions assigned to the Trident II in the future.

At the moment, the US Dept. of Defense considers the SLBM force at sea to be the portion of the US strategic forces least targetable by opposing strategic systems. It is operated and maintained under a wartime scenario, and this has been the case since the FBM force went to sea in December 1959. The greater the damage capabilities of the USSR become against the US ICBM and bomber forces, the more counterforce capability the US is likely to develop for the SLBM force, and the D-5 missile is the indication of that. A single Trident submarine, with 24 missile tubes and 10 MIRV warheads per C-4 missile means a total of 240 warheads per submarine of 100 KT each. As the current Poseidon's estimated 160 (or presently 224) MIRV's are already a formidable targeting problem, that for 240 warheads is even more so.

Ironically, the greater counterforce capability will also assure renewed Soviet efforts to target the US SLBM fleet at sea. This is a capability the USSR has apparently experimented with and sought for some years in the past. Perry's testimony made clear that renewed Soviet efforts to develop ballistic missile targeting of US SLBMs could be expected. Perhaps in 10 or 20 years should the USSR develop the same long-range ASW capabilities that the same kind of suggestions concerning US SLBM vulnerability as there were and presently are concerning ICBM vulnerability. The USSR can also be expected to target any external systems on which Trident I missile accuracy will depend, as well as Is systems such as VLF antennae. As indicated earlier in this section, SLBM accuracy is usually described as depending more on the submarine's ability to know its precise location than on the missile's performance. Stellar Inertial Guidance is one way to solve this problem. Another is to supply a satellite to serve as an analogue for stars. This is precisely the role that the Global Positioning System will perform. As a result, it is not unlikely that it would be a target for attack by USSR ASAT systems. (Other than in these brief remarks, this section on US SLBM and II counterforce capabilities does not discuss any of the major vulnerabilities of SLBM systems, such as communication, survivability, or survivability of supporting systems such as satellites. The tables which follow provide additional data on US SLBM systems.)

Chapter 7. The Origins of MIRV

A very important development in US counterforce capabilities was the deployment of in 1970, both on land-based Minuteman ICBM's and on sea-based Poseidon SLBM's. The genesis of the ideas for MIRV warheads in the US goes back to the 1960-62 period. The process in which design proposals evolved and were modified is recorded in some detail in Greenwood's study.¹⁴⁸ By 1962 the Mark 12 warhead was in development, but the authorized design did not yet include independent MIRV guidance capability. In the Navy, too, a MIRV configuration was not yet included in the baseline design of Special Projects' new missile, the Polaris B-3, for which the Navy unsuccessfully sought funding for FY 1965. 1964 was, however, the year in which major decisions set the framework for the systems that eventually appeared, During the FY 1966 budget review in the fall of 1964 the decision was made to proceed with development of a Mark

12 MIRV system for V Minuteman II and with a larger version of the Navy's B-3, later renamed Poseidon C-3, which would also carry a MIRVed front end. In November 1964, the Navy's Special Projects Office was instructed to include both MIRV and accuracy improvements in the design for its new missile.

The most widespread notion concerning US development and deployment of MIRV is that the program was conceived and developed in order to insure penetration of a USSR ABM system. Dr. Herbert York has also published several studies, long after contrary evidence was available, arguing that MIRV: came about as a result of R&D programs essentially unrelated to ICBM targeting concerns. The sole purpose of this short section is to provide evidence indicating that neither of these was the case, and that the driving force behind MIRV development and deployment was in fact the requirement for expanding target coverage. The following quotations from Dept. of Defense testimony to Congress in the 1968-69 period make this absolutely clear. The first is a question from Senator Mansfield to Dr. John Foster, Director, Defense, Research and Engineering, US Dept. of Defense:

MIRV System.

Question No. 10. Is it not true that the U.S. response to the discovery that the Soviets had made an initial deployment of an ABM system around Moscow and possibly elsewhere was to develop the MIRV system for Minuteman and Polaris?

Answer. Not entirely. The MIRV concept was originally generated to increase our targeting capability rather than to penetrate ABM defenses. In the 1961-62 planning for targeting the Minuteman force II it was found that total number of aim points exceeded the number of Minuteman missiles. By each (deleted) splitting up the payload of a single missile (deleted) could be programmed (deleted) allowing us to cover these targets with (deleted) fewer missiles. (Deleted) MIRV was originally born to implement the payload split-up (deleted). It was found that the previously generated MIRV concept could equally well be used against ABM (deleted).¹⁴⁹

The second is from Senator Pell to Defense Secretary Laird:

Reason for U.S. MIRV development

“Now, in connection with the system around Moscow, the so-called Galosh, the existence of which we discovered, I think, in the early 1960s, haven't we responded to that with our MIRV program? Wasn't it the Titan MIRV at that time?

Secretary Laird. Well, I don't believe that necessarily is the case, Senator Pell. I would like to agree with you but having worked on these programs through the years –

Senator Pell. Much more closely than I have because you were on the Armed Services Committee.

Secretary Laird. I would like to agree with you, I can't.

Senator Pell. You feel it is a separate response, a normal outgrowth of regular research and development.

Secretary Laird. Yes; it was a separate response, and it was something we had under development and under consideration for several years even prior to the time that we knew of the deployment of the Galosh. I would not want to mislead anyone, as much as I would like to agree with you.

Senator Pell. Would it not be fair to say that with the escalation in the balance of terror, whatever you want to call it, in the discovery of Galosh that with the development of MIRV shortly afterward, we now have that degree of sufficiency which we would like to have?

Secretary Laird. Well, I think the MIRV is important, and it is important for all of us to know that the Soviets have gone forward with their research and development, and they have even a greater capability for the deliverability of warheads because of the –I am sure this committee has been briefed on this point – because of the size and the thrust of the SS-9.

Senator Pell. But our basic reason for developing MIRV was to increase our own deterrent power, not related, in your view, then to Galosh?

Secretary Laird. It was not related to Galosh because we started appropriating funds for the development of this program prior to the time, we knew Galosh was in being. That is why I cannot respond that way to that question. I happen to have been involved in the appropriation process, and we were funding the research and development on the MIRV, and we knew about these possibilities and had funded work on it prior to the time that the Soviet deployment of Galosh around Moscow was discovered."¹⁵⁰

One of the policy goals arising out of the RAND Corporations Project Forecast prepared for the US Air Force was the need for "very precise target location and on-target controlled delivery."¹⁵¹ A somewhat later but very interesting study prepared by the Dept. of Defense's Institute for Defense Analysis measured the improvement obtained in US ICBM systems – particularly comparing Minuteman II and Minuteman III – of four different targeting capabilities, according to R&D expenditure.¹⁵² The four situations were:

- US first-strike capability against soft targets
- US first-strike capability against hard targets
- US second-strike capability against soft targets
- US second-strike capability against hard targets.

The question of hard-target counterforce capability for the forthcoming US MIRV force also came under some US Senate scrutiny. One US senator, Senator Brooke, was instrumental in pressing the administration and the Dept. of Defense on the quality of MIRV capabilities being procured and their relation to counterforce capabilities. (The following section relies heavily on Greenwood's narrative.) The general opinion was that although the Minuteman III fairly good

weapon for the second-strike counterforce role, and was an improvement over previous systems, its single-shot kill probability was still far too low to make it a credible first-strike weapon where the objective would be to destroy nearly all the Soviet hardened missile force in a pre-emptive ICBM attack. It was the potential future improvements of MIRV systems that concerned the Senate, and the fact that once MIRV was tested and deployed these improvements would be very difficult to control. Brooke stated that

While the US MIRV effort is certainly not designed to disarm the Soviet Union, it is ambiguous. Once deployed, operational testing and guidance modifications could give the force increasingly precise delivery with greater precision; the force would eventually acquire a growing capability against hardened missile silos.¹⁵³

During 1969 Senator Brooke, therefore, began to question several development programs whose purpose was to improve the capability of US MIRV's to destroy hard targets. In late 1969 Brooke wrote President Nixon concerning a statement made by General Ryan before the House Appropriations Committee in which Ryan said,

We have a program we are pushing to increase the yield of our warheads and decrease the circular error probable so that we have what we call a killer which we do not have in the inventory at the present time.¹⁵⁴

In his reply of December 24 President Nixon said,

There is no current US program to develop a so-called hard-target MIRV capability. The particular program to which General Ryan referred did not receive Department of Defense approval for funding in the forthcoming Defense budget.¹⁵⁵

At about the same time the Department of Defense cancelled the stellar inertial guidance program for Poseidon, { funding for which had been initiated in FY 1968. (in large part because of Congressional pressure generated by Senator Brooke) Secretary Laird expanded further on the implications of these actions and on the Administration's policy on the subject of hard-target counterforce. He told the Senate Armed Services Committee that,

The President has made it perfectly clear that we do not intend to develop capabilities which the Soviets could construe as having a first-strike potential.¹⁵⁶

Laird's statement is much weaker than President Nixon's. Given the fact that the Soviets have a substantially invulnerable submarine force, some strategic bombers, and the option to launch their ICBMs on warning of attack, one could easily argue that the type of hard-target counterforce capability mentioned by the President could not be construed by the Soviets as having first-strike potential.

The ambiguity became even more pronounced toward the end of 1970. On October 27 General Ryan said that the Minuteman III "will be our best means of destroying time-urgent targets like the long-range weapons of the enemy."¹⁵⁷ Senator Brooke wrote to Secretary Laird asking for a clarification of Ryan's statement. Laird, in his reply of November 5, reiterated that "we have not

developed, and are not seeking to develop a weapon system having, or which could reasonably be construed as having a first-strike potential." He then went on to say that he believed that "General Ryan's comment was made in the context of limiting damage to the United States by second-strike employment against remaining weapons of an aggressor nation which has struck first. I realize it could be misconstrued."¹⁵⁸

Although Gen. Ryan's full speech did make it clear the second-strike intention that Laird mentions, that hardly settled the issue. There is no technical difference between a force that has very good second-strike counterforce capability against residual missiles and one that could destroy a large fraction of an opponent's hardened missiles in a pre-emptive attack. It was argued that the issue here was perhaps not first-strike but the vulnerability of the USSR land-based missile force and the strategic instability and continuing need for more weapons, as a hedge against catastrophic failure of the submarine missile force, that might result. It was considered unfortunate that the discussion became diverted by the adoption by Senator Brooke and others of the first-strike terminology.

Senator Brooke was not content to let the Administration's statements stand on their own but sought to impose legislative constraints to prevent the United States from achieving a capability that would lead to this vulnerability of the Soviet land-based force. On August 27, 1979, he offered an amendment to the FY 1971 Military Appropriations Bill specifying,

No funds authorized to be appropriated pursuant to this Act may be used for operational development, testing, or procurement of any multiple independently targetable re-entry vehicle (MIRV) system in which an individual re-entry vehicle provides a capability to destroy a hardened target. For purposes of this section, 'a capability to destroy a hardened target' means that combination of warhead yield and accuracy required to generate the equivalent of one-third the level of blast overpressures related effects considered necessary to enable a single warhead to neutralize a hardened missile silo.¹⁵⁹

The wording of this amendment had been negotiated with Department of Defense officials and, as finally formulated, there was no objection from the Department.² Brooke argued that the amendment "would merely ensure that any MIRV systems which are deployed are in fact compatible with our declared retaliatory policy and do not determine strategic stability by becoming potential first-strike weapons."¹⁶⁰ In the ensuing debate no one challenged this interpretation although clearly the Laird letter of November cited above suggests that the development of warheads for the destruction of hard-targets in a second-strike mode would not contradict his own interpretation of the Administration's policy. There was also another effect of

2 The DOD agreed to threshold of one-third or a probability of .3 – for a single warhead to destroy a silo-based missile is extremely interesting in view of later arguments in the 1976-84 period as to the degree of capability that should be considered as a threshold for hard-target capability. Many authors argue that unless the capability approaches 1, after the MIRV era perhaps for 2 warheads, the exchange ratios are not worth the tactic for the attacker, and that therefore a preemptive attack would not be carried out unless that degree of probability was attainable. Such is likely to obtain in reality; suggestions seem far more strenuous than as the above suggests.

the congressional criticisms of MIRV. Over a period of about a year an effort was made within the Special Projects Office and DDR&E to determine whether the cross-range maneuvering capability could be removed from the Poseidon MIRV bus in a way that would be verifiable to the Soviets. Although DDR&E apparently did not feel that this was feasible, Special Projects thought that it was technically possible. However, when pressure from Congress abated, the entire subject was dropped.

By 1979-1980 and the development of the M-X and the Trident D-5 missiles and their respective accuracy capabilities, the ostensible restraints discussed above were completely forgotten. Dept. of Defense testimony to Congressional committees, particularly by senior military commanders in the early 1980's, begun to speak more and more openly about prompt counterforce hard target capabilities. MIRV's would now not only supply the required number of warheads through fractionation, but they would also now have the warhead yield and accuracy combinations to enhance their counterforce capabilities.

Chapter 8. The Constraints on Counterforce

The following discussion brings us closer to operational considerations and is overwhelmingly governed by uncertainties. It is a supplement to and a critique of both static measures and dynamic counterforce exchange models.

The most important point to make concerning the sizable group of concerns to be addressed here is that they pertain to the forces of both sides. Everything described here "works both ways". In describing the factors that reduce, complicate and essentially make unpredictable the level of counterforce capability that would be achieved by a US strike at Soviet ICBMs, one is simultaneously describing the same factors that would degrade any pre-emptive Soviet counterforce attack aimed at US forces. Thus, in explaining that US counterforce capabilities may in reality be severely limited, one is unquestionably forced to the simultaneous conclusion that US ICBMs would suffer far less damage from Soviet attack than is often claimed, and hence that much more US counterforce capability would survive such attack.

Sienkiweicz points out,

...not only that static measures cannot be precisely related to the outcomes of (exchange) calculations, but also that even these more sophisticated assessments are an imprecise and only partial measure of deterrence. They reflect only the technical, or "capabilities", component of a deterrent posture. ...(a) selective focus – in effect the necessary perspective of U.S. defense planners – has contributed to our failure to recognize the transformation in strategic postures which has taken place since 1959, substantially increasing the stability of the deterrent balance.

Among the most important elements of this transformation are (1) advent of near "real-time", high-confidence warning of the launch of large nuclear attacks; (2) the dominance of the ballistic missile delivery system and its implications for the relative ineffectiveness

of defenses as well as for the greatly foreshortened time frame within which the successful surprise attack must inevitably occur; and (3) the great increase in numbers and diversity (as well as in some individual survivability characteristics) of strategic forces, which contributes to the increased complexity of the problem of surprise attacks. These changes, on balance, have greatly increased the importance of operational uncertainty in the calculation of a surprise attack. In the strategic conditions of two decades ago, Wohlstetter could spin quite plausible scenarios for highly effective Soviet surprise attack capabilities, but that is no longer possible. The operational uncertainties that are today associated with such an attack can easily dominate the outcome of the scenario.

...The dominant uncertainties now reside with the aggressor in the strategic nuclear calculus.¹⁶¹

Sienkiweicz organizes his own discussion under the following captions: alert levels; strategy and tactics; operational capabilities (what will the victim do; what can the victim do; how will the forces work); cumulative uncertainty; operational uncertainty.

Former Secretary of Defense James Schlesinger has also stressed this point in 1982 Senate testimony.

Perhaps the dominant element in measuring nuclear forces against each other is the unknown and immeasurable element of the possibility of major technical failure. It would tend to dominate any outcome.

On May 19, 1983, US Senator John Warner released a short US Air Force "point paper" entitled "Uncertainties Concerning Survivability of Existing Silos", presenting very crude estimates of the percentage of a US ICBMs that would survive a USSR CF attack.¹⁶² The USAF graph presented in this paper apparently is the basis of various US ICBM survivability estimates recently released by US Department of Defense spokesmen, "...that 25% to 30% of the missiles would survive in hardened silos, if we ride out the attack" at present,¹⁶³ to "... as little as 1% of the US land based missile force might survive a well-executed first strike...by 1989".¹⁶⁴ The chart is crudely drawn and shows a range of US ICBM survivability estimates from 10-35% for 1983 and 1-7% for 1989. A congressional study released in January 1978 had estimated a USSR ability to destroy 90% of US ICBMs "toward the end of the 1980s" if USSR warhead accuracies achieved CEPs for 600 feet, far better than presently available.¹⁶⁵ In 1980, Under Secretary of Defense William Perry gave the USSR capability to destroy US ICBMs at that time as "certainly greater than 50%" in a surprise attack, and estimated that it would be 80-100% "within three years", that is, in 1983.¹⁶⁶

The 1983 Air force paper stated that the estimates presented a "Range of uncertainties due to US uncertainties about Soviet ICBM Yield, Accuracy, Reliability. (The Chart does not address Soviet uncertainties: will US launch during attack; can Soviets confidently attack all legs of Triad."

The Santa Fe study of March 1978 (Measures and Trends, US and USSR Strategic Force Effectiveness) similarly states "There is a significant degree of uncertainty associated with the yield, accuracy and number of independently targetable warheads associated with these (Soviet) ICBMs".

The US "uncertainties about Soviet ICBMs" include the most basic parameters of yield, accuracy and reliability. Soviet warhead yield is indirectly estimated from ICBM test data. US estimates for the USSR's SS-18 MIRV yields (the most important USSR warheads in terms of counterforce considerations) were strikingly reduced four times in a period of several years, from 3 to 2 MT, from 2 to 1.2 MT in 1978, and finally from 1.2 MT to 600KT in 1979.¹⁶⁷ The estimate for SS-19 MIRV warheads was also reduced, from 800 KT to 550 KT. Finally, in November 1980, intelligence officials gave the yields of the 10 MIRV's on the Mod-4 SS-18 as 500 KT – one-sixth the earliest estimate, although with increased accuracy.¹⁶⁸ The value assigned to USSR ICBM reliability in these calculations is often 100%, which is simply impossible. No mention was made of uncertainties due to fratricide, or of silo hardness and reactivity of silos. Warheads re-entry conditions and bias (discussed below) would be subsumed in the accuracy uncertainties.

A similar situation has obtained regarding the accuracy of SS-18 and SS-19 MIRV warheads. US intelligence estimates attributed substantial hard target killing capability to the Soviet missile tests that began in 1977 and ran through mid-1978. This resulted in the estimates that 2000 SS-18 warheads could destroy 90% of the US ICBM force and was a major driving force behind the development and procurement of the M-X ICBM, and then the Midgetman ICBM. However, in March 1985

a National Intelligence Estimate (NIE 11-3/8-85) lowered the SS-19's accuracy by over 33 percent, to a CEP (circle error probable) of 435 feet – meaning that exactly half of the SS-19 warheads fired at a particular target would land within a circle around that target with a radius of 435 feet. This removes the SS-19 from the class of hard-target killers. The probability that one such missile could destroy a Minuteman silo with a hardness of 2,000 pounds per square inch falls from .51, under the previous accuracy estimate to .32. The probability of two such warheads, fired from different missiles, destroying a single silo falls from .76 to .54.¹⁶⁹

After several years of study of various aspects of US ICBM vulnerability, Tsipis and his colleagues recently produced a short study re-estimating the Air Force projections. Apart from the general conclusion that the cumulative variability, the sums of the ranges of estimates for each individual factor contributing to uncertainty of outcome produces a very wide range of possible outcomes, they arrived at the conclusion that the most probable estimate for the capability of the USSR to destroy US ICBMs in a surprise attack was between 35 and 50%.¹⁷⁰ (The model essentially assigned two SS-19 MIRV warheads with .14 n.m. CEP and .5 MT yield and 5% loss to fratricide in a single wave attack. Variations were estimated for greater fratricide and four warhead attacks.)

In order to explain the considerations producing these uncertainties, the following topics are discussed in varying degrees of detail in this section: (1) reliability; (2) silo vulnerability; (3) accuracy, bias, etc.; (4) fratricide; (5) launch under attack/launch on warning (LUA/LOW); and

generated alert levels versus surprise attack; timing; (6) direct attack on C³I systems; (7) EMP; indirect attack on C³I systems; and (8) pindown.

These are followed by a concluding discussion of the political implications of constraints and uncertainty.

Reliability

Reports appeared in May and June 1983 of several operational test failures in two newly deployed US strategic missile systems, the Trident I SLBM and the air-launched cruise missile (ACLM), subsequent to their deployment.¹⁷¹ Fitzgerald (an ex-US Air Force official) reported that in January 1967 40% of the Air Force's recently deployed Minuteman II missiles – their deployment had begun in 1966 – were “down” for repairs.¹⁷² The history of four successive failures in attempts to launch a Minuteman missile in the late 1960s from an operational Minuteman silo has been officially reported.¹⁷³ Those Air Force analyses of USSR ICBM counterforce capabilities that disregard reliability in effect assume 100% reliability, and that is of course impossible. 100% reliability and that is of course impossible. is never assumed in analyses of US counterforce capabilities. Reliability for any missile is probably not better than .75 or .85. It has been customary to assume greater reliability for US strategic delivery systems than for Soviet ones, though perhaps this assumption should be considered very doubtful for several reasons:

- The USSR carries out many more missile tests than does the US each year, literally ten times more. One reason for this is that it has many more missile types and it tests several of each kind each year, but it simply indulges in a much higher testing frequency.
- The USSR additionally tests the US tests its ICBMs from their operational silos, while the US tests its ICBMs by removing them from their operational location, transporting them to a standard firing range (Vandenberg AFB) and firing them over a constant range to a test site in the Pacific.
- In addition, the USSR has routinely tested combinations of its missiles in rapid firing succession over the years, albeit in relatively small numbers on each occasion, using a single missile from each of several types in a jointly timed test. The latest of these grouped tests for which details were reported on June 18, 1982, included an ASAT missile.¹⁷⁴ The complete sequence included an ASAT, two (SS-11) ICBM launches, an SS-20, a Delta-class SLBM, and two intercepts. The test sequence was begun with the ASAT intercept. US government sources indicated at that time that the USSR had carried out about six such "large-scale" tests over a period of about fifteen years, in other words, at a frequency of approximately one integrated test every two and a half years. There is no public record of any such test ever having been carried out by the US, and there probably have never been any.

Silo Vulnerability

The operational target hardness, even of US silos, is in fact an estimate.¹⁷⁵ It has never been tested by the detonation of a nuclear weapon adjacent to a silo. Hardness of USSR ICBM silos are similarly estimates. Both US silos and those of the newer Soviet ICBMs were hardened

during the 1970s to a nominal hardness of 2,000 psi. Discussions in the past few years of Soviet super-hardening to 3,000 psi and even to 4-5,000 psi (as in US GAO reports and other testimony to Congress), and even higher values attributed to new USSR ICBM silos, for example, a new silo "hardened to approximately 6,000 psi" be extremely problematic, on physical grounds.¹⁷⁶ Silos made of reinforced concrete have a theoretical tensile strength that does not go much past 2,000 psi, is 2,000 psi, the silo is likely to be in the area within which it would be covered by the crater ejecta. Where the pressure is 4-5,000 psi, one is likely to be in the rim of the crater opened by the weapon. In both of these zones of plastic deformation and fractured rock, the missile and the silo would not survive. Thus, the significance of these suggested hardening levels seems to be a puzzle, unless they are interpreted to imply that accuracy is not expected to be sufficient to destroy the silo. If the accuracy/yield relations are sufficient to make the radius of the explosion crater greater than the CEP (for these comments, accuracy and CEP are assumed to be the same), then the silo will be within the crater or under its lip, and the degree of hardening will be irrelevant. Increased hardening is in fact meaningful to the degree that accuracy is less than anticipated, and the poorer the accuracy, then the greater are the savings offered by hardening, and the more a counterforce strike would be blunted.

Accuracy and Bias

More attention has been given to this consideration than probably to the others discussed in this section. That is perhaps because it is possible to derive the mathematical relationships for destructive capabilities relating to yield, accuracy and psi, perhaps because the formulas for kill-capability (k) and counter military potential (CMP) are dominantly governed by accuracy. For the same reason, the vulnerability of US ICBMs has been primarily discussed in terms of the increase in accuracy of Soviet MIRVed warheads.

The classic study in the open literature concerning missile accuracy was written more than ten years ago by David Hoag.¹⁷⁷ Perhaps the first thing to say that the United States cannot visibly identify the aim points of Soviet ICBM and SLBM is tests, and therefore presumably does not actually know the accuracy (or CEP) of Soviet missiles. Soviet missile accuracies, both ICBM warhead and SLBM, have always been considered to be substantially poorer than those of the US. To what degree that changed in the case of the warheads for the newest MIRVed models of the SS-18 and SS-19 in tests carried out during 1977-1978 is not altogether clear from the public evidence. However, it was reported that their accuracies had been substantially increased, and in 1980 that the USSR was backfitting these new warheads into SS-18 and SS-19 ICBMs rather than waiting for their next generation of missiles.¹⁷⁸ The CEP attributed to the Minuteman III is 600 feet and that for the best new Soviet warheads in 1980, 800 to 1,000 feet, is now reported as 400-500 feet. US warheads would have to land within 500 to 800 feet of their targets in order to have counterforce capability. Those of the USSR could land to within 1,000 feet, due to their higher yields. US MIRV yields have been consistently increased in the past ten years.

The second important point is that CEP is by definition not really a measure of accuracy; it is a measure of precision. The bias error – the distance between the actual target and the center of the pattern of test shots aimed at it is in fact the measure of accuracy.¹⁷⁹ "The bias, or systematic error, is the distance from the center of the circle of equal probability to the target. It is due to uncorrected gravitational field anomalies, errors in the model of the terminal atmosphere,

magnetic drift due to unknown electronic and anything else that has not been thought charge on the re-entry vehicle about."

Neither the United States nor the USSR have ever tested a missile over the North Pole, and computer software programs based on geodetic satellite information serve the purpose of compensating for gravitational anomalies, varying densities in the upper atmosphere, or unknown wind velocities at re-entry. All US tests have been from the California coast to Kwajalien Island in the Pacific, and all USSR tests from the northern European USSR to Kamchatka Island in the Northern Pacific. Garwin points out that despite the repeated US tests over a well-identified range, every new model missile fired over the same range, or the same missile over a slightly different range, results in a slightly different bias which has never been successfully calculated in advance. The report of one analysis of US tests in the early 1970s, after much experience and with constantly improving guidance systems, showed that in some tests the bias error and the miss distance to the actual target was greater than the CEP radius. In these tests bias error was clearly at least as important as CEP in measuring missile accuracy.

In 1974 Senate testimony, Schlesinger said:

"I believe there is some misunderstanding about the degree of reliability and accuracy of missiles. As this chart explains, it is impossible for either side to acquire the degree of accuracy that would give them a high confidence first strike because we will not know what the actual accuracy will be like in a real-world context ...

In that testimony, Schlesinger cited possible "operational degradation" of .2 nautical miles. This amount would be just accuracy between. 1 and equal to or greater than the best CEP's now being claimed. He has repeated his comments in Congressional testimony as recently as 1982.

The point is that assumedly no military decision-maker would undertake a surprise attack unless it were certain that he could win the exchange duel, in effect that the bias would be equal to or less than the CEP. Though the availability of large numbers of MIRVs complicates this assessment somewhat, the assumption is that such an attack would have to succeed on the first try, as fratricide and the other considerations to be discussed below would also come into play, as well strike. Since neither side has ever tested over the actual missile attack route, which would be in effect a new range in an untried direction, and though they would attempt to compensate by calculation derived from other sorts of R&D information, they could never be certain of the result. "If you cannot be sure that you would be able to hit the enemy's silos, then there is no point in even trying." Mid-course corrections utilizing stellar or satellite alignment is only capable of by-passing some of the errors introduced into CEP, and not those deriving from bias. Until ICBM warheads are fitted with terminal as the expected retaliatory guidance packages, the situation described here will pertain.

Fratricide and Timing

The first substantial public presentation on fratricide, or interference, including calculations of some of its effects, appeared in 1976.¹⁸⁰ The planning of nuclear attacks on counterforce targets had included cross-targeting – the delivery of more than one missile warhead and often several

from different missiles on the same target within a short span of time. This was assumed to increase the probability of destruction. At present, most nuclear exchange model calculations assign two warheads to each silo attacked, one air burst (in actuality a near-ground burst), and one ground burst.³) However, if more than one nuclear warhead is fired at a target to increase the kill probability, the first one to go off is very likely to destroy the others without causing them to detonate if they arrive within a short period of time thereafter.

Fratricide operates by several different mechanisms. The first is a flux radiation, the electromagnetic pulse (EMP) travelling at the speed of light, which is powerful enough to vaporize near-by warheads and destroy electronic equipment several miles away. It would reach a second warhead a mile away in 5 millionths of a second. This is followed by an aerodynamic shock wave behind which gas temperatures are high enough to destroy incoming warheads at ranges between one and two miles, depending on the yield of the initial explosion. The third destructive mechanism is rock, dirt and debris sucked up into the explosion plume. The fourth effect, high winds, would not destroy a warhead but would be likely to blow it off target.

Thus, the timing of attacking warheads would have to be meticulously coordinated. If not absolutely simultaneous, the second warhead would have to be delayed at least five minutes following the first one and possibly up to one-half hour. In the interim, the attacked side could launch its own surviving missiles. (See section on "Pindown", which follows.) The situation is further complicated in that both US and USSR missiles lie in relatively compact areas, so that a miss against one missile silo is liable to interfere with incoming warheads aimed at other silos. An attack on a missile field would require careful timing for incoming warheads to cross the field in a uniform direction, precisely timed.

EMP, Indirect Attack on C³I Systems

The consequences of an attack on its own 31 facilities is one of the major unknowns in assessing the ability of any nation to use its nuclear forces. The number of attacking nuclear weapons can be extremely few, and the nature of the attack need not be one directed against the physical integrity of the individual satellites, command-and-control facilities themselves. It can be via the characteristic of a nuclear burst called Electromagnetic Pulse, or EMP.¹⁸¹

³ Normally, the "two-on-one" Soviet attack on U.S. silos is described as an air burst followed by a ground burst. This is misleading because the detonation, while does occur in the air, is actually a near-ground burst because the fireball touches the ground and up large quantities of dust into the atmosphere. For the 550-kiloton warheads often postulated as the countersilo weapons the Soviet Union would use, detonation at an altitude much greater than 1000 feet it lifts could severely reduce the countersilo capability of the warhead. On the other hand, the fireball from such a warhead reaches a radius of over 1400 feet in about 50 milliseconds, and approximately doubles in size within a second. Thus, this near-ground burst would create a dust cloud over the silo it was targeted against.

All nuclear explosions produce EMP, as already indicated also those close to the earth's surface. Nuclear explosions at the margin of the atmosphere – up to 40 km. high or slightly higher – upset the ionosphere significantly and disturb radio communications and radar. The maximum EMP effect however is caused by nuclear explosions taking place between 40 and 400 km. above the earth's surface and is caused by a secondary interaction produced by the explosions initial long wavelength (gamma) radiation. The higher the altitude of the explosion, the larger the area on the surface of the earth which will be affected. Thus, the EMP effects of a high-yield nuclear burst at 300 km. altitude would essentially the entire surface area of the United States, and the effects of one at 500 km. would extend far beyond the US borders.

The high altitude EMP effect was discovered (for the US) in a July 1962 high-altitude detonation of a 1.4 MT hydrogen bomb at 248 miles over Johnson Island in the Pacific. The test was of the warhead of the Spartan missile that was to be part of the American "Safeguard" system. The effects occur in milliseconds and are directed out into space as well as down towards the ground. A relatively small explosion of two megatons just above the upper atmosphere at an altitude of 50 to 75 miles would damage an unprotected satellite in geosynchronous orbit 22,300 miles above the earth. (The mechanisms of these effects in space and those directed to the ground are different: the effects on a satellite are called "system generated EMP".) The range to which destructive effects will operate can be increased by raising the yield of the nuclear weapon. Thus "dark" satellites, "parked" in orbits for emergency use to substitute for other satellites either destroyed by ASATs or not operational for any other reason, would likely also be destroyed or affected. Ironically, older vacuum-tube technology is 4-5 orders of magnitude more resistant to these effects than are the semiconductor-based microelectronics that now make up missile, satellite and C³ control systems. The electronics of any "unhardened" system – that is electronics not specifically designed or constructed to be more resistant to EMP effects – could be destroyed or seriously affected.

The consequences could be enormous. The systems that could be put out of commission would include ground-based, airborne and satellite systems:

- missile early-warning satellites
- satellite communication links; both the satellites and the ground based receiving and control facilities
- all ground-based C3I systems
- missile-launch control complexes
- airborne alert C3 aircraft, the "Looking Glass", etc.
- the TACAMO airborne system for SLBM C3
- major warning radars, the DEW radars and SLBM warning radars.

As of 1983 for example, only a single one of the Looking Glass aircraft was hardened and none of the TACAMO aircraft.

The experience for over a decade now is that the USSR launches various reconnaissance satellites during any acute geopolitical crisis. It would therefore be entirely expected that similar launches, perhaps of an ocean-surveillance satellite, would take place during any major US/USSR strategic crisis. If such a Cosmos satellite, which routinely passes over the US at an

altitude of roughly 100 miles, were also equipped with a nuclear weapon, it is not difficult to conceive of a nuclear explosion for the purpose of producing major EMP effects being achieved with complete surprise. US officials report that the United States has therefore arranged no less than 43 independent ways of transmitting the "Emergency Action Message" (EAM) in an attempt to assure that the order for a retaliatory strike by US strategic forces could not be blocked by a high-altitude nuclear explosion intended to produce EMP effects, either concurrent with or prior to a missile attack on US strategic forces. Supplementary transponders are being placed in many different US satellites that have as their primary missions' functions other than dedicated emergency communication.

Direct Attack on C³ Systems

The quotation from Sienkiewicz on the opening page of this chapter referred to the "... high confidence warning of the launch of large nuclear attacks" which contributed to a present stability in the existing deterrent balance between the US and the USSR. However, authors such as Bruce Blair, John Steinbruner and Desmond Ball have written convincingly regarding the vulnerability of precisely the national "C³I" (command, control, communications and intelligence) system, and there would seem to be little question that these systems are far more vulnerable to nuclear attack than the weapons themselves. They are very few in number, they are for the most part stationary, and they are nearly all "soft". Richelson distinguishes between the components of these systems which would be necessary to launch a single nuclear strike versus those that would be necessary for extended counterforce warfighting, but the distinction becomes blurred by assumptions of scenarios, generated alerts, etc. Responses that call for carefully calibrated retaliatory strikes following full attack assessment, or "escalation control" – not to mention "escalation dominance", are well beyond the capabilities of the US command system, unless the Soviet attack were small, and unambiguously structured to spare that system.

"Specifically, there are six components of the strategic continued operation is required to allow for the conduct of a protracted nuclear war – the sensors which detect and assess an attack on the U.S., the command centers for the evaluation of sensor data, the decision making authorities that make retaliatory decisions, the command posts in which the decision makers conduct their deliberations, the communication links which connect the sensors, command centers, decision makers, and nuclear forces, and the intelligence resources to respond effectively to an attack."¹⁸²

Attack characterization and assessment is intended to identify three features of a nuclear attack:

- the scale of the attack;
- the source of the attack (i.e. type of missile and location of launch point);
- the likely impact points of the attacking warheads.

The principal components of the US attack detection, assessment and retaliatory command system are set out by Ball:

- Early warning:
- Defense Support Program (DSP)/Code 647 geostationary infrared early warning satellites – three satellites and two fixed ground stations.

- Ballistic Missile Early Warning System (BMEWS) ground-based early warning and tracking radars at Thule, Greenland; Clear, Alaska; and Fylingdales Moor, UK.
- The Enhanced Perimeter Acquisition Radar Characterization System (EPARCS), which consists of the upgraded Safeguard ABM radar at Grand Forks, N.D.
- The backscatter Over-the-Horizon (OTH) radar system two sites, one currently under construction in Maine and the other to be installed on the west coast of the US. Cobra Dane, a large, phased array radar at Shemya Air Force Base in the Aleutian Islands (USAF Program 633A).
- SLBM Detection and Warning Radars. Currently consists of seven AN/FSS-7 radars (Program 474N); to be phased out as Cobra Dane and new Pave Paws phased array radars enter service. Two Pave Paws sites are currently operational (Otis AFB, Mass., and Beale AFB, Calif.) and two others are under construction. The AN/FPS-85 radar at Elgin AFB, Florida, also performs a detection function against SLBMs launched from south of the US.
- Integrated Operational Nuclear Detection System (IONDS), which consists of sensors on DSP and GPS Navstar satellites.
- The Enhanced DEW (Distant Early Warning) Line of radars intended for early detection of Soviet Long Range Aviation bomber forces. Other intelligence sources, and most particularly satellite photography and signals intelligence (SIGINT).
- National Command and Control Authorities: NORAD headquarters under Cheyenne Mountain near Colorado Springs, Strategic Air Command (SAC) headquarters at Offutt Air Force Base near Omaha, Nebraska. The National Military Command Center (NMCC) and National Military Intelligence Center (NMIC) in the Pentagon. The situation Room in the White House.
- Communication Links: From the early-warning systems and facilities to the national command authorities and from these authorities to commands responsible for execution of war plans.¹⁸³

Ball points out that:

"The whole of the US system for detection and warning of ballistic missile attack and for formulating and issuing response orders consists of just over 20 points and could be destroyed by attacks on less than 20 points (since there is no need to attack, for example, both the three DSP satellites and the two DSP ground stations).

Most of the elements of the system are completely unprotected and could be destroyed by only a few pounds per square inch of blast overpressure this includes the DSP ground stations, the BMEWS and Pave Paws radars, and most of the other radars. Only the NORAD headquarters at Cheyenne Mountain is designed to withstand nuclear attack. In fact, the system can be rendered totally inoperable by attacks on carefully defined segments: (1) the sensor systems – perhaps 15 points: or (2) the NCA and other command agencies – perhaps six points; or (3) the communications links from the command authorities to the executing forces.

Destruction of segment (1) would probably be the easiest in operational terms, notwithstanding the political and strategic implications of such action."¹⁸⁴

"Looking Glass" and "National Emergency Airborne Command Post" aircraft, which are not otherwise specified under the national command and control authorities that Ball lists, could be deactivated by EMP or by direct attack.¹⁸⁵ It would appear that these aircraft, if not destroyed on the ground or incapacitated by EMP, would be vulnerable to yet other consequences of nuclear attack. Since they are intended to operate over long flight duration in relatively close approximation to the ICBM fields, their jet engines would be severely affected by even short exposure to the large dust clouds that would be produced by ground bursts at ICBM fields. Ball has also pointed out that senior military officials concerned with nuclear authority and control have claimed that so many checks, constraints and verification procedures have been established that the US might "actually be unable to release and launch a nuclear weapon or weapons if it decided to do so, even with the civilian hierarchy intact, in full control of their faculties, and all communications systems in full working order."¹⁸⁶ How the system could then operate if fragmented is a little difficult to understand, unless it is designed to bypass the specified pre-attack procedures once the nation has unquestionably suffered major attack. But that is not supposed to case.⁴

The situation is supposedly eased by the warning function of an attack on the C³I system itself, as well as on the timing difficulties of such an attack. Again, quoting from Ball:

"The well-known synergistic feature of the US Triad, whereby attacks cannot be launched so as to impact simultaneously against each of the three components without providing the ICBMs, SLBMs, and strategic bombers confirmed notice of attack against two of the components also operates in the case of the US early-warning sensors and systems. Unless they were destroyed simultaneously, some elements of the system would be able to monitor the attacks on the other elements and to provide some initial attack characterization and assessment intelligence. On the other hand, simultaneous attacks would require the use of SLBMs, launched from submarines off the coasts of the US, Canada, Greenland, Australia and the UK. Surprise attacks against early-warning facilities in these countries would be extraordinarily difficult to coordinate. Moreover, the SLBM launches would themselves be detected by the DSP satellites and the other elements of the SLBM detection and early warning system. Further, the simultaneous destruction and/or inactivation of all the elements of the US early-warning and attack assessment system would itself be tantamount to warning of attack."¹⁸⁷

Other than uniform agreement that attack and loss of the strategic warning systems yet warning of strategic attack, no one has, however, attempted to formulate what the proper response in such a case should be. Ball would serve as also does not consider the possibility of blinding the DSP system by a satellite borne nuclear weapons exploded to produce EMP, rather than by a directly preceding missile launch. Perhaps the only light point in this picture is the ambiguity in the actual degree of USSR ASAT capability. On the one hand, there are allegations that the USSR has tested short notice "roll-out" ASAT launchers and would have sufficient numbers of these to destroy not only the small of US reconnaissance satellites that are in space at any one time – which is not unlikely given the small number that are simultaneously deployed – but also via a

⁴ Our Nations Nuclear Warning System: Will it Work If We Need It, Hearing, Committee on Government Operation, House, 99th Cong. 1st Sess. (Sept. 26 1985) 1986.

direct-ascent attack using nuclear weapons, the US "early warning spacecraft at geostationary altitudes".¹⁸⁸ That capability certainly exists, but any nuclear explosion at such altitudes would presumably also blind the USSR's early-warning satellites. On the other hand, only half of the USSR ASAT tests to date have been successful and the system has been tested only against own a very narrow range of low-altitude US orbital inclinations, none of which corresponds to those (reconnaissance) satellites.¹⁸⁹

Launch-on-Warning/Launch-under-attack (LOW/LUA) Generated Alerts versus Surprise Attack: Timing.

Sienkiewicz points out that

"Here we return to the importance of, among other things, the alert/dispersal condition of the victim's strategic nuclear forces, and whether he chooses to launch any of them upon warning of (or during) the attack. These are, perhaps, the two fundamental (and irreducible) uncertainties that must be assumed away in order to perform the exchange calculations central to the evaluation of strategic forces."¹⁹⁰

There are perhaps three aspects that can be separated out to clarify the considerations involved here. It has always been emphasized that the existence of three different basing forms for the nation's nuclear weapons forces – ICBMs, aircraft, and SLBMs – would make it exceedingly difficult for another nation to carry out a simultaneous attack on all three, or even on the two land-based components. The first indications of attack on any one of the systems would supply strategic warning of attack on the others. The problems of timing of a counterforce attack would operate at all times, whether during an international crisis or under day-to-day levels of alert.

Second, there is the question of the differing conditions of readiness that would obtain in a crisis, under "generated alert", versus those that obtain routinely. In the most extreme case of generated alert, war between the US and the USSR may already be in process, and one may even already be involved in an escalatory process of nuclear weapon use, in contrast to the depiction of a massive counterforce strike without any antecedent. These two conditions, generated versus day-to-day alert levels of the strategic forces, are accounted for in most US/USSR nuclear-weapon exchange models. However, the direct link between these two alternative states of readiness and the question of LOW/LUA is that all of the discussion of LOW/LUA presumes the day-to-day context rather than states of generated alert, which seems rather illogical. If there is an extended period of generated alert and ample strategic warning, launch of one's own weapons would be very much more probable before the opposing weapons actually impacted on one's soil. Under such conditions, both sides' weapons would be prepared to fire on warning of attack. Certainly, whichever side initiated an attack would have the remainder of their missiles primed to fire on launch-on warning. The entire discussion therefore seems to be somewhat unrealistic and superficial.

If attack on C³I systems is added to attack on the strategic delivery systems this presumably increases attack timing problems still further. But as already indicated, if attack on C³I systems took place in an initial phase, without simultaneous attack on weapons, no one has quite suggested what the proper response should be. Apparently, however, no one has suggested that

there should be launch on that degree of strategic warning, or on increases in readiness in the opponent's strategic forces.¹⁹¹

The two most detailed discussions of LOW/LUA appeared in an in-depth study by Richard Garwin and in the US Office of Technology Assessment study of MX Missile Basing.¹⁹² Garwin addresses the technical requirements of such a policy while the OTA study examines the scenarios of political and military conflict under which launch under attack might be invoked. Garwin supplies the definitions of the relevant terms:

"Air Force definitions are approximately as follows: Launch on warning: a launch in response to sensor indication of an attack on the continental United States ("CONUS"). Launch under attack: a launch after high-confidence determination that CONUS is under massive attack. Launch on (or after) impact: Secretary Brown's term for a launch after nuclear explosions on or above ICBM fields. Launch on attack assessment: a launch after determination of the intent and extent of the attack, including the degree of threat to ICBM silos."

Exactly what US policy and plans are at present or have been in the recent past regarding LOW/LUA seems ambiguous. The preceding chapter of this study on the history of US nuclear war plans seems to satisfactorily demonstrate that commanders of US strategic nuclear forces expected to initiate a nuclear strike preemptively, that is, on relatively early indication of strategic warning. Whether and how long such policy or expectations extended into the late 1960s or the 1970s seems impossible to determine at present. Sienkiewicz writes:

"The Minuteman was originally developed to provide a "launch-on-warning" capability; only later was it sufficiently hardened to permit a policy of actually "riding out" a Soviet attack before launching a US second strike. An operational capability for a disarming first strike (even against ICBMs alone) thus is potentially a physical impossibility."¹⁹³

This implies that the original operational assumptions were for LOW and only later were they changed to include the possibility of absorbing a first strike.

As for the USSR in the 1950s, Soviet strategists emphasized preemptive doctrine and were ambiguous about it into the early 1960s. As will be described in a following chapter, McGwire's comprehensive study states as unquestionable that the USSR intended to initiate a massive preemptive nuclear attack on strategic 1968, with a transitional policy phase in the period 1968-1975. According to Garthoff, the USSR adopted a launch-on-warning policy in the early 1960s.¹⁹⁴ If Garthoff is correct, it would make slightly irrelevant the private comments by Soviet strategic analysts to members of the US arms control community from 1980 on that the Soviet Union would be forced into a LOW/LUA policy as a response to the MX missile, though some of these comments implied that the USSR was already operating under such a policy and had been for some time, without indicating when it had been initiated. Several speeches by the most senior Soviet military officials in 1982 repeated this theme with the addition that such a Soviet LOW/LUA policy would have to become "automatic".

In December 1979, Jeremy Stone wrote that,

"For a decade, at least, the Defense Department has been considering "firing on warning" or "firing under attack" procedures in which missiles would be launched if sensors suggested an attack would be coming."¹⁹⁵

This moves the time period of such consideration back to 1968-1969, or earlier. There were some suggestions that one of the options Secretaries of Defense Schlesinger explicitly ordered into the SIOP (presumably in 1974) was a LUA option. In the Carter administration, the first official suggestion of LOW/LUA policies apparently came early in 1977 from Secretary of Defense Harold Brown:

Secretary Brown: An attack large enough to strike all our Minuteman force always leaves open the possibility which the Soviets would have to consider that our missiles would be launched before the attack.

Mr. Carr: Out from under?

Secretary Brown: It is not our policy to do that, but it is not our policy never to do that either.¹⁹⁶

Brown repeated the idea that the USSR would always have to consider such a possibility in several of his Annual Department of Defense reports in the sections discussing the problem of Minuteman vulnerability. Later in the Carter administration, the statements were somewhat more explicit, as for example that by Assistant Secretary of Defense Perry.

We have always had an LUA option for the President: the recent changes have, we believe, removed significant impediments to exercising the option.

...

We already have a credible LUA option, and it does provide a strong deterrent against a Soviet first strike. But any LUA system could itself be vulnerable to some type of attack that will provide the NCA with ambiguous data. Relying on such a system as a matter of policy is in my view a dangerous, hair-trigger approach. We also need the capability to ride out an attack and deliver unacceptable damage, as viewed by the Soviets.¹⁹⁷

Similarly, Assistant Secretary of State Gelb stated;

The Soviet Union will have a theoretical capability, come 1983, ... to launch a very limited number of missiles, say a couple of hundred, with the possibility of destroying some 90 percent of our fixed ICBMs, a certain portion of our heavy bombers, and those submarines in port...

But... they then would have to make a second assumption, namely that even after we knew the Soviets had launched this first strike against our Minuteman forces, we would let them just sit in their holes and be destroyed. I don't think there is any basis for the Soviet leadership assuming that. We would have no reason, no incentive, to just let those

forces sit there destroyed. The only question would be a command and control one, the ability to respond in time. This is something I think we ought to make sure we have.¹⁹⁸

It has been assumed for decades that the United States has the physical capability to launch US missiles within 20-30 minutes of warning time, or less.

The present Secretary of Defense, Caspar Weinberger declined to reply to Senatorial suggestions that "the administration was moving toward a strategy of launch under attack", saying that we "would not discuss in public policies governing release of nuclear weapons", but at the same Hearing, the Chairman of the Joint Chiefs of Staff, General Vesey, replied that "The Soviets have no assurance that we will ride out the attack."¹⁹⁹ The present Assistant Secretary of Defense, Fred Iklé, wrote in 1979, before assuming his present office, that a launch-on-warning strategy "As an overall answer for the vulnerability problem, this idea is dreadfully dangerous and inadequate."²⁰⁰ Though it might not be the judicious "overall answer", this is no indication that Mr. Iklé would not recommend its implementation on notice of missile attack. At the conclusion of the chapter on the SIOP, Asst. Sect. of Defense Richard Perle in the Reagan administration was quoted in 1983 as saying that LOW/LUA was not and had not most been US policy.

The most informed members of the US arms control community, most of them with long periods of prior appointed or advisory government experience, seem to be similarly fragmented in their understanding of the reality regarding these policies. Richard Garwin explicitly recommends its adoption, Herbert Scoville denies that it is US policy: "It's (launch-on-warning) the last thing in the world that we want the Russians to do. Thank goodness the United States doesn't have that policy today"²⁰¹ while Sidney Drell considers it inconceivable that such a policy would not be in force:

At issue is whether it is reasonable to presume that the Soviet Union would initiate a preemptive nuclear strike against the US...

... my difference with Mr. Jones has nothing to do with the difference between forces at a "normal peacetime alert" and a "fully generated alert" as he suggests. It has to do with whether the US leaders would allow about one-half of our entire Minuteman and Titan force of 1054 ICBMs to be destroyed in a Soviet first strike despite the availability of at least 3 days of strategic warning of an extremely provocative Soviet massive population evacuation. I repeat as stated in my testimony, this "could result only from a total failure of our civilian and military leadership".²⁰²

Former Secretary of Defense McNamara's statement that NATO and the Warsaw Pact should renounce the use of a nuclear response to a(n) (presumably nuclear) attack "until it has been determined beyond any reasonable doubt" that the assault was intentional, doesn't seem to clarify anything at all.²⁰³ In fact, it is ambiguous in the extreme. 500 or 1000 incoming ICBM or SLBM warhead radar tracks could scarcely be interpreted as "unintentional". Such a determination could, and certainly would, be made on the basis of sensor criteria if the attack was massive – and hence he is in effect agreeing to a policy of launch-on-warning – and even launch-under-attack is often interpreted as relaunch-on-warning quiring no more than the impact of the initial missile. The entire strike need not be absorbed.

Pindown

The final consideration in this group is "pindown", the name given to an attacking nuclear weapon tactic intended to prevent the opponent from launching his own land-based missiles until a major wave of attacking ICBM warheads arrive to destroy them.²⁰⁴ The first attacking nuclear weapons would be launched from SLBMs at relatively short range and then perhaps from ICBMs fired on low trajectories still in advance of the main wave. These warheads (essentially neutron bombs) would be exploded at high altitudes – about 300,000 feet – in the air corridors above the missile fields through which the opposing missiles would have to pass. Their purpose would be to disable or destroy any rising missile via X-ray emission. To be successful, a pindown effort would require some hundreds of megatons per minute above the opponent's missile fields for 15 to 20 minutes. Garwin calculates the amounts required as 1-5 megatons per minute per Minuteman wing, or 1,800 megatons in all. Warheads designed for this purpose, however, need no re-entry vehicle and very little accuracy. If the opponent were certainly known to follow a policy of launch only on impact, however, such warhead expenditure could be presumably substantially reduced and need not derive primarily from SLBMs. It is otherwise usually assumed that warhead expenditure for this purpose would come for the most part from SLBMs. The United States has not structured its SLBM systems for this role, and I do not believe that it is that the USSR has either. Although a possibility, it therefore does not seem likely that this tactic would be used by either side given the force structures they presently have, though Garwin does not seem to find the tactic inconceivable.

A Concluding Note: The Political Implications of Constraints and Uncertainty.

The United States increased its counterforce capabilities throughout the 1970s, first by the deployment of MIRVs, then by increasing their accuracy and yield. The USSR responded by hardening its silos and in the late 1970s by deploying its own accurate MIRVed ICBMs. This produced two responses. The first was the claim that the silo-based missiles of the United States were vulnerable to a surprise Soviet attack. This contributed to the pressures for the deployment of the US MX missile, with its ten highly accurate warheads, which was intended to give the United States a counter-silo capability comparable to that of the USSR. The second response was the alarm from the arms control community, aroused by the trend of both US and USSR strategic nuclear weapons particularly land-based ICBMs towards greater accuracy, hard-target counterforce capability, warfighting contexts, increased advantages in damage limitation and pre-emption, and hence crisis instability. That damage limitation was not in fact a new interest or intention, but had been there all along, was overlooked. The point was frequently made, however that (at least usually by the same individuals so far) all of this concerned only the alleged vulnerability of one of the three segments of each side's strategic weapons, the land-based ICBMs. More of a point might, in fact, have been made of the vulnerability of the bomber portion of the strategic delivery systems to the same kind of surprise attack. Perhaps this receives less attention since no one has ever suggested that any portion of the bomber force should consider riding out even a surprise attack under any circumstances, and it is taken for granted that as many as possible should take off at warning. In addition, it is probably due to the mistaken assumption that the bomber force carries a lesser portion of the counterforce mission than do ICBMs. Perhaps the weakest part of the entire debate, however, has been the ambiguity surrounding precisely the limited and uniformly acknowledged implausible aspect of the

scenario envisaged: a massive, counterforce surprise attack. Essentially the same operational considerations and problems would exist if the very same size of attack took place under conditions that would be more likely to arise in a real-world political crisis, with the clear build-up of tension, threats, and possibly even of theatre use of nuclear weapons and subsequent escalation hence strategic warning. Such warning should as best one can imagine alter all the assumptions about the state of preparedness of one's own forces, riding etc., all of which apply to the context of surprise. But discussion of this ambiguity is avoided by out a massive counterforce attack, launch on warning, everyone, as it involves even more public consideration of nuclear threat, damage limitation, warfighting. By and large, one was left with a consensus for several years, at least in the arms control community but mirrored in the alarms about the "window of vulnerability", that strategic weapon development and procurement decisions by both sides were pushing strategic arsenals in an extremely dangerous direction, with major risks for crisis instability and preemption.

However, when one begins to look at the variables that would affect the operation of these systems in a counterforce role, both technical and tactical: accuracy, yield, overpressure, silo hardness, burst height reliability, fratricide, EMP, attack on C³I, pindown, launch on warning or launch under attack, attack timing – one seems forced to the conclusion that a successful counterforce attack is an unlikely proposition.

The military and political implications of this conclusion are considerable. They relate to the capabilities, the consequences and what is said about them:

- The United States under present conditions can have only a very uncertain expectation of being able to destroy any large number of Soviet ICBMs in a preemptive counterforce attack.
- The same applies to a USSR attack on US ICBMs.
- Therefore, US fears about the vulnerability of the land-based leg of its strategic force are probably exaggerated.
- Similarly, Soviet claims of US "first-strike" capabilities or intentions are not credible.
- Finally, both sides understand the first two of these propositions about their own capabilities and about those of their opponent, and the second two about the consequences of these propositions.
- Therefore, what both have been publicly saying they understand to be incorrect. The public statements are either made for propaganda purposes, or to justify their own present and subsequent strategic weapon acquisition decisions, which they find either no interest in controlling or too difficult to control for all of these reasons combined. Continued strategic weapon acquisition nevertheless constantly has as its aim, on both sides, at least in part the increase in counterforce capability.

Chapter 9. US Counterforce Capability, Soviet Nuclear Targeting Policy, the 1970s and at Present

Before turning to developments in US counterforce capabilities in the 1970s, we can first summarize some of the main points from other sections of the study, and briefly discuss one aspect not otherwise dealt with—probable USSR targeting policies

In summary, US counterforce capability has been substantial from the year 1950 on. The fraction of the total nuclear strike force allotted to counterforce targets has grown continuously since that time in comparison to the portion allotted to countervalue targets. Relative US capabilities reached a peak just before and just after 1960. There may have been some decrease in the late 1960's as the number of Soviet missile silos increased, but this was probably matched by increases in US accuracy and by MIRVing. There was probably a much more notable decrease Soviet ICBM silos were substantially hardened after 1975. Capabilities against non-hardened portions of the counterforce target set always increased. In this that regard, US SLBM warheads were also largely targeted on military targets—that is, had a counterforce function—and were not targeted on cities. It appears also that the USSR C³I systems have always been included among the prime targets. Even after the McNamara period, USSR economic targets were a last resort, and cities even more so. Garwin has indicated that together these two categories accounted for only 7 percent of the allotted US forces. Finally, there are very strong indications that the US intended to use its forces pre-emptively. During a period from the mid-1960s to mid-1970s this was probably referred to in terms of "damage-limitation".

If it is assumed that the USSR knew of any of this, via compromised documents, identified penetrations of the NATO Nuclear Planning Group or via any other means – or if they had arrived at these conclusions through their own analysis of US strategic force structure – it would be the strongest reason to believe that the USSR must itself have planned for nuclear counterforce pre-emption of US strategic force structure it would be the strongest reason to believe that the USSR must itself have planned for nuclear counterforce pre-emption. If there is a single reason to give credence to the claims of the most "hawkish" US analysts, that the USSR would begin a massive nuclear strike, or would have begun a major war with it would have been the knowledge or the very strong expectation that the US intended to do that. This is the last thing in the world, however, that analysts such as Foster, Douglas, Hoeber, Kohler and others holding similar opinions would ever discuss.

"Doctrines" and "Perceptions"

It would be useful to say something about both these phrases which one hears used so often, and which more or less by definition describe things at some indeterminate state from reality. "Perception", McGeorge Bundy wrote in 1981 "is a word planner often use for things they cannot really see".²⁰⁵

Senior United States officials have made absolutely clear that what is said – "doctrine" – is not the same thing as US publicly regarding nuclear weapons employment policy for their use in case of war. Given Soviet stylistic proclivities of long standing regarding their military statements, there would seem to be even less reason to assume any relationship between Soviet

public statements and their intended policies in time of war. In Lambeth's words, "States do not always mean what they say, say what they mean, or reveal all their intentions and contingency plans. Given the closed and secretive nature of Soviet society, this observation applies to the Soviet Union with particular force."²⁰⁶ This situation produces a constant difficulty in interpretation of Soviet sources. Given the administrative system and policies of the USSR, one must assume that the military publications of Sokolovskiy, Grechko or Gorshkov have been closely inspected for political approval to the last word. On the other hand, the unreliability of Soviet public statements remains constant. The way in which one should resolve these seemingly contrary operating principles when they apply to major Soviet statements regarding military policy remains unknown.

For the United States,

The relationship between our doctrine and the reality of our forces and programs, and the impact of each on deterrence is complex. Clearly forces themselves play the dominant role in perceptions and, therefore, in deterrence. What the Soviets judge we could do, not what we say we would do, has the strongest impact on deterrence.²⁰⁷

This study has gone to great lengths to present a description of what United States policy for the potential use of its nuclear weapons has been. Albert Wohlstetter, one of the prime critics of "mutual assured destruction" recently commented on this as follows:

After the missile crisis, McNamara often talked of Assured Destruction – and later Mutual Assured Destruction – if they were serious operational policies. Neither was. While Secretary, he never abandoned the goal of using strategic forces against Soviet military forces or the goal of limiting harm to American civilians... When he talked about a capability for assured destruction of 20-25 percent of the Soviet population, he was thinking of deterring the joint Chiefs of Staff from asking for higher budgets rather than the Soviets from attacking the US. It was his way, if not the best way, of winning a budget battle and putting a lower ceiling on the size of our strategic forces. He stressed that we would have the capability for destroying the Soviet population – and he expected that capacity to deter the Soviets; but if deterrence failed, we would use our strategic forces to destroy Soviet forces attacking the United States.²⁰⁸

As a comment one might say: so much for "doctrines", declaratory statements and an entire (Western) international analytic literature written and propagated by individuals bemused by a shadow play and incapable or unwilling to tackle realities. As an additional irony, one can point out that the "hawkish" critics – including Wohlstetter – always pretended that alleged "MAD" "doctrinal" statements were real policies when they argued for the acquisition of increased US counterforce capabilities. Finally, in contrast to the situation that developed in the 1970s concerning USSR strategic forces, which will be discussed in a moment below, we can see that the "perceptions" in the West regarding US strategic forces were not based on extrapolations of capability.

In mid-1983, the US Scowcroft Commission on the M-X missile "... recommend (ed) that the missiles be placed in Minuteman missile silos — the theoretical vulnerability of which had led to

the push for an M-X, and the search for a novel basing made for the M-X in the first place. By constant repetition

...the "theoretical" possibility was transmuted into a kind of actuality... The theory went that since there was a "perception" of Minuteman vulnerability – however this "perception" had come about – it had to be dealt with as if it were real.²⁰⁹

The Commission nevertheless in effect simply ruled the "window of vulnerability" – the idea that the USSR would be able to destroy all the United States' land-based missiles in a single concerted attack – out of existence. The main strategic issue that the incoming Reagan administration took into office was ICBM vulnerability, which they maintained was the overriding concern. They not only did nothing to advance the solution of the problem, but turned it into a near farce by placing the new M-X missiles into Minuteman silos.²¹⁰ One view, obviously supported by the recommendation of the Scowcroft commission was, in Talbot's words, "Minuteman vulnerability is largely a matter of perceptions, which is a fancy way of saying that it is an illusion we've talked ourselves into".²¹¹ At the very same time the commission's recommendation for M-X deployment placed

the United States as the deployment of first-strike counter silo weapons in a basing mode that the adversary may perceive as vulnerable... The Scowcroft commission report states: 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.

....

If 1,000 Minuteman silos are vulnerable to a Soviet attack, then the 100 MX silos would be even more so. It's a game of numbers. The Soviets have more than 100 but fewer than 1,000 of the very large warheads that are much more lethal against a silo than the rest of their smaller warheads. They have enough of them to attack the MX pre-emptively. In addition, the 10-warhead MX is both a much more tempting target and a much more threatening weapon than the three-warhead Minuteman III. For these two reasons the Soviets would be more willing to attack the 100 MXs than the 1,000 Minuteman more IIIs.

....

There is every reason to expect that such deployment will reduce crisis stability, increase the probability of a nuclear exchange and initiate the next round of the nuclear arms race, which will be completed only with the deployment of Soviet ICBMs of comparable accuracy. Arms control is ill served by such inescapable spirals.²¹²

Nevertheless, the M-X was deployed in older fixed silos despite the fact that it would be very much more valuable and easier for the USSR to destroy 100 M-Xs containing 10 very accurate

warheads each, than 1,000 Minuteman missiles, containing three less accurate warheads per missile.

To talk about "perceptions" without discussing and evaluating the substance and the origin of those perceptions is like discussing the virgin birth – a self-admitted failure both of knowledge and of analysis.

This study has so far said very little about the bomber component of US and counterforce capability, and we can also survey the strategic delivery developments that took place in the Minuteman III ICBM system during 1970-1980.

In 1982 the American bomber force consisted of 241 B-52s. Ninety of these aircraft (B-52Gs) have been converted to carry up to 20 Air-launched Cruise Missiles apiece. During 1985, modification began to enable B-52 "H" series aircraft to carry ALCMs. In addition to ALCMs, bombers may carry Short Range Attack Missiles (SRAM) and gravity bombs of various yields. In sum, the current bomber force may carry approximately 4000 weapons. These provide a comprehensive counterforce capability but require a substantial response time. As already indicated in the SIOP chapter, and hinted at in the Carnegie study table below, substantial number of ICBM warheads had been assigned the task of destroying Soviet air defenses systems so as to assure the penetration of the bomber force.

Bomber Force Capability

To ensure a survivable bomber force retaliatory capability against Soviet targets, we maintain about 30 percent of our total bombers at high readiness levels on day-to-day alert. Virtually all of these bombers would survive a Soviet first strike against bomber bases, by either ICBM by launching at the first warning of an attack. Taking into consideration the expected attrition to these bombers enroute, the theoretical capability of the surviving force against Soviet targets currently would be to destroy about /deleted/ of the identified Soviet economic value or about /deleted/ of all Soviet non-silo military targets or about /deleted/ of all Soviet silos. In 1985 as cruise missiles are deployed on the bomber force, this capability would /deleted/ of the economic value, or /deleted/ of the nonsilo military targets, or about /deleted/ of all silos. In the event the bomber force had sufficient warning to reach full alert prior to the Soviet first strike, about /deleted/ the number of bombers would be available to strike the Soviet targets in retaliation.²¹³

The Department of Defense has argued however that the B-52 force would not carry enough weapons to target both Soviet industry and Soviet ICBMs in a second strike. With the enormous growth in the Soviet target list in the 1975-1985 period this is understandable.

Following the deployment of the initial Minuteman III and Poseidon MIRV packages, the US initiated several warhead improvement programs and improving retargeting Ross capabilities, all of which improved counterforce capabilities, particularly of the Minuteman III. Each of these improvements which were deployed in the period 1975-1985, is briefly described below. Of 1,000 Minuteman IT missiles, 550 were replaced by Minuteman III, beginning in 1970. Only in these 550 was the 1.2 megaton single warhead of the Minuteman II replaced by three 170 kt

MIRV warheads: The guidance package of these Minuteman III missiles was designated the NS-17, and the reentry vehicle the MR-12. All the Minuteman III missiles were subsequently retrofitted with a new NS-20 inertial guidance system, replacing the NS-17. This change reduced the CEP of each warhead from 1,200 feet to 600 feet – roughly .1 of a nautical mile – which nearly tripled each head's chance of destroying very hardened USSR ICBM silos, from 19 to 55 percent probability.²¹⁴

Between 1979 and 1982, the Mk-12 reentry vehicles of 300 of the 550 Minuteman III missiles were replaced by a new reentry vehicle, the Mk-12 A. This contained a new warhead, the W-78, which doubled the explosive yield of each warhead from kilotons. (Press and other reports often refer to the new yield as 350 kt. but 335 kt. appears to be the correct value.) This improved the SSKP 170 to 335 against hardened targets from 55 to 70 percent. The NS-20 guidance package was further improved to reach its theoretical degree of accuracy of about 490 feet CEP. This raised the SSKP of the 300 Mk-12 A warheads to 83% and that of the remaining 250 Minuteman III with Mk-12 warheads to a SSKP of 70 percent.²¹⁵ The FY 1980 Arms Control Impact Statement for ICBM Programs stated that the improved NS-20 guidance set (is) currently deployed on all 550 Minuteman III's.²¹⁶ None of these improvements went into the remaining 450 older Minuteman II's. However, at the same time as the MS-20 program was installed in Minuteman III, the US initiated a Silo Upgrade Program that reduced the vulnerability of the entire Minutemen ICBM force. The increased silo hardening was completed in 1979 and increased the blast resistance of Minuteman silos from 300 psi to 2,000 psi. This program reportedly put off the time of Minuteman vulnerability to USSR counterforce capabilities by a half dozen years. In 1979 a program was also reported that would raise the yield of some 2,500 – 3,000 Poseidon MIRV warheads on 304 Poseidon missiles from 50 kt to 100 kt. The remaining 192 Poseidon missiles were to be replaced by Trident I missiles.²¹⁷

Two additional improvements were made to portions of the Minuteman III missile system, and both of these pertained to C³ and targeting. The first of these, the Command Data Buffer System, was a rapid retargeting capability installed in the 550 Minuteman III missiles between mid-1973 and mid-1977, and then in the Minuteman II missiles as well during the Silo Upgrade Program. The total retargeting time was reduced from 16-24 hours for an individual missile – involving manual operations in each missile silo to reset the missile-guidance computer – to 25-35 minutes for an individual Minuteman missile and 10 hours for computer the entire Minuteman force via secure cable computer links.²¹⁸ The second program was the Airborne Launch Control Phase III, which will be able to receive Minuteman status data from 200 of the 550 Minuteman III missiles and to remotely insert retargeting data to these same 200 missiles.²¹⁹ It is assumed that this program will be extended to the remaining 350 Minuteman IIIs, so that it, as well as the Command Data Buffer System, will eventually apply to all Minuteman III missiles.

In reply to charges – primarily aimed at the Carter administration that US strategic weapon programs were "standing still" in the 1970-1980 decade while the USSR deployed several entire new ICBM generations, Rep. Aspin pointed out in 1979 that:

"What all this means is that even though the US has built no new ICBMs since 1970 and has not designed a totally new ICBM since 1962, we have hardly been standing still over the past decade. We have more than doubled the number of warheads, nearly tripled the

ICBMs' force effectiveness against the hardest of Soviet targets, and reduced the counterforce capability of the most sophisticated Soviet ICBMs by more than 35 percent. Over the next two years, the counterforce capability of a significant portion of Minuteman missiles will be upgraded another 20 percent, and in the two years hence, by 15 percent more."²²⁰

He also pointed out that the changes made by the US in the second half of the 1970's, the Silo Upgrade Program and the Command Data Buffer System at a cost of £ 1.4 billion, the NS-20 guidance program at 150 million, and 1,0 billion for the 900 Mk-12 A warheads – or 2.5-2.6 billion in all – came to one-tenth or less of the costs expended by the USSR to obtain the same accuracy and counterforce capabilities by producing the SS-17, SSS-18, and SS-19 missiles.

It is also interesting to note that the status of the Minuteman system can be described as in large measure "incompleted", leaving very substantial room to expand its counterforce capabilities without the procurement of the M-X missiles:

- The remaining 450 single warhead Minuteman II could be replaced by MIRVed Minuteman III missiles with Mk-12 A/W78 warheads
- The remaining 250 Minuteman III that still have Mk-12 warheads could have these replaced by the more accurate and higher yield Mk-12 A/W78.
- The Airborne Launch Control System Phase III Program could be applied to the 350 additional Minuteman III – and all the 450 Minuteman II's.

The first two mentioned yield and accuracy increases would apply to 70% – 700 out of the total of 1,000 – Minuteman missiles. Little attention was given to these simple and relatively inexpensive possibilities, and US missile policy – as well as counterforce considerations shifted to the M-X and Trident D-5 programs.

The table below illustrates the US Minuteman accuracy and counterforce improvement programs in the period 1970-1982, indicating also major Soviet ICBM development programs in the same period.

USSR Nuclear-Weapon Targeting

A thorough study of presumptive USSR nuclear targeting policies would require another separate study equivalent to this one, and only brief comments will be included here. Excellent studies of USSR strategic systems have become available in recent years, of a quality that was not previously publicly available. In particular one can mention Baker and Berman's Soviet Strategic Forces, Requirements and Objectives, (1982), Michael MccGwire's Military Objectives in Soviet Foreign Policy, (1987), and the two Adelphi papers by Stephen Meyer on Soviet Theatre Nuclear policies.²²¹ These contain important information not only about the development of the systems but about Soviet nuclear-force deployment policies. It has become clear that Soviet strategic weapon development has not always followed that of the United States; it has had a substantial number of "firsts" of its own, and many development programs have run concurrently for long periods. Several tables which provide graphic and significant Soviet development histories, and the magnitude of this effort in multiple systems are presented below. With some hindsight it has

begun to appear at least to this author that a partial rethinking of the generally accepted reasons for a substantial "lag phase" in the deployment of intercontinental systems by the USSR might be justified, on the basis of the functional utility of Soviet medium-range systems at the time that they were deployed.²²² In any case, it is clear that USSR counterforce capabilities are presently substantial and roughly equivalent to those of the United States.

Whether USSR officials have ever expected a US counterforce attack – or a preemptive counterforce attack is difficult to ascertain. Soviet publications and senior officials have certainly accused the US of planning a first strike at various periods.²²³ Michael MccGwire writes that "... in the 1948-53 period... the Soviets took the threat of a premeditated Western attack very seriously," but that they "... had largely discounted the threat of deliberate attack by the end of the 1950's".²²⁴ For the present, William Hyland concurs: "... I doubt that the Soviets are terribly worried that the United States is going to launch an attack on their missiles".²²⁵ MccGwire writes further that

The Soviet response was a strategy predicated on intercontinental nuclear preemption. A decision that war was unavoidable would, at least in theory, trigger a Soviet strike on North America, as well as a ground offensive, in Europe and preemptive nuclear strikes on targets located on the periphery of the Soviet Union.²²⁶

MccGwire is convinced that in 1975 the USSR effectively altered its policy of strategic nuclear preemption, under a decision that had been taken in 1966 or 1968 but not effectuated until permitted by additions to the Soviet nuclear force structure. From 1975 on he believes that Soviet operational policy was no longer predicated on nuclear preemption and was to avoid a nuclear strike at the continental US if that was possible, and not to use nuclear weapons first in Europe.

The readiness and deployment patterns of certainly seem to speak against the expectation of a surprise US nuclear attack. As far as one can determine from publicly available evidence, there has so far been no international political crisis in which the USSR has altered the disposition of its strategic forces. USSR ICBM readiness apparently increased in the 1970s, but as this took place during a period of rising USSR capabilities, it does not seem meaningful to ascribe the change to any increased Soviet anticipation of attack by the US. In mid-1980, the most senior members of the Soviet military hierarchy – Defense Minister Ustinov and Marshall Ogarkov – made an unusual attempt to counteract both the US portrayal of USSR capabilities as intended for counterforce and warfighting, as well as various previous statements by senior Soviet military that Western analysts were quoting to support such interpretations. They claimed essentially that the USSR had spokesmen (such as Marshall Grechko's) always supported "mutual assured destruction":

The Soviet officials concede that their military planning had worked out similar "scenarios"(to PD-59) but emphasized that these are not a part of Moscow's political-military doctrine.²²⁷

The statement contains a multitude of ambiguities, not the least of which is the use of the word "doctrine" – whereas an entire series of alternative terms are used in Soviet military writings. Ustinov and Ogarkov also stated that "the Soviet Union would not permit the United States to

acquire superiority or advantages that could be translated into political advantages." This is of course, the exact inverse of the Nitze, Schmidt et al. position in the West.

If one looks at a rare statement of Soviet targeting policy by a senior military figure, former Soviet Defense Minister Marshal Grechko, it turns out not very surprising at all.

The Strategic Rocket Forces which constitute the basis of the military might of our armed forces are designed to annihilate the means of the enemy's nuclear attack, large groupings of his armies and his military bases; to destroy his military industries: to disorganize the political and military administration of the aggressor as well as his rear and transport.²²⁸

It is a brief synopsis – and reflection – of the targeting priorities of the US SIOP. A more detailed imaginative portrayal of what Soviet nuclear targeting preferences would be by a US analyst is no more than precisely the same thing; the direct inverse of the US SIOP.²²⁹ On January 14, 1960, in a speech to the Supreme Soviet of the USSR, Premier Khrushchev had also described the target system that would apply to a USSR attack on the US.

A rather important additional point is that in the encoded terminology of Soviet military literature, the word "annihilation" that appears in Marshall Grechko's statement apparently means the destruction of 80-90 percent of an opposing force.²³⁰ Marshall Grechko's extremely optimistic expectation of the performance of the USSR's strategic forces may perhaps be taken with a grain of salt. The statement nevertheless must unavoidably be interpreted as stating a policy for a preemptive counterforce strike by Soviet forces. As indicated, a review of the literature on USSR targeting cannot be presented here. One need only take into account that a Soviet counterforce attack is possible. Obviously, all US ICBM vulnerability estimates assume that the USSR strikes first, and that it strikes at ICBMs among other primary targets.

Not surprisingly, Soviet nuclear targeting lists look very similar to those of the United States. (See also chapter 5, page 28.) Three of these are shown below.

Soviet targeting was assumed to be a thoroughly comprehensive counterforce attack, for example

- the target of the highest yield Soviet ICBMs – the 20 MT SS-9 warheads – was assumed to be US Minuteman launch control complexes. Other C³ facilities, both within and without the US, were always assumed to be targeted by Soviet nuclear forces;
- the Soviet medium range land-based missile force was not only charged with targeting SAC and TAC facilities in Europe, North Africa or elsewhere, but also the US aircraft carrier fleet that might be within its range. It seems likely that that this mission was removed from Soviet land-based missiles in recent years.
- the USSR has always sought the ability (presumably with little success thus far) to locate and destroy US SLBMs on station, if necessary, also by the use of ICBMs

An important point in the achievement of Soviet counterforce capabilities was its 1977-1978 warhead test series.

The effect of these improvements in the CIA's opinion in 1978 was to advance the date by which US missiles could be vulnerable to attack by four years, to early 1982.

(The pre-1975 models of Soviet ICBM's had lethality (k) values ranging from 1.6 to 7.1, while the post-1975 models have k values of 14.3 to 140, and higher.)

The US Department of Defense increased its "threat estimates" still further in 1980 when it became evident that the USSR was retrofitting new warheads on SS-18 and SS-19 ICBMs rather than waiting for its next generation of ICBMs, as was its more common practice in ICBM development.²³¹ The warheads were presumed to be the MIRVs with improved accuracy, though simultaneously the estimates of their yields were reduced. It is worth noting at the same time that the direct implication of these latest and somewhat more justified US ICBM vulnerability estimates must clearly be that the same kinds of estimates that were being made since 1968 and the deployment of the SS-9, predicting a date three to five years off when US ICBMs would become vulnerable to Soviet ICBM attack, were grossly in error.²³² In the fall of 1981, the present US administration claimed that the "window of vulnerability" would be in 1984-1987.

McConnell has suggested that the USSR may also be increasing its SLBM counterforce capabilities by altering operational tactics in addition to warhead design. He points out that previous USSR SLBM development efforts emphasized a very long range SLBM missile which would permit the submarines to be located in ocean sanctuaries north of the USSR. On the other hand, the recent development of under-ice capabilities for the newest Soviet SLBM range several thousand miles shorter than presently expected.²³³ USSR SLBMs would permit launching missiles against military targets have always had counterforce roles against NATO targets submarines in the US from a in Europe. Incidentally, this capability might represent the Soviet compensatory move already threatened in 1982 for potential US deployment of Pershing II and GLCM in Europe, despite the additional Soviet gesture in the spring of 1984 of altering the deployment patterns of Soviet SLBM subs in the North Atlantic.

U.S. Counterforce Capability in the Decade 1970-1980, and to Date.

The 1970's were a decade of constant movement in the shape of strategic forces, with continuous increases in counterforce capability both on the part of the US and the USSR. The United States deployed its first MIRVed ICBMs in 1970, and its first MIRVed SLBM's in 1971; the USSR in 1975 and 1978. At the same time both sides attempted to reduce the capabilities of the other side by silo hardening, in addition to the increases in missile and warhead deployment. Tsipis reported that some 1,000 Soviet missile silos built before 1969-1970 were originally hardened to no more than the 100-psi level. Those built between 1970 and 1974 were hardened to 300 psi, while the newer Soviet silos built for the SS-17, SS-18 and SS-19 missiles were reportedly first hardened only to 450 psi, but then so very substantially increased that these first estimates may be incorrect.²³⁴ Both the US and USSR initiated large scale rehardening program in the mid-1970's, though the open literature is notably vague as to which Soviet silos were included and to what estimated degree of hardening. By the early 1980's the figure commonly given for the without any hardness of US silos was 2,000 psi and that of Soviet "silos"— without any further as to which or how many – 2,000 to 4,000 psi.²³⁵ This is a clear example of the way in which the counterforce capability of a US MIRV's against USSR ICBMs would have decreased

substantially – particularly those of Poseidon missiles – with the increased hardening of USSR missile silos. What previously may have been a counterforce capability disappeared as hardening progressed. The USSR also attempted all through the 1970's to achieve the capability to locate and destroy submarines on station and continuously modernized its very large air defense system against low flying bombers and cruise missiles. They also completed an extensive program of hardening of command, control and communication facilities.

Two very contrary views of this interaction, particularly in the latter half of the 1970s, are presented below. The first is an extract from a US Dept. of Defense reply to a Congressional question in September 1980, during the tenure of the Carter administration. The second is written by Raymond Garthoff and is an attempt to portray how the strategic developments and interactions taking place during the same period may have appeared to the USSR.

"A U.S. ability to threaten a specific percentage of the Soviet ICBM silos, at least equal to that which the Soviets could project against U.S. silos, is subject to a number of variables which among others, include: the level of force and C3 readiness; force and weapon system performance; targeting considerations the exact hardness and therefore, vulnerability of Soviet ICBM silos; hardness reliability and redundancy of Soviet strategic forces C3, Soviet launch doctrine, and the scenario of conflict initiation. Underlying these variables and uncertainties is a fundamental assumption that the limits and sub-limits of SALT II would remain in effect through the 10-year period considered in the current National Intelligence Estimate.

At present, in terms of percentages, the U.S. damage capabilities against some 1,400 Soviet ICBM silos is significantly lower than relative Soviet capabilities against U.S. Minuteman silos. This stems primarily from Soviet advances in numbers of RV's and missile technology that has resulted in improved accuracy, MIRVing of missiles and large yield warheads.

Because of the declining survivability of Minuteman, the U.S. ability to threaten Soviet silos with ICBMs in the more relevant case of a counter silo retaliation, is reduced accordingly. However, by 1990, as a result of deployment of MX with its high degree of survivability, improved accuracy and 10 RVs per missile, U.S. damage capability against Soviet silos in a counter-silo retaliation will increase. (Deleted.)

It is not, however, U.S. policy to seek a first strike capability against Soviet ICBMs. It also should be noted that, as is the case for the United States, this capability will by no means jeopardize Soviet overall retaliatory capability because of the number of Soviet ICBM's which could survive, as well as their large SLBM force. (Moreover, even if the United States did nothing about ICBM vulnerability, our first strike counter-silo capability would improve considerably – but in an unstable form – simply because of greater Minuteman III accuracy.)

The degree to which the Soviets would perceive as a serious problem an increased vulnerability of their ICBM systems resulting from deployment of the MX is uncertain. On the one hand, they certainly have not acted as if they believed that acquiring a

capability to threaten U.S. ICBM survivability potentially is so destabilizing as to justify self-restraint – which was, in the early years of the 1970's, the U.S. position. Nor in SALT have they shown much interest in measures that could reduce the vulnerability of the ICBMs of both sides, in which their investment is relatively larger than ours. On the other hand, they have shown sensitivity to the problem of the potential vulnerability of their own ICBM's and have invested heavily in significantly increasing the hardness of their ICBM silos as well as the development and deployment of more survivable and more capable SLBM systems."

If the Soviets find unacceptable the prospect of a U.S. capability to threaten a large part of their silos-based ICBMs in a pre-emptive U.S. strike, they could respond by increased reliance on launch-under-attack (LUA) or by reducing the vulnerability of their ICBM's. The Soviets ~~/deleted/~~ presumably could increase the capability of their warning/attack assessment sensors and the speed of their decision process. Because of geography (and greater C3 hardening and redundancy), the Soviets do not face as serious a problem in the vulnerability of their NCA to surprise attack by SLBM's that the United States does, but in all other respects – reliability of sensors, compressed time for decision, reluctance to pre-delegate execution authority, strategic instability which could result from depending on LUA – they face the same difficulties and uncertainties as we in making LUA an adequate answer to ICBM vulnerability.

Beyond LUA, the Soviets could respond by increasing their reliance on SLBM's and/or by moving toward mobile ICBM's. Although Soviet SLBM's have assumed a greater relative role in recent years, it seems unlikely that the Soviets would be prepared to rely entirely (or even largely) on SLBM's at the expense of their large, visible ICBM force. If they deployed a land-mobile ICBM system, ~~/deleted/~~ a road-mobile, above ground system relying for security on dispersal and location uncertainty in crisis – and probably on some level of dispersed alert in peacetime. Such a system presents far fewer problems to the Soviets than road-mobile options do for the United States in terms of land resources, security and public acceptability, but other drawbacks (e.g., lower ICBM throw-weight and potential vulnerability from failure to disperse road-mobile systems in a timely fashion) apply to the Soviets as well as to the United States. To overcome these drawbacks the Soviets might, ~~/deleted/~~ move toward a shelter-based ICBM system, with some of the features proposed for MX.

For the most part – and subject to the verification uncertainties connected with mobile ICBM systems – Soviet reactions in the form of a mobile system would, from a U.S. point of view, be stabilizing in that the ICBM force of both sides would be relatively invulnerable to a preemptive attack.²³⁶

Raymond Garthoff's description is notably different:

These comparisons, however, all postulate a Soviet initial attack, whereas Soviet assessments undoubtedly focus on an American first strike. According to the January 1981 report by outgoing Secretary of Defense Harold Brown, a Soviet first-strike preemptive attack against U.S. forces on day-to-day non-alert status during the 1980s

would, under SALT II limitations, leave a net U.S. advantage in numbers of warheads surviving: if a generated alert preceded the attack, the advantage would remain with the United States even without SALT limitations on Soviet forces. In some other respects, the U.S. forces would fare less well, although "the retaliatory potential of U.S. forces remaining after a counterforce exchange is substantial even in the worst case and would increase steadily after 1981, with or without SALT." The parallel report by General David Jones, then chairman of the Joint Chiefs of Staff, while more alarmist on the Soviet threat, provided additional data, which disclose, for example, that while the United States is and will remain at a disadvantage in "time urgent hard target kill potential" throughout the 1980s, it has and will retain an advantage in overall "hard target kill potential," as well as in numbers of surviving weapons, throughout the decade. Also, the 1981 report of the Joint Chiefs included (for the first time) one variant not contained in the secretary of defense's report or in most of the Joint Chiefs' analyses: U.S. "launch under attack." In this case, with current military programs and a generated alert, the United States would continue (except for a brief time of near parity in 1985) to have superiority in "discretionary force potential" (ability to destroy its targeting goals), and the margin of American superiority would increase in the last half of the decade.

It should, of course, be borne in mind that in all such comparisons, regardless of variations in assumptions and uncertainties about forces and variations in counterforce capabilities, the United States and the Soviet Union would each retain second-strike capabilities clearly adequate to devastate the society of the other side. Mutual deterrence may be debated or repudiated as a "doctrine" by either side, but it remains a fact that both sides must and do acknowledge.

The analysis presented in 1982 by the Reagan administration was less extensive in the range of alternatives and was predicated on a somewhat revised program. But the general picture was the same: the only cases presented are Soviet initiation, with U.S. forces on either day-to-day alert or generated alert. Under day-to-day conditions a Soviet first strike that the United States rode out would yield a modest Soviet advantage in numbers of weapons remaining; under a generated alert, however, the United States would have near parity for equivalent megatonnage and an advantage both in numbers of weapons remaining and in hard-target kill potential (although not in time-urgent hard-target kill potential much less significant after an all-out Soviet first strike). And although the results of the analysis were not detailed, it was remarked that "in both cases, the relative US post-exchange posture would be considerably improved if the US were to launch under attack." In other words, the assumption of a Soviet planner must be a considerable American superiority even after a Soviet first strike under prudent assumptions of an American launch under attack, particularly with a generated alert.

With the Joint Chiefs' cautious analysis indicating a growing U.S. superiority in the 1980s even in the case of a Soviet first strike, it is not difficult to visualize Soviet analyses of the results of a possible American first strike.

The secretary of defense's report in 1982 did not provide comparable analyses of force capabilities but instead presented detailed data on estimated military expenditures in

recent years. There were, however, general comments about the probability that American and Soviet assessments of the strategic balance differ. Reference was made to a continuing "major reappraisal of our methods of assessing the strategic nuclear balance" in the Department of Defense, including efforts "to take account of Soviet-style assessments of the roles and performance of strategic nuclear forces and to evaluate Soviet perceptions of a wider set of contingencies." If done well, such a broadened approach could be highly useful: if not, it could be detrimental.

Regrettably, the annual reports of the secretary of defense and the Joint Chiefs of Staff in 1983 contained no dynamic analyses or net assessments. Again, the only comparisons in the secretary of defense' annual report were of overall military investment outlays. Nothing was said about the major reappraisal mentioned the year before, to say nothing of any analyses based on such a new assessment of the strategic nuclear balance. In fact, there was no longer even a section on the nuclear balance. Similarly, the Joint Chiefs' 1983 report, only half the length of the previous year's report, omitted the few dynamic analysis comparisons that had survived the year before. All that remained were an inventory of the numbers of strategic forces on the two sides and a chart showing silhouettes of comparative U.S. and Soviet missile sizes.

One other consideration must be stressed. All the above discussion and the strategic force comparison are geared to the Western definition of U.S.-USSR strategic forces: they cover only ICBMs, SLBMs, and heavy bombers. While the United States succeeded, against stiff opposition, in gaining Soviet acceptance of only these forces as subject to SALT limitation, the Soviet view of the forces that actually constitute the U.S.—USSR balance differs greatly. In this discussion little attention is paid to the strategic defensive forces of the two sides for three reasons. The first is the absence of all but minimal ballistic missile defense systems (the Soviet Union currently maintains only 32 operational launchers around Moscow and is limited by treaty to 100, and the United States has none) and the generally acknowledged inadequacy of civil defense to mitigate substantially the catastrophic consequences of a major nuclear war. Second, the strategic defensive element at present plays no significant role in public or political perceptions. And third, this analysis is not concerned with aspects of the relationship in which strategic defenses need to be considered antisubmarine warfare as a factor affecting the employment of ballistic-missile submarines, and air defenses as a factor in attrition of or constraint upon intercontinental bomber and strategic cruise missile operations. In military operational analyses, of course, these and other similar factors must be considered.²³⁷

The US response nevertheless was that US force acquisition and force planning Soviet counterforce missile strike. In 1978 Sec. of Defense Harold Brown stated that

"... we have been obliged to make the contingency of a Soviet surprise attack on our strategic forces the fundamental test of the adequacy of those forces and the main basis of our strategic planning."²³⁸

This raises an interesting question regarding the readiness levels of USSR strategic forces. They are generally at a far lower level of readiness than their US counterparts. Until recently most USSR ICBMs were apparently not held in advanced states of readiness. Reports in the latter half of the 1970's than uniformly implied that their readiness had been increased, but even more than regards silo hardening, there is little reliable information that indicates how much of the USSR ICBMs is kept at what particular levels of readiness.²³⁹ However, USSR ICBMs, even of the present generation, reportedly take longer to launch than do those of the US. A much smaller fraction of the USSR SLBM force is on station at any given time. The USSR long range bomber force is not on alert at all. All this would stand in seeming contradiction to the requirements of a "launch on warning" policy, which the USSR apparently adapted as far back as the 1960's (see page), and even more so, for strategies of preemption, both of which have been emphasized in Soviet strategic writings.

The logic of these different postures regarding crisis stability is in the eye of the beholder. The rationalization of the US position is that it increases deterrence and crisis stability, since it is less likely that a preemptive attack would destroy a larger portion of the force. This decreases the attractiveness and incentives for such an attack. Of course, the opponent can claim greater fear of a surprise attack from a force kept at higher readiness and alert rates. Another corollary of these different patterns of US and USSR behavior would be the effects of changes in force disposition during a crisis. For a force kept at constant high alert levels (as is the US one) there is less change from routine peacetime operations and deployments. In the case of the USSR the change in operational behavior could be expected to be far more noticeable, raising images of a possible parallel set of developments to those which took place in August 1914, preceding the onset of WWI. Which of these behavior patterns may contribute the most to crisis escalation only the next major nuclear crisis exhibit.

The changes in the force structures of the US and the USSR in the past two decades have been striking. In the late 1950's the US enjoyed an advantage of 14:1 in strategic delivery vehicles (SDV's) over the USSR. In 1964, the US had 1880 SDV's to 389 for the USSR, a ratio of 5,5:1. These figures follow customary practice and omit US carrier strike forces, which were included in the SIOP at the time, as well as Soviet strategic mid-range nuclear capability against Europe and the Eurasian-North African periphery, areas in which SAC stationed at the time. By 1970 the USSR had surpassed the US in the number of ICBM's, in 1973 in the total number of ICBM's, SLBM's, and long range was bombers, and in 1975 in the number of SLBM's alone. In June 1979, at the time of the signing of the SALT II agreements, which included a common ceiling of 2,400 delivery vehicles, the USSR had 2,504 and the US 2,058. However, the US sharply increased the number of its strategic introduction of MIRV's had warheads. Thus, the number of US warheads had risen from 3,950 in 1969 to 9,200 in 1979 – an increase of 5,200 – and the USSR sum from 1,659 to 5,100 in the same period, an increase of 3,950. The growth in the US strategic arsenal in those ten years was equal to the total size of the USSR arsenal at the end of the same period. Schilling points out that measured in terms of total strategic warheads surviving a Soviet first strike, the second-strike capability of the United States was larger in 1980 than it was in 1964, when the Soviet build-up began.²⁴⁰ An analysis with similar implications in 1979 indicated that US forces could deliver a percentage of total force warheads in retaliation equal to the Soviet capability with a preemptive attack, and the US was expected to maintain more available warheads at least through 1985.²⁴¹ Conversely, in a first strike in 1980 the US

reportedly could destroy 50 percent more warheads strike against the US.²⁴² In missions other than hard target counterforce, estimates in 1978 were that even after absorbing a massive Soviet first strike while US forces were in their normal day-to-day alert status:

- “Each component of the "triad" could, by itself, destroy at least 75 percent of the industrial target base in the Soviet Union;
- Two of the three components could destroy at least 65 percent of the Soviet industrial target base and of the military targets other than ICBM silos. Military targets other than silos were defined in this study to include Soviet army, air force, and naval installations as well as theater nuclear weapons and all nuclear weapon storage sites – in other words, all types of military targets other than ICBM silos and their launch control than the USSR could in a similar facility.
- All three components could destroy over 80 percent of the industrial target base and general-purpose force targets and governmental centers, while keeping 1,000 weapons in reserve to continue the conflict if required. Current US weapons systems have little capability to destroy Soviet ICBM silos.²⁴³

The estimates of US retaliatory capabilities would increase in a situation of generated alert. At the highest alert status, estimates in 1980 were that some 60 B-52's (if armed with 20 cruise missiles each) could destroy 80 percent of USSR industrial B-52's would reportedly have been

sufficient to deliver enough warheads to destroy 50 percent of the military target base, excluding hard targets.

When one turns specifically to hard-target counterforce capabilities, the picture is, however, substantially different but still rife with contradictory claims and assessments. US government spokesmen, even in the Carter administration, claimed that US damage capabilities against some 1,400 Soviet ICBM silos were significantly lower than relative Soviet capabilities against US Minuteman silos – in both cases assuming only the use of one side land-based missiles against the other. This is the basis of the statements and graphs presented by the US DOD, Nitze, Cordesman and others, claiming that the USSR has greater "prompt hard target counterforce capability." This assessment is not without contention however, as the paragraph from Schilling would indicate.

If numbers tell the story, the United States can pose a greater threat to Soviet ICBMs than the Soviets can pose to American ICBMs, even without the MX. By 1982, given the information publicly available about the capabilities each side is expected to have by that date if they continue to adhere to the terms of SALT II, the Soviets could, by firing some 210 SS-18s (using some 2,100 warheads) destroy about 91 percent of the American ICBMs and thereby destroy some 1,960 warheads, about 18 percent of the expected US total by that date. But the United States, by firing 550 Minuteman IIIs (using 1,650 warheads with the presently programmed improvements in their yield and accuracy) and by concentrating its fire on the 820 MIRVed Soviet ICBMs, could destroy some 4,300 Soviet warheads, about 39 percent of the expected 1982 Soviet total.²⁴⁴

It is clear from this example that Schilling, Nitze, DOD, Cordesman et al. are not addressing the same set of criteria. All would agree that the USSR would destroy more of the US ICBM force than the US would of the USSR ICBMs. The US would however destroy more Soviet warheads and a far greater percentage of the USSR's total strategic arsenal. In addition, the warheads expended-to-warheads destroyed ratios, (for such an ICBM vs. ICBM strike only), are twice as advantageous for the US as for the USSR. (The calculations assume that both sides would sit out an ICBM attack on their own ICBMs and not launch on warning.) Thus, it seems clear that the criteria one uses has much to do with the assessment of which side has greater prompt hard target counterforce capability." Nevertheless, it is absolutely unquestionable that Soviet ICBM weapon acquisition policy has emphasized such "damage-limiting" capability in the past decade.

Assuming sufficient advance warning of attack for most US forces to be on alert, and a scenario in which the USSR mounts a major first strike attack on all US strategic forces, programs initiated by the Reagan administration would substantially

increase strategic capabilities. Numbers of surviving warheads for example, would go from 6,500 in 1983 to 11,400 in 1990, an increase of 75 percent. By 1996, the number of warheads would fall back to 10,700 as some older submarines were retired.

The more dramatic increase would come in the numbers of surviving warheads that could destroy hard targets. That number would go from 1,600 in 1983 to 5,000 by 1990 (an increase of 213 percent) and to 7,900 in 1996 (an increase of 395 percent). The dramatic growth from today's low levels occurs because all the systems noted above – the MX, B-1, ATB, cruise can deliver warheads capable of destroying missiles, and Trident II – can deliver warheads capable of destroying hard targets. This growth indicates U.S. emphasis in recent years on hard-target capability, which has become an increasingly important feature of nuclear forces since the mid-1970s. The buildup noted above for post-attack surviving warheads also applies to the pre-strike situation, though obviously the inventories are larger.²⁴⁵

Crawford has argued that freezing present ICBM warhead accuracy and slight increases in silo hardening would essentially leave both sides ICBMs invulnerable to counterforce attack.

If the "abolition of powerful silo-based missiles" is not negotiable, is there any remedy for their destabilizing effect? Yes, in principle, if the remedy can be verified. The destabilizing effect of these weapons arises primarily from two characteristics: their hard-target destructive capability (CMP), and their vulnerability to the CMP of the opponent. The capability could be substantially nullified and the vulnerability greatly reduced if both sides would freeze missile accuracy at present levels and moderately increase the hardness of their missile silo.

This remedy is possible now and will remain so for a few years, because missile accuracy is just beginning to catch up with silo hardness. The most accurate MIRVed missiles currently deployed on either side barely meet the minimal criterion of a hard-target weapon: a 50 percent capability of destroying an enemy silo. (This statement applies to MIRVed missiles only: the Soviets deploy perhaps 70 SS-18s and SS-19s with single

warheads, whose CMP is far greater.) (These are presumably intended to attack US C³I systems.)

The most powerful MIRVed missile warhead deployed by the United States has a CMP index of 33 or 34: the most powerful such warheads deployed by the USSR have CMP indexes of 25 to 30. An index of 25 percent capability to destroy silos that can withstand blast pressures up to 2,000 pounds per square inch: an index of 34, the same capacity against silos hardened to withstand 3,000 pounds per square inch. The figure commonly given for the hardness of US silos is 2,000: for the Soviets, 2,000 to 4,000.

The United States now has 900 hard-target, first-strike warheads, the W-78 deployed on 300 Minuteman IT missiles. The USSR may now have 2,000 such warheads, deployed on 250 MIRVed SS-18s and SS-19s, and may double that deployment by 1985.

...

But hardening cannot win the race if accuracy with no change in yield will give the MX warhead, scheduled for deployment toward the end of this decade, a CMP index of 193, almost six times as high as Minuteman's 33. Nobody expects improvements in hardening that would be remotely comparable.²⁴⁶

The USSR actually has over 600 SS-18 and SS-19 missiles, not just the 250 referred to above. They are the most accurate and most reliable of the Soviet ICBMs, and they carry more than half the total strategic warheads deployed by the USSR. In an excellent study, Stephen Meyer attempts to demonstrate by an examination of Soviet strategic weapon production and deployment schedules in the 1970s why the USSR rejected President Carter's July 1979 offer of a freeze, and why the USSR might be more sympathetic to such a move in the mid-1980s.²⁴⁷ As the analysis was written in 1982, before the accession of either Andropov or Gorbachev, it can be considered somewhat prescient. The newer Soviet ICBM and SLBM systems, including the successor to the SS-18, are illustrated below.

Thus, we see that in a cursory survey of launchers, total warheads, missile silo counterforce indexes (CMP) in particular, or total strategic missions or capabilities, one gets somewhat different impressions of what the "balance" of opposing US and USSR strategic forces is. It is also notable that in the US discussion the terms "stability" and "instability" are frequently used in the sense of being equivalent to US advantage or disadvantage. Schilling has raised the question, since delivery vehicles are potential targets for warheads, whether the most appropriate measure might not be the ratio between the total US warheads and their targets, the delivery vehicles of the USSR. In 1964 this ratio was 8.7 to 1 and in 1980 it was 3.7 to 1, (though the US had 3,400 more strategic warheads in 1964 than the USSR, and 3,700 – nearly the same level – in 1980). However, the ratio of USSR warheads to US delivery vehicles is also somewhere between 3.5 or 4:1 and is rising as the number of USSR MIRV's rises and the number of US delivery vehicles has been dropping. Without SALT II that trend will probably continue through the 1980's. If one looked at land-based missiles in particular, then the data above indicates that the warheads to launchers (weapons to targets) ratios would substantially favor the USSR. This study has consistently emphasized the interaction of US and USSR counterforce capabilities in

any estimate of US CF capabilities. It does not make sense to describe US CF capabilities as a single accounting of US force structure alone, in the abstract, as if against a tabula rasa. If one does so, one must explicitly or implicitly be assuming a US strategic first strike.

Chapter 10. US/USSR Counterforce Nuclear Weapon Competition and its Relation to Other Arms Control Issues: A Look at the Years Ahead

We can attempt to draw some conclusions regarding the relation of the specific question of counterforce nuclear-weapon capabilities that this study has dealt with to several related military-political issues. Some of these relate specifically to the US and the USSR, others to Europe and the NATO alliance, and others to international political crises. In some cases, US counterforce capabilities alone are the basis of the interaction with these other subjects. In other cases, both US and USSR counterforce capabilities and their interaction account for the effects. The discussion is relatively brief and is organized according to the following topics.

- Effects on US-USSR Arms Control
- Effects on the Proliferation of Nuclear-Weapon States
- The Complexity of Forces Driving Strategic Weapon Competition... and How Long Can the Process Continue
- "Extended Deterrence": NATO and the LRTNF Issue
- The Political Utilization of Equivalence, Equality, or Superiority: Crises, Alerts, Deployments.

Effects on US-USSR Arms Control

It was pointed out in a paper published in 1972 that development and deployment of new strategic weapon systems took clear priority in both the US and the USSR over their efforts to reach arms control agreements.²⁴⁸ It was also pointed out that each new major system deployment had an important impact in setting the framework of the relations of the two states for perhaps two decades ahead.

It is also clear that both nations continued with major systems deployments during the period of temporary and partial easing of political tensions between them in the years 1970-1980.²⁴⁹ The advances on the part of the USSR were probably somewhat more marked, given that it was emerging from a period of relative disadvantage. The numerical SALT I "ceilings" had done nothing to halt development of offensive missile systems of either side. The USSR apparently rejected a US offer in March 1977 to cancel M-X missile development in exchange for significant cuts in major Soviet offensive systems, and reportedly again rejected an offer by President Carter in July 1979 at the time of the signing of SALT II for a total freeze. Though the actual limitations of systems in SALT II were still only marginal, the failure by the US Senate to ratify the agreement was extremely damaging for two reasons. First, the substance of the SALT agreements was getting more complicated, more detailed, and was getting closer to actual controls over specific systems. A precedent was set for at least partial limitation of follow-on systems. Second, though there is no guarantee that further successes – numerical cuts and

qualitative controls – would have followed, and reason to suspect that further agreements would in fact have been more difficult to obtain as they began to bite into existing deployments and to curtail follow-on developments, the signing of SALT II at least would have supplied a useful base from which to work and allowed the momentum for further agreement to have been maintained.

Instead, as the situation has developed, the momentum for counterforce has increased on both sides since 1979. On the US side, M-X, Trident II, SLCMs and long-range cruise missiles all have counterforce capability. The USSR has now begun to deploy new generations of ICBM and SLBM systems including two mobile ICBMs. Some are MIRV'ed systems and some are not, but all are alleged to have increased accuracy. In view of the difficulties and the amount of time necessary to achieve the SALT II agreement, even under the conditions of serious negotiations during the Carter administration, there is no reason to expect any near-term SALT-type agreements between the US and the USSR. In addition, it is probably correct to assume that each succeeding system development by both sides makes the eventual likelihood of major agreement between the US and the USSR for the control of offensive nuclear systems less likely.

Effects on the Proliferation of Nuclear Weapon States

The effects in this area essentially derivative of those just discussed. As long as the US and the USSR continue both quantitative and qualitative increases in their nuclear-weapon systems, two mutually reinforcing effects are unquestionable:

- There are increasing incentives for Non-Nuclear Weapon States (NNWS) to acquire independent nuclear forces.
- There is absolutely no possibility for the exercise of effective diplomatic and political pressure under these conditions by the US and the USSR, and by the remainder of the nuclear-weapon states, to counteract initiatives by NNWS to acquire nuclear weapons.

The same would just as likely hold true if US/USSR competition continued in only

one of the two parameters, either quantitative or qualitative. As is, the attempted constraints of the London Suppliers Group have already been breached in several instances. Despite the fact that proliferation has taken place at a slower pace than most observers (and some governments) had feared in the late 1950s and again in the mid-1970s, none of the nuclear-weapon states have placed any great priority since 1968 on efforts to control the further increase in the number of nuclear-weapon states except for the United States during this process turns out to be slow for some Carter administration. Even if additional time to come, say one new nuclear weapon state every ten years, a threshold is likely to be passed after several more decades, with a subsequently much more rapid rate of proliferation following. It would only be under conditions of a definite reversal in the US/USSR nuclear-weapon competition and substantial achievements in the areas of arms control and disarmament – aside from amelioration of other major international security problems such as foreign military intervention – that there would be any real hope of containing eventual nuclear proliferation.

Some analysts (rarely arms controllers) have at times put forward an alternative position at least insofar as it concerns the United States and its allies. They maintain that secure and sufficient nuclear delivery systems requisite to deal with all military and political situations are necessary to reassure the allies regarding their ultimate security.²⁵⁰ This line of argument was particularly prevalent in the mid-1970's. It was argued that any "perceived" inadequacies in the (US) "nuclear umbrella would increase pressures in states presently "covered "for it to obtain independent nuclear forces. These analysts have consequently argued in favor of the desirability of MIRVing and increased counterforce capabilities for US forces, and so on. Though it is difficult to argue against this alleged causal sequence in terms of abstract logic, the degree to which it obtains in the real world is dubious. The arguments presented in the earlier paragraphs above are rather more likely to represent the dominant political effects regarding nuclear proliferation produced by increasing levels of US and USSR capabilities.

The Complexity of Forces Driving How Long Can Strategic Weapon Competition... and the Process Continue

The literature on weapons acquisition processes, particularly in the United States, is enormous and cannot be reviewed here.²⁵¹ Suffice it to say here that the driving mechanisms are numerous on both sides and that the sum of their interaction in each case seems to be sufficient in both countries to maintain the process more or less impervious to major restraint or any sort of "freezing" of capabilities. The short answer to the question, "how long can it continue", appears, so far in the post-WWII history, to be "indefinitely". There has been no constraint to date either due to pressure on economic resources or due to saturation of destructive capability or attainment of "sufficiency".

In the early and mid-1970s it was nearly universally argued that one of the major reasons for détente, as well as more specifically for the initiation of US and USSR negotiations in strategic arms control was the desire on the part of one or both parties for reduced military expenditure as well as increased stability and military security.²⁵² It is now clear that the SALT negotiations per se did not produce any drop in expenditure on strategic weapons, and certainly not in the USSR. Neither did "détente", as a more general and political process.

After the failure of the US Senate to ratify the SALT II agreement at the end of 1979, statements by the most senior Soviet officials roughly in the years 1981 to 1984 asserting that the USSR would match any and all US strategic weapon developments were continuous and noticeably strident.²⁵³ Nevertheless the US systems that could have been in question were several years from deployment and when the mid-1980's arrived, the USSR had in fact deployed its own analogues – particularly mobile ICBM's – substantially in advance of the United States. Such statements had never been made by Soviet spokesmen before 1979, when overall levels of Soviet strategic forces were much lower, and when proportional differences between the levels of US and USSR strategic forces were much greater. Nevertheless, in the early 1980's when there were virtually no significant differences – or certainly few – between the forces of the two states, the USSR continuously emphasized its insistence to stay "neck and neck" with the US. These promises of Soviet strategic weapons compensation and matching were often accompanied by scornful remarks that anyone should expect "unilateral disarmament" on the part of the USSR, and frequent accusations that the US weapons developments and deployments demonstrate that

the US (and the West) are "plotting war against the East bloc". The statements always promised a Soviet system or systems in response to a possible US deployment. They never explain that the Soviet system in question may already have been under independent Soviet development for some years and may already have been observed and even reported in the West.

Perhaps even more significant than these public statements have been the pace of ICBM and SLBM generational succession in the USSR in the past decade, and the evidence of the investment – both political and financial – that this signifies. Development during this period has been on a broad scale, always including several different ICBM and SLBM systems simultaneously, and the available evidence indicates that the pace of that process has been continued to the present moment. As already indicated, the US similarly has systems under advanced development in the area of bombers, ICBM, SLBM and SLCM. If the USSR follows the US example, as it has done in the past, rather than negotiate away systems, they will develop and deploy new ones. The USSR also categorically rejected the somewhat more serious "deep cut" proposals of the Carter administration in March 1977 as well as a total "freeze" in July 1979. The 1982-84 START proposals of the two sides reverted to relatively extreme patterns of attempting to reduce the other side's major systems and/or forbid the subsequent ones under development, while maintaining all of one's own systems. Both sides have a large series of systems in development. There are no indications at present of a halt in this process, despite a sharp change in the nature of Soviet negotiation proposals since the accession to power of Michael Gorbachev.

In June 1983, the US Congress decided to approve the procurement of the M-X missile. It was a decision of major consequence, and one of the unusual aspects of the decision process was the nature of the final argumentation used to support it. The most astute of the political analysts who had followed the Congressional process described it as follows:

At some future time, historians may look back and wonder how it was that politicians and policymakers made a decision to proceed with the development of a weapon that they knew had lost its original rationale, might escalate the arms race, and could put their own country's military forces at greater risk. Congress's recent decision to approve going forward with the MX for "missile experimental", a large, ten warhead, land-based missile was, at one level, predictable: Congress is traditionally loath to deny a President a weapons system. But, given the MX's bizarre history, the convoluted reasoning that went into its most recent justification, the serious misgivings of those who were most responsible for helping the weapon win congressional approval, and the potential consequences of their action, the story is an unusual one. It is a story of well-intentioned people acting out of a combination of their own sense of what it means to be "responsible"; their own sense of what they needed to do to "position" themselves politically or lay the groundwork for political advancement; and political fear. Almost none of those who made the President's victory possible thought that the missile was, in itself, a good idea.

....

...the (Scowcroft) commission offered a number of rationales, some of them quite imaginative. It said that deployment of the MX, since it would give the United States a hard-target kill capability, might induce the Soviet Union to negotiate and also to shift its land-based system to a force of single-warhead missiles. One of its more imaginative rationales was that the booster for the MX might come in handy for space shots. But the most important reason for deploying the MX, the commission said, was that we must demonstrate to our allies and our adversaries that we "have the will" to proceed.

....

...and they (former senior government officials, lobbying the Congress in support of the M-X decision) also say that, working on the assumption we're not going to launch on warning, it gives you only marginal strategic value. But they say we're not talking about much military value – that it's a test of this nation to make and implement a decision that the Soviets do not want to see made and implemented." He adds: "The way you succeed in getting a program like this through is you define it as narrowly as possible from a military point of view and as widely as possible from a symbolic point of view."²⁵⁴

The question is, of course, "have the will to proceed" ...to where? US policymakers would certainly have preferred to see the USSR not "make and implement" its previous decisions to install the most accurate MIRVs on SS-17s and SS-18s, or the SS-20 program. They will of course prefer that the decision to install its next generation of ICBMs, which the USSR did in 1986. But Soviet officials would, no doubt, argue that it is a test of their ability to implement a decision that the US does not want to see them implement, and they had already been promising loud and often in the previous years that they would do exactly that. Everyone can go on proving their "determination" in the procurement of new strategic systems forever, and USSR had not made and implemented the "sufficiency" does not enter into the question. "Determination" always has to be demonstrated, and it can always be argued by either side that every step is "test of the nation" and that a halt at any stage is a great political defeat. It is very likely that the US Congressmen who supported this decision used arguments far more convoluted than the situation warranted, and that they will undoubtedly lose out in the long run to the process they expressed hope of controlling.

It is particularly interesting to wonder what the Soviet deployment decisions on the SS-24 and SS-25 mobile ICBMs would have been if the United States had foregone deployment of the M-X ICBM. The governing issue, at least in the near term, from the mid-1980's on will be whether US administrations go ahead with a space-based ballistic ABM systems – so called "star war" systems, and as, a corollary, if the United States abrogates the ABM treaty, or if the USSR eventually agrees to its essential modification.

"Extended Deterrence", NATO and the LRTNF Issue

"Extended deterrence" is the concept that the threatened escalation to nuclear war and the ultimate recourse to the use of US nuclear weapons should deter any nation from invading a US ally with conventional military forces. As Soviet tactical nuclear forces have improved since the mid-1970s, a Western capability for "escalation dominance" was added by some officials of

NATO-alliance states – notably West Germany – as a necessary characteristic of US strategic forces. It was also the fear that this concept had been weakened with the achievement of strategic parity by the USSR, and the appearance of US willingness to accept limitations on cruise missiles in the SALT negotiations that led former Chancellor Schmidt to press the issue of LRTNF modernization in NATO.²⁵⁵

However, there has always been one overwhelming internal contradiction in this notion: As Betts has pointed out:

To extent that NATO succeeds in continuing to make the flexible response policy credible... the policy need not make sense in order for Moscow to believe it; it only has to appear that the West really intends to implement it... alliance policy enhances deterrence. But, if deterrence fails, it also enhances Soviet incentives to strike with nuclear force at the onset of war, and to do so with surprise. Unlike conventional surprise, the consequences of this are not confined to military forces or territory far from US shores. This danger is the one and only one that directly threatens the American homeland with apocalyptic devastation... if deterrence and conventional defense fail, constraints against deliberate implementation of the rest of the flexible response policy will be overwhelming.²⁵⁶

Warnke too had considered preemptive Soviet nuclear attack against US TNW forces in Europe plausible:

If the Soviets ever feel they have to start a nuclear war, I think the first thing that they would do would be to wipe out any of the theatre nuclear forces that are stationed in Western Europe. They think that would be the least provocative thing they could do in terms of the United States.²⁵⁷

In addition, important former officials in the West have begun to call the entire concept into question, at times in terms that are amazing.

NATO's nuclear strategy is founded on illusion with a large component of self-deception: the dubious hope that America's nuclear threat will permanently deter the Soviet Union from attacking Western Europe with conventional forces. That threat the pretense of a winning hand in a transcendental poker game is becoming every day less persuasive. The Soviets know as well as we that, should our bluff be called, whether by accident or design or the momentum of actions and reactions that escape the control of both sides, the president would face two unacceptable options. He could either precipitate mutual catastrophe or capitulate.

Once the Soviet leaders conclude that no president would be likely to adopt the disastrous first option, our cosmic bluff will have lost its deterrent force.²⁵⁸

It is these internal contradictions that have led the NATO allies of the US, and in particular West Germany, to constantly seek every means to reinforce the linkage of the US strategic deterrent to NATO-European "coupling" and to oppose any policies in NATO, either regarding conventional

defense or nuclear forces, that could be interpreted as "decoupling" or loosening that linkage. It was already pointed out in the discussion in section b) above that those who stress extended deterrence tend to emphasize the necessity for continued improvements in US counterforce capability, the continual need to match, or preferably surpass, USSR counterforce capabilities.

There are also two very specific interactions of LRINF systems and counterforce issues, namely the specific new missiles on both sides that are involved. The USSR's SS-20 missile is undoubtedly intended for counterforce targets, albeit for soft ones: NATO airbases, Pershing I facilities, nuclear ammunition depots, and the like. The number of SS-20 warheads as well as the missile's range is sufficient to cover the entire complex of NATO nuclear-weapon delivery facilities including airbases, C³, etc. The Pershing II as well as the GLCM and the analogous counterforce targets on the USSR/WTO side. Longer range nuclear munitions assigned to NATO use have always had counterforce missions.²⁵⁹ (See chapter 5, page)

The Political Utilization of Equivalence, Equality, or Superiority: Crises, Alerts, Deployments

Opinions on the effects of the status of the US/USSR strategic nuclear weapons balance on the international political behavior of the US and the USSR differ strikingly. They could perhaps be typified by six contrary positions:

- Sienkiewicz has already been noted. In essence it suggests that the enormity of the strategic forces on both sides of necessity produces stability. Neither dare produce a situation that could lead to nuclear war, and the situation has not deteriorated due to the increases in these forces in recent years. Rather, these allegedly enforce an even greater stability. As expressed by Michael Mandelbaum: Because the retaliatory power of each side was so vast, deterrence rested on more solid foundations in 1976 than it had in 1966, than Wohlstetter and others had feared might be the case in 1956, and then had been anticipated by almost all but Bernard Brodie in 1946. The opinion that nuclear weapons have kept the peace has probably been the conventional one in the post-WWII period, and its somewhat more extreme form – that only nuclear weapons have kept the peace – is expressed most frequently in the writings of strong counterforce and arms advocates such as Teller, Alvin Weinberg and others.
- The notion that the danger of outbreak of nuclear war has been receding as the nuclear forces of the US and the USSR have grown in size and in performance capabilities is of course opposed by a very large body of arms-control specialists, for example, Scoville, Rathjens, Bundy, Myrdal, Feld, Barnaby, and others. These analysts have seen the increases in counterforce capability in particular, MIRVing, missile accuracy, etc., as a constantly increasing danger and destabilizing.
- Those who spoke most of the "window of vulnerability" also raised the explicit consequence of "nuclear blackmail": in the event that the USSR would obtain nuclear "superiority" as they defined it the US would be vulnerable to political coercion by the USSR. Nitze, for example, (and the Committee on the Present Danger) suggested this danger repeatedly. A mild version of this position appears in the 1981 Military Posture statement of the Chairman of the US Joint Chiefs of Staff: "as noted in last year's report, US capability to avoid coercion and exert leverage in crisis is eroding in direct relation to continuing Soviet force improvements and the aging of US strategic nuclear systems."²⁶⁰

It is noteworthy that Gen. Jones explicitly paired the opposites: "to avoid coercion and (to) exert leverage..." It is fair to assume that those who hold this position quite consciously recall the post WWII instances in which they felt that nuclear superiority had previously afforded the US a coercive advantage and was able to "exert leverage" over the USSR. They simultaneously fear the inverse situation, and hope for the return of such leverage to the United States through the acquisition of new strategic systems which they routinely urge.

- A quite contrary position has been taken by Bernard Brodie, Michael Howard, McGeorge Bundy, Herbert Scoville, Bethe, Panofsky and others.²⁶¹ This states that nuclear weapons can have no political coercive value whatsoever, and that their only possible value is the deterrence of their use by another state.
- The position of former Chancellor Schmidt on the other hand, regarding the alleged dangers of the USSR's deployment of the SS-20 missile, can be seen as a corollary to the Nitze position, related by extremely vague phrasing to West Germany alone, or perhaps to the remainder of NATO Europe. The SS-20 would have allegedly offered the USSR some mechanism of political coercion in a European crisis that the USSR would not otherwise have had, if not militarily balanced in the West in some way – or removed. Once the United States accepted this position –after considerable initial skepticism – it also became the official US rationale. In particular, once skepticism the Reagan administration came into office, it was a common expression of Secretary of Defense Weinberger.
- The final position is based on an examination of the historical experience regarding the threatened use of nuclear weapons in the post-WWII period.²⁶² Nuclear forces have been alerted and deployed during crises on many occasions. There is no question but that nuclear weapons have explicitly or implicitly been used for purposes of political effect. The crucial question is what patterns these uses will take in the future, given
 - that the nuclear forces of both the US and the USSR are now of approximately equal overall capability,
 - that the USSR has begun to develop and use conventional military force projection capabilities for use far from Soviet borders and the contiguous WTO Pact states, and that such capabilities are no longer a monopoly of the United States.

Whether the increase in counterforce capabilities and USSR strategic in particular of both US forces will be a third factor of equal weight affecting crisis interactions is unclear but seems less likely. The important point is that actual historical experience regarding political uses of nuclear weapons is quite different from much of the rhetoric surrounding them and betrays a much more dangerous situation than its usual characterization. Combined with active foreign interventionary policies on the part of both the US and the USSR, they promise a very uncomfortable future.

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EXTRACT FROM FY 1963 POSTURE STATEMENT OF SECRETARY OF DEFENSE ROBERT S. McNAMARA

"Furthermore, it is possible that the Soviets initial strike might be directed solely at our military installations, leaving our cities as hostages for later negotiations. In that event, we might find it to our advantage to direct our immediate retaliatory blow against their military installations, and to withhold our attack on their cities, keeping the forces required to destroy their urban industrial complex in a protected reserve for some kind of period of time. "Accordingly, we should plan for the 1963-1967 time period a force which could: 1. Strike back decisively at the entire Soviet target system simultaneously; or 2. Strike back, first, at the Soviet bomber bases, mi; sites and other military installations associated with their long-range nuclear forces to reduce the power of any follow-on attack—and then, if necessary, strike back at the Soviet urban and industrial complex in a controlled and deliberate way. Such a force would give us the needed flexibility to meet a wide range of possible general war situations."

EXTRACT FROM FY 1964 POSTURE STATEMENT OF SECRETARY OF DEFENSE ROBERT S. McNAMARA "In talking about global nuclear war, the Soviet leaders always say that they would strike at the entire complex of our military power including government and production centers, meaning our If they to do x0, we would, of course, have no alternative but to retaliate in kind. But we have no of knowing whether they would actually do so. It would certainly be in interest as well ours to try to limit the terrible consequences of nuclear a were at least eliminate namely, against the them including their cities. Such a prospect would give the Soviet Union no incentive to withhold attack against our cities in a first We to give them a better alternative. Whether they would accept it in the crisis of a global nuclear no one can sang what is at stake, we believe it is worth the ad option."

Extract from FY 1965 Posture Statement of Secretary of Defense Robert S. McNamara: It is quite likely that the Soviet Union, in an attack upon the United States and Western Europe would not fire all of its strategic

nuclear weapons in a “salvo launch.” Regardless of whether the Soviets at both struck first at our cities or first at our military probable installations or blow, to strike babe onr choice, but also at the elements of their forces that had not yet been launched. To achieve this capability, we must have a force considerably larger than that which might be needed simply to destroy Soviet cities. Certainly, the United States would be greatly damaged by the initial wave of a nuclear attack. And certainly, as time goes on and the Soviet Union continues to harden its missile sites and continues to build missile-firing submarines, it will become increasingly difficult to destroy a substantial portion of the residual forces....Over the last 2 ½ years we have made many comprehensive studies of alternative U.S. strategic retaliatory force structures employed in a nuclear exchange with a wide range of possible Soviet forces and under a wide variety of assumptions pertaining to the outbreak of war and United States and Soviet operational factors. In every pertinent case we found that forces in excess of those needed simply to destroy Soviet cities would significantly reduce damage to the United States and Western Europe. And the extent to which damage to ourselves can be reduced depends importantly of the size and character of our own forces, particularly the surface-to-surface missiles such as MINUTEMAN that can reach their targets quickly.

EXTRACT FROM FY 1966 POSTURE STATEMENT OF SECRETARY OF D NSE ROBERT S. MCNAMARA. “For purposes of this discussion, we can define general nuclear war as war in which strategic nuclear weapons are launched against the homelands of the Soviet Union. Such attacks might be directed against United States and the military targets only, against cities only, or against both types of targets, either They might be selective in terms of specific simultaneously or with targets attacked or they might be general.” “NATO should not only have an improved capability to meet major nonnuclear assaults with non-nuclear means and forces prepared for that option, but it should also achieve a true tactical nuclear capability which should include a broad. flexible range of nuclear options, short of general nuclear war, and the means to implement them.”

EXTRACT FROM FY 1970 POSTURE STATEMENT OF SECRETARY OF DEFENSE CLARK 3. CLIFFORD. “Until technology progresses to the point where an effective ABM defense against the Soviet threat becomes feasible, our major hope for limiting damage if a nuclear war occurs is that it can be stopped short of an all-out attack on our cities. We try to bring this about by providing our forces with characteristics that will permit them to be used effectively in a limited and controlled retaliation as well as for ‘Assured Destruction’, thereby being prepared for any type of Soviet attack.”

Laird, FY1971: the “sufficiency criteria” that were promulgated as the government's official standards of strategic policy. As first expressed in Defense Secretary Laird's Posture Statement of 1970 they included: maintaining an adequate second-strike capability to deter an all-out surprise attack on our strategic forces; providing no incentive for the Soviet Union to strike the U.S. first in a crisis; preventing the Soviet Union from gaining the ability to cause considerably greater urban-industrial destruction than the U.S. could inflict on the Soviets in a nuclear war; defending against damage from small attacks or accidental launches.

EXTRACT FROM FY 1973 POSTURE STATEMENT OF SECRETARY OF DEFENSE MELVIN B. LAIRD. “In order to maintain needed flexibility, we design our forces so that we have strategic alternatives available for use depending on the nature or level of provocation. This means capabilities that enable us to carry out an appropriate response without necessarily resorting to mass urban and industrial destruction.”

EXTRACT FROM FY 1974 POSTURE STATEMENT OF SECRETARY OF DEFENSE ELLIOT L. RICHARDSON. “U.S. strategic offensive forces have long been designed to carry out retaliatory options appropriate to the nature and level of provocation as well as to maintain an assured destruction capability. Our planning objectives and the sufficiency criteria for deterrence of direct strategic nuclear attack against the United States are currently under intensive review, following the conclusion of the Strategic Nixon's request for a more flexible Arms Limitation agreements and President capability in the application of our strategic forces. In particular, it is our goal to be able to respond to a nuclear attack without having to resort to mass urban and industrial destruction in retaliation. At the same time, we are seeking to maintain a deterrent posture that will not jeopardize the stability of the strategic balance.”

⁹³ Sec. of Defense J.R. Schlesinger, Annual Defense Department Report, FY 1975Y. January 1974. pp. 39-45.

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⁹⁵ Jack Anderson, "Not-So-New Nuclear Strategy," Washington Post, October 12, 1980.

⁹⁶ Department of Defense Appropriations for 1978, Hearings Before a Subcommittee of the House Committee on Appropriations, 95 Cong. 1 Sess. Part 2, pp.212, 1977.

⁹⁷ Desmond Ball, "Counterforce Targeting, How New, How Viable," Arms Control, cit. p. 2 Today, 11:2 (February 1981):2.

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¹⁰¹ Donald H. Rumsfeld, Annual Defense Department Report, FY 1978, p. 68.

¹⁰² U.S. Congress, Military Implications of the Treaty on the Limitation of Strategic Offensive Arms and Protocol Thereto (SALT II Treaty), Hearings, Committee on Armed Services, U.S. Senate, 96th Congress, July 1979, Part I, p. 169-70.

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¹¹³ Michael McGwire, Military Objectives in Soviet Foreign Policy, The Brookings Institution, Washington, D.C. 1987.

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Without representing in fact how we target the forces, there are charts which appear in the defense report (annual DOD Defense Report) which relate to what you are talking about, Senator Levin. These are not representations of how we in fact target the forces; they assume a Soviet attack on US strategic capability and a US response aimed at reducing surviving unused, as it were, Soviet strategic capability, and then compare the capability of the remaining US and remaining Soviet forces against non-military targets, that is a close approximation to what you are talking about." Dept. of Defense Authorization For Appropriations for FY 1981, Committee on Armed Services, Senate, 96 Cong. 2nd Sess. 1980, p. 573.

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Bruce Blair, "Electromagnetic Pulse" (Appendix C), and "Satellite Vulnerability to System-Generated EMP" (Appendix O), in *Strategic Command and Control*;

Redefining the Nuclear Threat, The Brookings Institution, Washington, D.C. 1985, pp. 321-326 and 327-331.

Hans Neuheuser, "The Nuclear Electromagnetic Pulse", *Military Technology*, (June 1985): 98-104

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W.S.Knapp, "Communications in Nuclear Burst Environments", *Space/Aeronautics* 38:6, Part 2 (November 1972): 69-73.

H.Lowenhar, "Hardened Electronics", *Space/Aeronautics* 52:3 (August 1969): 36-43

Federation of American Scientists, Public Interest Report, 33:8 (October 1980).

W.J.Broad, "Military Grapples with the Chaos Factor", *Science* 212: (September 1981): 1228-1229.

W.J.Broad, "Frying All Our Electronics with a Nuke Over Omaha", *Washington Post*, December 5, 1982.

P.J.Klass, "Radiations Hardened Electronics Gain Interest", *Aviation Week & Space Technology* 91:10 (September 8, 1969): 88-98.

¹⁸² Jeffrey Richelson, "PD-59, NSDD-13 and the Reagan Strategic Modernization Program," op.cit.

¹⁸³ Desmond Ball, "Management of Strategic Retaliation, Technical Capabilities and Vulnerabilities", Reference Paper no. 83, August 1982, mimeographed, 8 pages.

"The systems which provide this intelligence are by and large part of the early-warning network, but are far from co-extensive with that network. Many detection and warning systems contribute only marginally to the attack characterisation and assessment mission, except perhaps with respect to the question of the scale of the attack.

Determination of the source of the attack – e.g. whether an ICBM is an SS-18 from the Zhangiztobe field or an SS-11 from Svobodnyy – can really only be done by the DSP satellites. This information would assist in determining the nature and purpose of the attack (since the highly accurate, MIRVed SS-18 would be employed for different purposes than would the SS-11) and would also be used by the US to retarget its own ICBMs away from the vacated silo(s) to targets of more immediate interest. Some intelligence on the source of an attack would presumably be available from SIGINT monitoring. Because the infra-red sensors in the DSP satellites are currently limited to operations around 2.7 microns, there is no real capability for tracking missiles in the ballistic parts of their trajectories and hence of predicting impact points.

In 1979, General Lew Allen testified that of the various early warning sensor systems in operation, only BMEWS provides impact point predictions. These predictions, although very limited in quantity and quality, provide some idea of what targets are being attacked.

Attack characterisation is now also provided by the EPARCS at Grand Forks, but this would not be as timely as that provided by the forward-based BMEWS."

¹⁸⁴ *Ibid.* See also, Richard Burt, "US Revamps Safety of Leaders in War", *New York Times*, 13 August 1980; Michael Getler, "US Ability to Retaliate After Nuclear Attack Concerns Officials", *Washington Post*, 26 January 1981; Patrick Osler, "How We're Prepared for A-Attack", *Chicago Sun-Times*, 30 August 1981; and Richard Halloran and Charles Mohr, "Nuclear Missiles Warning System and the Question of When to Fire", *New York Times*, 29 May 1983.

¹⁸⁵ W.J.Broad, "Threat to US Air Power: The Dust Factor", *Science* (25 September 1981): 1475-1477.

¹⁸⁶ Desmond Ball, personal communication, August 1982. See also Bruce Blair's *Strategic Command and Control*, op. cit., and Jonathan B. Tucker, "Strategic Command-and-control Vulnerabilities: Dangers and Remedies", *Orbis*, 26:4 (Winter 1983): 941-963.

¹⁸⁷ Desmond Ball, ref. above, op cit.

¹⁸⁸ "Soviets Stage Integrated Test of Weapons", *Aviation Week & Space Technology* (28 June 1982):

¹⁸⁹ Dr. Richard Garwin, Personal communication, 10 June 1983.

¹⁹⁰ S.Sienkiewicz, 1979, op. cit., p. 105.

¹⁹¹ Charles Mohr, "Once Unthinkable, 'Launch Under Attack' Nuclear Strategy is Being Discussed", *New York Times*, 18 July 1982 (*International Herald Tribune*, 19 July 1982).

¹⁹² Richard L.Garwin, "Launch Under Attack to Redress Minuteman Vulnerability", *International Security* 4:3 (Winter 1979/1980): 117-139 and Chapter 4, "Launch Under Attack", pp.147-164, in *MX Missile Basing*, US

Congress, Office of Technology Assessment, Washington, DC: September 1981. See also Richard K. Betts, "Nuclear Surprise", pp. 228-254, in *Surprise Attack*, Washington, DC: The Brookings Institution, 1982.

¹⁹³ S. Sienkiewicz, 1979, op. cit., pp. 104-110.

¹⁹⁴ Raymond L. Garthoff, "Mutual Deterrence and Strategic Arms Limitation in Soviet Policy", *International Security* 3:1 (Summer 1978): 131-132.

¹⁹⁵ "The Ultimate Absurdity", *Federation of American Scientists Public Interest Report* 32:10 (December 1979): 6

¹⁹⁶ US Congress, House, Committee on Armed Services, Hearings on Military Posture, March-April 1977, Washington, DC: US Govt. Printing Office, 1977, p. 469

¹⁹⁷ US Congress, Senate, Committee on Armed Services, Hearings: Department of Defense Authorization for Appropriations for Fiscal Year 1981, Part 2, Washington, DC: US Govt. Printing Office, 1980, pp. 636, 600.

¹⁹⁸ United States Congress, Senate, Committee on Foreign Relations, Hearing: Arms Control Implications of Current National Defense Programs, 24 May 1979 Washington, DC: US Govt. Printing Office, 1980, pp. 31-32.

¹⁹⁹ Richard Halloran, "Nuclear Strategy Shift Hinted by Weinberger", *New York Times*, 6 May 1983 (*International Herald Tribune*, 7-8 May 1983). See also Charles Mohr, "Once Unthinkable, 'Launch Under Attack' Nuclear Strategy Is Being Discussed", op. cit.

²⁰⁰ "Ik1e on Launch on Warning", *Federation of American Scientists Report* 32:4 (April 1979): Public Interest

²⁰¹ US Congress, House, Committee on Armed Services, Subcommittee on Intelligence and Military Application of Nuclear Energy, Staff Study: Land-Based ICBM Forces Vulnerability and Options, Washington, DC: US Govt. Printing Office, 5 October 1978, p. 9.

²⁰² United States Congress, Senate, Committee on Foreign Relations, Hearings: United States/Soviet Strategic Options, 95th Cong., 1st Sess., Washington, DC: US Govt. Printing Office, 1977, p. 114.

²⁰³ "McNamara Urges Shift in US Atomic Strategy", *New York Times*, 8 October 1982. The "launch-on-assessment" policy recommended by Blair Stewart is identical to launch-on-warning: Blair Stewart, "MX and the Counterforce Problem: A Case for Silo Deployment", *Strategic Review* 9:3 (Summer 1981): 23-24.

²⁰⁴ MX US Missile Basing, op. cit., p. 156, and Garwin, op. cit., p. 133.

²⁰⁵ McGeorge Bundy, "Instead of Missiles, *New York Times*, 21 May 1981.

²⁰⁶ Benjamin S. Lambeth. "Selective Nuclear Operations and Soviet Strategy" Chapter 4 in J.J. Holst and Uwe Nerlich, *Beyond Nuclear Deterrence*, London: Macdonald, 1977, pp. 79-104. This subject is discussed extensively in several studies by James McConnell. For brief discussions of USSR military "doctrine", see Benjamin S. Lambeth, "The Sources of Soviet Military Doctrine", pp. 200-216, in F.B. Horton et al., *Comparative Defense Policy*, Baltimore, Md.: Johns Hopkins University Press, 1974; D.L. Strode and R.V. Strode, "Diplomacy and Defense in Soviet National Security Policy", *International Security* 8:2 (Fall 1983): 91-116; and Hannes Adomeit, "The Political Rationale of Soviet Military Capabilities and Doctrine," pp. 70-72 in *Strengthening Conventional Deterrence in Europe: Proposals for the 1980s*, Report of the European Security Study, New York: MacMillan, 1983.

²⁰⁷ Walter Slocombe, "The Countervailing Strategy", *International Security* 5:5 (Spring 1981): 19-27.

²⁰⁸ Albert Wohlstetter, "Bishops, Statesmen, and other Strategists on the Bombing of 15-35. Innocents", *Commentary*, (June 1973): 15-35.

²⁰⁹ Elizabeth Drew, "A Political Journal", *The New Yorker*, 9 May 1983, pp.

²¹⁰ Leslie Gelb, in "Covering Arms Control: A T_W_Q Roundtable", *The Washington Quarterly*, 5:4 (Autumn 1982): 149

²¹¹ Strobe Talbot, in *Nuclear Negotiations: Reassessing Arms Control Goals in US/Soviet Relations*; edited by Alan F. Neidle, Univ. of Texas, Austin, 1982, p. 119.

²¹² Kosta Tsipis, "Not Such a Bargain After All", *Bulletin of The Atomic Scientists*, 39:9, (November 1983): 54. See also Steve Smith, "MX And The Vulnerability of American Missiles" ADIU Report, (May-June 1982) :1-5.

²¹³ Dept. of Defense Authorization For Appropriations For Fiscal Year 1981, Committee on Armed Services, Senate, 96 Cong. 2nd Sess. Part 2, 1980, pp. 574.

²¹⁴ Rep. Les Aspin, "Are We Standing Still"; US Strategic Nuclear Forces in the 1970's and early 1980's," July 1979, 18 pages, mimeographed.

²¹⁵ Aspin, *ibid*.

²¹⁶ ACIS, FY 1980.

²¹⁷ Walter Pincus, "US Plans to Boost Missile Warhead, International Herald Tribune. June 30-July 1, 1979.

²¹⁸ Maj. J.B. Osgood Jr., "Change Those Targets", *Combat Crew*, (December 1975): 9-10.

²¹⁹ ACIS, FY 1980, op.

²²⁰ Aspin, July 1979, op. cit.

²²¹ Robert P. Berman and John C. Baker, *Soviet Strategic Forces, Requirements and Responses*, Washington, DC, The Brookings Institution, 1982. Michael MccGwire, *Military Objectives in Soviet Foreign Policy*, Washington, D.C., The Brookings Institution, 1987. Stephen M. Meyer, *Soviet Theatre Nuclear Forces, Part I, Development of Doctrines and Objectives, and Part II, Capabilities and Implications*, Adelphi Papers 187 and 188, Winter 1983/84, International Institute of Strategic Studies, London. See also, David Holloway, *The Soviet Union and the Arms Race*, New Haven, Conn.: Yale University Press, 1983; Donald R. Cotter et al., *The Nuclear 'Balance' in Europe: Status, Trends, Implications*, USSI Report 83-1, Washington, DC: United States Strategic Institute, 1983.

²²² An example of a study reflecting the traditional notions is Martin McGuire, "A Quantitative Study of the Strategic Arms Race in the Missile Age: Preliminary Analyses", Paper P-1079, Washington, DC: Institute for Defense Analyses, November 1974. For some of the classic studies that review prognoses of Soviet strategic weapon development see: John Prados, *The Soviet Estimate, US Intelligence Analysis and Russian Military Strength*, New York, The Dial Press, 1982. Lawrence Freedman, *US Intelligence and The Soviet Strategic Threat* (2nd Ed.) London, Macmillan 1986. Albert Wohlstetter, *Legends of the Strategic Arms Race: Part I: The Driving Engine; Part II, The Uncontrolled Spiral*, USSI Report 75-1, 1975. Also series by Albert Wohlstetter, *Foreign Policy*, No. 15 and 16, 1974, Jeremy Stone, *Foreign Policy*, no. 16, 1974, and Wohlstetter, *Foreign Policy*, No. 20, Fall 1975. Les Aspin, "Debate Over US Strategic Forecasts: A Mixed Record", William T. Lee, *Debate Over US Strategic Forecasts: A Poor Record*, "A Rebuttal by Cong. Aspin", *Strategic Review*, 8:3 (Summer 1980): 22-59.

²²³ Henry A. Trofimenko, "Counterforce: Illusion of a Panacea", *International Security* 5:4 (Spring 1981): 28-48, and Yu. N. Listvinov, *First Strike*, JPRS 55622, 4 April 1972, translation of *Pervyy Udar*, Moscow: International Relations Publishing House, 1971.

²²⁴ Michael Mcc Gwire, *Military Objectives in Soviet Foreign Policy*, op. cit. p 335.

²²⁵ William Hyland in A.F. Neidle, *Nuclear Negotiations...* op. cit. p. 28.

²²⁶ MccGwire, op. cit. p. 336. See also: Jack H. Nunn, *The Soviet First Strike Threat; The US Perspective*, Praeger, 1982. J.M. Weinstein, "Soviet Offensive Strategic Nuclear Forces: Evolution and Prospects", *Parameters*, 15:4 (April 1986): 29-47 Steven J. Cimbala, "Soviet Nuclear Strategies: Will They Do The Expected?" *Strategic Review*, 13:4 (Fall 1985): 67-77. (This is a small sample of recent analyses of Soviet strategic nuclear policy since 1975. A larger list will be appended.)

²²⁷ Dusko Doder, "Heated Defense Debate of US Campaign Worries Soviets", *Washington Post*, August 1980.

²²⁸ Marshal A.A. Grechko, *Guarding Peace and the Construction of Communism*, (translation), Voenizdat, Moscow, 1971.

²²⁹ The surprise nuclear strike likely would be launched within such a time and designed in such a manner that would minimize the possibility that the President or other members of the senior command chain could make and communicate a decision to launch the U.S. missile force before the arriving Soviet missiles made that launch impossible. This time would probably be on the order of 30 minutes at as expected, the leading most, but more likely as few as ten minutes or less if, as expected, edge of the Soviet strike is an attack by submarines located close to the coast of the United States.

...The leading edge of the missile strike would likely also be directed at the C³I capabilities and would include high-altitude nuclear explosions whose electromagnetic pulses (EMP) would cause widespread disruption of all electronic systems. Careful consideration also would be directed to initial strikes on launch control centers, both land-based and airborne, to most quickly disable major segments of the missile force. Ultimately, however, it is the missiles themselves that have to be destroyed.

The subsequent weight of the first wave of the attack would be directed at what the Soviets refer to as active nuclear targets, that is, all nuclear capabilities of the United States including their associated target acquisition (reconnaissance), command and control, and ground support. Of special importance would be strikes on all missile silos, all submarines whose locations were known, all carrier task forces, all ports where either submarines or major combatant ships are located, all airbases of either a strategic, support

(refueling), or dispersal nature, all related communications, and all nuclear weapon storage areas. Needless to say, this attack would be global and would include attacks on all appropriate U.S. bases regardless of their locations. The final category of targets to be struck in this wave would be all other significant military bases and installations, the Soviet overall objective being to destroy the total immediately available U.S. military capability – Army, Navy, Air Force, intelligence, and command/control, both military and governmental. Joseph D. Douglas, "US Strategy for General Nuclear War" 5:3 (Fall 1980), 287-316.

²³⁰ McConnell had noted that in writings beginning in 1963, Soviet authors had described the combat objectives against US strategic forces as being to "degrade" these in a retaliatory strike. In an unusual piece of detective work, he had found an article in *Morskoy Sbornik* which explained that "annihilation" implies sinking or removing 80-90 percent of the forces of an enemy grouping from the order of battle; "smashing", 70 percent; "inflicting a defeat", 50 percent; "substantially degrading", 30 percent; and "degrading", 10-15 percent. He was able to correlate these with estimates in other sources. (James M. McConnell, personal communication, 1982.) If McConnell's interpretation serves to supply the quantitative values for the lower damage estimates meant by 10 to 15 percent it simultaneously must be used to supply the "degrading" 80-90 percent value for Marshall Grechko's use of "annihilate".

R. Jeffrey Smith, "An Upheaval in US Strategic Thought", *Science*, pp. 30-34

²³¹ George C. Wilson, "Soviets Can Kill 50% of US Land Missiles, Expert Says" *Washington Post*, 19 December 1980.

²³² In each case, the vulnerability window would be predicted for a period several years off, the date would appear but not the vulnerability, and a year later a new estimate of exactly the same sort would appear for several years further on. There were several such cycles, beginning with the first projections by Foster, Wohlstetter and Laird in 1968. (See John Prados, *The Soviet Estimate...*, op.cit. in particular pages 213-218, and J.H. Nunn, *The Soviet First Strike...* pp. 212-217, 229, as well as the Senate Hearings on the ABM issue..By 1973, instead of 907 loss, it was predicted that 90% of US ICBMs would survive a USSR counterforce first strike. (*Aviation Week and Space Technology*, 31 May 1973, p. 11.)

²³³ James M. McConnell, "Possible Counterforce Role for the Typhoon", pp. 347, Washington, DC: Center for Naval Analysis, March 1982.

²³⁴ Kosta Tsipis, *Offensive Missiles*, Stockholm Paper 5, SIPRI, Stockholm, International Peace Research Institute, 1974. This situation was in principle not very different from the first US ICBM, the Atlas, which was completely vulnerable. Perry points out that US strategic doctrine really did not clearly establish a requirement for force survivability when the first systems were being developed; R.L.Perry, *The Ballistic Missile Decisions*, The RAND Corporation, P-3686, October 1967., pp. 13-15.

²³⁵ Even higher values for the hardening of USSR ICBM silos frequently appear in *Aviation Week and Space Technology*. Their derivation and reliability is unknown, and it seems probable that hardening above around 3,500 psi is physically impossible.

²³⁶ *Nuclear War Strategy*, Hearing, U.S. Senate Committee on Foreign Relations, 96th Congress, Sept. 16, 1980, U.S.Govt. Printing Office, Washington, DC. pp.35-36.

²³⁷ Raymond L. Garthoff, *Perspectives on The Strategic Balance*, The Brookings Institution, 1983, pp. 9-11.

²³⁸ Annual Report, Dept. of Defense, for FY 1979, U.S. Sec. of Defense Harold Brown, Dept. of Defense 1978, p. 53. For additional assessments of US ICBM vulnerability see "Strategic Vulnerabilities", in *Challenges For US National Security*, Nuclear Strategy Issues For the 1980's, Carnegie Endowment, 1982. Bruce Blair, "Trends in ICBM Vulnerability, Appendix A", in *Strategic Command and Control*, op. cit. See chapter 8, footnote 1 Several years later, Brown would write "The number of U.S. strategic warheads has remained roughly constant during the past ten years, and the previous increase was more the result of concerns about survival and penetration of U.S. forces than of a longer target list"; Harold Brown, *Thinking About National Security*, Westview Press, Boulder, Colorado, 1983, p. 82, "More the result..." does not exclude the effect of "a longer target list", but Browns description in general disagreement with Fosters testimony quoted earlier in the chapter on the origins of MIRV. The development cycle of MIRV's and the number that were planned and procured would appear to support Fosters position more than it does Browns.

²³⁹ See Congressional Budget Office, *Counterforce Issues for the U.S. Strategic Nuclear Forces*, January 1978, pp. 32-33; H.Brown, Dept. of Defense, Annual Report for FY 1981, p. 81; J. Kruzel, "Military Alerts and

Diplomatic Signals", in E.P.Stern (ed.) *The Limits of Military Intervention*, Sage Publications, Beverly Hills, 1977. pp. 87-90.

²⁴⁰ Warner Schilling, "US Strategic Nuclear Concepts in the 1970's: The Search for Sufficiently Equivalent Countervailing Parity", in R.O'Neill and D.M. Horner, (Eds.) *New Directions in Strategic Thinking*, London, G.Allen & Unwin 1981, pp. 34-59.

²⁴¹ Bernard D. Albert, *Comparative Strategy*, 1:3 (1979): 139-167.

²⁴² David C.Aaron (in) "A Debate: Are US Defenses Ready, Rusty or Adequate?" *New York Times*, Oct. 12, 1980.

²⁴³ Retaliatory Issues for United States Strategic Nuclear Forces, Congressional Budget Office, Washington D.C., June 1978, pp. 5.

²⁴⁴ Warner Schilling, 1981, op. cit. pp. 71-72.

²⁴⁵ "Contribution of MX To The Strategic Force Modernization Program" extract from CBO Congressional Budget Office report, page 3. Other major relevant studies are: Retaliatory Issues For the US Strategic Nuclear Forces, CBO, June 1978. Counterforce Issues For the US Strategic Forces, CBO, January 1978. Trident II Missiles... op. cit. (CBO, July 1986). L. Finch and A. Tinagero, *Cost To Attack: Measuring How Strategic Forces Effect US Security*, Congressional Research Service, Report No. 85-64 F, March 20, 1985. A Tinagero and L. Finch, *Cost To Attack US and Soviet Strategic Forces Under Three Alternative Arms Control Approaches*, Congressional Research Service, Report No.85-117 F, May 23, 1985. See also G.F.Rathjens and Jack Ruina, "Nuclear Doctrine And Rationality", *Daedalus*, (Winter 1981): 179-189

²⁴⁶ Curtis Crawford, "Freezing Missile Accuracy", *Foreign Affairs*, 62:1 (Fall 1983): 200-201. I have made no attempt to reconcile either the US or USSR ICBM CMP values that Crawford uses with those of Nitze, whose values for Minuteman III are higher and for USSR MIRVs very much higher. It is possible that overestimates of USSR MIRV yields and accuracies by Nitze would account for some of the differences in CMP values but I have left this unresolved.

²⁴⁷ Stephen M. Meyer, "Soviet Military Programs and the Freeze," pp. 124-133, in *The Nuclear Weapons Freeze and Arms Control*, Boston: American Academy of Arts & Sciences, 1983.

Soviet Strategic Force Developments, Hearing, Committee on Armed Services and Committee on Appropriations, US Senate, 99 Cong., 1st Sess, 1986, p. 7.

²⁴⁸ Milton Leitenberg, "The Present State of the World's Arms Race, *The Bulletin of the Atomic Scientists*, 28:1 (January 1972): 15-21.

²⁴⁹

Milton Leitenberg, "Developments in US and USSR Strategic Nuclear Weaponry Since SALT-I, May 1972", *The Bulletin of the Atomic Scientists*, 30:7 (September 1974): 8-20.;

Milton Leitenberg, "The SALT-II Ceilings and Why They are so High", *British Journal of International Studies*, 2:7 (1976): 149-163.;

Milton Leitenberg, "US-USSR Strategic Arms Control: The Decade of Detente, 1970-1980, and a Look Ahead", in press.

²⁵⁰ See, for example, Malcolm W. Hoag, "One American Perspective on Nuclear Guarantees, Proliferation, and Related Alliance Diplomacy", in *Security, Order and The Bomb*, ed. J.J. Holst, Oslo: Universitets forlaget, 1972 pp. minus the corollary about independent pressures for This was also the position of former Secretary of Defense Schlesinger and, nuclear-weapon acquisition implicitly, of the Schmidt FRG government position during the 1976-1978 period of the SALT negotiations.

²⁵¹ Several sources which deal somewhat more with overall military-political determinants rather than with military-service priorities etc. are John L. Gaddis, *Strategies of Containment. A Critical Appraisal of Postwar American Security Policy*, Oxford: Oxford University Press, 1981; Thomas W. Wolfe, *Soviet Power and Europe, 1945-1970*, Baltimore, Md.: The Johns Hopkins University Press, 1970 Its Impact on US and Soviet Strategic Thomas W. Wolfe, *The SALT Experience: Policy and Decisionmaking*, R-1686-PR, Santa Monica: Rand, 1975; and David Holloway, *The Soviet Union and the Arms Race*, New Haven, Conn.: Yale University Press, 1983. See also M. Leitenberg, "The Dynamics of Military Technology Today", *International "The Social Science Journal*, 25:3 (1973): 336-357; and Milton Leitenberg, *Counterpart of Defense Industry Conversion in the*

United States: The USSR Economy, Defense Industry, and Military Expenditure. An Introduction and Guide to Sources", *Journal of Peace Research*, 16:3 (1979): 263-277.

²⁵² One of the few analyses at the time that claimed that the evidence available from strategic-weapon development and deployments during this same period did not substantiate this generally accepted assumption was by Leitenberg, "The SALT-II Ceilings and Why They are so High", *op. cit.*

²⁵³ For some examples, John F. Burns, "Kremlin Pledging Response on Arms", *New York Times*, 5 October 1981; "Moscow Warns it Will Match M-X Missile", *International Herald Tribune*, 17 December 1982 (report of an interview by USSR Defense Minister Ustinov, with Tass, 7 December 1982); Leslie Gelb, "In Moscow, 3 Concerns Dominate, Missiles, Reagan's Hard Line, and Andropov", *New York Times*, 30 March 1983 (*International Herald Tribune*, 31 March 1983); Dusko Doder, "Moscow Says MX Plan Violates Arms Pacts", *Washington Post*, March 25, 1983. (*International Herald Tribune*, March 26, 1983), report of *Pravda*, March 24, 1983 editorial.

²⁵⁴ Elizabeth Drew, "A Political Journal", *The New Yorker* (20 June 1983).

²⁵⁵ Milton Leitenberg, "The Genesis of the LRTNF Issue in NATO", pp. 57-94, in *The Military Balance in Europe*, ed. Bo Hultdt and Atis Lejins, Conference Papers 2, Stockholm: Swedish Institute of International Affairs, 1982. See also Anthony H. Cordesman, *Deterrence in the 1980s: Part I, American Strategic Forces and Extended Deterrence*, Adelphi Papers no. 175, London: International Institute for Strategic Studies, 1982.

²⁵⁶ Richard K. Betts.

²⁵⁷ "Avoid the Strategy that Makes us Sitting Ducks" (Interview with Paul Warnke), *Guardian* (UK), 27 September 1980. For a short review of the literature on possible USSR use of its tactical or theatre nuclear forces in the NATO area, see Milton Leitenberg, "Tactical Nuclear Weapons of the USSR", Section 4 in Chapter I "Background Information on Tactical Nuclear Weapons", pp. 73-89, in *Tactical Nuclear Weapons: European Perspectives*, Stockholm International Peace Research Institute, Londo: Taylor and Francis Ltd., 1978. It should be noted that it is no longer considered likely that the USSR would initiate TNW use in the European theatre. Note Stephen Meyer, and Michael McGwire's 1987 Brookings study, both quoted earlier.

²⁵⁸ George W. Ball, "The Cosmic Bluff", *New York Review of Books*, 30:2 (21 July 1983): 37. The same general orientation produced the call in 1982 by McNamara, Bundy, Smith and Kennan for NATO to consider renouncing its "first use" policy of tactical nuclear weapons and to increase its conventional defense capabilities. George Ball's position is of course the old one of Gen. de Gaulle, and the opinions of Warnke and Ball could be interpreted as supporting those of former Chancellor Schmidt, for example, in contrast to those of Michael Howard)

²⁵⁹ Milton Leitenberg, "The Genesis of the LRTNF Issue in NATO", *op. cit.*, and "NATO and WTO Long-Range Theatre Nuclear Forces", pp. 9-64, in *Arms Control in Europe: Problems and Prospects*, ed. Karl E. Birnbaum, Laxenburg Papers no. 1, Laxenburg: Austrian Institute for International Affairs, March 1980.

²⁶⁰ United States Military Posture for FY 1982, General David C. Jones, Chairman of the Joint Chiefs of Staff, Washington, DC: US Department of Defense, February 1981. A more extreme version of this view was typified by Michael Nacht in the following words: "The increasing vulnerability to attack of the US land-based missile force, the weaknesses within NATO, the decline in production of US capital ships, and the token nature of the Japanese military commitment present golden opportunities for Soviet adventurism. At a minimum, if present trends continue, the Soviets will take advantage of their military position to coerce the West for political and economic gain. In a future Cuban missile crisis it will be the Soviets who will prevail. And it is possible that the Soviet leadership is or will soon be contemplating either the seizure of Western Europe, banking on Soviet nuclear forces to deter the use of American nuclear forces, or a nuclear attack on US strategic forces, relying on the threat of a Soviet nuclear third strike on US cities to deter a US second strike

on Soviet cities." (Emphasis in original.) Michael Nacht, "Arms, Arms Control, and Conflict", in *The Future of Conflict*, Capt. J.J. McIntyre, ed., Washington, DC: National Defense University Press, 1979, pp. 81-82. 14.

²⁶¹ See, as examples, Bernard Brodie, ed., *The Absolute Weapon*, New York: Harcourt Brace, 1946, p.76; Michael E. Howard, "On Fighting Nuclear War", *International Security*, 5:4 (Spring 1981): 3-17.

²⁶² Milton Leitenberg, "Threats of the Use of Nuclear Weapons Since World War II: An Introductory Note", pp. 388-395, in *Problems of Contemporary Militarism*, ed. A. Eide and M. Thee, London: Croom Helm, 1980.