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**The U. S. Defense Problem as it Pertains to
Battlefield Nuclear Weapons**

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FOREWORD

For the last seven years I have worked with colleagues at the Los Alamos Scientific Laboratory on the subject of a more reasonable U.S. political-military posture. A number of us had served in various capacities in Western Europe and were appalled by the construction of the NATO military machine. In our investigation we were privileged to work in the relatively unconstrained atmosphere of the Los Alamos Scientific Laboratory to develop our ideas in what we felt to be in the best interest of the United States. In this endeavor we received assistance from friends on both sides of the Atlantic.

This document is one product of that effort. It is the text which served as the basis for a speech presented at an unclassified Tuesday colloquium in the auditorium of the Los Alamos Scientific Laboratory, January 17, 1978.



THE U. S. DEFENSE PROBLEM AS IT PERTAINS TO
BATTLEFIELD NUCLEAR WEAPONS

by

Robert Shreffler

ABSTRACT

The military forces of the United States, and its NATO Allies have been closely patterned after those forces employed to win the Second World War. U. S. theater policy is strongly oriented away from nuclear weapons and toward dependence upon conventional forces, which in NATO are confronted by an overwhelming Warsaw Pact conventional force, and a potent theater nuclear capability, the use of which is relatively morally unconstrained. The evident consequence is a NATO force which would serve as little more than an ill defined tie to the threat posed by the U.S. strategic force. The high risk associated with such a strategic deterrent, along with the high cost of a conventional force of questionable potential, suggests that other solutions to the NATO defense problem be explored. Such is the purpose of this paper. The possible solution lies with a defensive NATO force dependent upon the warfighting capability of battlefield nuclear weapons and a strategic force operating under a no-first-use strategy. As this force is optimized, it carries an increasing price of social, political, and military change of distressing proportions.

I. INTRODUCTION

This morning I would like to pass on my opinions on the U.S. political-military posture. I want to concentrate on U.S. theater forces, specifically those on the NATO Central Front, i.e., the German front, appreciating that our responsibilities elsewhere are of something like equal importance. It should be no surprise to you that my interests focus on the role of nuclear weapons. I would

I like to begin by reading a sentence which I want to adopt as a text:

"The whole object of making the (nuclear) weapons is not to kill people but to find time for somebody to find other ways to solve these problems."

Most of you will recognize this to be the inscription on the bronze plaque dedicating the LASL science museum to Norris Bradbury. This morning we will explore our success over the past 30 years in using this time to meet Norris' objective, and then inquire how we might possibly improve a not too promising situation by considering other ways.

As a first step we need to examine our present military force posture which is a carry-over from the Second World War. The strategic bombing force, admittedly with gross changes, has become our strategic nuclear force. The conventional force has been transplanted essentially intact into the present time frame. The third and foreign element of the U.S. triad is the tactical nuclear force, which you might consider as married to the conventional force; at least many treat it as an extension of the conventional force, albeit an ill-defined extension. Now this marriage was certainly not conceived in heaven; in fact, you might consider that it was brought about and has been maintained by the business end of a political shotgun. In any case, it has not been the happiest relationship. To improve the situation we have two alternatives. On the one hand we can try to put the nuclear genie--at least the tactical aspect of it--back in the bottle, a sort of divorce. The second solution is to resolve how the conventional and tactical nuclear elements can be blended together into a more agreeable relationship.

II. EVALUATION OF FORCES

In order to evaluate the present force and these possible modifications I want to define what I consider to be their essential six qualities, and then I want to use these qualities to describe the present force (Fig. 1).

- | | |
|---------------|-----------------|
| o Deterrence | o Cost |
| o Warfighting | o Acceptability |
| o Risk | o Proliferation |

Fig. 1. Force qualities.

Deterrence is the capability of a political-military posture to prevent a war of any kind. Today, and particularly in the United States, one should add that it is essential to deter any kind of nuclear war. We depend upon our strategic force for the bulk of our deterrent, and in my opinion, herein lies our major problem. Were deterrence to fail, one is confronted with the task of stabilizing the situation. In NATO, nominally this would mean maintaining or reestablishing the present political boundaries with the warfighting capability of the force. Many would argue that our present NATO force is not quite up to this task. In fact, this is a view expressed in a recent Washington policy document called PRM 10 (Presidential Review Memorandum) entitled, "Military Strategy and Force Posture Review." Let me quote a sentence from that report as it was stated in The New York Times.

"The chance of NATO stopping an attack with minimal loss of territory and then achieving its full objective of recovering that land which had been lost appears remote at the present time."

I suppose one can associate risk with any political-military action. However, I would like to restrict our attention to that risk associated with the prospect of strategic nuclear war. There are several reasons for my conclusion that this risk is unacceptably high. In the first place, the present deterrent rests almost completely on the threatened use of our strategic force, along with a strategy which capitalizes on our unpredictable behavior. In addition, our performance over the last 20 years in the Far East hardly inspires confidence in our capability to manage crisis.

I would concede that an evaluation of the risk of a strategic exchange involves a subjective evaluation as does the next quality of cost. This year our military budget was \$105 billion. Next year it will be between \$125 and \$130 billion. To some of my friends this is a reasonable price to pay for insurance against war, particularly nuclear war. For me it is a rather steep premium, particularly when I am not at all certain of the quality of the insurance. With regard to cost there are a few additional bits of information which are worth remembering.

First, we devote only about 15% of our budget for our strategic force; practically all of the remainder is expended on our conventional force. Relatively little, but probably too much, is expended on our tactical nuclear component.

Secondly, according to a brief recent report in Newsweek, the Russians are spending 40% more on their military machine than we are and their return per

dollar spent may be significantly higher if for no other reason than their expenditure on manpower, the principal military expense item, is much lower.

In our current nuclear reference frame, acceptability is a quality of overriding importance. Strategic nuclear forces are tacitly accepted, possibly because there seems to be no alternative and their prospect of employment is so low. Battlefield nuclear weapons, on the other hand, are rejected by every element of our bureaucracy; they have few supporters particularly in our military organizations where the incompatibility of conventional forces and nuclear weapons as we plan to use them is professionally appreciated. Unquestionably a major purpose for our expensive conventional force is the isolation it is supposed to give from any necessity to contemplate the prospect of nuclear war of any kind. Again may I add that we are paying a high premium for insurance of questionable quality.

There is another reason why the U.S. at large is revolted by these theater nuclear weapons. It has to do with how they visualize these weapons are to be tactically employed by the NATO forces. In brief, nuclear weapons can be employed in a great many ways. Of course none of them has been tested in battle, but it is fair to say that some of these ways, such as disarming strikes, certain tactical offensive uses, and the defensive uses I will discuss, are extremely effective. Others are ineffective--even counterproductive. It is unfortunate that those ways considered by the United States fall into this second category. As a consequence it is no wonder that these nuclear weapons have been rejected by the U.S. and its Allies on this account alone.

Finally there is this quality of proliferation of nuclear weapon technology, capability, and assets. It is probably fair to say that there is no single topic which provokes more concern in this country than this subject. The President seems willing to jeopardize the nuclear aspect of his energy program to guard against the prospect of proliferation. To some unquantifiable degree this high concern is one measure of the unacceptability of the current political-military posture. Since I think proliferation is about as sure as death and taxes, actions to put off proliferation evidently are to buy time for us to realize Norris' objective, i.e., to generate some better solution to the problem.

I want to return to this figure later in order to assess a possible substitute for the present force. Evidently a candidate to be successful must excel in these six qualities, and it must be increasingly superior as it departs from the present force. Indeed, the present force posture is about as secure as the

Rock of Gibraltar. Secondly, a candidate which employs nuclear weapons as a recognized warfighting tool is certainly in for a difficult time.

III. ATTITUDES WITH RESPECT TO THE PRESENT NATO FORCES

In order to further assess our present force, I'd like to give you my perception of how various people evaluate it and how some would like to see it developed and deployed in the future. First I want to take a quick look at the NATO strategy, which of course, the United States has endorsed; then give you my impressions of allied and adversary attitudes.

Our present military strategy in NATO was developed during the 60s to replace an earlier strategy of massive retaliation, a strategy that depended almost totally on the threatened use of our strategic forces. The new strategy promised to defend NATO at its borders (it was termed a forward defense). The documents which define this new strategy are masterpieces of ambiguity. They will accommodate almost any political-military attitude. For example, the U.S. has chosen to depend almost completely upon conventional forces. Although a perfunctory bow is given to the strategy of flexible response which insures meeting an attack at the border and at any level chosen by the Warsaw Pact--conventional or nuclear, at the same time a contrary strategy, depending upon a strong fire-break or barrier between conventional and theater nuclear war, is officially endorsed.

Our European Allies evidently disagree with the U.S. position about the value of conventional forces. First, they are reluctant to become a party for a third time in this century to a conventional holocaust. Second, were they to agree in principle to a conventional approach they would be reluctant to enter a conventional arms race which they feel they would probably lose in spite of their superior GNP and population. Third, and most important, there would seem to be little advantage in deploying a conventional force which could be so easily destroyed with nuclear weapons in the hands of an adversary who has few hangups about using them. In fact, it is not clear that improving NATO conventional forces does not insure that if war does come it will be initiated with a Soviet nuclear attack. Finally, it is evidently extremely difficult to evaluate how large a conventional force NATO needs. Such elements as strategy, tactical surprise, quality of training and material as well as numbers of people and equipment, all evaluated for both the Warsaw Pact and NATO spell out a difficult task which produces results with large uncertainty and questionable value.

According to the PRM 10 this imbalance at the present time favors the Warsaw Pact by a factor of 2. I've already quoted the conclusions from that document. Not only is this imbalance frightening, but there is no consensus as to what the goal should be. Somewhat in jest, I take comfort in a quotation from Admiral Zumwalt's book "On Watch," where he reports a conversation with Prince Bernhard of the Netherlands on how the U.S. should set its force levels:

"...if the U.S. reduced its troop levels in Europe, the allies would reduce theirs, on the ground that what was good for one was good for all, and that if the U.S. increased her troop levels in Europe, the allies would reduce theirs, on the grounds that more U.S. troops meant fewer allied troops were needed. Therefore, he said, the only thing for the U.S. to do was to keep the level just where it was which would not give any other nation an excuse for making changes. He was absolutely right."

On the other hand, the current European perception of theater nuclear war is probably more horrifying than the perception of conventional war. Their only alternative short of surrender (which would seem an increasingly more likely prospect) would seem to be to follow the U.S. dictates at any cost and hope that they will be able to salvage some degree of deterrence from the linkage the NATO force gives to the U.S. strategic force. Such an attitude is particularly characteristic of the West Germans. I will refer to this option as "SIOP linkage."

The stated attitude of the Soviet Union with respect to battlefield nuclear weapons is to eliminate them from the NATO theater--both NATO and Warsaw Pact weapons. This is understandable in the context of the investment they have made in their conventional force. Remember that the U.S. assessment is that this force is twice the size of the NATO force. Now the purpose of this preponderant force may be to serve a purely defensive role; I consider this objective quite unlikely. More probably the Soviet force mission is to leave the strong impression in the mind of the NATO Alliance that it could take over and hold Western Europe by force whenever it desired. In either case, but particularly in the latter case, this conventional force loses its credibility when NATO nuclear weapons are introduced into any scenario. In my opinion this stems much more from the ill-defined linkage these weapons give to the U.S. strategic forces than in their warfighting capabilities. In brief the Soviets fear our NATO force for the same reason our Allies endorse it--SIOP linkage. In any case, these Soviets could hardly propose to remove all theater nuclear weapons without

feeling confident that they have, and can maintain, conventional dominance. There are other issues which enter into the Soviet decision to trade their battlefield nuclear weapons for ours. Most important is the fact that their new Soviet based, nuclear missile, the SS-20, would serve their invasion of Western Europe by supplying direct support for their offensive thrust. More likely these weapons would be employed in a surprise disarming strike against NATO's airfields, nuclear and conventional ammunition storage sites, surface navy, other select elements of the conventional force, and possibly seaports. In a matter of minutes they would essentially wipe out NATO's fixed military capability and, incidentally while doing only nominal damage to Western Europe at large. The way would thus be paved for easy take-over and control. The only Soviet concern in executing such a disarming attack is, again, the fear of retaliation by the U.S. strategic force. This fear diminishes as the relative strength of the Soviet strategic force increases, as its civil defense improves, and as ties between Europe and the U.S. weaken by such action as the partial removal of U.S. theater nuclear weapons.

In light of the attitudes of our allies and our adversaries, it is not surprising to find the U.S. growing uncomfortable under the risk associated with the strong tie of NATO defense to the U.S. strategic force, i.e., SIOP linkage. This suggests serious attention be given to the conventional and tactical nuclear legs of the triad along with their unhappy marriage. What I should like to do is what I proposed in my introductory remarks--to explore a bit more deeply the prospects for divorce of the two legs of the triad on the one hand, and improving the relationship on the other. Clearly there are other alternatives which, in general, try to make the best of the present situation. In fact, I imagine we will end up making nominal but painful changes in our NATO force, and increase our efforts at the conference tables in Vienna and Geneva. When one considers the difficulty of making any changes in our political-military posture, our senior authorities may feel that they have no other choice. Now let us explore two force alternatives.

IV. U. S. MILITARY ALTERNATIVES

By divorce I mean to imply the improvement of the NATO conventional forces to a level that would defeat a Warsaw Pact conventional attack. At the same time NATO tactical nuclear weapons would essentially be eliminated, either by

various political and military artifices, or by physical removal from the theater. The threatened use of strategic forces striking close or within the Soviet Union would serve as a major deterrent to tactical nuclear weapon use by the Warsaw Pact. It is not surprising that this extreme position is strongly supported by many of our senior retired military officers whom you may consider act as the relatively unconstrained conscience of our military personnel. However, such an approach is simply out of the question for precisely those four reasons raised by our allies in opposition to increasing conventional forces. They have no desire for a proposal which offers a conventional World War III, a taxing, ill-defined arms race, or a force which may serve to precipitate, not prevent, nuclear war. In short, this conventional approach is a loser.

Now let's take a look down the other avenue, the one which leads to a happier relationship between the conventional and the tactical nuclear elements. In March 1977 the U.S. Army published a revised version of its field manual, FM 101-31-1, in which the dominant role to be played by battlefield nuclear weapons in NATO in the event of war, as described therein, is to support the conventional NATO force in halting an enemy penetration. This is accomplished by a field (corps) commander firing packages of rather large numbers (50 and possibly many more) of higher yield nuclear weapons within a short time pulse primarily to saturate selected areas with nuclear fire. Although the Army goes to some pains to restrict the number of civilian casualties and constrain property destruction, noncombatant deaths due to a frontal attack by the Warsaw Pact into the Federal Republic of Germany would, according to the Army's own calculations, be measured in many tens of thousands. Such Army planning is somewhat surprising since it should be quite clear to them from many well documented NATO examples that one just cannot carry out peacetime military planning involving nuclear weapons which overtly place the people of the country in jeopardy. In short, the U.S. Army's concept of the role of battlefield nuclear weapons will not find acceptance in Europe. In addition, the approach can be questioned on military grounds. The tactics for employment are complex and may well be applied in a deteriorating military situation. Finally, such use could well cause the Warsaw Pact to preempt with their own nuclear weapons. The New York Times, summarizing a PRM 10 conclusion, which of course may not have been made with this Army proposal in mind, states the following: "The report questions whether the use of nuclear weapons in Europe would work to the advantage of the West." Similar statements are recorded many times in the recent literature.

Questionable as the current approach by the U.S. Army may be, it has several points worthy of comment. The first is that it represents an attempt to use battlefield nuclear weapons in a warfighting role. Secondly, it retains the flexibility to permit the President to postpone the release of the nuclear weapons as long as he wishes; though it should be stated in all fairness, that the Army places high value on early release. As such the Army proposal can be defined as a dutiful and realistic response to the U.S. interpretation of the NATO doctrine of flexible response. It is questionable whether any other member of the U.S. bureaucracy but the architects of this position within the U.S. Army would have gone this far.

V. A NATO POLITICAL-MILITARY ALTERNATIVE

Although this attempt by the Army falls short of the mark, its deficiencies can be largely corrected without seriously intruding upon the present force structure. As a first step, it would seem prudent, however, to involve the entire Alliance in the exercise by posing the following question: Will NATO consider changing the role of its battlefield nuclear weapons to support a deterrent based upon a true nuclear warfighting capability?

It is not at all clear how this question would be answered in the U.S. For that large body who see the solution as making the best of the status quo, the preference may be to not address the question. On the other hand, for those who would choose to do so, the question would certainly be dominated by a majority preferring a strong conventional force with no nuclear warfighting capability. I would expect a small minority to respond positively, though this would seem to offer the optimum prospect for success, particularly in the long run. In any case, for the rest of the hour we will explore an extension of the Army position which would better serve NATO's purpose and still not depart too far from the present Army proposal. It would consist of a fixed, highly developed nuclear defense deployed at some distance from the border, and superimposed upon the present conventional force (Fig. 2). The precise positioning of this nuclear deployment from the border would be mutually endorsed by all involved Allies. Instead of using weapons to saturate an area with nuclear fire, they would be employed to attack only acquired targets, with the Warsaw Pact maneuver company (the basic building block of Soviet combat power) as the target of interest.

An ideal weapon for this defense, one well within current technical capability, would be a relatively cheap, highly survivable, and accurate ($\sim 100\text{-m}$ CEP)

- o Fixed Highly Developed Nuclear Defense
- o Located at Some Agreed Distance from Iron Curtain
- o Superimposed upon Conventional Deployment
- o Acquired Not Area Fire
- o Target: Warsaw Pact Maneuver Company
- o Nuclear Weapon: 100 km Range, Relatively Cheap, Highly Survivable, Reasonably Accurate (100 m CEP), All Weather Missile
- o Nuclear Warhead: 0.5 kt Fission Bomb (10 to 100 Times Smaller)
- o Deployment: Four Missiles on Standard Five-Ton Truck
- o Depth of Defense: 100 km
- o Conflict Restriction: Forward Few Kilometers, from Which Noncombatants are Removed

missile' capable of operating in all weather conditions. To defeat the maneuver company, it would deliver a warhead of fission yield about 1/2 kt, 10 to 100 times smaller than the fission weapon yields proposed for area fire under current doctrine. To meet the demands of the threat posed by the Warsaw Pact on the Central Front would require of the order of 4000 such weapons. One proposal mounts four missiles on 1000 standard Army trucks, 300 to 400 of which would be continually deployed.

Fig. 2. Nuclear warfighting element proposal.

In order to restrict collateral damage and meet the military demands of target acquisition and force invul-

nerability, the depth of the defense would be about 100 km (the range of the missile), with intense nuclear fire essentially restricted within a few kilometers of the forward edge. In time of crisis all noncombatants would be removed from this forward area, which would be carefully prepared with highly instrumented, properly manned, fixed defenses.

Such a defense would serve as an almost impenetrable barrier against massive aggression. At the same time it would not overtly place noncombatants at risk to nuclear fire. Behind such a barrier the NATO conventional force could effectively regroup to recapture overrun territory. Such a defense would have sufficient probability of success to strongly deter implementation of Soviet plans for aggression.

For this fixed defense to work well, there are four additional steps to be taken, natural extensions of this nuclear defense.

1. The NATO strategic force should have one purpose, to deter a Soviet strategic punitive attack. These weapons would be trained on Soviet cities and should operate under a no-first-use constraint. Extended range Pershing or missiles launched from submarines would serve this purpose. A strong effort should be made by the U.S. to promote a Western European responsibility for this force.

2. The NATO nuclear stockpile would consist only of the battlefield defensive weapons and these strategic weapons. There would be no interdiction weapons.

3. To deter or frustrate Soviet nuclear attack against NATO military targets, every reasonable effort should be made to reduce the vulnerability of these targets, while maintaining a capability to defend NATO real estate.

4. A new strategy would be written around a force so described which recognizes the complete independence of the two forces until the highest political level. Such words as "escalation" and "flexible response" would be struck from the NATO lexicon. This force would be characterized by a well-defined distinction or firebreak between battlefield and strategic forces in order to insure the timely release of battlefield nuclear weapons.

Were such a battlefield nuclear capability deployed with the improvements cited in the four steps, it is probable that in time the importance of the roles of the present conventional forces will diminish to be replaced by a NATO nuclear defense with its forward edge moved to the border. Let us have a look at how such a nuclear border defense would be evaluated using the six force qualities shown in Fig. 1. The deterrence of the NATO strategic force would be restricted to the deterrence of a Soviet punitive strategic attack under a no-first-use policy, and the responsibility for this force and its release should rest ultimately with Western European political authority. In time, U.S. strategic weapons should be employed to deter attacks on the United States, with U.S. commitment to employ them otherwise unstated. Deterrence of an enemy border intrusion would have shifted to the battlefield defense, which would now possess a true warfighting capability. The risk of a strategic exchange of any description would be correspondingly lowered. With all the present forces removed and replaced by a border nuclear defense the cost would be significantly lowered. One would hope that the force would be accepted by the European Allies. U. S. acceptance may be secondary. In addition to the advantages just reviewed, one should remember that the area of warfighting has been restricted, and the threat to noncombatants by the NATO defense has been essentially eliminated. Nevertheless, acceptability where nuclear weapons are involved is not a rational quality. Finally there is the thorny subject, proliferation. Were this force to work as well as our studies would indicate, it would become readily accepted, if not in NATO, by countries with more immediate and pressing needs. It is just too simple and credible a solution to be ignored. In spite of the fact that more

countries might have nuclear weapons, the prospects of use may be lower and the consequences, if the weapons are used, far less severe. As a consequence, hopefully, we would worry far less about proliferation.

My friend Sandoval, wrote an article on proliferation published in the Bulletin of the Atomic Scientist which contains a few quotes not quite on this NATO point, but just too good to pass up. He states:

" . . .It remains to be seen whether some hitherto nuclear-naked country will opt for a nuclear defense, forego posing the risk of destruction to its potential enemies, and accept the risk that its enemies may find a reason to destroy it, though they could not capture it intact." He goes on to say, "With the defense of its borders entrusted to forces structured around the firepower of nuclear weapons, any nation not now a nuclear power, and not harboring ambitions for territorial aggrandizement, could walk like a porcupine through the forests of international affairs; no threat to its neighbors, too prickly for predators to swallow."

VI. CONCLUSION

Specifically what should be done in order to reach a decision on this matter? At this moment we should take advantage of the attention generated by the neutron bomb debate to urge consideration of our leading question. Such opportunities rarely occur. Secondly, we should encourage the further definition of the Nuclear Warfighting Element, if not in NATO, in those countries where the need is more pressing. We have already done a considerable amount of thinking and writing on the subject of a Nuclear Border Defense Force, and we will probably do more; however, a far more meaningful effort could be done by political-military authorities. This force is far more simple than the existing conventional force and can be evaluated and tested on computers. The DOE weapons laboratories are well equipped to do this. John Hayes has already carried out this kind of gaming at Los Alamos. The Sandia Laboratory at Livermore and the Lawrence Livermore Laboratory have impressive software capabilities for such gaming. Finally, before final acceptance of such changes, one must test such forces in the field. Somewhat tongue in cheek, as a first step we would propose "nuclearizing" a rather nondescript and small force called the ACE Mobile Force. The intention would be to use this force to establish segments of the Nuclear Warfighting Element across major European invasion routes. A final task would be to develop the type of missile which I described a few minutes ago. Such a missile would enhance any force which placed dependence--no matter how ill-defined--on battlefield nuclear weapons.

To a degree my remarks have been contrary to the position taken by President Carter. However, I'd like to let you be the judge in this matter in light of a quotation from a speech he made on October 4 of last year before the General Assembly of the United Nations. I quote from the conclusion of that speech:

"To summarize. . . In order to reduce the reliance of nations on nuclear weaponry, I hereby solemnly declare on behalf of the United States that we will not use nuclear weapons except in self-defense; that is, in circumstances of an actual nuclear or conventional attack on the United States, our territories, or Armed Forces, or such an attack on our Allies. . ."

If one interprets the President to mean "reliance of nations on nuclear strategic weaponry" then the proposed battlefield nuclear defense force coupled with a strategic force bounded by a no-first-use strategy would seem to be made to order.

However, I do not want to leave you with the impression that I think we should rush out and deploy a nuclear border defense. To introduce the rather simple modification of the present U.S. Army proposal would be difficult, particularly because it would raise the consideration of the nuclear warfighting issue. To adventure down those ensuing four steps would prove more painful. However, I do feel that we should explore these issues with great care, appreciating that the stakes are enormous. We may not choose to adopt the nuclear border defense force, but the exercise may permit a far more enlightened journey down whatever path we choose to take. On the one hand we are faced with making these difficult changes to our military force; on the other we are faced with the risk associated with an almost complete dependence upon a strategic deterrent and the high cost of a conventional force of questionable potential. It is a difficult choice.

It would certainly be nice to have a simple and pat answer to our political-military problem. It would be comforting to be able to meet Norris Bradbury's objective by forcing the nuclear genie back in the bottle. It should be clear that I don't know how to do that and I'm not sure I would do it if I could.