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THE ESSENCE OF ARMED FUTILITY

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Unclassified

The opinions and conclusions discussed here are those of the author, and do not reflect those of the Los Alamos Scientific Laboratory, the University of California, nor the U.S. Atomic Energy Commission.

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THE ESSENCE OF ARMED FUTILITY

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ABSTRACT

Data from unclassified sources are analyzed in order to estimate the near and longer term countersilo capabilities of U.S. and U.S.S.R fixed-base ICBM forces. It is concluded that projected Soviet deployments in the near term threaten 60% of the MM forces in a first-strike; with predictable accuracy improvement the entire force would later be placed in jeopardy. In either case, current views on fratricide suggest that 70% of the Soviet ICBM force would remain after the initial attack. U.S. force modernization for improved countersilo capability, combined if necessary with a launch-on-warning strategy, would permit destruction of most of the remaining Soviet ICBM's in a disarming second-strike. Feasible changes in MM III yield and accuracy would provide the necessary capability, particularly if MM III deployment is expanded. The generally accepted notion that instability results from ICBM vulnerability (the "first-strike premium") is questioned; mutual vulnerability can destroy that premium, by establishing the expectation that a first-strike will lead to substantial elimination of the attacker's remaining ICBM forces. If (and only if) a disarming second-strike capability is developed by the U.S., any Soviet attempt to achieve a disarming first-strike capability would be the essence of armed futility. The argument applies equally in the reverse direction. "Stability" thus depends on maintaining either mutually invulnerable or mutually vulnerable ICBM forces, to the extent that other forces can be discounted. Failure by the U.S. to respond to growing vulnerability of its MM forces, by matching Soviet countersilo capability at each step, could lead to disaster. On the other hand, such improvements in the U.S. force as is required, if it does not conspicuously overmatch the Soviet capability, should not lead to instability; on the contrary, it is necessary if instability is to be avoided.

INTRODUCTION

(U) It has been axiomatic in strategic analysis that vulnerability of fixed land-based ICBM forces is destabilizing. A "first-strike premium" resulting from such vulnerability, it is argued, increases the probability of preemptive launch in a crisis. This concern has, until recently, led to Senate action opposing improvement in the counter-silo capability of the U.S. Minuteman force, and to widespread alarm at the counter-silo potential inherent in expected Soviet deployments of new MIRVed missile systems. It has been suggested that those deployments, if unrestrained, will lead to (and indicate a desire for) a disarming first-strike capability; most of the discussion of recent Soviet ICBM programs, both official and in the press, has focussed on the first-strike issue.

(U) It is suggested here that any attempt by either side to achieve a disarming first-strike capability against the other's ICBM is the essence of armed futility, if the threatened side responds appropriately; and further that an appropriate U.S. response to the perceived Soviet threat is available within existing technology. It is argued that mutual vulnerability of the ICBM forces is not an unstable situation, in that neither side can gain a significant advantage by striking first, and in fact both may perceive a high probability of loss by doing so. Thus, if the ICBMs of one side become vulnerable to attack, crisis stability can be restored by rendering those of the opposing side equally vulnerable.

THROWWEIGHT AND NUMBERS: THE SOVIET THREAT

(U) The counter-silo potential of possible Soviet deployments of MIRVed SS-X-18 and 19 missiles was emphasized by the Secretary of Defense, James Schlesinger in recent testimony (Note 1). The threat was described in terms of 1400 high throwweight missiles carrying an average of five, one-to-two megaton warheads (the Vladivostok understanding has not significantly changed these numbers). Destabilizing implications of such high throwweight missiles were illustrated by the chart reproduced here as Fig. 1; the chart shows that at high throwweight per missile (five and ten kilopounds) a very favorable exchange ratio obtains for the nation striking first, while at a lower throwweight (two kilopounds) the exchange ratio is unfavorable. Therefore, Secretary Schlesinger described large numbers of low-throwweight missiles, in preference to smaller numbers of heavy missiles, as "the essence of armed civility".

Figure 1 here

(U) This argument, while consistent with the technology on which Fig. 1 was based, does not justify a general conclusion that low throw-weight (two kilopound) missiles cannot achieve a favorable, even a very favorable, exchange ratio; technology can substitute for throwweight (and vice versa), and the MM force with predictable improvement (a prediction based on unclassified sources) can achieve whatever countersilo capability is required against the fixed Soviet silo target system.

(U) The large number of RVs (7000) in the potential Soviet force also was a subject of concern in the discussion of Soviet first-strike capability; recent public discussions of the fratricide problem (Note 2), however, suggest that only a fraction of this total force (perhaps 30%) could be used in an attempted disarming first-strike. High throwweight reduces the fraction of available launchers that would be used in the first wave of our attack, but if it (as we shall see) should become necessary to eliminate the remainder of the Soviet ICBM force in a disarming second-strike, the precise fraction remaining to be struck is not a matter of primary significance. Secretary Kissinger is reported to have described the throwweight problem as "a bit of a phony" (Note 3); it would seem from the argument here that it is more properly the "disarming first-strike problem" that can be so described, and that only because the first-strike threat can be countered. Throwweight and numbers of deployed missiles are less important in the first-strike, and disarming second-strike, calculus than the relations between the numbers of usable RVs and silo targets, and the SSPKs of those RVs against those targets. Other implications of superiority in numbers and throwweight, for instance as against area rather than point targets, or as political factors, require further examination before an unqualified judgement can be reached that the issue is indeed a "phony". We examine here the characteristics of U.S. and Soviet ICBM systems only as they relate to the narrow issue of first-strike against each other.

PRESENT AND FUTURE CAPABILITY OF ICBM FORCES

(U) Secretary Schlesinger in his testimony described the "Hypothetical Reciprocal Countersilo Capabilities: Soviet Union and U.S. ICBMs", using a chart reproduced (with some additions by the writer) here as Fig. 2 (Note 4). CEP values derived from the sanitized chart, for the expanded

figure 2 here

MM III force, are about half the CEP conventionally attributed to the MM system; these, as noted in the testimony, together with an assumed Mk 12 yield of 170 kt, do not lead to an overly impressive counter-silo capability; the situation is worse if operational CEP degradation is assumed. Neither, it should be observed, do the corresponding derived figures for the postulated Soviet force: if it is assumed that fratricide considerations would limit the initial Soviet launch to one in which the MM silos are double-targeted (400 missiles or 2000 RVs), then, with the yield and accuracy inferred from the testimony, 400 MM silos would remain after the first wave of the attack; still more if Soviet CEP degradation is assumed. These conclusions depend on the state of technology on which Fig. 2, as presented in the Schlesinger testimony, is based.

(U) Destabilizing implications of a potential Soviet disarming first-strike capability will clearly be greatest when the Soviets can predict with confidence that (a) U.S. strategic forces other than the land-based ICBMs will be unusable, through intrawar deterrence or as a result of their prior or simultaneous destruction; and (b) the U.S. ICBM force will be reduced by a first-strike to a level that precludes an intolerable riposte by the remainder of that force, and leaves the balance decisively in favor of the Soviet Union. To the extent that these conditions fail to be met, perceptions of crisis instability must be modified. Survivability of the SLBM and some of the bomber forces is most often cited by those seeking to demonstrate that condition (a) cannot be met, and therefore that a disarming first-strike against the ICBM forces would be profitless. It is less than comforting, however, to place total reliance on assumptions about the impossibility of technological progress - in ASW for example - if alternatives exist; furthermore, the possibility of intrawar deterrence, particularly of employment against value targets, must be considered.

(U) Thus it is important to examine whether the Soviets can in the future attain condition (b). Can an unacceptable reply by the U.S be precluded? Will the imbalance resulting from an attempt to disarm be decisive, so that in effect we have no alternative but to quit?

(U) It is clear from the curves in Fig. 2 that this condition can be attained, in the short range, by neither side. A Soviet attack that left 400 operational MM missiles is hardly decisive in the sense that no

U.S. reply, unacceptable to the S.U., is possible; neither, using Dr. Schlesinger's figures, is a decisive U.S. first-strike against the Soviet forces possible. If CEP degradation is considered likely, this conclusion follows with even more force. But what about the longer term, when the Soviet MIRVed forces may attain sufficient accuracy (about 880 foot CEP with high reliability) to place the entire U.S. MM force in jeopardy in the first wave of the attack? Unless a U.S. reply can be devised that makes such a first-strike profitless, severe crisis instability could be the result.

(U) An appropriate U.S. reply becomes evident when possible improvements in the MM III system are considered; these would give the Mk 12 RV a much higher PK against Soviet silo targets. Several examples based on published estimates of yield/accuracy improvement (Note 5) are plotted in Fig. 2. With the CEP assumed by Secretary Schlesinger and a yield of 500 kt, a factor of three rather than the factor of four increase suggested by William Beecher, single-targeting of the Soviet silos (implying retention of over 50% of the MM force) could take out 70 to 85% of those silos, neglecting effects of CEP degradation. If the still smaller CEP suggested by Ulsamer is assumed, the fraction surviving is essentially dependent only on reliability.

THE DISARMING SECOND-STRIKE

(U) Modification of the MM III force to achieve the yield and accuracy described above, as well as the expansion to 1000 MM III suggested by Schlesinger (but now perhaps precluded by Vladivostok), might in the short range be construed (especially by some Senators) as an attempt to develop a U.S. disarming first-strike capability, and therefore as destabilizing. That this inference is unfounded follows from detailed examination of such factors as operational degradation of CEP and reliability, ignored in the preceding paragraph. The first-strike attacker must be expected to take the most pessimistic view of his own force capability and the most optimistic view of his opponent's. This asymmetry of perception adds to crisis stability. Thus, a Soviet leader contemplating a disarming first-strike against MM must anticipate a U.S. reply, and that anticipation will be based on his estimate of nominal, not operationally degraded, U.S. force characteristics. In the extreme case in which S. U. accuracy and reliability has advenced to a point where the first wave of an attack could be expected to substantially eliminate the MM

force, the Soviets would have to anticipate a launch of an improved MM force against his entire silo system. The point plotted at the lower righthand corner of the lefthand chart in Fig. 2, while it can be moved around a bit by varying assumptions, essentially predicts the result of such a U.S. reply: the land-based ICBM forces of both sides would be effectively eliminated as a factor in any subsequent conflict. In view of the massive collateral damage that would result on both sides, and in view of the completely indecisive nature of the result in terms of balance of force, it is clear that no "first-strike premium" exists under these conditions and therefore no crisis instability results from the mutual vulnerability of the ICBM forces. If, in addition, the U.S. has been able to withhold attack against those Soviet silos already emptied, a capability William Beecher has suggested we will have (Note 6), the U.S. would emerge from the exchange with a clear advantage, further decreasing the Soviet incentive to strike first.

(U) I have here invoked both the necessity for implementation of feasible improvements in MM III countersilo capability, and the notion that an eventual launch-on-warning capability may be necessary to preserve stability. The latter has correctly been deplored in the context of a spasm-response countervalue-oriented strategic emphasis. It is quite a different situation when counterforce (damage-limitation) objectives are primary, when an opposing force is known to have the characteristics imputed to future Soviet forces, and when the warning is based on observation of an attack as massive as would be necessary in any attempt to disarm us. Attack assessment in the 1980s must be made adequate for that purpose if the postulated maximum Soviet deployments take place.

(U) Similarly, it is clear that maintenance of crisis stability in a future state of MM vulnerability depends on achieving a high enough kill probability against Soviet silos so that the Soviets can perceive no advantage in striking first. With the defeat in June, 1974, of the McIntyre-Brooke amendment, there may be grounds for optimism that the appropriate improvements will be made; if necessary, in this situation, it appears that feasible changes in yield and accuracy (possibly, but not necessarily supplemented by expansion of the MM III force to 1000 missiles) are more important, and certainly less costly, than development and deployment of a new heavy missile.

THE CHALLENGE TO ANALYSIS

(U) The discussion in this paper is intended more to raise, than to elaborate the solution of a complex problem. It suggests that improvement of the countersilo capability of the U.S. MM III force may be essential to the preservation of crisis stability, although the degree to which such improvement will become necessary depends on the countersilo threat that evolves as a result of Soviet deployment and subsequent improvement of their new-generation ICBMs. It also suggests that in analysis of the disarming first-strike problem, throwweight disparity between the forces is a secondary issue. The numerical relations between available U.S. MIRVs and their kill probabilities, and the number of undefended Soviet silo targets (now presumably fixed by the SALT I and Vladivostok agreements), is the critical factor in calculations of strategies aimed at negating the possibility of a "profitable" disarming first-strike against the U.S. If throwweight is to remain a major point at issue in future SALT negotiations, its importance should be justified through analysis of its other implications, including political. This analysis, if done on a timely basis, may directly affect perceptions of the acceptability of the Vladivostok accord, and any resulting treaty.

(U) On the other hand, detailed analysis of the role of accurate MIRVs in the maintenance of crisis stability; of the inherent stability that results when the ICBM forces of both sides are vulnerable, and of the instability that would follow from unilateral acceptance of ICBM vulnerability, is absolutely essential if those now opposed to force modernization are to become educated to the danger to U.S. national security that their position implies. Finally, the progress, not only of the SALT II negotiations in which the Vladivostok accords will presumably be turned into a treaty (and the fate of that treaty in the Congress), but also of future negotiations in 1980 and beyond, aimed toward future force reductions, could be profoundly influenced by adequate analysis of the issues raised here. This, then is a challenge to those involved in military operations research, and to the members of the Military Operations Research Society.

Note 1. Testimony of Defense Secretary Schlesinger, U.S.-U.S.S.R Strategic Policies, Hearing before the Subcommittee on Arms Control, International Law and Organization of the Committee on Foreign Relations, U.S. Senate, 93rd Congress, 2nd Session, March 4, 1974.

Note 2. The subject of warhead fratricide is discussed, wtih perhaps some hyperbole, by Simon Winchester in the Manchester Guardian, June 29, 1974. For a considerably more technical exposition of the fratricide problem see "Why ICBMs Can Survive", by Joseph J. McGlinchey and Jacob W. Seelig, Air Force Magazine, September, 1974. An even more restrictive interpretation of the effect of fratricide appears in Kosta Tsipis, Offensive Missiles (Stockholm: Stockholm International Peace Research Institue, Stockholm Paper No. 5, August 1974).

Note 3. In Wall Street Journal, December 2, 1974.

Note 4. The sanitized chart did not contain the figures for NRR, CEP, yield, and target hardness that appear in Figure 2. However, the product of NRR and SSPK can be derived from the curves presented (the lower curves assume no operational CEP degradation). I have assumed 1.0 and 0.8 as reasonable upper and lower values for reliability that may have been used in developing the charts for MM against Soviet silos; these lead to lower and upper values for SSPK, which in turn define ratios of Lethal Radius (LR) to CEP. But a second curve is given showing the result when the CEP is degraded by 0.1 nautical mile. Thus both LR and CEP can be calculated; the higher value for CEP goes with the higher value of NRR, and conversely. The Mk 12 yield is classified, but for this calculation I have assumed the value 170 kilotons, as suggested by William Beecher in the New York Times, March 21, 1971. This yield, with the LR's calculated, gives the corresponding values for target hardness. In calculating the points that I have added to the chart, corresponding to effects of a 500 kiloton warhead, I maintained the same relationship between NRR and target hardness as in the original calculations. The arithmatic for the Soviet attack is similar to that for the U.S. attack. The dashed lines were added to the original chart by the author in order to indicate the result of specific execution choices with improved MM forces, and of the double-targeting option with the Soviet force characteristics assumed in development of the original chart.

Note 5. In addition to Beecher's suggestion (New York Times, August 5, 1972) that the Mk 12 yield may be increased by a factor of four (more than I have assumed in this analysis), improvements in guidance accuracy to a CEP of 700 feet are reported to be the objective of existing programs (Edgar Ulsamer, "The Soviet ICBM Threat is Mounting", Aviation Week and Space Technology, February 4, 1974, page 14); elsewhere Ulsamer reports a new guidance system (AIRS) that "has a very real potential to cut CEP roughly in half". The first figure is consistent with those derived from the sanitized charts; the second leads to the 350 foot CEP point added to the chart by this author (for that calculation an intermediate NRR of 0.9 was assumed).

Note 6. New York Times, March 21, 1971.

Note 7. "Counterforce Exchange Strategies", UCRL-51632, July 31, 1974.

Relationships Between Missile Size and Residual Payload Following Counterforce Attacks of Varying Size

Each side has 1000 missiles. One 1 MT RV requires 1 KP throw weight.
Non-reprogrammable reliability 0.9 KC=1.0 (0.25 NM CEP 1000 psi silo)

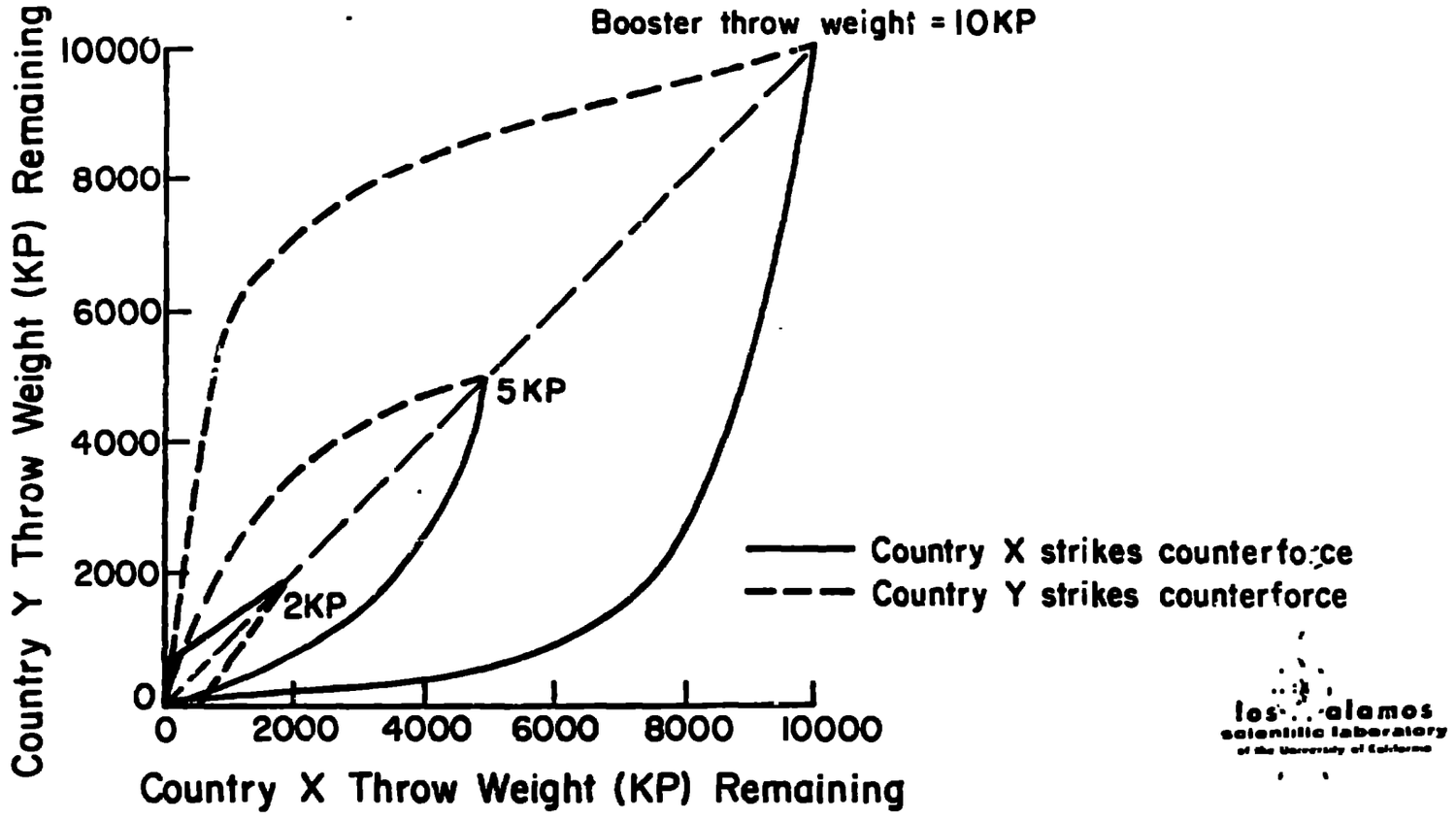

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FIGURE 1 (U)

Hypothetical Reciprocal Countersilo Capabilities: Soviet Union and US ICBMs