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THE QUANTITATIVE BALANCE: A QUALITATIVE ASSESSMENT.(U)
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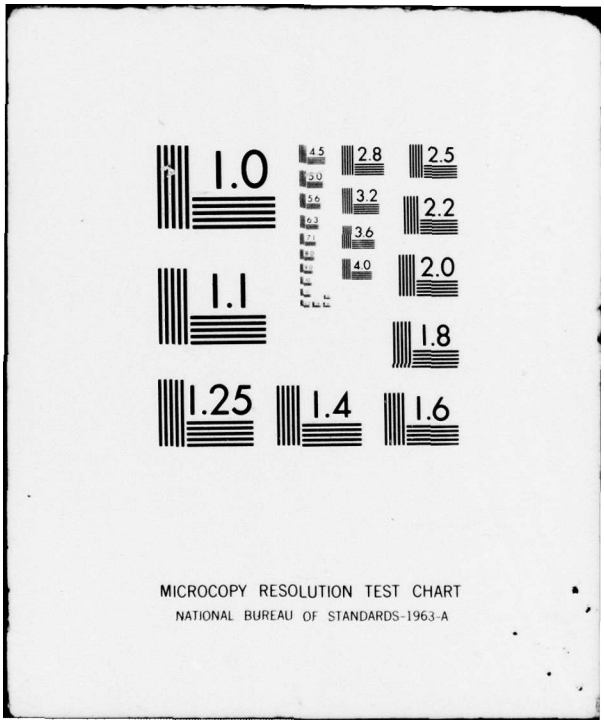
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THE QUANTITATIVE BALANCE: A QUALITATIVE ASSESSMENT.

by

(10) Robert Kennedy
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FOREWORD

This memorandum examines the strategic balance between the United States and the Soviet Union not only in terms of standard quantitative indicators of military power and capability, but also in terms of the qualitative factors which serve to modify even the most scientifically derived data. The authors conclude that, rather than in delicate balance over sharp fulcrum, US and Soviet strategic forces are counterpoised on a broad base of uncertainties which permits a number of force alterations on either side without affecting in any significant way the existence of an essential equivalence of US and Soviet strategic capabilities.

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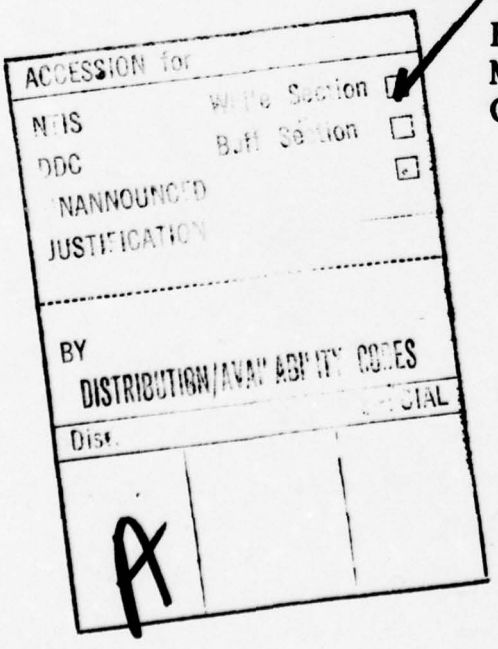
This memoranda was prepared as a contribution to the field of national security research and study. As such, it does not reflect the official view of the College, the Department of the Army, or the Department of Defense.

ROBERT G. YERKS
Major General, USA
Commandant



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DR. ROBERT KENNEDY joined the Strategic Studies Institute in 1974. A graduate of the US Air Force Academy, Dr. Kennedy completed his graduate work in political science at Georgetown University. Dr. Kennedy served on active duty briefly with the Army and then with the Air Force from 1958 to 1971 and is currently a reserve officer. Prior to his present position, he was foreign affairs officer, US Army Control and Disarmament Agency.

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THE QUALITATIVE BALANCE: A QUALITATIVE ASSESSMENT

National power, broadly defined as the ability to bargain successfully in pursuit of national interests in a multistate milieu, may be meaningfully operationalized only in a multidimensional context. Such a context must take into account cultural, psychological, political, geographical, economic and military factors. Indices of national power are not separable from material and manpower resources, the nature, size and location of territory, the rate and level of economic and technological development, cultural and ethnic composition and character, and political structure and functioning.[1] Nevertheless, in an environment in which armed conflict remains the *ultima ratio regum,* military power continues to emerge as the most prominent manifestation of national power. Hence, international bargaining entails a series of dynamic interchanges in which calculations concerning the capabilities of opposing military forces are continually pursued.

The current debate over the strategic balance between the United States and the Soviet Union reflects this process. Military power continues to be perceived as fundamental to the international bargaining process. Hence, concerns over shifts in the strategic balance are germane to the question of whether this nation will continue to accomplish, with a modicum of success, its foreign policy goals.

ON MEASURING THE BALANCE

Until the early 1960's, US nuclear superiority by any measure was so enormous that little effort was expended on attempts to calculate the US-Soviet balance of strategic power. It was generally assumed that the United States had sufficient nuclear weaponry not only to deter a direct attack by the Soviet Union on the United States, but also to deter the Soviets from initiating a major hostile action against its European allies. Moreover, it was presumed that under the umbrella of its strategic superiority, the United States was largely free to accept challenges and initiate actions in order to influence the course of world events without fear of a direct nuclear confrontation with the Soviet Union—provided that it did not directly threaten the USSR or Eastern Europe. Expressed in terms of its ability to maneuver to seek a favorable outcome to events in the international arena (without fear of a nuclear assault from its major opponent), the strategic balance clearly favored the United States.

The phenomenal growth of Soviet nuclear power over the past two decades and concurrent perceptions of a decline in the ability of the United States to exercise the degree of influence on world events it did in the immediate postwar era have generated concerns over the strategic balance. The declining US position in Asia, the inability to manage OPEC or effectively control events in the Middle East, the potential for additional fragmentation within the North Atlantic Alliance, Soviet inroads in Africa, and a host of other events have served to reinforce the contention that the overall strategic balance has begun to shift in favor of the Soviet Union and has led statesmen to wonder whether nuclear parity and the perceived potential for Soviet nuclear superiority has been translated into a meaningful advantage which might alter in a significant manner the strategic advantage the United States has enjoyed since World War II. In short, does nuclear parity or a future Soviet superiority enhance the ability of the USSR to influence the course of world affairs while limiting our own? Or, perhaps more importantly, has the balance of strategic nuclear power shifted to such an extent that the United States is now vulnerable to a preemptive first strike by the Soviet Union?

As concerns over the strategic balance have multiplied over the past few years, so have attempts to measure in a more precise manner the balance of strategic nuclear systems. In recent years efforts aimed at determining the balance of strategic systems have progressed from such

"static" measures such as relative force size, numbers of warheads, and megatonnage to more dynamic attempts to combine certain "static" measures with measures of technological sophistication such as accuracy in order to determine the strategic exchange ratio of weapons launched to silos destroyed. Such dynamic exchange calculations are purported to more accurately reflect the status and nature of the balance of strategic nuclear weapons between the United States and the Soviet Union.

Contemporary, essentially quantitative, measures of the strategic ratio of nuclear forces between the Soviet Union and the United States, supposedly indicating an increase in capability for the former vis-a-vis the latter superpower in recent years, however, remain fundamentally statistical descriptions with little explanatory power. The strategic imbalance, by all quantitative estimates previously weighted on the side of the United States and by common assumption currently and increasingly shifting in favor of the Soviet Union, must be qualitatively assessed before foreign policy action or reaction is undertaken.

This essay proposes to examine the developing quantitative superiority of the USSR from three critical standpoints: first, an examination of the quantitative-technical balance in terms of force requirements and force vulnerabilities; second, a qualitative-technical critique of the impact upon military, industrial and societal sectors of the two systems assumed in first-strike hypotheses; and third, a qualitative-political assessment of assumptions concerning perceptions and intentions of the superpowers. On each of these critical dimensions, methodological assumptions of proponents of one thesis (i.e., improvements in Soviet strategic forces represent a serious threat to the survivability of the United States) or on the other (i.e., the quantitative imbalance does not disturb rough equivalence or deterrence) must be submitted to an analysis which pays equal attention to qualitative as well as quantitative factors.

THE QUANTITATIVE-TECHNICAL BALANCE

The US strategic posture is founded upon the assumption that US strategic forces must be capable of conducting a retaliatory strike which is commensurate with the nature of a strategic attack. In this regard, US forces must be able to (1) survive a limited or general Soviet counterforce first strike; (2) penetrate Soviet defenses; (3) conduct limited options in support of a favorable early termination of conflict,

and as a last resort, (4) inflict a level of damage on the Soviet political and economic infrastructure and residual military capabilities which would clearly be perceived by Soviet leaders as a cost in excess of any conceivable benefits to be derived from actions likely to lead to a strategic exchange.[2] The quantitative-technical aspects of the current strategic balance address the issue of whether or not the Soviet Union through a preemptive first strike in combination with its surface-to-air (SAM) missile defenses and civil defense efforts could deny the United States an ability to retaliate against the Soviet Union.

At the heart of the current strategic debate is the question of whether and to what extent the survival of the US land-based deterrent forces is threatened by improvements in Soviet strategic rocket forces. This debate, of course, is not new. The survival of US land-based missile forces has been the subject of intense discussions since the Soviet Union began MIRVing its ballistic missile forces. Before the MIRV era conventional wisdom held that the Russians would have had to fire two or three missiles in order to have a high confidence of destroying one US Minuteman ICBM in its silo—a price, it was thought, no attacker would be willing to pay. Today, however, a number of analysts contend that the MIRVing of Soviet missiles coupled with continuing improvements in accuracy now threaten the survivability of US land-based forces. In an attempt to determine the survivability of the US ICBM force if the Soviets were to initiate a counterforce attack, Kosta Tsipis, a senior researcher at the Stockholm International Peace Research Institute, has assessed the interrelationship among a number of factors such as the number of warheads possessed, the warhead yield, silo hardness, and missile accuracy.[3] Tsipis calculated the total countersilo kill capacity needed to destroy, within a given probability, all US silos (KS) (see Table 1) and the total countersilo kill capability possessed by the Soviet Union (KN) (see Table 2).

Tsipis' calculations clearly demonstrated that the Soviet Union fell far short of the countersilo capability necessary to destroy the US land-based missile force in 1974.

Responding to the Tsipis calculations, Dr. R. J. Rummel of the University of Hawaii contends that, based on Tsipis' optimistic assumptions concerning CEP, the Soviets did not have a "preclusive" or "dominant first-strike[4] capability" as of 1974. However, in light of current and near future improvements in accuracy, he asks will they have one soon? Citing Tsipis' own projections, Rummel contends that "the Soviet Union will have (as a worst-case estimate—that is, the top of

Table 1. Countersilo Kill Capacity (KS) Needed to Destroy All US Silos

Missile	H (psi)	S	TOTAL KS P = .97	TOTAL KS P = .90
Minuteman III	1000	550	59,400	39,050
Minuteman II	300	450	20,250	13,500
Titan	300	54	2,430	1,620
Totals			82,080	54,170

Source: Kosta Tsipis, "Physics and Calculus of Countercity and Counterforce Nuclear Attacks," *Science*, February 7, 1975, p. 395.

ABBREVIATIONS: H = silo hardness; S = number of silos; P = probability of success.

Table 2. Countersilo Kill Capacity (KN) Available to the Soviet Union

Missile	Yield[1]	CEP[2]	K[3]	n[4]	m[5]	KN
SS-7, 8	5	1.5	1.3	1	209	270
SS-9	20	1.0	7.0	1	288	2,016
SS-11, 13	1	1.0	1.0	1	970	970
SS-N-6	1	1.2	1.0	1	528	528
SS-N-8	1	1.2	1.0	1	80	80
Totals					2,075	3,864

Source: Kosta Tsipis, "Physics and Calculus of Countercity and Counterforce Nuclear Attacks," *Science*, February 7, 1975, p. 394.

1. Estimated yield in megatons.
2. CEP = circular error probable. The radius of a circle in which one-half of all warheads delivered will land.
3. $K = (\text{yield})\ 2/3\ /\ (\text{CEP}).^2$
4. n = number of warheads per missile.
5. m = number of missiles.

a range of possible capabilities) KN's of about 80,000 in 1980, 200,000 in 1981, and 800,000 in 1985.[5] Rummel goes on to note that if our accuracy estimates were off by a factor of 4, the KN would raise to over 3 million.[6] Hence, he concludes that the Soviet Union will soon possess a more than ample countersilo kill capability (KN) which if used in a preemptive fashion could not only be used to eliminate all but a few (<12) ICBM's, but also could be used to destroy 80 percent of our bombers before they have been launched.[7]

Rummel rounds out his argument in support of the contention that the Soviet Union will soon have a "preclusive first-strike capability" by responding to those who maintain that even if much of the ICBM force and a large majority of bombers were destroyed, the United States would still possess a formidable retaliatory force composed of surviving bombers and SLBM's. Rummel contends that, given Soviet SAM defenses and civil defense efforts, the handfull of surviving ICBM's and bombers and the US SLBM force "would probably kill about 4 percent of the Soviet population, or 10 million people." This, Rummel notes, is half the cost of World War II to the USSR and far below the lower limit of destruction (20 percent of the population) set by McNamara when he was Secretary of Defense.[8]

Under such circumstances, Rummel asks "What would the Soviets gain by a first strike?" To this he responds that in a counterforce attack against its strategic nuclear forces (ICBM's, bomber bases, and missile-submarine support bases), the United States would suffer 6.7 million killed and 5.1 million injured, while an overwhelming percentage of US manufacturing capacity and agricultural capability would survive. Thus, he concludes:

> The United States would survive such an attack as a viable society. Our cities would remain largely intact, as would our industrial might. America would still be a handsome size.[9]

Conclusions based on the above calculations, however, must be faulted on at least three points. First, of the host of variables which affect the ability of the Soviet Union to execute, with a high degree of assurance of success, a preemptive first-strike, only numbers, yield, degree of silo hardness, and accuracy are considered in the above equations. Second, the equation $KN=NY^{2/3}/CEP^2$ (used by Tsipis to calculate Soviet countersilo kill capability and apparently accepted by Rummel), is subject to some inherent limitations which are not readily apparent in the Rummel presentation. Third, even if the Soviet Union

could destroy the US ICBM and bomber forces, serious questions remain concerning whether or not Soviet civil defense efforts would be sufficient to preclude an effective assured retaliation by US SLBM forces.

Concerning the first point Tsipis has noted,

> The mere fact that the total K x N of one country may be larger than the K x S of an opponent does not necessarily guarantee that the first country can destroy with certainty all the silo-based missiles of the second, because additional parameters such as reliability of reentry vehicles, the timing of their arrival against a silo, the characteristics of a silo and the type of soil it is in may affect the lethality of a warhead . . .[10]

John Steinbruner, Thomas Garwin, and Michael Nacht in excellent efforts have added significantly to the public debate by detailing a number of such constraints scientists and soldiers confront when trying to compute vulnerabilities or probabilities of silo destruction. As Steinbruner and Garwin have suggested, "calculations about overall performance [of ICBM's] under actual combat conditions must be projected from data on single components under highly unrepresentative test conditions."[11] They point out that as far as is known from the public record the Soviet Union has never exploded a nuclear warhead at the end of an intercontinental missile flight, has never fired a strategic missile on short notice from an operational silo randomly chosen, and has never fired more than a few missiles simultaneously or in close coordination.

In this vein, Steinbruner and Garwin cite a host of factors which affect the ability of a missile to destroy its target which they have grouped into two broad categories: (1) reliability and (2) interference. Reliability includes the reliability of the missile during the boost and postboost phase. Interference generally refers to the effect on the warhead during the reentry phase resulting from previous warhead detonations. This includes the effects generated by the electro-magnetic pulse (EMP), the violent movement of air near the explosion which persists for a considerable length of time and can deflect an incoming warhead off target, and the large amounts of debris that rise rapidly into the upper atmosphere which can seriously affect the accuracy of an incoming warhead. In fact, where more than one warhead is required to achieve a high degree of confidence that a missile has been destroyed in its silo, the debris from previous blasts may pose an insurmountable targeting problem.

In an earlier effort Michael Nacht also questioned assumptions which are implicit in conclusions derived from calculations based on the four above mentioned variables. In addition to the interference effect (sometimes called fratricide), Nacht noted several other variables which render difficult countersilo kill calculations—the terrain in which the silo is located, the amount of radiation visited on the silo, the weather at time of detonation, and the duration and intensity of both cratering and ground shock that follow the detonation. Moreover, Nacht argued that because the earth's nonuniform sphericity produces gravitational variations that could have an uncertain effect on the ballistic trajectories of warheads fired from different launch points to different targets, there is perhaps more uncertainty about the precise values for particular delivery CEP's than is generally reflected in the literature.[12]

Such variables as those mentioned by Tsipis, Steinbruner, Garwin, and Nacht make it difficult to determine with any high degree of confidence the probability of launching a successful counterforce first-strike.

On the second point, the value of KN, which for Soviet missiles, Rummel purports, could possibly exceed 3 million, or 2,900,000 more than needed to destroy the entire US ICBM force, is subject to limits inherent in the nature of equation itself. Where $KN = NY^{2/3}/(CEP)^2$, as CEP approaches zero KN approaches infinity. It is therefore possible to demonstrate mathematically that a country with one ICBM with a yield of 25 megatons and a CEP of .01 would have a sufficient countersilo kill capacity (KN) to destroy 97 percent of the US ICBM force. $KN = NY^{2/3}/(CEP)^2 = (1)(25)^{2/3}/(.01)^2 \sim 90{,}000$ (where a KN of only 82,080 is required to achieve a 97 percent probability of destruction of the US ICBM force). As Kosta Tsipis has pointed out,

> K does not increase indefinitely with the shrinkage of CEP. Once accuracy is such that the CEP is smaller than the radius of the crater excavated by the explosive force of the weapon, the lethality K has reached its maximum value . . .[13]

Hence it would appear that the extremely large KN's forecast by Rummel for the Soviet ICBM force are of little predictive value in terms of the success of a Soviet preclusive first-strike.

Finally, civil defense preparedness is often used to indicate a distinct Soviet advantage in event of nuclear exchange. As noted above, Dr. Rummel has contended that in the wake of a Soviet counterforce first-strike, US retaliatory forces would only kill about ten million

people or about one-half the losses they sustained during World War II. As a result of such calculations, we are asked to believe that our ability to deter a Soviet first-strike is rapidly deteriorating, that the Soviet Union might be willing to initiate or threaten a nuclear war under conditions in which forecast Soviet losses might be less than those experienced during World War II.

The first test of such a proposition lies in the strength of the analogy. Is it reasonable to expect Soviet leaders to initiate a conflict in which, at the outset, they are assured of ten million fatalities? It is one matter to find oneself engaged in a conflict, not of one's choosing, which over the course of 5 years twenty million casualties are absorbed in the defense of the homeland. It is quite another matter to consciously decree a conflict in which ten million fatalities can be expected within the first few hours of conflict, all major cities are destroyed along with, perhaps, the fabric of society.

Second, the figures offered by Rummel not only fail to account for those additional fatalities likely to result through military action should war continue beyond the first day, but also do not include the millions of fatalities, casualties, or losses likely to result from fallout, disease, starvation, defection, and societal chaos which would certainly follow a strategic nuclear exchange.

Finally, the notion that the Soviet Union could exercise a degree of coercive diplomacy knowing that it might sustain as few as ten million casualties is misleading. Any attempt at coercion through the threat of nuclear war would provide the United States an important measure of warning for its strategic and forward-based forces. Warning would enhance their survivability, increase their destructive potential, and, hence, significantly increase the casualties likely to be suffered by the Soviet Union should a conflict occur. Bomber forces might be placed on airborne alert or laterally dispersed to a wide variety of airfields. On airborne alert they would remain essentially invulnerable to preemptive attack, while lateral dispersal would seriously compound Soviet targeting. Ballistic missile submarines which are in port could be put to sea. Forward-based forces, particularly aircraft, might be vertically or laterally dispersed. The President might even consider authorizing the launch "under attack" of the ICBM force.

QUALITATIVE-TECHNICAL DIMENSION

If one grants the assumption that the Soviet Union could launch a

preclusive first-strike against the United States, what sort of impact would be felt in military, industrial, and social sectors of the American system? Given an assessment of such impact, would in fact the military victor acquire rewards sufficient to justify his own material and manpower losses, even if we grant those losses at the lowest percentages imaginable?

Dr. Rummel, citing Former Secretary of Defense Schlesinger, suggests that, assuming maximum use of civil defense facilities, if each of our 1054 ICBM's were attacked with two warheads and if each of our Strategic Air Command (SAC) and missile-submarine support bases were struck with one warhead, the United States would suffer 6.7 million killed and 5.1 million injured while 99 percent of US manufacturing capacity would survive and the effects on agriculture and livestock would be negligible. As a result, Rummel contends that America would be a "handsome prize." Hence, a "preclusive first-strike" would be a profitable endeavor for the Soviet Union.[14]

Such a line of reasoning must be faulted on at least two grounds. First, it is unlikely that a nuclear strike severe enough to immobilize the overwhelming majority of US retaliatory forces would not at the same time destroy, directly or indirectly, much of the manufacturing, agricultural, and human potential of US society. Rather than the limited attack postulated by Rummel, it seems more likely that the Soviets would attack more vigorously a wider variety of targets in order to increase the probability that an effective US retaliatory response was not forthcoming. At least two warheads, not one, could then be used against each SAC base and SSBN facility. A wide variety of command, control, and communications (C^3) facilities (including those in the nation's capital) necessary for the survival, recovery, and reconstitution of American military forces could be attacked. Moreover, if as Rummel has suggested, there were adequate time for the United States to make maximum use of civil defense facilities to reduce casualties, presumably there would be adequate time for the United States, as a minimum, to begin the dispersal of the SAC bomber fleet. Under such conditions, it seems reasonable to assume, if the Soviets seek a high assurance of success, that they would be required to target the large number of civilian and military airfields which might be used by dispersed SAC bombers. Such counterforce strikes as these would obviously greatly increase the destructive potential of a Soviet first-strike and would appear to place in serious doubt the notion that somehow the handsome prize of American agricultural and industrial potential might be left intact after a Soviet counterforce first-strike.

Second, even if the US industrial/manufacturing and agricultural capacities were relatively untouched by a Soviet first strike, is it reasonable to assume that the Soviet Union through such a strategic exchange could somehow capture this prize in a manner which would have made Soviet losses worthwhile? One must occupy the territory, administer the society, and indeed to a great extent rebuild the elements destroyed before such military victory can be translated into economic and political advantage. It is unlikely that the Soviets could attack and administer the victory over the United States in the same way that they did over Hungary in 1956, Czechoslovakia in 1968, or as we did in Germany and Japan in World War II.

QUALITATIVE-POLITICAL DIMENSION

If, as argued above, it is unlikely that the Soviet Union can achieve a high degree of confidence in its ability to execute a successful counterforce first-strike and, even if it could, would find the rewards of such an attack outweighed by the costs, what then drives the Soviet Union in its continuing path toward what some have come to call "strategic superiority?"

A number of well known explanations have been offered to counter the notion that the Soviet armament is offensive in nature. The dynamics of a military/industrial society, bureaucratic politics, ideological implications, a history, long and recent in memory, of intervention into Soviet territory, a psychological as well as technological, although interrelated, inferiority, an unstable social and economic infrastructure which is given concrete control by extensive militarization and concomitant politicization of society, numerically and/or technologically superior adversaries close to its borders, the mirror image phenomenon, all such factors point to the internal logic of a Soviet obsession with military security. The Soviet strategic buildup can also be seen as a means of securing status in an international system in which the Soviet Union remains fundamentally inferior at the economic and technical level to other major actors in that system.

In recent years, however, there has been a growing concern that the Soviet Union will be able to translate its improved strategic position vis-a-vis the United States into an important political advantage—that it will be able to achieve significant political gains in Africa, the Middle East, the Indian Ocean, and elsewhere around the world on the basis of its quantitative advantage in strategic forces. There is, however, scant

historical evidence to support such a contention. Rather, just as the United States found its quantitative *and* qualitative superiority in strategic forces of little utility as a means of forging an international system to its liking, so the Soviet Union is likely to find that margins of superiority in strategic forces are unlikely to yield significant benefits in terms of political influence.

As long as the United States maintains an ability to extract costs in excess of benefits, the USSR will remain deterred from the initiation of a strategic exchange; and threats to do so, except in the extreme circumstances of national survival, will fail to convince interested audiences. Such is the essence of an essential equivalence that caused Dr. Kissinger to question whether in an age of mass destruction either the United States or the Soviet Union could achieve a meaningful superiority in strategic systems.

CONCLUSIONS

The above analysis would seem to indicate that rather than in delicate balance over sharp fulcrum, US and Soviet strategic forces are counterpoised on a broad base of uncertainties which permits a number of force alterations on either side without cataclysmic result. Neither now nor in the immediate future will either the United States or the Soviet Union be able to attack and destroy with a high level of confidence the other's strategic retaliatory capability. Nor will threats to do so be likely to yield any significant political advantage.

Hence, there is no pressing need for the United States to move hastily in the direction of a new round of force improvements. Rather, there would appear to be adequate time for the United States not only to explore a multitude of arms control considerations with the Soviet Union in an attempt to fashion that type of stable strategic relationship desired as we approach the 1980's and 1990's, but also to look introspectively at our own strategic force modernizations to insure that at bedrock they will satisfy in the future both our minimum security requirements and the requirements of crisis stability.

ENDNOTES

1. The multidimensionality of power assessment is given attention in a recent work by Ray S. Cline, *World Power Assessment: A Calculus of Strategic Drift.*

2. Donald H. Rumsfeld, *Annual Defense Department Report FY 1978,* pp. 67-73.

3. Kosta Tsipis, "Physics and Calculus of Countercity and Counterforce Nuclear Attacks," *Science,* February 7, 1975, pp. 393-397. For additional background, see Lynn Etheridge Davis and Warner R. Schilling, "All You Ever Wanted to Know About MIRV and ICBM Calculations But Were Not Cleared to Ask," *Journal of Conflict Resolution,* June 1973, pp. 207-242; Representative Robert L. Leggett, "Two Legs Do Not a Centipede Make," *Armed Forces Journal,* February 1975; Michael Nacht, "The Vladivostok Accord and American Technological Options," *Survival,* May/June 1975; Phyllis Schlafly and Chester Ward, *Kissinger on the Couch,* pp. 63-70; Paul Nitze, "Assuring Strategic Stability," *Foreign Affairs,* January 1976, pp. 207-232; and Jan Lodal, "Assuring Strategic Stability: An Alternate View," *Foreign Affairs,* April 1976, pp. 462-481.

4. R. J. Rommel has argued that around 1980, perhaps as early as this year, it will be physically possible for the Soviet Union to attack our strategic forces and destroy our retaliatory capability. He defines such a capability as a "preclusive first-strike" capability. Moreover, Rummel argues that on the political side the Soviet Union will soon (if they don't already) have the ability to eliminate a significant portion of our strategic offensive forces while deterring us from retaliating with what is left. He calls this a "dominant first-strike capability." See R. J. Rummel, "Will the Soviet Union Soon Have a First-Strike Capability?," *Orbis,* Fall 1976, p. 579 and 590; also see R. J. Rummel, *Peace Endangered: The Reality of Detente,* p. 163.

5. Rummel, *Peace Endangered,* p. 163. Also see Kosta Tsipis, "The Accuracy of Strategic Missiles," *Scientific American,* July 1975, p. 23.

6. Rummel, *Peace Endangered,* p. 163.

7. *Ibid.,* p. 163 and p. 165.

8. Rummel, *Orbis,* Fall 1976, p. 590.

9. *Ibid.,* pp. 591-592.

10. Tsipis, *Scientific American,* July 1975, p. 20.

11. John D. Steinbruner and Thomas M. Garwin, "Strategic Vulnerability: The Balance Between Prudence and Paranoia," *International Security,* Summer 1976, p. 3.

12. Nacht, "The Vladivostok Accord and American Technological Options," pp. 109-110.

13. Tsipis, *Scientific American,* July 1975, p. 20.

14. Rummel, *Orbis,* Fall 1976, pp. 591-592.

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The strategic ratio between the Soviet Union and the United States has long been the subject of dialogue and debate in public and professional circles. From the missile gap of the early 1960's to the current estimates of an imminent "preclusive first strike" capability for the Soviets, the arguments over imbalance in superpower strategic forces to the favor of one side over the other may best be evaluated on the basis of methodological assumptions implicit or explicit in a given position.

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In addition to the standard quantitative indicators of military power and capability, which in themselves demand situational and contextual interpretation which many times defies empirical indices, there are a variety of qualitative factors which modify even the most scientifically, much less merely statistically, derived data on who is superior to whom. Credibilities, wills, goals and perceptions, not only of those immediately involved in the balance but also of those third parties to be impacted by the outcome, must be given equal attention and emphasis despite the "softness" of such indicators.

With respect to the numerical analysis of land and sea forces, conventional and nuclear arsenals of the Soviet Union and United States, several recent books and articles by leading academic and governmental authorities correctly detail a shifting scale in relative strategic power of the superpowers. The Soviets have made measureable progress toward parity or "rough equivalency" with the United States. These quantitative gains must be assessed in historical terms, i.e., the inferiority of the Soviets in previous decades, and according to a variety of qualitative factors which feature technological dynamism and economic stability in particular.

The most crucial questions, however, in the examination of the meaning of the Soviet advance in weapons acquisition center on the necessary, albeit uncertain, guestimates of Soviet intentions. Put simply, is there validity to the widely and recently distributed theses concerning "profitability" of Soviet preemtion in the near future? If there is other rationale than that of manipulating and even conquering the United States behind Soviet strategic policy, then there are obvious implications for ongoing US actions in defense expenditures and disarmament proposals.

The quantitative strategic ratio must be given an empirical context which includes economic and technological factors as well as a qualitative framework which includes political, social and psychological realities within the Soviet and American societies.