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THE MX MISSILE AND STRATEGIC PROGRAMS

HEARING

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THE MX MISSILE AND STRATEGIC PROGRAMS

THURSDAY, JULY 30, 1981

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON INTERNATIONAL TRADE,
FINANCE, AND SECURITY ECONOMICS
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:10 a.m., in room 5110, Dirksen Senate Office Building, Hon. William Proxmire (vice chairman of the subcommittee) presiding.

Present: Senator Proxmire and Representative Richmond.

Also present: Richard F. Kaufman, assistant director-general counsel; Charles H. Bradford, assistant director; Betty Maddox, assistant director for administration; and Chris Frenze, Keith B. Keener, Marian Malashevich, Robert Premus, and Richard Veddar, professional staff members.

OPENING STATEMENT OF SENATOR PROXMIRE, VICE CHAIRMAN

Senator PROXMIRE. The subcommittee will come to order.

Gentlemen, we are delighted to have you here this morning. Of course, we are here to discuss the MX missile in a different context than it is usually discussed. This is the Joint Economic Committee. This committee has a particular concern about the economy and the effect of government policy on the economy.

The MX is a weapons system that could have a profound effect on our economy in many ways, and that is one of the reasons why I want to discuss this. I have something else in mind that I want to emphasize a little bit later.

But let me start off by saying, the idea of a mobile missile system has been debated for years. President Carter formerly proposed MX and Congress appropriated $670 million in 1979. About $1.5 billion was appropriated in 1980 and the current request is for about $2.4 billion. Yet, the program remains highly controversial.

If there is a clear case for building the MX, there are few in Congress who understand it, fewer enthusiastically support it.

The Pentagon, even now, appears to be straining over a decision to go forward with the present program of 200 MX missiles hidden among 4,600 shelters, or to shift to a seabased or airborne system.

One can only wonder about the orderliness of MX decisionmaking. For the Government to spend hundreds of millions of dollars on a program over a 2-year period, and then consider a drastic change of course and design hardly seems the best way to proceed.

If there is so much doubt about the design today, why was the program launched 2 years ago? Is there also doubt about the justification for the program?

Let me say that there is a case for increasing—in my judgment—for increasing and improving our deterrent. I want to know whether or not the MX will provide the same deterrence as other alternatives, or better deterrence.

The MX, in my judgment, does not destabilize the arms race any more than any other improvement in our deterrent would destabilize it. It does not violate the unratified Salt II treaty. It would not increase our first strike capability.

It would increase our capacity to survive a first strike and launch a retaliatory strike—if it would work—and we do need that.

I start from the assumption that only the U.S.S.R. would launch a first strike. We would not. I assume the U.S.S.R. would only launch such a strike if they believed such an action would leave them with clear nuclear superiority. And I assume that the present U.S.S.R. leadership would probably not launch a first strike, but that leadership will die off in the next 5 years or so and a younger, more aggressive, more desperate leadership may succeed them.

With the Soviet Union failing so dismally in its own economy and in world leadership, and facing the prospective disintegration of its Warsaw Pact Alliance as developments in Poland suggest, a new Russian leadership might consider a first nuclear strike seriously.

Consider the advantages: If successful, it could wipe out our ground-based missiles. It could wipe out half to two-thirds of our submarine deterrent—everything we have in port. It could annihilate up to half of our airbased nuclear strike force—everything that we have sitting on the ground. It could start an evacuation of its cities the moment it launched its strike.

As a result, this country loses two-thirds of its nuclear capacity, all of its industrial capacity and half its population. The remaining half would have to spend full time struggling to stay alive.

The U.S.S.R., after a second strike from our depleted nuclear capability, would lose much of its industrial capacity. If evacuation is successful, as some would argue it could be, they might have 90 percent of its population survive, and relatively little of its nuclear capacity lost, because when we retaliate all their subs would be at sea, all their planes in the air. We could have only a third or less of our nuclear capacity available for retaliation.

On the other hand, if we have a survivable ground-based deterrent, our retaliatory capacity would provide a much closer match after a first strike.

So, I think the case for a survivable retaliatory capacity is a very powerful case. What concerns me is whether or not the MX offers that.

The clearest thing about the MX is that it will be expensive and have important effects on the economy. One of the purposes of this hearing is to inquire into the costs and the economic effects of the MX.

I hope we don't get lost in a maze of numbers, but it is important to cite some figures.

The Air Force has estimated the MX will cost about $34 billion to buy, and $6 billion to operate, or a total of $40 billion in 1980 dollars. Obviously, those costs will be much higher when future inflation is

taken into account. How much higher? And, has the Air Force correctly estimated the support as well as the acquisition costs?

We have learned the Pentagon's estimates of the future costs of new programs are almost always too low. Cost overruns of 50 percent to 100 percent or more are not uncommon. In addition, most weapons cost figures refer to investment or acquisition. Support or operating costs are often overlooked or minimized.

In the past few days, the subcommittee staff has learned that an internal Air Force review earlier this year concluded that the acquisition costs of the MX have increased by $4.6 billion. This alone would raise the official estimate to $44.6 billion, although the Air Force has not yet officially acknowledged this increase.

One disturbing aspect of this program is that it has so far not been included in the Pentagon's selected acquisition reports, the SAR's, by which Congress tries to keep track of new major weapons. So, despite the notoriety, MX has not had the visibility it deserves.

Before introducing the witnesses, I would like to say that I began investigating military programs during the Johnson administration and I raised questions about the management of military programs, their costs and their economic effects every year since the middle 1960's.

This is an important and constructive function. I can think of no greater disservice for Congress to perform than to adopt a noncritical, permissive attitude toward the Department of Defense.

I believe we need to strengthen our defense. The issue is always whether any particular initiative is a productive allocation of military resources. It goes without saying that the first prerequisite is to know the truth about the costs of defense programs.

Appearing with us today are David Gold, director of military research for the Council on Economic Priorities, and Christopher Paine, staff assistant for arms control at the Federation of American Scientists. Mr. Gold, Mr. Paine, and Gail Shields are coauthors of a new study of the MX to be discussed this morning.

Following their testimony, we will hear from Peter Sharfman and Robin Staffin, both of the Office of Technology Assessment.

Gentlemen, if you will summarize your prepared statements, we will then address some questions to you, and of course, we will start with Mr. Gold.

STATEMENT OF DAVID GOLD, DIRECTOR OF MILITARY RESEARCH, COUNCIL ON ECONOMIC PRIORITIES, NEW YORK, N.Y.

Mr. GOLD. Thank you, Senator.

As you stated, the Council on Economic Priorities is releasing its study of the MX missile today, a study entitled "Misguided Expenditure."

I have a prepared statement which I will submit for the record, and what I will do now is briefly summarize it.

Our work was in two parts. The first part discussed the military rationale for the system, and our final conclusion in that analysis, is that no matter how it is based the MX missile is not needed for deterrence of a nuclear attack upon the United States.

In addition, we conclude that the basic purpose of the MX missile in military terms, is the addition of a counterforce capability to the United States arsenal, and we also conclude that the MX is not necessary for that mission and in addition it would result in an increase in the likelihood of nuclear confrontation with the Soviet Union.

Now, I would just leave it at that for the time being, just briefly summarize it, and Mr. Paine can discuss more substantively, the basis for those conclusions.

What I would like to do in my oral statement is to summarize some of the key arguments in our economic analysis, and particularly the issue of what will the system cost.

PROJECTING COSTS OF MX

We think there are two ways of approaching costs. One is to add up the dollars and cents. And I will have some comments on that. That is to focus upon the budgetary costs, the costs to the taxpayer of such a system. The second way is to employ economic analysis to focus on what will be the cost to the economy as a whole; what will be the impact, the economic impact of spending this massive amount of money over the next 20 years?

We performed some economic tests using input/output analysis which I would also like to summarize.

First, with regard to the budgetary cost, what we did in our analysis was to do an exercise on what we will call classification. That is, we looked at the various elements that go into making up the costs, looked at the results that have been put forward by agencies that we have studied—and, may I add parenthetically that our work was completed before the release of the analysis of the Office of Technology Assessment, so later if the committee desires, I can comment on their analysis.

What we did simply was to try to isolate what areas are likely to see changes in costs or increases in costs. As you stated, Senator, the Air Force has estimated that the system will cost $34 billion in 1980 dollars to acquire, an additional $6 billion, also in 1980 dollars, for operations and maintenance.

There are at least two other areas where there are likely to be changes in costs. The first, also one that you mentioned in our opening remarks, is the history in recent years of the cost of existing weapons systems. It is not very optimistic with regard to being able to control those costs.

If the Soviet Union were to build beyond the ceilings established by the SALT agreement, the size of the MX system could grow by as much as 158 percent. Now, that is the outer limit. The growth of the system as a result of the CBO analysis, would be somewhere between 7 percent and over 150 percent of the baseline cost estimates.

Translating that into dollars—and this is still in 1980 dollars—results in an addition to cost of some $7 billion to as much as over $70 billion. That brings the cost estimate to between $52 and $116 billion, again in 1980 dollars.

Now, the other element that I think has to be seriously discussed is the element of inflation. It is quite legitimate to discuss costs in constant dollars. Certainly any analysis of how resources are allocated in

this society, has to be stated in terms of what the real or deflated costs are going to be.

It is also, however, legitimate to state costs in current or inflated dollars. The basic reason is that those are the dollars that people pay taxes in, and those are the dollars that bills are paid in. Those are the dollars that appear in the press and those are the dollars that the Members of Congress are asked to appropriate.

Now, estimating inflation over a period as long as 20 years, or perhaps even longer, results in a substantial amount of guesswork. I don't know of anybody who can really project inflation over that period of time. In fact, I sometimes am very pessimistic about our ability to project inflation from month to month, or even week to week.

Most estimates of inflation have tended to result in current dollar costs that are approximately double the size of the constant dollar costs for a system like the MX. I simply adopted that as a rule of thumb. I don't claim scientific precision, but it seems to me that gives us an order of magnitude with which to operate.

If we assume that inflation will double the stated cost to the system, that brings the estimate to between $104 and $232 billion.

Again, just purely by way of illustration, and recognizing that a figure of $232 billion represents an outer edge of a range, that figure would amount to some $2,500 for every taxpayer in the United States. Currently about 90 million taxpayers, and that figure would have come to something like $2,500 for each taxpayer.

I would also like to point out that there are several other areas of costs that have simply not been included. The costs of producing the warheads themselves are under the Department of Energy, are classified and are not included in any estimates. The cost of adding a ballistic missile defense system which is increasingly being discussed, have also not been included.

Estimates for a BMD system range to as much as $10 billion, again in 1980 dollars.

There have been estimates of what it would cost to engage in what is known as split basing—putting half of the shelters in Nevada and Utah, and half in New Mexico and Texas. According to the Air Force, that would add another $3 billion in costs.

In addition, there are costs that are going to be borne by Government agencies other than the Department of Defense. I am particularly thinking of costs of local economic and social adjustment. There have been some funds transferred to the Four Corners' Commission involved in the States of Utah and Nevada. But as far as I am aware, there has been no concerted effort to itemize and to account for what these costs are going to be.

At one point in 1979, then Undersecretary of Defense William Perry was questioned by the Senate Armed Services Committee about MX costs, and he was quoted as saying: "It is not within our ability to estimate costs on a program this large over this period of time."

That was in May of 1979. As you are aware in June of 1979, President Carter announced the system and announced its cost, and in September of 1979 the President announced the multiple protective shelter basing system, announced it would cost between $33 and $34 billion, and in the ensuing 2 years, that figure has been the only one that has been officially stated.

I would simply like to urge, make a plea for realism in our cost estimates. Realism first in understanding what the magnitude of the costs could be, and realism also in understanding the uncertainty that goes in making any cost estimate on a project this large with this much uncertainty as to its composition and over this period of time.

All right, let me turn to the second item of what I mentioned earlier as a way of allocating the cost of the system. Talking about the cost of the system.

ECONOMIC EFFECTS OF MX

The second item is to ask what effect on the economy will there be of spending this amount of money, an amount of money that as I just stated will probably be at least $50 billion, and perhaps substantially higher.

At the council we performed a series of tests using available input-output data, using data that has been produced by the U.S. Department of Labor, based upon data collected by the Department of Commerce and published and put out by tables.

I won't go into a lot of the technical details, or read off a whole lot of the numbers. In my experience as a teacher, that is a sure way of putting an audience to sleep.

What I would like to simply do is to summarize what it was we did and to simply list our conclusions, and then perhaps in discussion we could get into some of the details of the numbers.

What input-output data does——

Senator PROXMIRE. Mr. Gold, let me just interrupt for a minute. As I follow you, you are reading from your prepared statement now?

Mr. GOLD. Well, I am skipping some of it in the interests of time.

Senator PROXMIRE. The reason I ask is because you have a 35 to 37 page statement, and we have 3 other witnesses. And if you could finish up in 3 or 4 minutes we would appreciate it so we can give each witness about 10 minutes.

Mr. GOLD. Fine. I was going to just summarize one other section of the prepared statement, and then leave the rest.

What input-output analysis does, is measure the quantity of productive inputs that are required for the production of any kind of final demand. In this case the final demand that we are talking about is guided missiles. This is an expenditure by the Federal Government on an item for final demand.

What we did is compare the effect of spending on guided missiles with five other items of expenditure, all nonmilitary, all fairly standard. Those items are residential construction, the construction of new public utilities, the construction of inner city rail equipment, the construction of rapid transit equipment, and the construction of solar energy equipment.

We analyzed the effect on production, the effect on employment and the effect on inflation. And I will simply read the conclusions.

We found as follows: That guided missile expenditure when compared to the five alternatives, has the smallest stimulative effect on output, has the smallest stimulative effect on the output of manufacturing industries, has the largest stimulative effect on the output of service

industries, and has the smallest stimulative effect on the output of capital goods producing industries.

When we switched to employment, what we found is that spending on a new guided missile, as compared to any of the five alternatives, has the smallest positive effect upon employment. The fewest extra jobs would be created.

And on inflation, what we found is that spending on the new guided missile as compared with the five alternatives would be likely to have the largest impact on increasing the rate of inflation. The effect on inflation would be greatest from guided missile spending as opposed to any of the five alternatives.

Those are our fundamental conclusions. There are plenty of numbers and analysis behind it, which we can obviously get into.

We did a number of other things. We focused on the contracting network that has been put together, we did a critique of the Air Force's economic analysis in their environmental impact statement, and we raised the question of what would be the impact of shifting the money spent for the MX to a program of long-term energy conservation.

I can discuss any of those if you want in the question and answer session.

Thank you very much.

Senator PROXMIRE. Thank you, Mr. Gold.

[The prepared statement of Mr. Gold follows:]

Prepared Statement of David Gold

Mr. Chairman, members of the subcommittee. My name is David Gold. I am an economist and Director of Military Research at the Council on Economic Priorities. The Council is using the occasion of these hearings to release its study of the proposed MX missile system titled Misguided Expenditure.* We are especially honored to present our findings before this committee, with its long history of support for research on the economic impacts of military spending in the United States.

The decision whether or not to produce the MX should be based upon the legitimate defense needs of the United States. In Part I of Misguided Expenditure, we analyze the military rationale behind the MX. Our analysis leads us to conclude that the threat to the U.S. deterrent posed by a growing Soviet missile force has been vastly overstated, and that the MX is not needed for the deterrence of nuclear war. We also conclude that the more fundamental rationale behind MX is the drive for a counterforce ICBM as part of the evolving strategy of limited nuclear war. Deployment of the MX in the context of such a strategy would increase the number of instances in which a nuclear weapon might be used, thereby increasing, not reducing, the chances of such a conflict actually occuring. CEP concludes that the MX cannot be justified for purposes of national defense.**

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* David Gold, Christopher Paine, and Gail Shields, Misguided Expenditure: An Analysis of the Proposed MX Missile System, New York, Council on Economic Priorities, 1981. The study, and the material presented in this testimony, are the products of a team of researchers. While I bear final responsibility for this testimony, Sections 2 and 3 are based on the original research of Gail Shields, Section 4 on work prepared by Robert DeGrasse, Jr., and Section 5 owes much to the assistance of David Brooks and Nick Jordan. Part I of the study, analyzing the military rationale for the MX, was prepared by Christopher Paine.

** A summary of our findings for the military analysis is attached.

The material that I will present to this Committee today analyzes some of the economic impacts of spending money on the MX missile system. First, we analyze the budgetary cost, and conclude that the MX system will cost at least $52 billion, and perhaps as much as $232 billion. Then, we discuss the economic analysis presented by the Air Force as part of their Milestone II Environmental Impact Statement for MX. This analysis, which systematically overstates benefits and ignores important costs, has formed the basis of numerous press accounts on the economic impacts of the system. Third, I present the results of CEP's use of input-output analysis to compare the economic impacts of spending on a new guided missile with five alternatives, residential construction, urban rail transit, intra-city rail transit, solar energy equipment, and new public utilities construction. Each of these five alternatives would stimulate more output in the economy as a whole, stimulate more output in capital goods producing industries, generate more employment, and add less to already high inflationary pressures, than guided missile expenditures. In our view, placing such expenditures in a comparative perspective provides a more useful evaluation than looking at the effects of any possible project in isolation. Finally, I briefly present the results of two other analyses, one which assesses what would be the effect of shifting MX money to a long-term program of oil conservation, and the other the collection of data on the companies that have received prime and subcontracts for MX and related work.

1. Estimating System Costs

Just how much will MX cost? Although the Department of Defense has consistently claimed that the system, in the present multiple protective shelter basing mode, will cost $33 to $34 billion, there remains substantial disagreement as to what the final cost will be. CEP concludes that the system will cost far more than $34 billion.

Acquisition--The Air Force estimate covers acquisition only, and is in constant, 1980, dollars.	$34 billion
Operations and Maintenance--The GAO has estimated operations costs, for a twenty year system life, at $5 billion in 1978 dollars, which is about $6 billion in 1980 dollars.	6 billion
Cost Growth--Costs will grow due to production prcblems, design changes, and contractor management difficulties. The General Accounting Office identificd $750 million in cost growth as of early 1981. We estimate a modest reserve of $5 billion for cost growth.	5 billion
Expansion of the System--If the number of Soviet warheads grows, the MX would have to be larger. The CBO has estimated that even if the Soviet Union stays within SALT II ceilings, the MX system would have to grow by 15%, and if the Soviets build to their maximum capacity the MX would have to grow by 158%.	7 to 71 billion
Total	$52 to $116 billion

There are additional costs of the system that should be investigated and possibly included:

Warheads--Warhead costs are classified by the Department of Energy and not included in any published estimate.

BMD--If a ballistic missile defense system is added, this would cost as much as $10 billion extra.

Split basing--If the multiple shelter system is divided between Nevada-Utah and some other area, the Air Force claims that this would increase system costs by $3 billion.

Social and Economic adjustment--There will be costs borne by non-military agencies of the federal government, and state and local governments. Some of these may be subsidized by the DoD, or compensated by increases in local government tax revenues. But there may well be uncompensated costs and these should be assessed.

Inflation--All of the above costs are in constant dollars. While this is a legitmate basis for presenting cost data, it is also legitimate to present current dollar estimates, since taxes are collected, and bills are paid, in inflated dollars. Estimating inflation over a twenty year period is little more than guesswork; moreover, according to the GAO, the Defense Department has consistently understated inflation in making its cost projections. Existing inflation estimates for the MX result in current dollar costs that are about double the constant dollar costs. Assuming, as a rough rule of thumb, that inflation will double the cost of MX, we estimate it to be $104 to $232 billion

The Department of Defense has not had a good record in recent years in its projections of weapon system costs. At one point in 1979, Undersecretary of Defense William Perry told the Senate Armed Services Committee that with regard to MX, "it is not within our ability to estimate cost on a program this large over this period of time."[1] Despite this admission, the Pentagon has claimed that the MX would cost $34 billion.

2. The Air Force's Analysis of the Economic Impact of MX Spending

When President Carter announced his decision, in June 1979, to proceed with the engineering development of the MX, there were widespread press reports of the economic benefits that would accrue to the nation in general and to key states and regions in particular. The source of these optimistic estimates was the Air Force's Environmental Impact Statement (EIS) for Full-Scale Engineering Development (FSED) of the MX. According to the Air Force, FSED expenditures of approximately $1 billion per year for five years would generate 130,000 new jobs nationally, and up to 46,000 jobs in California. (These estimates are for FSED on the missile alone, and do not include the basing mode.)

Two methods were used to estimate the effect on the national economy. One was an input-output model, modified to include Keynesian demand effects. In order to use this model, a number of assumptions had to be made which, according to the Air Force, "result in estimates that are at the upper end of the range of all results that might be expected. There are, in fact, conditions under which these results would obtain,but the probability of these conditions prevailing throughout the period of FSED is small."[2] Despite this small probability, the Air Force released the model's estimate that 130,000 jobs would be created by the billion dollars per year of FSED expenditures.

A second set of estimates came from the quarterly econometric model developed by the Bureau of Economic Analysis of the U.S. Department of Commerce. Using various hypothetical unemployment rates, the Air Force estimated that MX expenditures would add between 15,000 and 126,000 jobs per year, for the five years of FSED. The wide range of results implies that the effects of FSED expenditures depend heavily on the state of the economy, a conclusion that is hardly surprising. However, it is a conclusion that should have precluded the Air Force from releasing an estimate of job creation--130,000--that is outside of the upper bound of the highest range of their own estimates.

Moreover, the Air Force did not use this model correctly. They used policy multipliers from the BEA model, one for a $1 billion per year increase in government purchases, to represent MX spending, and the other for a $1 billion per year increase in taxes to represent the opportunity cost of the MX in terms of foregone consumption and investment spending. The use of policy multipliers to predict MX effects is considered by the model's author, Albert Hirch, to be inappropriate.[3] The BEA model is useful over short prediction periods (up to two years) to assess impacts of government spending on the economy as a whole. The model is not capable of analyzing industries or of isolating a missile sector, let alone the impact of increasing demand in that sector.

The use of a tax increase to measure the opportunity cost of MX expenditures is similarly inadequate. Moreover, in the context of the present administration's economic policies, it is woefully incorrect. Taxes are being cut, and funds are being shifted from civilian programs to the military, a situation that would yield radically different economic effects than raising taxes to pay for MX.

The bias of the Air Force's focus is further illustrated by their comments on the possible inflationary impact of MX expenditures. The Air Force has been excessively sanguine about the effects of inflation on MX system costs, and essentially has ignored the possibility that the MX will cause higher inflation. Yet their own analysis indicates the opposite is true. The econometric tests referred to above compared the job-generating capabilities of MX expenditures at different levels of national unemployment. Under conditions of low unemployment, the Air Force concluded that "positive net effects would persist for only a short time; the high level of employment and capacity utilization in the economy result in the positive impacts of MX FSED being transformed into price-level changes."[4] In other words, if national unemployment is low, MX expenditures will tend to generate substantial inflationary pressures.

The Air Force ignored its own conclusion. In response to a question submitted by Nebraskans for Peace commenting on the draft Milestone EIS, the Air Force stated: "The national inflationary impact of the MX system is beyond the scope of this EIS. Such impacts are considered in the overall Federal funding allocation process, and thus are more properly within the purview of the Office of Management and Budget and the Congress.[5]

The Air Force was not required to present socioeconomic analysis in the EIS. The agency chose to do so, and the results from the economic analysis formed the basis of press accounts as to how MX expenditures would affect the economy. It is quite striking, then, for the Air Force to claim that certain economic impacts were beyond the scope of their analysis.

It appears that the Air Force has been willing to conduct analysis, and widely publicize the results, of economic impacts that they see as supportive of the MX system, but they are unwilling to analyze negative ones.

The rosy picture that emerges from the Air Force's analysis of MX expenditures is consistent with the tendency, over the last thirty years, to treat military outlays as beneficial to the economic health of the United States. This tendency is in contrast to an earlier conventional wisdom, going back at least as far as Adam Smith and informing public policy in the first few years after World War II, that treated military spending as competing with private outlays, especially business investment, and continually threatening to undermine the economy. Recent research has tended to support the earlier view with regard to employment, economic growth, and inflation.[6]

Military budgets, and the awarding of military contracts and the opening or closing of military bases, are frequently discussed in terms of the effects of the action on employment. There can be no doubt that military spending generates employment. U.S. military outlays are approaching $200 billion for FY 1982, and that amount of spending can create large numbers of jobs.

However, a growing body of evidence supports the notion that military

spending is an inefficient job generator. An increase in military expenditure stimulates employment and a decrease destroys existing jobs. But when explicitly compared with an alternative, such as a change in taxes or a change in some other government program, money spent on the military shows up poorly. Military spending creates fewer jobs than alternative forms of government expenditure. An increase in military outlays that is compensated for by an increase in taxes or a cut in other forms of government spending will tend to result in fewer, not more, jobs in the economy as a whole. A cut in military spending that is compensated for by a tax cut or a rise in alternative government programs will tend to result in a net gain in employment.

Similiar results have been found with respect to investment and economic growth. A rise in military outlays induces slower rates of growth of output and slower growth, or even a decline, in investment spending. A trade-off beween military spending and investment--that has been discovered in several studies--occurs for two reasons. One is that military spending and investment spending frequently compete for the same resources, such as technical, managerial, and other highly skilled labor, productive capacity in capital goods industries, raw materials, and finance. Second, higher military outlays result in taxes or, more likely, larger government borrowing requirements and higher interest rates. Both higher taxes and higher interest rates are disincentives to new investment.

There is widespread agreement that military spending is inflationary. Data Resources, Inc. a prestigious private research and forecasting firm, introduced a study of the Carter Administration's five-year defense spending program for FY1981-85 by stating: "Military spending is typically thought to be more inflationary than most other forms of federal spending because it adds to aggregate demand without increasing the supply of privately consumable goods."[7]

Much of the recent research on military spending casts doubt on the Air Force's analysis for two reasons. First, the calculated effects

of military outlays on employment, economic growth, and inflation can only be described as poor, in contrast to the optimism that pervades the Air Force analysis. Second, many of the conclusions are derived from analyses that are explicitly comparative, measuring the effect of military spending in relation to some set of alternatives. For example, while it is true that military spending creates jobs, it is also true that military spending creates fewer jobs than alternative uses of the same money.

3. Input-Output Analysis of Guided Missile Production

To provide a structure for analyzing how money spent on a new ICBM would affect the economy, CEP undertook an examination of Department of Labor input-output data. Our objective was to assess the effects of MX expenditures on output, employment, and inflation. In order to provide a comparative perspective, CEP also analyzed five examples of alternative expenditure patterns: "residential construction," to represent new housing; "public utilities construction," to represent the building of solid waste treatment facilities; "railroad equipment manufacturing," for inter-city rolling stock; "mass-transit equipment manufacturing" to represent rail vehicles for urban transportation; and "solar energy equipment," representing the manufacture of solar collectors for housing and business.

The five were chosen to reflect non-defense public policy options, each of which had two additional characteristics; they could be represented by final demand categories in the I-O tables and they were basic expenditures with well-known technologies and significant but not extremely high capital utilization. We had no prior knowledge of their economic impact except at the most general level; we avoided choosing projects needing a very high level of technology, such as space research, or employing unusually large numbers of people, such as education.

Production

Guided missiles, like other sophisticated modern weapon systems, are thought to embody high levels of technology, sophisticated labor and technical skills, and substantial inputs from metals and manufacturing industries. Expenditures on sophisticated, or "state of the art," weapon systems are frequently justified on more than military grounds; they are considered to have beneficial impacts on technological developments for the economy as a whole. Testifying before the Senate Budget Committee in February 1980, Defense Secretary Harold Brown argued that military outlays "are beneficial in the longer term to the civilian economy, since much of the additional spending promotes domestic production in our most capital- and technology-intensive sectors."[8]

CEP investigated the effect of increases in the final demand for guided missiles and compared it with the effects for five alternatives. We focused on the amount and distribution of inputs for the six categories of demand. The entries in Table 1 are in the form of multipliers, telling how much is required of each input to product a unit ($1, $1 million, $1 billion, etc.) of guided missiles for final demand. Adding the entries in the column gives the gross output multiplier; subtracting final output--a multiplier of 1 since final demand can only equal itself--gives the secondary output multiplier, a measure of the effect of the increase in final demand on input demands.

Solar energy equipment manufacturing has almost twice the secondary impact of guided missiles, with the other alternatives arrayed in between. Even residential construction, with well-known and relatively straight forward technologies, has a larger secondary multiplier than guided missiles. In I-O analysis, the magnitude of the secondary output is considered to be related to the production requirements of the commodity being produced. In general, the more complicated, sophisticated, and demanding the technology of production, the larger the indirect, or secondary, effects. A higher level of technology tends to draw more resources from other sectors, and to draw from a greater number of sectors.

Table 1

Comparison of the Secondary Effects
Of Guided Missile Production
And Selected Alternatives

Final Demand Categories	Gross Output Multiplier	Secondary Output Multiplier
Guided Missiles	1.937	.937
Residential Construction	2.250	1.250
Public Utilities Construction	2.261	1.261
Railroad Equipment	2.528	1.528
Mass Transit	2.629	1.629
Solar Energy Equipment	2.781	1.781

SOURCE: Bureau of Labor Statistics, Office of Economic Growth, U.S. Department of Labor, 1972 Input-Output Study, INVC1973, for guided missiles, residential construction, public utilities construction, railroad equipment, and mass transit. For solar energy equipment, source is Craig Peterson, Sector-Specific Output and Employment Impacts of a Solar Space and Water Heating Industry, prepared for the National Science Foundation, Research Applied to National Needs (RANN), December, 1977.

Yet, according to the secondary output multipliers presented above, guided missiles, generally considered to be a technologically sophisticated product, has a smaller impact on the structure of production than any of the alternatives tested.

Table 2 shows how the secondary output multiplier is distributed among industries that provide inputs. Each element of the missile column of the inverse matrix was divided by the secondary output multiplier for guided missiles (.937) to obtain a percentage distribution of input requirements. The importance of each industry in the total requirements for guided missiles varies considerably. For example, dairy and poultry products contributes 0.1 per cent of inputs for each unit increase in the demand for guided missiles, gifts, entertainment, and travel contributes 5.0 per cent of the inputs. This means that an increase in the demand for guided missiles will boost sales of gifts, entertainment, travel and substantially more than it will increase dairy and poultry sales. The industries that receive the most stimulation from the increase in final demand will then command the labor and materials they need. The distribution of input requirements is, in effect, a portrait of how resources can be expected to move as final demand is increased.

Using data from Table 2, we calculated the impact on input industries divided into the traditional broad industry categories of services, manufacturing, construction, and agriculture and mining. All six of the final demand categories draw almost all of their inputs from services and manufacturing. Comparing the distribution of inputs for the six alternatives, we found that guided missiles has the highest service content of its inputs, and the lowest manufacturing content, while solar energy has the highest manufacturing and lowest service content.

Guided missiles draws 36 per cent of its inputs from service industries, and 60 per cent from manufacturing. Every one of the five industries used for comparison draws a smaller proportion of its inputs from services, and a larger portion from manufacturing. Housing has a 32.5 per cent service content, and has 61 per cent of its inputs from manufacturing; railroad manufacturing draws 22.1 per cent from services and 74 per cent from manufacturing; and solar equipment has a service content of 11 per cent and a manufacturing content of 85.3 per cent. Guided missile production

Table 2

Intermediate Goods Requirements for Guided Missiles

Industry	Per cent of Total
Aircraft	20.0 %
Miscellaneous Business Services	7.0
Business Travel, Entertainment, & Gifts	5.0
Electronic Components	3.8
Real Estate	3.5
Communication (except radio & tv)	3.4
Retail Trade	2.9
Wholesale Trade	2.5
Machine Shop Products	2.2
Primary Aluminum & Aluminum Products	2.1
Plastic Products	2.1
Blast Furnace & Basic Steel Products	2.0
Air Transportation	1.9
Miscellaneous Professional Services	1.3
Scientific & Controlling Instruments	1.3
Other Primary Non-Ferrous Products	1.3
Electric Utilities	1.2
Maintenance & Repair Construction	1.2
Radio & Communication Equipment	1.2
Truck Transportation	1.2
Metalworking Machines	1.1
Other Fabricated Metal Products	1.0
Industrial Inorganic & Organic Chemicals	.9
Petroleum Refining & Related Products	.9
Primary Copper & Copper Products	.9
	72.3 %
Other Requirements	27.7
Total	100.0%

Source: See Table 1.

does draw inputs from manufacturing. But, when compared with the five alternatives, it is clear that guided missile expenditure is a weak stimulator of manufacturing.

For guided missiles, the high service content is largely attributable to business services and gifts, entertainment and travel. These inputs probably reflect the high administrative costs associated with major military production activities and the extensive travel and lobbying expenditures characteristic of military industries. The 7 per cent business services content of guided missile production reflects the importance of highly-paid professional and consulting services to military production. Defense production requires considerable technical expertise, often provided through consulting firms and think tanks as well as the staffs of large weapons manufacturers.

Marketing in the defense sector requires services to coordinate initial contracts between the Department of Defense and contracting companies and also throughout the extensive subcontract network. There were more than 12 million separate procurement orders in FY 1980 involving 32,472 firms; an additional large number of firms were involved in subcontracting, which on a major weapons project can be immense.[9] On the B-1 project, for example, Rockwell International Corporation had lined up 5,000 separate firms to do subcontract work, while Boeing, for the Minuteman missile, had 40,000 suppliers.[10] In addition, someone must constantly evaluate contract performance, maintain product quality, and supervise cost accounting. For the MX, one company, TRW Inc., has been awarded sizeable contracts solely to perform coordination functions.

CEP also calculated the relative distribution of the impact within manufacturing, distinguishing between "key" capital goods industries (those industries that primarily produce plant and equipment for others) and "other" manufacturing industries, which produce final demands. Key manufacturing industries include basic metals (steel, copper, aluminum), forging and foundries, machine-tool production, and so forth.

"Other" manufacturing industries include apparel, glass, cement, aircraft, and solar collectors. These latter industries do make intermediate products, but they are primarily producing for final demand.

Table 3 presents the distribution of manufacturing inputs between the two classifications, for guided missiles and the five alternatives. Guided-missile production is the smallest of the six alternatives in its impact on key industries, with only 14.4 per cent of the input for guided-missile production drawn from the capital-goods sector. Any of the alternatives would stimulate more activity in these industries. Almost half of the secondary demand stimulated by an increase in railroad-equipment manufacturing would be concentrated in the capital-goods industries.

Despite Harold Brown's argument that defense spending stimulates production in high-technology industries, it appears to be just the opposite with guided missiles. Guided missile expenditure:

- -has a smaller effect on output than any of the alternatives studied, and a smaller total level of stimulation;
- -has the smallest relative impact on manufacturing, and a low degree of stimulation of manufacturing output;
- -has the smallest relative impact on capital-goods manufacturing industries; and
- -has the largest relative impact on service industries.

Employment

Whenever a large amount of money is poured into the economy, it stimulates employment. Defense spending is no exception, and the money allocated to the MX would create a number of jobs, especially in those states that have a high concentration of contractors, such as California, Utah, and Massachusetts.

Table 3

Manufacturing Inputs for MX and Alternatives

Per Cent of Total Inputs

	Guided Missile	Mass Transit	Solar Energy	Rail Roads	Public Utility	Housing
"Key" Manufacturing Industries	14.4%	30.0%	33.9%	46.2%	40.0%	18.0%
Other Manufacturing Industries	45.6%	47.0%	51.1%	27.8%	26.0%	43.0%
Total Manufacturing	60 %	77 %	85 %	74 %	66 %	61 %

1. "KEY" MANUFACTURING loosely refers to those industres within the manufacturing sector who produce plant and equipment (capital goods) for other industries rather than an 'end product' for final demand (other than for investment final demand). An example would be the metal working equipment industry which produces metal working machines needed by aircraft and solar development industries, respectively, for jet fighter planes and solar heating collectors.

2. "OTHER" MANUFACTURING would include, for example, the aircraft and solar industries which produce predominantly for final demand rather than for other industries. Their products are 'end products', such as jet fighter planes or solar collectors. Other examples would be apparel, glass, and cement. While many of these products are produced for industry as well as for final demand, their character is not as directly 'capitalized' as is plant and equipment.

Jobs are generated in two ways. Prime contractors hire more people in order to undertake the contracts; subcontractors add employees when they begin work on particular sub-systems. Prime and subcontract employment is measured by I-O tables, prime contractors corresponding to the direct component of production and subcontractors to the indirect component. As individuals begin receiving and spending their income from the project, there is more ready money available in the community. This in turn stimulates demand, sales, and production, resulting in the creation of yet more jobs. The establishment of new jobs because of increased purchasing power is known as the "induced effect". I-O analysis measures the direct and indirect effects.*

Using I-O tables, it is possible to calculate, for each category of final demand, employment coefficients to measure the number of jobs that would be generated for each billion-dollar addition to final demand. The employment per billion dollars of final demand for guided missiles and alternatives is presented in Table 4. For this comparison, we supplemented our work with employment data from other studies. Each of the alternatives would generate more employment than guided missiles.

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* I-O analysis does not measure all employment gains that follow an increase in final demand. With induced effects excluded, there may be some variation among the six alternatives we cite that is not measured by I-O analysis. However, the multiplier effects for induced expenditures will tend to be lower the larger the portion of the injection of final demand that is saved. Since military expenditures tend to go to those at higher ends of the income distribution, where savings rates are higher, the employment multiplier for induced expenditures on military procurement projects will probably be lower than the employment multipliers for alternatives where savings rates are lower. The exclusion of induced employment may bias the employment comparison in favor of guided missile expenditures.

Table 4

Employment Impact of Alternative Uses of
One Billion Dollars of New Final Demand

Numbers of Jobs per One Billion 1972 Dollars

Alternatives	Direct Plus Indirect Employment	Direct Employment	Indirect Employment
Missile	53,248	25,055	28,193
Mass Transit	77,356	32,889	44,467
Public Utility	65,859	32,173	33,686
Railroads	54,220	20,260	33,960
Housing	68,657	31,016	37,641
Solar Energy/Energy Conservation	65,079	+	+
Solar Energy Equipment	57,235	+	+

Source: Bureau of Labor Statistics, Office of Economic Growth, U.S. Department of Labor, Charles Bowman, Supervisory Economist Data taken from the Employment Requirements Table 1977 (Employment Inverse), which gives labor requirements for each industry in 1972 dollars.

Buchsbaum, Steven et al, Jobs and Energy: The Employment and Economic Impacts of Nuclear Power, Conservation and Other Energy Options (Council on Economic Priorities, New York, 1979). See 2-2 "Conservation Scenario Net National Employment." This figure (48.8) was converted from 1976 dollars to 1972 dollars using an implicit GNP deflator (1.334) from the Economic Report of the President, January 1977, p. 192.

Peterson, Craig, Sector-Specific Output and Employment Impacts of a Solar Space and Water Heating Industry Prepared for the National Science Foundation, Research Applied to National Needs (RANN), December 1977. See especially, Table VI, Page 37, for the breakout of percentage requirements of industrial sectors of BLS categories (1963) for a solar industry. The percentages given in Table IV were applied by industry to the appropriate employment requirements given in the BLS Employment Table (op.cit.) to arrive at the total requirements listed in (3) above, under 'Solar Energy.'

The relatively low employment derived from the direct and indirect output for guided missiles has two causes. One is the high service component, which means low secondary output multiplier effects. Since secondary output is low, not many people will be needed to produce this output. In addition, military industries tend to employ a high proportion of skilled labor, including scientists, engineers, managers, finance and lobbying specialists, as well as skilled machinists and other production workers. These workers receive wages and salaries far above the average for the labor force as a whole, which means that a given value of output will generate a smaller number of jobs than most alternatives. Industries providing materials for guided missile production also employ highly skilled labor.

A billion extra dollars spent on guided missiles will create fewer jobs than the same amount added to any of the alternatives listed in Table 4. Furthermore, a comparatively small increase in jobs caused by the increase in expenditure for guided missiles will actually turn into a loss if those funds are taken from one of the alternatives, for example, by cutting federal aid for mass transit. In such a situation, extra money for the MX could, in the short run, make the overall employment situation worse for the nation as a whole.

Perhaps even more important are the long-term effects on the economy. The manufacture and increased use of transit equipment, solar collectors, and waste-disposal facilities would tend to reduce costs and improve prospects for economic growth throughout the economy. The use of solar collectors, for example, can reduce demand for fossil fuels and mitigate the rise in their costs. Improved transportation facilities can make it cheaper and

quicker to tranport people and goods, and, as a result, can stimulate trade and factory and housing construction. Thus, the employment-generating effects extend outward, both in time and across economic activities.

With missiles, there are no such beneficial effects. A guided missile in its silo or its submarine does not make it more economical to produce other products, nor does it reduce costs or stimulate output in other sectors of the economy. What missiles are intended to purchase is national security. We contend, however, that building and deploying the MX is likely to make the United States less, not more, secure in at least one respect; it would undoubtedly weaken the economic component of our national security when considered as an alternative to other, more productive, expenditures.

Inflation

CEP also explored the possible inflationary consequences of MX expenditures. As we noted above, the Air Force did not analyze inflationary effects of MX outlays, arguing that such analysis was the responsibility of other government agencies. There are a number of reasons, however, why CEP became convinced that inflation would be one likely consequence of proceeding with the MX.

Input-output analysis assumes that all inputs are freely available and that final demand can be met. In fact, production is frequently hampered by bottlenecks in production of parts, shortages of key materials, and rising prices. Various simplifying assumptions are needed to make mathematical and statistical manipulations manageable, but the results must be modified to take account of actual conditions. The main simplifying

assumption in I-O analysis is that all materials are freely available at constant prices. However, if some items have limited availability, the impact of the output multipliers can be reduced or significantly offset through price increases or shifts of resources among sectors.

Rising costs, shortages of capacity and inputs, and increased imports would all contribute to reducing the economic situation that might occur from an increase in military industry output, including guided missiles. Even without the MX, the industries that produce for the Department of Defense are having a hard time keeping up with the major expansion in the 1980s of military spending, with its emphasis on research and development and the procurement of new weapons; they are experiencing severe shortages of capacity, labor, and materials, and rapidly rising costs.

The 1980 Summer Study of the Defense Science Board reported extensive cost growth in important components and materials, lead times of up to two and three years, and extreme shortages of engineers, technicians, and skilled laborers leading to large increases in labor costs. In addition, the study considered that a widespread undercapitalization in defense industries contributed to insufficient production capacity, and it raised doubts about the ability of the industry to expand capacity in the near future. There have been similar reports from other observers, and from researchers who have studied defense production over a period of time.

These problems have led to an increase in imports by defense industries. The value of imported machine tool, aircraft parts, electronic components and telecommunications equipment have doubled, and in some cases tripled, between 1977 and 1980.

Table 5 lists the major production requirements for guided missiles, along with the estimated rate of capacity utilization, as of the last quarter of 1979, for industries where that information is available. The capacity utilization rates for guided missile production are all very high, in many cases at or approaching 100 per cent. The industries contributing to the five alternatives have lower rates. This discrepancy reflects conditions in the defense industrial base, as against the greater use of more traditional and presently underutilized, industries, such as basic metals, in the alternative production patterns.

With the four largest supplying industries operating at 100 per cent of capacity, they will obviously find it difficult to avoid severe problems in expanding. An increase in the final demand for complete guided missiles will face quite inelastic supply curves for inputs. The output multiplier will be smaller than was predicted from the I-O analysis. The price rises resulting from these difficulties will reduce the ability to use all the available inputs efficiently. There may also be costly and time-consuming shifts in technology, production methods, and searches for new inputs.

All of the five alternatives investigated have considerable available capacity for expansion, so that their full multiplier effects are more likely to be realized. Capacity utilization tends to be highly cyclical, with excess capacity occuring in recessions and shortages appearing during boom periods. Thus, the sluggish economy forecast for 1981 will mean the continuation of spare capacity in many basic industries. However, the continuing demand for military equipment means that the problems plaguing the defense industrial base will continue, unaffected by normal business cycle movements. Thus an expansion of guided missile production will be

TABLE 5

MAJOR INDUSTRIAL REQUIREMENTS FOR GUIDED MISSILES AND ALTERNATIVE EXPENDITURES COMPARED TO CURRENT INDUSTRIAL CAPACITY UTILIZATION

GUIDED MISSILES

INDUSTRY	TOTAL REQ.%**	C.U.* RATE 1979***
Aircraft	20.0	100%
Business Services	7.0	—
Travel, Entertainment, Gifts	5.0	—
Electronic Components	3.8	100%
Real Estate	3.5	—
Communications	3.4	100%
Retail Trade	2.9	—
Wholesale Trade	2.5	—
Machine Shop Products	2.2	100%
Primary Aluminum & Alum. Products	2.1	85%
Plastics	2.1	99%
Blast Furnace Basic Steel	2.0	77%
Air Transport	1.9	—
Professional Services	1.3	—
	59.7%	

SOLAR ENERGY

INDUSTRY	TOTAL REQ.%**	C.U.* RATE 1979***
Solar	17.7	—
Steel	11.1	77%
Copper	10.5	62%
Plastics	6.3	99%
Aluminum	5.4	85%
General Industrial Machinery	3.4	98%
Scientific & Control Instruments	2.8	94%
Millwork & Plywood	2.6	94%
Primary Non-Ferrous Metals	2.2	93%
Chemicals	2.1	98%
Plastic & Rubber	2.1	87%
Cement	2.1	90%
Wholesale Trade	2.0	—
Truck Transportation	1.6	—
Glass	1.6	92%
	73.0%	

Table 5 (con'd)

RAILROAD MANUFACTURING

INDUSTRY	TOTAL C.U.* RATE REQ.%**	1979***
Steel	17.8	77%
Railroad Equipment	13.0	100%
Iron & Steel Foundries & Forgings	8.3	94%
Engineers—Turbine	4.8	90%
Machine Shop Products	4.5	100%
Aluminum	3.8	85%
Retail Trade	3.8	—
Real Estate	3.1	—
Business Services	2.6	—
Fabricated Metal	2.5	95%
Truck Transportation	2.2	—
Copper	2.1	62%
Railroad Trans.	1.6	—
Other Primary Non-Ferrous Metals	1.6	93%
Metal Working Machines	1.4	100%
	76.0%	

RESIDENTIAL CONSTRUCTION

INDUSTRY	TOTAL C.U.* RATE REQ.%**	1979***
Millwork & Plywood	8.0	96.2%
Sawmills & Planing Mills	6.5	91.1%
Cement, Concrete	5.2	90.5%
Professional Services	4.4	—
Wholesale Trade	3.9	—
Fabricated Metal Products	3.7	97.2%
Retail Trade	3.6	—
Blast Furnace & Basic Steel	3.2	76.8% 81.4%
Business Service	2.9	—
Real Estate	2.9	—
Logging	2.9	91.1%
Copper	2.7	62.4%
Truck Transport	2.3	—
RR Transport	1.6	—
Travel, Entertainment, Gifts	1.6	—
Other Metal Products	1.6	98.7%
Heating & Plumbing	1.6	98.4%
Petroleum Refining	1.6	94.1%
	60.3%	

Table 5 (con'd)

MASS TRANSIT

INDUSTRY	TOTAL REQ.%**	C.U.* RATE 1979***
Motor Vehicles	23.9	—
Blast Furnaces & Basic Steel	7.5	76.8% 81.4%
Metal Stampings	3.9	—
Iron & Steel Foundries	3.8	74.0%
Wholesale Trade	3.2	—
Business Services	2.0	—
Real Estate	2.0	—
Other Fabricated Metal Products	1.9	98.7%
Truck Transport	1.9	—
Misc. Electrical Products	1.7	—
Auto Repair	1.7	—
Primary Copper & Copper Products	1.5	62.0%
Service Industry Machinery	1.5	—

PUBLIC UTILITIES

INDUSTRY	TOTAL REQ.%**	C.U.* RATE 1979***
Cement Concrete Products	23.9	90 %
Primary Copper & Copper Products	10.1	62 %
Blast Furnace & Basic Steel	8.8	76.8% 81.4%
Fabricated Structural Metal	8.3	95 %
Wholesale Trade	3.3	—
Business Services	3.2	—
Other Fabricated Metal Products	3.1	98.7%
Real Estate	2.7	—
Millwork, Plywood & other Wood	2.5	96.2%
Professional Services	2.5	96.2%
Truck Transport	2.4	—
Iron & Steel Foundries & Forgings	2.3	74 %
Electrical Lighting & Wiring	2.2	—

* Capacity Utilization
** Requirements
***U.S. Department of Labor, 1972 Input-Output Study
Wharton Econometric Forecasting Associates: Capacity Utilization Rates are as of the last quarter of 1979

more costly and less stimulative to the economy as a whole and more likely to generate further inflationary pressures, than any of the alternatives we studied.

Labor constraints are more difficult to measure, since there is no periodic index of occupational unemployment. A review of trade literature and Labor Department data on employment can give some idea of the employment picture in specific industries. The recent and continuing increase in military spending has occurred at a time of severe aerospace labor shortages, due to the boom in civilian aircraft production in the late 1970s. In many companies, the major bottleneck preventing expanded production was not the availability of manufacturing capacity, but the unavailability of appropriately trained engineers and technical specialists. Many companies, seeing labor shortages looming, tried to stockpile experienced workers through excess hiring in the late 1970s, but even such foresight proved insufficient. A study of the Machine Tool Builders Association found that 70 per cent of its member firms reported significant labor shortages. The lack of skilled labor is so acute that several of the missile production input industries had to cancel plans to initiate second shifts.[11]

There are very few problems of labor supply in the industries representing the alternative spending patterns. Unemployment in basic production industries, such as automobiles, lumber and wood, and metal production, is high. This is only partly due to the 1980 recession, for many of these industries have high long-term unemployment rates. In general, operatives and non-farm laborers have higher unemployment rates than professional,

technical, and managerial workers. Since missile production employs a much higher ratio of professional to production workers than the alternative industries, labor shortages will be more prevalent in the production of guided missiles than in any of the alternatives, whatever the ups and downs of the business cycle.

4. Shifting MX Money to Energy Conservation

In January of 1980, responding to the seizing of American hostages in Teheren and the Soviet invasion of Afghanistan, President Carter declared that defense of the Persian Gulf was in the vital interest of the United States. Air Force representatives soon used the Carter statement and events in Iran and Afghanistan as evidence why the MX was needed.

In that context, and on the assumption that U.S. dependence upon Persian Gulf oil was high on the list of reasons why the Administration was contemplating an increased military involvement in that area, CEP decided to investigate the effect of shifting money planned for the MX to a long-term program of oil conservation. (We were also prodded by a question from Rep. John Seiberling (D-OH) at a hearing of the House Subcommittee on Public Lands, the day after President Carter's 1980 State of the Union address. The initial results, presented as a CEP Occasional Paper by Robert DeGrasse Jr., "Shifting MX Expenditures to Energy Efficiency: Memo on the National Security Implications of Alternative Energy Development," were updated for inclusion in Misguided Expenditure.)

We assumed the existence of a federal government program of subsidies to residential and commercial applications of existing conservation technology, amounting to $5.2 billion per year for ten years, roughly the equivalent of the bottom of our range of estimates for MX system costs. Using prices of conservation technology, 1980 oil prices, and estimates from experts in the field as to the likely effectiveness of conservation measures, we estimated that such a program could reduce oil imports by between 44 and 75% per year and totally eliminate the 1980 balance of trade deficit of $24 billion.

Since these results are based upon static comparisons they should be taken as illustrations of possible effects, and not projections of what would necessarily occur. But they do contribute to the raising of a set of important questions. Is United States national security better served by building a costly missile system with which to threaten the Soviet Union, and probably increase the chances of nuclear confrontation and even nuclear conflict, or by using the same money to strengthen our economy, reduce our dependence upon Persian Gulf oil, and reduce the need to commit large elements of our military force to protecting vital interests in that region of the world? More generally, can't some portion of our national security be obtained through economic strength, rather than almost exclusive reliance on new and dangerous weaponry?

5. The MX Contracting Network

As part of our analysis of the economic impacts of MX expenditures, CEP collected data on the companies that are involved in testing and building the MX system.

A large contracting network is now in place. For the MX, a series of associate prime contractors are assigned different components of the system with a separate contract issued for each task. As of February 1981, thirty seven companies had contracts from the Department of Defense. In a number of cases (e.g., Rockwell, Northrop, Martin Marietta, Boeing, TRW, Draper Labs) a company received more than one contract.

The associate contractors subcontract a substantial portion of their work to other companies. On most weapon projects, fifty to sixty per cent of the value of the prime contract is subcontracted.[12] In addition, there are companies that have received contracts for work closely related to the MX project. Some contracts are for work where the MX is one component; the Olin Corporation received a contract for propellents for MX and other applications. Still other contracts are for work where the possible application to MX is one of the stated goals. Ballistic missile defense is one example. The Army is testing several BMD systems and one, the Low Altitude Defense system (LoAD), is being designed to be compatible with MX. CEP identified 12 contractors with $126 million in contracts involved in work closely related to the MX program.

A variety of government agencies, in addition to the Air Force's Ballistic Missile Office, have been involved in work for the MX program. The Army Corps of Engineers, for example, is the contracting agency for the construction of MX test facilities. Some of these are civilian agencies, such as the Bureau of Land Management of the Department of

Interior, which has been involved because of the planned use of public lands for the basing mode in Nevada and Utah. Others, such as the General Accounting Office and the Office of Technology Assessment, have performed studies of the massive project. Warhead development is under the Department of Energy.[13]

Associate Contractors

CEP's primary source of data for associate contractors was the Ballistic Missile Office. The BMO was quite helpful in providing lists of active prime contractors (the most recent as of February 1981) and in responding to various inquiries. BMO data was supplemented by data gathered by NARMIC,[14] by journalistic accounts, especially announcements of contract awards and modifications in Aerospace Daily and the Wall Street Journal, and by interviews with company representatives. Many of the companies were quite responsive to CEP inquiries about their prime contracts, supplying information about the amount of the award, location of the work, and other data. Others were largely unresponsive, supplying either no information or only confirming what was already published in the press.

CEP has identified 37 associate contractors for FSED of MX. These 37 companies have 47 contracts, some going to different divisions of the same company, with a value, to date, of over $3.5 billion. Six companies have received 70% of this money. The six are: Rockwell ($723.7 million), Martin Marietta ($708 million), GTE Sylvania ($445 million), Northrop ($274 million), Boeing ($254 million), and General Tire and Rubber's Aeroject Strategic Propulsion subsidiary ($243 million).

The largest MX prime contracts are cost-plus-incentive-fee (CPIF) contracts. They establish a target cost, a target profit, and a formula for allocating cost increases between the contractor and the government. The initial contract awards, in the case of the largest contracts, defined the period of performance as being the period of FSED; in practice, many of the contracts began earlier and were simply updated. One of the difficulties in assessing how much money has been contracted is the fairly continual revisions that occur in agreements between the DoD and the contractors. Most changes are described simply as "face value increases" and include both changes in design as well as cost increases and schedule changes. Small changes (under $5 million) are often not reported and are lumped together with larger adjustments. In at least one instance, an alteration in the design of the missile's first stage, the contract modification was not announced until ten months after the design change decision was made.[15] It presumably took that long for the change to work its way through the bureaucracy. As one example of the data problems this creates, a list of contracts that CEP obtained from Air Force Systems Command included the following message: "Dollar amounts are not included because the figures experience frequent revisions."

Contracts have been awarded for MX work since the late 1960s, long before there was an MX program. The main characteristics of the new missile were first defined in 1967. Early development of MX occured under budget line items for Minuteman, Advanced ICBM Technology, and Advanced Ballistic Reentry Systems. By 1976 the present contracting structure was largely in place with regard to the missile itself--the basing

system had not yet been chosen--and the companies that had been involved with early development work had a clear advantage in obtaining further contracts.[16] In making inquiries among companies CEP found very few instances where a company felt it was in serious competition with another company for a contract; most awards went to the company that already had a contract for early development work.

In addition, most of the companies with major MX contracts had performed similar work on past ICBM programs, especially Minuteman. Fourteen MX associate contractors are performing work that is very similar to the work they performed as Minuteman associate contractors.* One company, Boeing, responsible for missile assembly for Minuteman, has a different task in the new project--constructing the transporter vehicle for MX. Martin Marietta, the test and assembly contractor on MX, did not have a major role in Minuteman but was the assembly contractor on the Titan ICBM program. Northrop's Electronics Division, with a large guidance and control contract for MX and a small role in Minuteman, and Rockwell's Rocketdyne Division, with the Propulsion Stage IV contract for MX, are the only other examples of sizeable MX business for companies not heavily represented in the Minuteman project.

The Minuteman program experienced extensive cost management

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* The fourteen companies are Aerojet General, Avco, Draper, General Electric, GTE Sylvania, Hercules, Honeywell, Logicon, Northrop Precision Products Division, Parsons, Rockwell Autonetics, Science Applications, Thiokol, and TRW.

problems. The entire program, according to Pentagon cost analyst A. Ernest Fitzgerald, was subject to inadequate cost and quality control by both the contractors and the Air Force. The most widely reported example was the performance of the Autonetics division of North American Aviation, now Rockwell, in producing guidance and control equipment. Within a year after the contract had been awarded the cost had risen 90% and the equipment was rated by Air Force engineers as having a life span one-third the length specified by the contract. According to Fitzgerald's account, the Air Force responded by ordering and paying for spare equipment from Autonetics.[17]

Rockwell is the largest single contractor on MX to date in terms of dollar amount of awards with $724 million in prime contracts and several small subcontracts, primarily to its Autonetics and Rocketdyne divisions. They have also been a major contractor on two recent projects where large cost growth has been an issue, the B-1 bomber and the Space Shuttle.[18] Other MX contractors have been involved in cost management or quality control problems on major projects, for example Boeing with the Short Range Attack Missile, General Electric with the Mark 12 warhead, Avco with the engine for the M-1 tank, and McDonnell Douglas, the main contractor for research on LoAD, with the F-18.[19] In recent years, most large military projects have had serious difficulty controlling costs and there have been some major problems of quality control.[20] In many instances the bulk of the problems are outside of the control of any company, in some cases reflecting national economic conditions and in some cases resulting from program changes and management problems within the Department of Defense. Past problems of cost growth are certainly no proof that problems

will occur on MX. But a project of this scale is bound to experience some difficulties in the best of circumstances--the GAO has identified significant cost growth in the first year of FSED--and cost and quality problems should be expected to occur as the project proceeds.

Subcontractors

Subcontract data is very difficult to obtain. The BMO does not systematically track subcontracts. For one year, FY1979, Washington Headquarters Services of the Department of Defense obtained data by asking contractors to poll their subcontractors, with about 20 per cent compliance. CEP obtained this data for the the MX, using prime contract numbers, but since the survey has not been continued the information is not up to date. The other main sources were NARMIC, press reports, and the prime contracting companies. Our survey of the companies yielded uneven results. Some companies were helpful. Avco, for instance, gave CEP a list of its major subcontractors. Other companies were totally unresponsive. Thiokol, to give one example, refused to provide any information. CEP also polled some of the subcontractors to ask for information on the size of their contract, the type of work performed, and the location of the work. The subcontracting companies were even less responsive than the prime contractors, often claiming that releasing such data would compromise their relations with the associate contractor.

The data on subcontractors is seriously incomplete and we have little idea of how incomplete it is. The number of subcontracting companies on a major military project can run into the thousands and even tens of thousands. Thus it is clear that CEP was barely able to scratch the surface in obtaining data on subcontracting for MX. This is a general problem in tracing the impact of military contract

dollars; the paucity of data on subcontractors is a serious impediment to any attempt to study the distribution and impact of defense expenditures.

CEP has identified 88 companies that have received 101 subcontracts from MX associate prime contractors. (One major subcontract is second-tier, a subcontract from a company that is itself working on a subcontract. In this instance Hercules has a subcontract from Westinghouse which in turn is a subcontractor to Martin Marietta on the MX launcher.) We have identified $124 million in value for subcontracts. In most instances, however, the dollar value of the subcontract is not available. Six of the subcontractors are also associate contractors working on other components of the system. The six are Avco, E-Systems, Hercules, Honeywell, Northrop, and Rockwell. Given the history of past weapon systems, it is certain that the number of subcontracts and the amount of money involved will be substantially larger as the program moves into production.

6. Summary

- The MX will cost far more than the $34 billion claimed by the Air Force; the exact cost, however, is subject to many uncertainties, involving the size of the system, the likelihood of schedule slippages and contractor cost growth and, for current dollar estimates, the rate of inflation over the next two to three decades, making any precise cost estimate an impossibility.

- The Air Force's economic analysis overstated benefits in terms of job and income gains, misused existing economic models, and ignored the possible inflationary consequences of MX spending.
- CEP's analysis, using existing input-output data, found:
  - --spending on a new guided missile would provide smaller stimulation to gross output than any of five alternatives studied.
  - --spending on a new guided missile would provide smaller stimulation to basic captial goods industries than any of the five alternatives
  - --spending on a new guided missile would generate less new employment than any of the five alternatives
  - --spending on a new guided missile would be more likely to generate inflationary pressure than any of the five alternatives
- Using MX money for a ten-year program of oil conservation would reduce U.S. dependence upon Persian Gulf oil; such a program is likely to contribute more to U.S. security than building the MX system.
- Over $3.5 billion in contracts have been awarded for MX
  - --70% of the money has been awarded to six companies
  - --several companies receiving MX awards have been involved in serious cost and quality control problems in the past
  - --data on subcontractors is sparse, preventing analysis of this aspect of the awarding of MX money

Footnotes

1. Senate Armed Services Committee, Department of Defense Authorization Hearings for FY1980, Part 3, p. 1433.

2. Department of the Air Force, MX: Milestone II Environmental Impact Statement, volume II, p. 125.

3. Telephone conversation with Albert Hirch, Bureau of Economic Analysis, U.S. Department of Commerce, July 2, 1980.

4. Milestone II EIS, volume II, p. 127.

5. Milestone II EIS, volume VI, part 4, p. 19.

6. A number of studies are summarized in Misguided Expenditure, chapter 13.

7. Dr. Robert A. Gough Jr., Dr. Paul H. Earl, and Stephen H. Brooks (all of Data Resources, Inc.), "More for Defense?" Senate Budget Committee Hearings, March 3, 1980, p. 283.

8. Secretary of Defense Harold Brown, Prepared Statement, Senate Budget Committee Hearings, February 27, 1980, p. 82.

9. Directorate for Information, Operations, and Reports, Washington Headquarters Services, Department of Defense.

10. Gordon Adams, The B-1 Bomber: An Analysis of its Strategic Utility, Cost, Constituency, and Economic Impact, New York, Council on Economic Priorities, 1976; Jacques Gansler, The Defense Industry, MIT Press, Cambridge, Mass, 1980, p. 43.

11. Telephone conversation, Bureau of Industrial Economics, U.S. Department of Commerce, June 1980. See also Christian Science Monitor, February 8, 1980, p. 1, and Wall Street Journal, April 2, 1980, p. 1.

12. Gansler, op. cit., p. 43.

13. "The Energy Department plans to start in FY1981 a three-year, $35 million construction program to equip seven sites to production of the MX warhead, and increasing work on two MX warhead designs is the main reason the department plans to beef up its weapons development workforce by more than 3% during the coming fiscal year." Aerospace Daily, April 9, 1980.

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14. MX Missile Contractors, NARMIC Map Series, National Action/Research on the Military Industrial Complex, December 1980.

15. Telephone Conversation, Ballistic Missile Office, Norton Air Force Base.

16. Business Week, October 25, 1976.

17. A. Ernest Fitzgerald, The High Priests of Waste, New York, W.W. Norton & Company, 1972, pp. 15-18, 122-123. See also Richard Kaufman, The War Profiteers, Garden City, New York. Doubleday & Company, 1972, pp. 81-83, and United States Congress, Joint Economic Committee, "Hearings on the Military Budget and National Economics Priorities," Part 2, Washington, D.C., U.S. Government Printing Office, 1969.

18. On the B-1 see Adams, op. cit. On the Space Shuttle see Aerospace Daily, February 11, 1980, p. 217.

19. On Boeing and General Electric, see Fitzgerald, op. cit., pp. 166-170, 194-198; on Avco and the engine for the M-1 tank see Comptroller General of the United States, "XM-1 Tank's Reliability is still Uncertain," Report to the Congress, U.S. General Accounting Office, January 29, 1980; on the F-18 see Comptroller General of the United States. "F/A-18 Naval Strike Fighter: Progress Has Been Made but Problems and Concerns Continue," Report to the Congress, U.S. General Accounting Office, February 18, 1981.

20. As of December 30, 1980, 50 weapons projects currently in procurement had cost growth averaging 114 per cent of their baseline cost estimates. See Department of Defense Comptroller "Selected Acquisition Reports as of December 30, 1980." On other recent problems in procurement see James Fallows, National Defense, New York, Random House, 1981.

Senator PROXMIRE. Mr. Paine, please proceed.

STATEMENT OF CHRISTOPHER PAINE, STAFF ASSISTANT FOR ARMS CONTROL, FEDERATION OF AMERICAN SCIENTISTS, WASHINGTON, D.C.

Mr. PAINE. Thank you, Senator.

I guess I will differ substantially from what you said in your introduction, but I presume that is why I am here.

MX AS DETERRENT TO SOVIETS

Virtually all the attention to date has focused on MX basing, since the Carter administration announced its racetrack plan 2 years ago.

The FAS feels that this range of vision is unfortunate, since the MX, no matter how it is based, is unnecessary for deterrence, which we also believe is the only plausible mission of our strategic forces in an age of nuclear parity between the superpowers.

As the Office of Technology Assessment observed in the introduction to its recent basing study:

"Due to the study's boundaries, OTA's criteria of analysis and comparison tend to use, rather than critically evaluate conventional wisdom about how strategic forces support U.S. national security."

And it is precisely that conventional wisdom that I would like to critique today.

Over the years, the Pentagon has elaborated this conventional wisdom much as the medieval astronomers propounded orbits within orbits to forestall the collapse of their vision of an Earth-centered universe.

Legislators and defense contractors and officials from Department of Defense have subscribed with varying degrees of emphasis and enthusiasm to what I call the four pillars of strategic wisdom—or unwisdom, as I feel it is:

Current silo-based ICBM's are vulnerable. That's the first assumption.

The second one is the air and sea legs of the Triad of nuclear forces could become vulnerable.

The third assumption is that essential equivalence—whatever is meant by that term—must be maintained with Soviet nuclear forces to prevent what is known as coercion.

And fourth assumption—the range of nuclear options must be expanded to insure deterrence of any Soviet attacks on our global interests.

Now, I feel these four axioms, or pillars of strategic wisdom, encompass the four main lines of defense of the MX missile system, and I don't think that they hold up under analysis.

The first general point to make is that the nuclear forces on both sides have become so large, and the consequences of their use so unpredictably catastrophic, that they have become useless as affirmative or coercive instruments of policy.

In other words, it is a misnomer to use the word "coercion" with reference to Soviet putative nuclear superiority. They cannot coerce us to do anything. They may be able to restrain us from doing something

to them, but they cannot actively coerce us to do anything. And that is an important distinction to make. The English language is being somewhat degraded by the use of the word "coercion" in this context.

Since at this late stage in the arms race, additional nuclear weapons cannot increase deterrence—both sides have long since passed the point of having 1 million tons of TNT equivalent for every population center over 10,000 persons—nor significantly limit damage should deterrence fail by preemptively destroying a sufficient number of Soviet weapons—and I will explain in detail why we cannot do that—nuclear arms control thus would appear to me more fundamental to the national security than any new strategic weapon we could reasonably hope to deploy. I add the word "reasonably," because there are people who do purport, for instance, to deploy a space laser defense, which would guarantee a leak-proof defense.

In theory, such systems are conceivable, but they are not reasonable either in terms of cost or for their implications, long-term implications for the arms race.

Beyond obscuring the meaningless sinkhole which the nuclear arms race has become, the more immediate purpose of these strategic nostrums has been to dignify the fundamental and, in fact, I feel, alarmingly primitive impulse which lurks behind the MX project—a reflexive imitation of the Russians. Basically, since the Russians were permitted under SALT to keep their large landbased multiple-warhead missiles, we must have them, too. That appears to be the logic.

If the recent testimony of Messrs. Rowny and Rostow is any guide, this would appear to be the bottom line, now justified largely on psychological grounds.

By itself, the fact that a small single-warhead, land-based ICBM is under consideration as an alternative to the MX gives the lie to the big missile's status as a unique military requirement.

These strategic nostrums needs to be dispelled before we can make real progress in sorting out what does and does not contribute to our national security. The conventional wisdom on strategic matters cannot withstand even a mildly probing analysis. And as I discovered in private conversations with persons in the military and in the defense community, they admit this. But few of these analysts will do so publicly, partly out of the understandable fear of isolating themselves from their colleagues, and partly out of what can only be called a failure of imagination.

The first pillar of wisdom is that the MX is needed to replace a vulnerable Minuteman. The weaknesses of this justification are well known in the defense community. Immense technical and operational uncertainties would have to be overcome in coordinating a first strike against targets as numerous, small, distant, and protected as missile silos.

The fundamental principal at stake here is that the lethal effects of nuclear detonation on a hard target decline exponentially with distance, so that even small errors in measuring the physical conditions affecting the missile's trajectory—be they initial geodetic position, target location gravity, Earth's rotation, atmospheric density, electrostatic and magnetic fields, and other factors—these small errors produce large variations in the number of enemy missiles likely to survive an attack.

From the military standpoint, this range of uncertainty by itself is so large as to preclude any rational calculation of military advantage. But it is merely increased by additional real-world uncertainties surrounding the operational reliability and split-second control of equipment and forces which have never been used and which can never be tested in a manner in which they are intended to be used.

Even if—granting all these other assumptions—a high degree of equipment and personnel reliability could somehow be assured in advance, a large measure of doubt would persist as to whether minute tolerances and alinements of equipment had been maintained within the strict limits needed for successful countersilo attack.

Fielding a credible countersilo force would require an unprecedented degree of attention to maintenance and calibration of complex equipment over extensive periods. And this is an area of military performance in which both military establishments are weak—the Soviet Union relatively more so.

And this speaks to your point in your introduction, Senator. Even without such formidable obstacles to a counterforce attack, and presuming the United States had not already moved to a generated alert posture or placed some fraction of the force in a launch-under-attack posture—and I emphasize some fraction of the force in a launch-under-attack posture, targeted on limited targets in the Soviet Union—the hypothesized Soviet surprise attack on U.S. missile silos, bomber bases and, submarines in port would leave a long-range missile force of some 4,300 warheads—hardly a negligible number, as well as an additional 600 bomber-launched, short-range attack missiles and gravity bombs to execute a potentially wide range of limited responses, as well as pose the threat of assured destruction of Soviet society.

Now, someone should tell me, because I have never understood this: What could the Russians possibly expect to gain by launching, or even coerce by threatening to launch, such a surprise attack on U.S. strategic forces? This question has never been answered satisfactorily by the Department of Defense, suggesting that the real rationale for the MX, if there is one, lies elsewhere.

The second pillar of wisdom, is that the MX is needed to hedge against potential vulnerabilities of the other two legs of the Triad.

The argument is, if these forces become vulnerable to improvements in Soviet air defense, and antisubmarine warfare then a secure land-based missile would be even more important as a means of preserving deterrence.

But already the introduction of air-launched cruise missiles will increase the survivability of bombers, since they will no longer be required to penetrate Russian air defenses in order to deliver their weapons, while the United States has a lead of at least a decade in missile-launching submarine technology and antisubmarine warfare.

And I would emphasize that this technological edge, which can erode—it is very possible it could erode in the future—is reinforced by geographic and geopolitical advantages, and these are: Easy access to the world's oceans and a global alliance structure to facilitate submarine surveillance. These advantages could not be duplicated by the Soviet Union, regardless of cost.

The effectiveness of our nuclear deterrent can be assured by maintaining the present program of countermeasures to prospective Rus-

sian antisubmarine warfare efforts rather than by an expensive new land-based missile. Moreover, the requirement—and I put "requirement" in quotes—for the current Triad of strategic forces, is more a product of history, particularly interservice rivalries over nuclear missions and budgets, than of logic.

And here, I would just interject the persistence of the manned bomber in the missile age is proof of the instance of interservice rivalry. One can calculate that 16 missile exchanges could occur before our bombers reached the Soviet Union. And in that case what difference does it make what penetration capabilities our bombers have, since in the first wave our attack planning calls for targeting Soviet air defense, we would have long since blasted corridors into the Soviet Union for our bombers. Thus, the penetration capabilities and all the expensive ECM that they want to load on the B–1 is useless and a wasteful defense expenditure.

In summing this point up, I would say that the strategic Triad is much like the Holy Trinity. It is a theological construct which, over the years has come to embody some very temporal and self-serving interests. And I would only hope that today the defense establishment could put itself in a frame of mind whereby it could bring about a reformation of our strategic assumptions. In particular, it needs a Defense Secretary who has the courage to nail a new set of strategic theses to the doors of the Pentagon, much as Martin Luther nailed a revolutionary set of theses to the door of the Wittenberg Cathedral.

These theses need to be grounded in inescapable nuclear realities of the present age, rather than in the present meandering and unfocused nostalgia for the superiority of yesteryear.

It has been argued—the third "Pillar"—that the MX is needed to maintain parity or essential equivalence.

I would only note here that when pressed, defense officials admit that the real purpose of essential equivalence is largely symbolic. The idea is that if the United States does not modernize and expand its force in response to recent Soviet nuclear developments, we will be "perceived" by the world as weak, giving the Russians political and diplomatic leverage.

The proponents of nuclear buildup sometimes contend that the very act of buying more and better weapons, no matter how superfluous from the military standpoint, enhance the Soviet perception of American will. In other words, if we persevere in building an enormous nuclear weapons system like the MX, the Soviets will say to themselves, "Why are the Americans stripping their health and welfare budgets to improve their nuclear weapons, and to buy more of them? Anyone who would do that would be serious indeed about using nuclear weapons."

And therefore, they would conclude, "We'd best behave ourselves and not provoke the Americans."

I would note that if we are focusing the justification for the MX on perceptions of who has the stiffest nuclear backbone, then the current campaign to convince the Congress, this subcommittee and the country that Soviet counterforce capability is sapping American resolve can only been regarded as a boon to Moscow, and damaging to the national security of the United States.

If the perception's argument is to be taken seriously, then all the talk about a dangerous window of opportunity for the Soviets in the mid-1980's will only embolden them to leap through it.

And I would add that a number of high-ranking military officials share that view—those that I have talked to and corresponded with. They think that this constant harping on our vulnerabilities is damaging, and I agree with that.

Moreover, there is no evidence that increasingly marginal changes in the strategic balance have any influence whatsoever on the success or failure of our foreign policy endeavors.

And this stands to reason, as I have noted, we have 9,000 nuclear warheads, and 17,000 tactical weapons. At least the superpowers, if not equivalent in a strict numerical sense, are at least mutually sufficient in those measures of strategic power essential for deterrence.

I would like to here note what Secretary Weinberger said in New York recently:

> Weapons systems will not be funded to make our forces mirror Soviet forces in terms of some superficial tally of missiles and bombs sitting on the ground in peacetime.

This is Secretary Weinberger. He says:

> Obtaining symmetry between U.S. and Soviet forces in terms of such superficial counts is not a requirement important enough to qualify for our scarce defense dollars.

So much for essential equivalence, because I don't believe that if one takes Weinberger's remarks seriously, this administration subscribes to that notion.

The fourth and final argument frequently offered in support of the MX is that we need a new, highly accurate, and secure missile with excellent command and control to afford U.S. leaders the option of threatening a limited nuclear response in the event of a severe Soviet challenge to U.S. interests abroad.

Higher nuclear yields, and accuracy in principle, increase the probability of destroying smaller and better protected targets, such as command posts and missile silos.

With present forces we are told a conflict with the Soviet Union that moved beyond conventional forces would force us to choose between backing down or escalation to nuclear attacks on cities, industrial facilities, and unprotected military installations. With more accurate and powerful MX warheads, we are told, the United States could purportedly threaten mainly the hardened Soviet command structure and its nuclear retaliatory forces, thereby avoiding automatic escalation to nuclear Armageddon.

The MX is a disjointed addition to this policy. There are two faces to the nuclear policy in the United States. The public face claims that the purpose of the U.S. nuclear arsenal is to deter the Soviet Union. But the private face has really been—laid an emphasis on our ability to escalate from conventional warfare and have many options at each level.

I have found that while most strategists would concede that a true disarming first-strike potential is unlikely to be achieved by either side, some of them believe that a potentially decisive "not incredible first-strike" capability can be obtained within a given theater of operations, or a given level of conflict.

While this strategy recognizes that a portion of the Soviet Union's strategic nuclear force would remain intact—I might add thereby allowing American officials to continually disavow a first-strike intention—this strategy would, by preemptively destroying conventional and tactical nuclear capabilities within a given theater, shift the burden of escalation of all-out warfare to the Soviets.

If we entrust them with the decision over their own as well as their enemy's fate, the Soviets would naturally step back from the brink and concede victory to the United States. So goes the reasoning.

Better yet, having made all these calculations in advance, they would refrain from challenging American interests in the first place, which is considered the optimum outcome, and which the Defense Department calls extended deterrence.

In other words, the Soviets would be deterred in the very broadest sense of that term.

We believe that this strategy attempts to extend the concept of strategic nuclear deterrence far beyond what is reasonable and safe in an age of nuclear parity between the superpowers. While it attempts to minimize the peculiarly Soviet dimension of the threat to our national interest overseas, this strategy would do so at the cost of maximizing the number of instances in which nuclear weapons, including strategic weapons, might be used, thereby heightening the dangers I referred to earlier—the dangers of nuclear war through bluff, miscalculation, and accident—the so-called war nobody wants.

And beyond this, it provides the nuclear weapons establishment with a poorly thought-out, but nonetheless welcome, rationale for why the Nation needs to spend additional billions on nuclear weapons, which I presume is the chief concern of this subcommittee.

So, therefore, this rationale is somewhat germane to your proceedings.

Ironically, however, the MX has certain characteristics which make it particularly unsuited for carrying out this strategy, thereby confirming what critics of the Pentagon's counterforce tendencies have long suspected; that doctrine is evolved independently and somewhat haphazardly to fit weapons programs which have a life of their own, rather than the other way around.

Let me just examine briefly the deficiencies of the MX in terms of strategy, and why someone who would be interested in improving the strategic nuclear deterrent of the United States would not want to support the MX.

A large targetable land-based missile, loaded with a minimum of 10 to 12 high-yield nuclear warheads that must traverse an intercontinental range for 30 minutes or more, is hardly optimum from the perspective of fighting a limited exchange. Viewed solely from the standpoint of military flexibility and effectiveness—and I emphasize that solely from that standpoint—larger numbers of smaller single warhead missiles launched from truly mobile platforms, deployed close to the Soviet Union, would be preferable. In this case, other conditions being equal, an error in the missile guidance systems or a malfunction in flight would then affect the delivery of only 1, not 10, warheads.

Moreover, given comparable initial conditions, the unaccounted for sources of guidance error or bias, as it is known in the trade, would be less for a missile launched at closer range than for an ICBM, as

would the missile's flight time, and hence the Soviet opportunity for launch under attack.

Shorter range ballistic missiles reenter the atmosphere at slower speeds and leave the blackout region at higher altitudes, thereby facilitating the use of potentially accurate terminal guidance techniques, if jam-resistant methods could be found. And I emphasize the latter, if jam-resistant methods could be found.

This, in turn, would permit the use of relatively low-yield warheads, to carry out the theoretically pinpoint attacks called for by the limited nuclear war strategy as codified in PD-59.

Because the locations of these smaller missiles would either be secret, deployed in submarines, or constantly changing, in theory, these missiles could be withheld, an important factor in most limited exchange scenarios. And, they could be withheld with more assurance than a targetable land-based ICBM in a semimobile deployment like the MX.

Since the Reagan administration is already vigorously pursuing this avenue for nuclear escalation in the form of ground-launch cruise missiles, Pershing II, and possible deployment of cruise missiles on carrier-based naval aircraft, in view of its obvious defects, the MX would appear to offer little toward filling this particular requirement for a credible nuclear escalation capability.

In other words, the MX would really not give us any additional options, and that is one of the stated reasons for buying it.

Beyond these considerations, the problem, the real nub of the problem lies not only with the general unsuitability of the MX for the requirement, but the requirement itself.

The problems with an extended deterrence, or a limited nuclear warfare role for our strategic forces are legion. The technical difficulties I have referred to.

A number of prominent scientists consider these difficulties to be insuperable. I would add that some weapons designers and military officers also feel that way. Many well-informed persons, with years of accumulated experience in the nuclear weapons field, consider the idea of fighting a nuclear war that can be limited beforehand to specific targets and predictable levels of civilian damage, to be a dangerous illusion.

Guidance errors aside, the effects of even small nuclear explosions cannot be limited to precise targets because of the extent of the initial blast, radiation, and thermal effects as well as subsequent firestorms and radioactive clouds.

The longer term effects are often neglected by people who analyze the situation. For example, we could launch a flexible response strike against the Soviet Union's refining capacity hydroelectric facilities, reserve stocks of fuel, what the military calls a limited target set.

If we launch this in winter, it could result in the death of thousands and perhaps millions of Soviet citizens.

What response the Soviet leaders might make to this and many other possible limited attacks is simply not known.

Moreover, the first use of nuclear weapons in a conflict would probably lead to escalation—not automatically lead to escalation, but probably lead to escalation—and there is no guarantee where such escalation would end. Such a guarantee would require assurance of

perfect communication between and within the forces on both sides, a criterion unlikely to be met in the heat of nuclear battle.

I would mention, in this connection, that even in a situation in World War II, where we were not under attack, our command and control forces were not under attack, we were unable to coordinate our diplomatic initiatives with Japan, and we gratuitously destroyed the city of Nagasaki. And in my prepared statement I have detailed why that occurred.

In fact, to the extent that the threat posed by MX to Soviet missiles in their silos is taken seriously, then the MX will contribute to escalation rather than limit it, which is the avowed purpose of the missile, by prompting a use-it-or-lose-it syndrome in Soviet operational planning.

I see really no justification for the so-called retaliatory countersilo mission. All that will do—especially in the instance in which we are responding to a Soviet first strike—is it will force a quicker launch of the remaining Soviet missiles.

Taken together——

Senator PROXMIRE. Can you wind up in about a minute?

Mr. PAINE. Right, I am summarizing it.

Taken together, the above considerations suggest that if the primary purpose of our nuclear arsenal is to deter a nuclear attack, then deployment of the MX is a strategic giant step in the wrong direction, as well as a horrendous waste of money. No matter how it is based, the MX is not needed for a deterrence of nuclear war, nor is it suited for use in a limited nuclear conflict, should such an implausible phenomenon ever emerge as a realistic possibility.

Thank you.

Senator PROXMIRE. Thank you, Mr. Paine.

[The prepared statement of Mr. Paine, together with a memorandum, follows:]

Prepared Statement of Christopher Paine

The Office of Technology Assessment, the House Public Lands Subcommittee, and Republican Senators Garn and Laxalt have recently issued reports criticizing the multiple protective shelter (MPS) basing mode the Air Force plans for the MX in Nevada and Utah. The Townes committee, a blue-ribbon group of defense experts appointed by Secretary Weinberger to study MX basing, is completing its work and the President will soon decide on yet another "final" basing plan. Virtually all the attention to date has focused on MX basing.

This restricted range of vision is unfortunate, since the MX, no matter how it is based, is unnecessary for the deterrence of nuclear war, the only plausible mission of our strategic forces in an age of nuclear parity between the superpowers. As the OTA analysts observed in the introduction to their recent basing study, "Due to the study boundaries, OTA's criteria of analysis and comparison tend to use, rather than critically evaluate, conventional wisdom about how strategic forces support U.S. national security."

Over the years, the Pentagon has elaborated and embellished this conventional wisdom much as the medieval astronomers propounded orbits within orbits to forestall the collapse of their vision of an

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earth-centered universe. In the continuing controversy over deployment of a new mobile land-based intercontinental ballistic missile, Air Force officials, civilian leaders of the Department of Defense, legislators and defense contractors have all subscribed, with varying degrees of emphasis and enthusiasm, to what might be called the Four Pillars of Strategic Wisdom: 1) current silo-based ICBM's are vulnerable; 2) the air and sea legs of the "Triad" of nuclear forces could become vulnerable; 3) "essential equivalence" must be maintained with Soviet nuclear forces to prevent "coercion"; 4) and the range of limited nuclear options must be expanded to insure deterrence of any Soviet attacks on our global interests.

In a larger sense, like the medieval astronomers' epicycles, these arguments represent a headlong flight from reality. They are symptomatic of the military establishment's--indeed, the entire national leadership's--collective unwillingness to acknowledge that the nuclear arms race is a demonstrably futile means of defending our national interests and guaranteeing our security.

The nuclear forces on both sides have now become so large, and the consequences of their use so unpredictably catastrophic, that they have become useless as affirmative or coercive instruments of policy. Unlike conventional arms, nuclear forces can not rationally be employed to occupy another's territory, defend one's own, or liberate those suffering under the yoke of external or internal oppression.

The role of nuclear weapons is almost entirely negative, and consists primarily of denying, to the maximum extent possible, the rational possibility of their use by the other side by posing a credible threat of retaliation in kind, or worse. Given the extraordinarily lethal effects of nuclear weapons, the forces required to accomplish this task are not large, perhaps more than

a hundred weapons but certainly a good deal less than the many thousands both sides possess today.

But the possibility of irrational, accidental, miscalculated, or impulsive use of nuclear weapons can not be "deterred" in this fashion. Rather, it can only be minimized by limiting the deployments and characteristics of the weapons (and their associated delivery vehicles) and by reducing the number of instances in which they might be employed. Since at this late stage in the arms race, additional nuclear weapons can not measurably strengthen deterrence (both sides have long since passed the point of having one million tons of TNT equivalent for every population center over 10,000 persons), nor significantly damage should deterrence fail (by preemptively destroying a sufficient number of Soviet weapons), nuclear arms control would appear to be more fundamental to the national security than any new strategic weapon we could reasonably hope to deploy.

Beyond obscuring the meaningless sinkhole which the nuclear arms race has become, the more immediate purpose of these strategic nostrums has been to dignify the fundamental, and, in fact, alarmingly primitive impulse which lurks behind the MX project--reflexive imitation of the Russians; since the Russians were permitted under SALT to keep their large land-based multiple-warhead missiles, we must have them too. If the recent testimony of Messrs. Rostow and Rowny is any guide, this would appear to be the bottom line, now justified largely on psychological grounds. By itself, the fact that a small single-warhead land-based ICBM is under consideration as an alternative to the MX gives the lie to the big missile's status as a unique <u>military</u> requirement.

Despite their essentially figleaf role, these strategic nostrums have so permeated the MX debate that their hold over the official and public mind

needs to be dispelled before real progress can be made in sorting out what does and does not contribute to the national security. The conventional wisdom on strategic matters can not withstand even a mildly probing analysis, a state of affairs which some defense experts are willing to admit privately. But few will do so publicly, partly out of the understandable fear of isolating themselves from their colleagues, and partly out of what can only be called a dangerous failure of imagination.

1). According to the Pentagon, the first pillar of wisdom is that the MX is needed to replace Minuteman, a missile housed in fixed silos that is becoming vulnerable to a surprise attack from increasingly accurate Soviet missiles. The weaknesses of this justification are well known to the defense community. Immense technical and operational uncertainties would have to be overcome in coordinating a first strike against targets as numerous, small, distant, and protected as missile silos.

Since the lethal effects of a nuclear detonation on a hard target decline exponentially with distance, even small errors in measuring the physical conditions affecting a missile's trajectory--initial geodetic position and target location, gravity, earth's rotation, atmospheric density, electrostatic and magnetic fields--produce large variations in the number of enemy missiles likely to survive an attack. From the military standpoint, this range of uncertainty by itself is so large as to preclude any rational calculation of military advantage. But it is increased by additional real world uncertainties surrounding the operational reliability and split-second control of equipment and forces which have never been used, and which can never be tested in the manner in which they are intended to be used. Even if a high degree of equipment and personnel reliability could somehow be assured in advance, a large measure of doubt would persist as to whether minute tolerances and alignments of equipment had been maintained within the strict limits needed for a successful counter-silo attack. Fielding a credible counter-silo

force would require an unprecedented degree of attention to maintenance and calibration of complex equipment over extended periods, an area of military performance in which both military establishments are weak, the Soviets relatively more so.

Even without such formidable obstacles, and presuming the U.S. had not already moved to a "generated" alert or placed some fraction of the force in a launch-under-attack posture, the hypothesized Soviet surprise attack on U.S. missile silos, bomber bases, and submarines-in-port would leave a long-range missile force of some 4300 warheads--hardly a negligible number--as well as an additional 600 bomber-launched short range attack missiles and gravity bombs to execute a potentially wide range of "limited" response options and pose the threat of "assured destruction" of Soviet society. What could the Russians possibly expect to gain by launching--or "coerce" by threatening to launch--a surprise attack on U.S. strategic forces? This question has never been answered satisfactorily by the Department of Defense, suggesting that the real rationale for MX--if there is one--lies elsewhere.

2). A second argument frequently put forward is that the MX is needed to hedge against potential vulnerabilities in the other two legs of the strategic Triad, submarine-launched missiles and bombers. If these become vulnerable to improvements in Soviet air defense and anti-submarine warfare, then a secure land-based missile would be even more important, we are told, as a means of preserving deterrence. But the introduction of air-launched cruise missiles will increase the survivability of bombers, since they will no longer be required to penetrate Russian air defenses in order to deliver their weapons, while the U.S. has a lead of at least a decade in missile-launching submarine technology and anti-submarine warfare. This technological edge is reinforced by geographic and geopolitical advantages--easy access to

the world's oceans and a global alliance structure to facilitate submarine surveillance activities--which cannot be duplicated by the Soviet Union regardless of cost.

The effectiveness of our nuclear deterrent can be assured by maintaining the present program of countermeasures to prospective Russian anti-submarine warfare efforts, rather than by an expensive new land-based missile. Moreover, the "requirement" for the current Triad of strategic forces is more a product of history--particularly interservice rivalries over nuclear missions and budgets--than of logic. A secure deterrent force can be attained in a variety of ways, and need not involve a mobile land-based missile.

Like the Holy Trinity, the Strategic Triad is a theological construct which over the years has come to embody some very temporal and self-serving interests. The defense establishment today is clearly in need of a Reformation. In particular, it needs a defense secretary who has the courage to nail a new set of strategic theses to the doors of the Pentagon, theses grounded in the inescapable nuclear realities of the present age rather than in the present meandering and unfocused nostalgia for the superiority of yesteryear.

3). It has also been argued that the MX is needed to maintain "parity" or "essential equivalence" with the Soviet Union, in light of their program of expanding and modernizing their nuclear forces. Since these forces are not identical--the U.S.S.R. has more ballistic missiles, in particular "heavy" land-based missiles, but fewer warheads, especially submarine-launched missile warheads, and fewer long-range bombers than does the United States--it is difficult to define precisely what equivalence means.

When pressed, defense officials admit on occasion that the purpose of maintaining the appearance of equivalence with the Soviet Union in nuclear arsenals is largely symbolic: if the U.S. does not modernize and expand its

force in response to recent Soviet nuclear developments, we will be perceived by the world as weak, giving the Russians political and diplomatic leverage in the world's trouble spots. The proponents of nuclear buildup sometimes contend that the very act of buying more and better weapons, no matter how superfluous from the military standpoint, enhances the Soviet perception of American will, by reinforcing the view that the United States will not shrink from using nuclear weapons in defense of its vital interests. In other words, if we persevere in building an enormous nuclear weapon system like the MX, the Soviets will say to themselves, "Why are the Americans stripping their health and welfare budgets to improve their nuclear weapons, and to buy more of them? Anyone who would do that must be serious indeed about using them. We'd best behave ourselves and not provoke the Americans."

Paradoxically, however, if the argument for MX is allowed to rest on perceptions of who has the stiffest nuclear backbone, then the campaign to convince the Congress and the country that Soviet counterforce capability is sapping American resolve can only be regarded as a boon to Moscow and damaging to the national security of the United States. If the "perceptions" argument is to be taken seriously, then all the talk about a dangerous "window of opportunity" for the Soviets in the mid-eighties will only embolden them to leap through it.

Moreover, there is no evidence that increasingly marginal changes in the strategic balance have any influence on the success or failure of our foreign policy endeavors. A recent Brookings Institution study of the political uses of military power concluded, for example, that "...our data would not support a hypothesis that the strategic weapons balance influences the outcome of incidents in which both the United States and the U.S.S.R. are involved."

This stands to reason. The United States already has some 9000 nuclear warheads which can be delivered at intercontinental ranges to targets in the Soviet Union, a stockpile of some 17,000 additional weapons for use at shorter ranges and on the battlefield, and several strategic and theater nuclear modernization programs well underway. Since the superpowers are already "equivalent", or at least "mutually sufficient", in those measures of strategic nuclear power which are "essential" for deterrence of deliberate nuclear attack, clearly, the MX is not needed to maintain that kind of "essential equivalence", even if a consensus could be found on exactly what is meant by the term. And for more than a decade every defense secretary, including Secretary Weinberger, has rejected simple numerical equivalence, or "bean-counting" as it's known around the Pentagon, as a meaningful standard for comparing strategic nuclear forces. "Weapons systems will not be funded to make our forces mirror Soviet forces in terms of some superficial tally of missiles and bombs sitting on the ground in peacetime", Weinberger remarked in a recent speech (June 17, 1981). "Obtaining symmetry between U.S. and Soviet forces in terms of such superficial counts is not a requirement important enough to qualify for our scarce defense dollars". In short, the demand for essential equivalence is a bureaucratic subterfuge which affords scant justification for the MX.

The fourth and final argument frequently offered in support of the MX is that a new, highly accurate and secure missile with excellent command and control is needed to afford U.S. leaders the option of threatening a limited nuclear response in the event of a severe Soviet challenge to U.S. interests abroad. Higher nuclear yields and accuracy, in principle, increase the probability of destroying smaller and better protected targets, such as command posts and missile silos. With present forces, we are told, a conflict

with the Soviet Union that moved beyond conventional forces would force the U.S. to choose between backing down or escalation to nuclear attacks on cities, industrial facilities, and unprotected military installations. With more accurate and powerful MX warheads, the U.S. could purportedly threaten mainly the "hardened" Soviet command structure and its nuclear retaliatory forces, thereby avoiding "automatic" escalation to nuclear Armageddon.

The MX is a rather disjointed addition to the emerging policy of being prepared to fight, or at least threaten to fight, limited nuclear wars, the policy that was leaked to the press last summer and contained in the classified Presidential Directive 59. For years, U.S. nuclear weapons policy has had two faces. The public face claims that the purpose of the U.S. nuclear arsenal is to deter the Soviet Union from launching, or coercing concessions by threatening to launch, a nuclear attack on the U.S. and its major allies, chiefly NATO and Japan.

So long as the United States has a force of nuclear weapons that could survive a first strike and retaliate against Russian infrastructure and industry, the Russians, we were told, would never have anything to gain from launching, or even threatening, a nuclear attack. And since the Soviet Union by the late 1960's had also developed a retaliatory force that was, in former defense secretary Schlesinger's phrase, "beyond the capacity of the United States to take away", a condition of mutual deterrence exists with respect to the first use of nuclear forces by either side.

Unfortunately, U.S. policy has never been that clear-cut. The more private face of U.S. doctrine has incorporated a wide-range of missions and options for the nuclear arsenal, both tactical and strategic, with deterrence of a nuclear first strike only one of them. When the U.S. had a virtual monopoly of nuclear weapons delivery capability in the 1950's, the Eisenhower-

Dulles doctrine of "massive retaliation" threatened the use of such weapons in a variety of situations. Since then, while the United States has had to accept the development of a significant Russian nuclear force, U.S. actions, as opposed to declaratory doctrine, have emphasized maintaining, if not outright numerical superiority, then at least a superior capability for nuclear escalation in the major theaters of potential conflict. The aim is to deter not just nuclear attacks out-of-the-blue but any military move by the Russians and their allies against the U.S., its allies, and its global interests.

While most strategists would concede that a true "disarming first-strike" potential is unlikely to be achieved by either side, some believe that a potentially decisive "not-incredible-first-strike" capability can be attained within a given theater of operations, or at a given level of conflict. While this strategy recognizes that a portion of the Soviet Union's strategic nuclear force would remain intact, by preemptively destroying conventional and tactical nuclear capabilities within a given theater it would, we are told, shift the burden of escalation to all-out warfare to the Soviets. Thus entrusted with the decision over their own as well as their enemy's fate, the Soviets would naturally step back from the brink and concede "victory" to the United States. Better yet, having made all these calculations in advance, they would refrain from challenging American interests in the first place--the "optimum" outcome.

In other words, the Soviets would be "deterred" in the very broadest sense of that term. This strategy attempts to extend the concept of strategic nuclear deterrence far beyond what is reasonable and safe in an age of nuclear parity between the two superpowers. While attempting to minimize the peculiarly Soviet dimension of the threat to our national interests overseas, this

strategy would do so at the cost of maximizing the number of instances in which nuclear weapons, including strategic weapons, might in principle be used, thereby heightening the danger of nuclear war through bluff, miscalculation and accident--the so called "war nobody wants".

And by providing the nuclear weapons establishment with a poorly thought-out but nonetheless welcome rationale for why the nation needs to spend additional billions to refine its already grossly excessive capacity for nuclear overkill, the limited nuclear war strategy gives added impetus to the nuclear arms race while providing its proponents with at least a superficially plausible rationale for why this race cannot be stopped.

Ironically, however, MX has certain characteristics which make it particularly unsuited for the doctrine it is supposed to implement, thereby further confirming what critics of the Pentagon's counterforce tendencies have long suspected, that doctrine is evolved independently, and at best haphazardly, to fit weapons programs which have a life of their own, rather than the other way around. A large targetable land-based missile, loaded with 10-12 high-yield nuclear warheads that must traverse an intercontinental range for 30 minutes before striking their targets, is hardly optimum from the perspective of "fighting" a "limited" nuclear war. Viewed solely from the standpoint of military flexibility and effectiveness, larger numbers of smaller single-warhead missiles, launched from truly mobile platforms deployed close to the Soviet Union, would be preferable. An error in the missile guidance systems, or a malfunction in flight, would then affect the delivery of only one, not ten warheads. Moreover, given comparable initial conditions, the unaccounted-for sources of guidance error ("bias") would be less for a missile launched at closer range than for an ICBM, as would the missile's flight time and hence Soviet opportunity for launch-under-attack.

Shorter range ballistic missiles reenter the atmosphere at slower speeds and leave the blackout region at higher altitudes, facilitating the use of potentially accurate terminal guidance techniques if jam resistant methods could be found. This in turn would permit the use of relatively low-yield warheads to carry out the theoretically pinpoint attacks called for by the limited nuclear war strategy. And because the locations of these smaller missiles would either be secret (submarine deployment) or constantly changing (ship, air, or land-mobile deployment), in theory, they could be withheld--an important factor in most limited exchange scenarios--with more assurance than targetable land-based ICBMs.

Since the Reagan administration is already vigorously pursuing this avenue for nuclear escalation, in the form of ground-launched and sea-launched cruise missiles, cruise missiles launched from carrier-based naval aircraft, and land-mobile Pershing II intermediate range ballistic missiles with precision guided reentry vehicles, in view of its obvious defects the MX would appear to contribute little toward filling the "requirement" for a credible nuclear escalation capability.

The problem, of course, lies not only with the general unsuitability of the MX for the requirement, but with the requirement itself. As noted above, the problems with an "extended deterrence" or limited nuclear warfare role for our strategic forces are legion: the technical difficulties--and operational uncertainties--in achieving the advertised levels of accuracy, reliability, and control are formidable, and a number of prominent scientists, weapons designers, and military officers consider them inherently insurmountable. And many well-informed persons, with years of accumulated experience in the nuclear weapons field, consider the idea of fighting a nuclear war that can be limited beforehand to specific targets and predictable levels of civilian damage to be a dangerous illusion.

Guidance errors aside, the effects of even small nuclear explosions cannot be limited to precise targets because of the extent of the initial blast, radiation, and thermal effects as well as subsequent firestorms and radioactive clouds. The longer term effects of disruption to the target society's life support systems must also be taken into account when estimating damage and the likelihood of escalation. For example, destruction of the Soviet Union's refining capacity, hydroelectric facilities, and reserve stocks of fuel--a "limited" target set--in winter could result in the death of thousands, perhaps millions of Soviet citizens. What response the Soviet leaders might make in this and many other possible "limited" attacks is simply not known.

Moreover, the first use of nuclear weapons in a conflict would probably lead rather rapidly to escalation and there is no guarantee where such escalation would end. Such a guarantee would require assurance of perfect communication between and within the forces on both sides, a criterion unlikely to be met in the heat of nuclear battle.

In this connection, the circumstances surrounding what strategists call the "war-termination phase" of the conflict with Japan are instructive. Even in a situation in which its own forces and command and control systems were not under attack, the U.S. was unable to coordinate its diplomatic overtures with its military forces in the field. Because the scheduling of the Nagasaki raid had been left to the initiative of the bomber command on the island of Tinian--which advanced the raid from August 11 to August 9 to take advantage of favorable weather conditions--the city of Nagasaki was gratuitously obliterated. The Japanese surrender offer came on August 10, 1945. In other words, we could "terminate" the war on the Hotline and still lose Omaha because some Soviet missile commander somewhere believed it was now or never.

In fact, to the extent that the threat posed by MX to Soviet missiles in their silos is taken seriously, then the MX will contribute to escalation rather than limit it--the avowed purpose of the strategy--by prompting a use-it or lose-it syndrome in Soviet operational planning.

Taken together, the above considerations suggest that if the primary purpose of our nuclear arsenal is to deter a nuclear attack then deployment of the MX is a strategic giant step in the wrong direction, as well as a horrendous waste of money. No matter how it is based, the MX is not needed for deterrence of nuclear war, nor is it suited for use in a limited nuclear conflict, should such an implausible phenomenon ever emerge as a realistic possibility.

In short, after years of costly excavation, MX proponents have yet to unearth an acceptable rationale for a new land-based ICBM. If this inconvenient reality is ignored, and the MX deployed out of political expedience or mindless bureaucratic momentum, then Americans should be made aware of precisely what their billions of tax dollars have bought--a malevolent high-tech totem pole, commemorating a national obsession with the accumulation of nuclear weapons for defense which is a foolhardy as it is obsolete.

Memorandum on the Question of Silo Vulnerability, and the MX

To: Dr. Charles Townes, Chairman, MX Review Panel, Department of Defense

From: Christopher Paine, Staff Assistant for Arms Control, Federation of American Scientists

The case for a new land-based ICBM hinges to a large extent on uncritical acceptance of several interlocking "axioms" underlying current thinking about the strategic nuclear forces:

(1) Serious degradation of the Minuteman force after a Soviet first strike will leave the National Command Authority without sufficient limited counterforce options, forcing the President to choose between a "suicidal strike" against Soviet cities or compliance with whatever objectives the Soviets may be seeking.

(2) The Soviet Union is on the verge of acquiring the capability to destroy a large percentage of the Minuteman missiles in their silos.

(3) Even if the probability of an actual first strike on Minuteman remains extremely low, as most defense officials admit, widespread perception of Soviet potential to conduct such a strike will embolden their foreign policy, diminish American global prestige, and contribute to the "Finlandization" of allies.

(4) A new survivable land-based missile is needed as a hedge against the future vulnerability of submarine-launched and cruise missile forces.

(5) Some form of Multiple Protective Shelter (MPS) basing is the preferred compromise between the competing requirements for hardness, mobility and deception needed for survivable land-basing.

I am convinced that both the narrower military as well as broader political and economic aspects of national security would be better served by a thorough reconsideration of all these axioms, not merely the last, although reconsideration of the basing mode alone -- in favor of sea-basing, for example -- would logically entail some revision of the other fundamental assumptions.

Axiom #1 ("Suicide or surrender") - The scenario which the Department of Defense and others have advanced goes something like this: the USSR is assumed to have acquired the ability to destroy the entire U.S. capacity for "limited" nuclear response options, which are likewise assumed to be confined to the land-based ICBM force. The Soviets would then be in a position to destroy all the Minuteman and say to an American president, "Surrender, we hardly killed anybody." It is often said that the mere existence of this assymetry would be sufficient to cause an American president to back down in a crisis or abandon an ally

without firing a shot.

Even granting the (wholly unwarranted) technical, military and psychological assumptions underlying this scenario, it still doesn't make sense. The prelude of destroying Minuteman is completely unnecessary -- hence, the strategic and political significance of Soviet counterforce capability is greatly exaggerated. The Soviets could just as plausibly threaten to attack some limited set of critical industrial or infrastructure targets, such as the oil industry and electric power generating facilities, and then say, "We can cripple your economy -- 'surrender,' or 'get out of Europe.' We are implacable. We see no reason to waste our warheads on your military forces, and you know what nuclear warheads can do to your cities. If you retaliate, we will destroy all of you."

The important question here is, as R. L. Garwin and others have pointed out, who believes what? What is inevitable in this scenario? Since everyone from the Joint Chiefs on down agrees that at present levels of nuclear armaments, each side will retain the capability to inflict varying degrees of damage (including "assured destruction") on the other, how will the acquisition of additional weapons, such as the MX, affect the outcome of such scenarios? The answer is, of course, that in any measurable sense, they won't. As Harold Brown, among others, has observed, the outcome depends "more on a weakness of will than a weakness of weapons systems."

However, in harmony with the way such things are traditionally done in the Pentagon, one must consider the "worst case" -- a successful first strike on Minuteman accompanied by an SLBM attack on U.S. bomber and submarine bases. Would this attack leave the U.S. with insufficient counter-military and flexible response options?

Briefly, by 1985, when Minuteman is presumed by some observors to be very vulnerable, the U.S. submarine fleet will have on the order of 6000 deliverable warheads. Assuming that the 60% of the force on patrol survives a surprise attack (this percentage would increase with warning), a force of about 3,600 warheads will be available for second strike retaliation from the sea-based deterrent. Assuming a very generous (to the Soviets) 90% probability of kill in a one-on-one attack on the U.S. ICBMs leaves a force of 215 warheads. A 25% bomber alert rate (this is generally considered a peacetime minimum) would guarantee the survival of roughly 500 out of the projected force of some 2000 air-launched cruise missiles (ALCM's) in service by 1985. Adding these already programmed surviving forces together yields a long-range missile force of 4315 warheads -- hardly a negligible number -- to execute the full range of limited

response options.#

In addition, some 640 Short Range Attack Missiles (SRAM's) and gravity bombs would survive as part of the alert bomber force. (Cruise missiles deployed on submarines and surface ships, and on land in Europe, along with Pershing II medium range ballistic missiles, would further enlarge the prospective 1985 retaliatory force). Given the introduction of presently programmed, and a few additional, improvements to the submarine force between now and 1989 -- the earliest target date for completion of the MX -- there is no technical reason why this surviving force could not provide "coverage" of even the most hardened military targets equivalent to that provided by ICBM's.* The facts are that the obstacles to a high-confidence, strategically meaningful counterforce capability are not the special liability of submarine-launched missiles, but rather are inherent in the task of delivering several thousand warheads to small hardened targets along trajectories never flown before. In fact, because submarines may launch their missiles at much closer range, the bias error along an untested trajectory would be less than for an ICBM, as would the flight time and hence the Soviet opportunity for launch-under-attack. And because their locations are secret, SLBM's may be withheld -- an important factor in some limited exchange scenarios -- with far greater confidence than targetable land-based ICBM's, regardless of whether these are based in fixed silos or a semi-mobile shell game.

Nor are the purported generic advantages of ICBM's over submarines in the areas of Command, Control, and Communications (C^3) so large as to justify the creation of a new land-based force costing tens of billions of dollars. The argument has been made that submarine communication systems are subject to preemptive attack. The same caveat applies to silo systems as well, but with one difference. The submarines themselves are not subject to attack, at least not at present or projected levels of Soviet anti-submarine warfare capability. The allegedly superior command and control provided by a ground based communications link may not be worth all that much if those giving the orders and those receiving them are in the process of being inundated by a massive nuclear attack.

If the SAC commander and the NCA are forced to take to the air, upon warning of an impending attack, as called for in current planning, then this situation would appear to differ little from, for instance, the TACAMO airborne system for communicating with submarines. Some observors have suggested the creation of a survivable Emergency Rocket Communication System for the SLBM force, in which

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*See Appendix I.

#See Addendum entitled "Comments Received."

a certain number of launch tubes throughout the force would be dedicated to launching emergency communication satellites, or the creation of special subs for this purpose. If there are uncertainties concerning the "connectivity" of the nuclear deterrent force to the NCA in wartime, this would appear to be a far more sensible way of dealing with the problem than burying thousands of miles of fiber optic cable in the western desert so that thousands of concrete bunkers might communicate with each other and the NCA after "absorbing" a nuclear attack.

Surely if we can arrange live television coverage of our shuttle flights in space, we can devise a plausibly reliable means for communicating with our submarines in wartime. Moreover, the introduction of intercontinental range missiles into the SSBN fleet is making this task easier, by allowing deployment in American home waters. And the advent of stealth technology undoubtedly could be made to enhance the survivability of future TACAMO-type aircraft. One might also envision -- rather than the current land-based C-130 derivative aircraft -- an "amphibious, stealth TACAMO" which could stay on station almost indefinitely, refueling from submerged storage tanks emplaced by a fleet of high speed surface effect ships which would themselves constitute an alternate Communications link to the submarine force. Obviously, concerted ingenuity on a far less imposing scale than that involved in the exhaustive and continuing search for the survivable land basing mode would produce many promising C^3 alternatives. In short, the communications deficiencies of submarines are neither as serious or as insuperable as the MX advocates appear to believe.

As Harold Brown has noted, the problem with all such limited counterforce/countervalue exchange scenarios -- whether played out with ICBM's, SLBM's or the entire force is that

> their proponents find it difficult to tell us what objectives an enemy would seek in launching such campaigns, how these campaigns would end, or how any resulting asymmetries could be made meaningful. We are left instead with large uncertainties about the amount of damage that would result from such exchanges, about escalation, and about when and how exchanges would terminate...We have to admit that we have not developed a plausible picture of the conflict we are trying to deter.

Until such time as a plausible picture of a counterforce or limited strategic nuclear exchange does emerge, it seems reasonable to conclude that military "requirements" arising form the need to either deter or fight such conflicts are premature, particularly when the purported requirement is on the scale of the proposed MX-MPS system. Indulging in this particular scheme for insuring against

the breakdown of deterrence carries a very heavy pricetag. There must be cheaper ways of accomodating the military's psychic need to feel prepared "should deterrence fail." And it should be clear to everyone concerned, military and civilian alike, that we are indeed talking about providing for a psychic need rather than a real improvement in military capability. No nuclear system, either in inventory or in prospect, and least of all the "nuclear sponge" of MX-MPS, offers even the slightest chance of avoiding massive damage from even a "limited" counterforce attack. Thus, even if one were to grant the validity of the nuclear warfighting requirement, it is far from clear that the proposed MX-MPS system is the way to fill it. In fact, I believe that any fair-minded examination of the liabilities of the MPS system reveals quite clearly that it must be rejected. (See also discussion of Axiom #5 below).

Crisis stability - The DOD contends that doing nothing about Minuteman vulnerability will force the adoption of an unsettling launch-on-warning posture for the United States, creating a hair-trigger atmosphere in time of severe international tension. There are a number of misleading aspects to this contention:

First, as former Undersecretary Perry has testified, "We always have had an LUA option for the President." In fact, Perry noted that "recent changes have, we believe, removed significant impediments to exercising that option." So the issue is not the possible resort to launch-under-attack per se, but whether, in the absence of MX, the President would be "obliged" to use it.

The MX/MPS system is being designed to assure the survival of 100 missiles after a surprise attack in the 1990's and beyond. This is about the same number of missiles expected to survive a surprise attack on Minuteman silos in the 1980's, 10%. Not only does the MX fail to significantly increase the President's pre-attack confidence in the number of surviving missiles, but the survival of these 1000 warheads, out of a projected 1990's inventory of 12,000 - 15,000 nuclear warheads potentially available for retaliation, would not exactly "oblige" the President to launch on warning of an attack. Furthermore, MX is survivable only for the first round. After absorbing an initial large scale attack, a sufficient number of shelters would have been destroyed to permit the Soviets to concentrate their second strike, requiring the MX to be launched under attack to avoid destruction in its shelters.

Similarly, with respect to Minuteman, if even the slightest doubt persisted about the nature of the incoming attack, the President would not be obliged to launch, having at his disposal thousands of other nuclear weapons on board submarines and bombers equipped with cruise missiles. The fact is, however, that

the massive scale of an attack aimed at destroying Minuteman would offer fairly unambiguous warning, or else be preceded by a preliminary "blinding" attack on our early warning satellites. It is highly unlikely that the latter attack would itself escape detection by the U.S. ground based Space Detection and Tracking System (SPADATS), now in the process of being supplemented by the construction of the global five-site Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) system. The BMEWS (Ballistic Missile Early Warning System), currently being upgraded, and other ground based radars provide an alternative means of confirming that an attack is under way. This is not to argue in favor of reliance on a launch-under-attack (LUA) system, but only to note that Minuteman vulnerability does not compel reliance on such a system any more than the MX would preclude its use.

Axiom #2 ("Minuteman is dangerously vulnerable to a Soviet first strike") - There have been many "gaps" in U.S. national security planning, all of them fraudulent in so far as the integrity of the nation's defenses was never at stake, and many of them fraudulent on a purely factual basis as well, in that the postulated threat never materialized. There was the "tank gap" of 1952, the "bomber gap" of the mid-fifties, the "missile gap" of 1960, and the various and sundry "gaps of the SALT era -- the ICBM "throw-weight gap," the "civil-defense gap," and the "hard-target kill capability gap," also known as the "window of vulnerability" or "strategic bathtub" (the latter denoting precipitous troughs in SAC's Vu-graphs of the number of U.S. warheads surviving a Soviet surprise nuclear attack).

Crediting the Soviets today with what they might be able to accomplish some years hence has long been a dominant syndrome in U.S. defense planning, and more recently, an effective way of undermining the SALT II Agreement. But regrettably, where the issue of Minuteman vulnerability is concerned, this syndrome afflicts even erstwhile proponents of arms control. In the prewailing political climate, failure to broadcast this latest purported achievement of Soviet militarism is considered the height of political irresponsibility. In the jargon of the strategic planner, soft-pedaling the problem would be "highly imprudent," a bellwether of one's unwillingness to face the "hard hard strategic realities" of the 1980's.

Lost in the chorus of last rites for Minuteman is any sense of timing. Like overseas debacles and second marriages, strategic threats demand a "decent interval" before they can be consumated. Responsible officials, however, have been burying Minuteman with unseemly haste. Secretary Brown, for example -- normally a very circumspect individual -- told a Naval War College audience (and the world press) last August that Soviet military programs could, "at least potentially,

threaten the survivability of each component of our strategic forces. For our ICBM's, that potential has been realized, or close to it. The Soviets are now deploying thousands of ICBM warheads accurate enough to threaten our fixed MINUTEMAN silos."*

Minuteman's vulnerability -- on paper -- is premised on the Soviets obtaining a deployed accuracy of .14 nautical mile CEP or better. This degree of accuracy has been inferred from U.S. telemetry intercepts and radar observations of recent tests of the SS-18-Mod 4, which is said to carry 10-500 KT MIRVs and incorporate guidance improvements expected to be forthcoming on the fifth generation Soviet ICBMs currently under development. According to one authoritative U.S. missile industry source, the Soviets began incorporating improved guidance -- approximating Minuteman III's in 1972 (1500 ft. CEP) -- in all models produced since 1977. This would mean that some 110 MIRVed SS-19s and 32 single warhead SS-18s are without improved guidance, but also, more importantly, that even those that have it possess only a .35 SSKP or less against Minuteman silos. In the words of Jim Miller, Chief of the Ballistic Missile Systems Branch of the Defense Intelligence Agency, "With today's force they do not have a good acceptable PK capability."

"The Mod-2," Miller told a Congressional Committee in 1979, "had serious problems. The guy who designed the post-boost vehicle is probably in Siberia because everything that you could do wrong in the design of a post boost vehicle he did. He really goofed it."†

As for the Mod-4, Miller remarked, "this is the best accuracy of all their fourth generation systems. That is still not good enough for the planner," he noted, "because you still have to go 2 on 1" to obtain a sufficiently high kill probability. A 500KT MIRV with a CEP of 850 ft. has about a .56 SSKP against a target hardened to 2000 psi. Assuming 80% reliability for Soviet warheads in a 2 on 1 attack yields an overall damage expectancy of .81. In other words, to destroy 1745 U.S. warheads the Soviets would have to expend 2108 of their own. Around the Pentagon this is what is known as an "unfavorable exchange ratio." Hence, even if the Soviets do manage to rapidly deploy the required 211 SS-18-Mod 4's (or 352 accurate SS-19's, or some combination of the two), in "nuclear warfighting" terms the "incentive" to conduct such an attack is hardly compelling,

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*Remarks prepared for delivery by the Honorable Harold Brown, Secretary of Defense, at the Convocation Ceremonies for the 97th Naval War College Class, Naval War College, Newport, R.I., August 20, 1980," DOD News Release, Aug. 20, 1980, p. 2.

†HASC, FY 1980, Part 3, p. 132, 129.

quite aside from the fact that 409 U.S. ICBM warheads would survive the attack.

The question remains, however, should the Soviets attempt to backfit this SS-18-Mod 4 accuracy improvement to their current ICBM force, how long such a deployment might take. President Carter's Undersecretary of Defense, Dr. William Perry, testified in February, 1979, that the "major uncertainty in our estimates today is the rate at which they will retrofit the force." The Pentagon's projections, he said, "assume an accelerated program to retrofit the force. They might go more slowly than that....It is no small task to retrofit the guidance system." DIA analyst Miller testified that "it is going to take a couple of years" to replace the Mod-2 with the Mod-4.

Whether the Soviets are actually conducting such a retrofit program has never been confirmed by the Department of Defense. Publically available sources, including the DOD's FY 1982 Annual Report, do not list the SS-18-Mod 4 as being deployed. It may well be that Minuteman's paper demise must await the deployment of fifth generation Soviet ICBM's, a development which would have been averted by U.S. ratification of SALT II and the prompt initiation of substantive reductions and additional qualitative restraints in SALT III. Even at this late date, a near term halt to all further testing, production, and deployment of nuclear weapons and delivery vehicles would in all likelihood obviate the theoretical justification for doing anything about Minuteman vulnerability. Such a proposal is not simply pie-in-the-sky. On the contrary, the general idea of a freeze, as well as some of its specific provisions, has been put forward repeatedly by the Soviets.*

Viewed in practical, operational terms, however, Minuteman vulnerability becomes an almost theological proposition. You either believe it or you don't. What is beyond dispute, however, is that while little in the way of what may properly be called scientific evidence exists to support the contention that the Soviets could attain the requisite degree of ("rational") confidence in their capabilities to launch a successful attack on Minuteman, significant evidence is available on the numerous operational uncertainties which any national leadership would confront in contemplating such an attack. The Soviets would face at a minimum, the following uncertainties:

Command and Control - the Soviets could not be sure that their command and control system would work perfectly at launch, that all echelons of command would obey the orders received, and that these orders would be executed with

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*See Appendix II.

the precise timing needed for a countersilo attack.

Missile failures - the Soviets could not be sure that all of the missiles required for a successful attack would achieve launch -- in their case, less reliable liquid-fueled missiles which have been sitting unused in their silos for several years, some at comparatively low levels of operational readiness. Nor could they be sure how many missiles would achieve proper stage separation and the split-second thrust termination needed to place the post-boost vehicle on the precise ballistic trajectory required for a counterforce attack. Nor could the Soviets be sure what percentage of their post boost vehicles would properly deploy their MIRVs.

Guidance errors - the Soviets could not be sure that their MIRVs would detonate close enough to the Minuteman silos to destroy them, because of the unpredictable effects of the following along uncalibrated ranges: gravity; upper atmospheric density; weather; accelerometer sensing error; gyroscope sensing error; on-board computer error; geodetic target location; and magnetic and electrostatic fields.

Warhead reliability - the Soviets could not be sure what percentage of their warheads would strike their targets but fail to detonate.

Fratricide - the Soviets could not be sure that the shock waves and debris from early arriving warheads would not interfere with those arriving later. Shock waves will travel between silos in ten to thirty seconds, and within roughly a minute, nuclear clouds will grow to heights that effectively mask downrange silos. The Soviets, therefore, would have to time the attack so that all reentry vehicles in the first round strike their targets within the span of a few seconds, or else sweep through the complex from the farthest silos to the nearest ones in at most a few minutes. Given the dispersal of the Soviet ICBM force in diverse parts of the Soviet Union, both a near simultaneous or tightly sequenced attack poses formidable problems in launch timing. Such a massive sequential launch can never be tested, and the Soviets are thus likely to harbor grave doubts that it could be achieved.

Variations in yield and hardness - for those warheads which detonate at a distance close to the lethal radius specified by the predicted yield of the warhead and hardness of the target, variations in either yield or hardness will create uncertainty about destruction of the target.

Launch-under-attack - a massive counterforce attack would offer fairly unambiguous warning. In the words of former Secretary Borwn, the Soviets "would necessarily have to consider whether the U.S. missiles would still be in their

silos when the attack arrived, or whether, given our capability to have unambiguous confirmation of a massive attack, we would launch from under the attack."

Retaliation - an attack intended to destroy U.S. silos would kill at least two million and possibly as many as twenty million Americans and would leave untouched at least the alert bombers and at-sea SSBNs with thousands of warheads. The Soviets would not know in advance what response we would make to such an attack, but they would have to consider the possibility that we would retaliate against Soviet cities and industry. The alleged "irrationality" of this response is no guarantee against its occurence in the mayhem prevailing after a Soviet counterforce attack on the U.S. The Soviet planner would also know that surviving U.S. forces would, in Harold Brown's words, "be capable of a broad variety of controlled responses aimed at military and civilian targets and proportioned to the scale and significance of the provocation." Since the Soviets have given no sign, any more than we, of being able to overcome these numerous uncertainties, nor even deployed the quantities of highly reliable and accurate weapons required by such a scenario, it seems fair to conclude that the Soviet "first strike" on Minuteman is but another in a long line of Pentagon paper fantasies put forward to justify new weapons acquisitions.

Axiom #3 ("Perceptions are the thing") - True believers in the "surrender, we hardly killed anybody" scenario usually acknowledge that the Soviets would be deterred from launching such a massive counterforce attack by the enormous uncertainties involved, and by the prospect of retaliation from the sizeable percentage of the U.S. strategic force which would survive such an attack. But recognizing this fails to undercut their belief in the coercive value of Soviet superiority in heavy land-based missiles, and hence their belief that the MX is needed to buck-up American resolve. They contend that the very act of buying more and better weapons enhances the Soviet perception of American will, by reinforcing the view that the United States will not shrink from using nuclear weapons in defense of its vital interests. In other words, the Soviets will say to themselves, "Why are the Americans spending so much money on improving their nuclear weapons, and buying more of them. They must be serious about using them. We'd best be docile and not provoke them."

Paradoxically, however, if the argument for MX is allowed to rest on perceptions of who has the stiffest nuclear backbone, then the campaign to convince the Congress and the country that Soviet counterforce capability is sapping American resolve can only be regarded as a boon to Moscow and damaging to the national security of the United States. If the "perceptions" argument is to be

taken seriously, then all the talk about a dangerous "window of opportunity" for the Soviets in the near future will only embolden them to leap through it.

This same perceptions argument is frequently extended to include the need to forestall any "misperceptions" by lesser antagonists and allies that U.S. strategic forces are "inferior" to the Soviets'. Failure to build the MX, we are told, could lead to a loss of confidence in the U.S. nuclear "umbrella" by our allies, creeping neutralism, and major Soviet political gains.

Such an intimate correlation between the strategic force balance and the achievement of foreign policy goals is easily asserted, but virtually impossible to demonstrate. What evidence does exist indicates, if anything, an inverse correlation between U.S. strategic superiority and Soviet international behavior. True, recently the Soviets invaded Afghanistan, a country of so little consequence to the U.S. before the Soviet invasion that we once even refused to finance construction of a highway from Herat to Kabul. But thirteen years ago, long before the world had ever heard of the SS-18, the Soviets invaded Czechsolovakia, and Hungary suffered a similar fate twenty-four years ago, when the USSR lacked a reliable nuclear intercontinental capability but was surrounded by a U.S. bomber force capable of dumping twenty thousand megatons on the USSR within a twenty-four hour period. Indeed, it was this major assymetry in strategic capabilities which was partly responsible for Khruschev's rash gamble in Cuba in 1961. Thirty-one years ago they abetted the North Korean attack on South Korea, and thirty-three years ago they blockaded Berlin.

A recent investigation of the political uses of military power conducted under the auspices of the Brooking's Institution (Force Without War, 1979) concludes, "the data do not support propositions as to the importance of the strategic balance. It was not true that positive outcomes were proportionally less frequent, the less the U.S. advantage vis-a-vis the Soviet Union in the number of either nuclear warheads or delivery vehicles....our data would not support a hypothesis that the strategic weapons balance influences the outcome of incidents in which both the United States and the USSR are involved."

Even if one accepts (for the sake of argument) that the loss of Minuteman would dangerously constrain U.S. retaliatory options, one is still left with the question of whether MX is an appropriate solution to the problem. The need for the MX missile itself, as well as its MPS basing mode, is premised on the notion that the United States needs a "prompt countersilo retaliatory capability." Aside from the fact that a counter-silo retaliatory strategy could easily be defeated by a launch-under-attack posture on the part of the Soviets, such a

strategy would tend to increase, rather than diminish, the weight of the prospective Soviet counterstrike by "compelling" the launch of Soviet missiles. Since a U.S. countersilo second strike will largely exhaust the inventory of U.S. ICBM's, it makes little sense for the Soviets to make these the target of their remaining missiles. If residual Soviet ICBM's are placed in a launch-under-attack posture to avoid getting caught by a U.S. retaliatory strike, then they will be programmed to attack conventional military, industrial, and infrastructure targets, resulting in more damage to the U.S. in a "limited" war scenario than if the Pentagon had refrained from threatening Soviet missiles in the first place. Since this scenario calls for MX to absorb a first strike from the very missiles it is programmed to attack, quite obviously, the remaining Soviet missiles will be on a very high level of alert, and the chance of conducting a successful damage-limiting strike against them is decidedly nil.

A number of countersilo advocates accept this analysis, but then proceed to counter it by making the unwarranted assumption that the Soviets would be unwilling to bear the burden of escalation implied by this launch-on-warning posture. They would, we are told, find this an intolerable position to be in, and would therefore bow out of a confrontation long before it reached the last desperate stage. Although this is certainly one possibility, an American president could hardly afford to rely on it as a means of resolving crises. From his perspective, the costs of miscalculating the Soviet response are likewise intolerable, and thus an American president would be subject to the same impulse to self-deterrence as the Soviet leader who feared the escalation implied by launching his missiles-under-attack.

This scenario of trumping the Soviets with the burden of massive escalation is flawed in other respects. Depending on the further development of U.S. ASW capabilities and Soviet countermeasures to safeguard their submarines, the Soviets now have adequate survivable megatonnage on their submarine force such that they would not be compelled to launch all their ICBM's under attack. In the interests of limiting escalation, they could plan to launch only a portion of their threatened missiles at important industrial and infrastructure targets, or they could plan to absorb the entire attack and rely on their SLBM's for post-attack "bargaining."

The Soviets could also presumably work their way out of the launch-on-warning dilemma by rebasing a portion or all of their ICBM's in a mobile or shell game mode, just as the United States is planning to do with MX. MX's vaunted counterforce capability would then be nullified, or made severely

deficient, requiring a continuing shelters-warheads race just to stay even. In this case, MX advocates say, there emerges the possibility of trumping the Soviets once again with an ABM system to defend MX. Although the Soviets could also deploy such a system to defend their ICBM's, the presumption is that the U.S. system could be deployed more quickly and that it would be more effective. This is merely another version of the "fallacy of the last move," which finds no support to date in the history of the arms race, and which would have to be repeated in any case with respect to sea-based systems in order to gain any clear-cut coercive capability much less decisively overthrow mutual deterrence. The prospects for the Soviets allowing this to happen are decidedly nil.

Axiom #4 ("Hedging the TRIAD")

The fourth major argument advanced in favor of the MX is that a survivable land-based ICBM is essential to the preservation of a TRIAD of strategic forces, and that the TRIAD, in turn, is essential for maintaining deterrence of nuclear war. Historically, this has meant, since 1960, the maintenance of a diversified force of silo-based ICBM's, intercontinental bombers, and submarine based missiles. However, the current distribution of strategic nuclear forces among these three types of delivery vehicles is as much an accident of interservice rivalry, contractor lobbying, and pork barrel politics as it is the fulfillment of some conscious design for the forces necessary to deter nuclear war.

To the extent the TRIAD has origins apart from the bitter interservice battles over strategic weaponry in the late 1950's, they can be traced to a technical requirement for diversity as a hedge against the failure of what were then two very innovative delivery systems, intercontinental ballistic missiles and submarine-launched ballistic missiles, particularly the latter. As Dr. Herbert York, a former director of Defense Research and Engineering has observed, there would have been no reason for building a TRIAD if we could have assured ourselves in advance that any one of the systems would maintain its viability indefinitely. In other words, given a sufficiently reliable delivery system, with an acceptable degree of pre-launch vulnerability and assured penetration to its targets, there is no logical reason why deterrence could not be maintained by fielding just one type of system, as the United States did with its bomber fleet during the decade from 1945-55. What is important about the TRIAD is not the particular existing mix of weapons but rather the general principle of diversity, which provides a hedge against unforseen technical failures as

well as technological breakthroughs on the other side. Note that a TRIAD of forces will not automatically be more reliable than a DYAD or MONAD. It merely guarantees that any single failure will affect only a portion of the total force. While the probability of three simultaneous catastrophic failures might appear less than the probability of one or two such failures, such an outcome actually depends on the individual reliability of the weapons involved.

Similarly, to the extent that technological breakthroughs can be anticipated and hedged against in advance, the need for a TRIAD of deployed forces is correspondingly diminished. If the Soviets require -- as does the U.S. -- on the order of eight to twelve years to develop and deploy a new system in quantity, then this would appear to leave ample time to deploy responses before the alleged "breakthrough" threatened the deterrent capability of U.S. forces. There is no logical reason, for example, why the existing force of ballistic missile submarines could not perform the nuclear deterrent function presently performed by the entire TRIAD. Both cruise missiles and a mobile ICBM could be maintained -- if additional hedges against submarine vulnerability were required -- as continually evolving five to seven year production/deployment options, along with a continuing anti-submarine warfare countermeasures program. In view of the probable success of the latter, it is likely that the cruise missile and MX options would never have to be deployed. If a serious threat to the submarine force did arise, countering this threat would logically require, at most, deployment of either cruise missiles or mobile ICBM's in quantities sufficient to offset the anticipated degradation of the submarine force, and no more. Such a posture implies acceptance of one important, and in view of the awesome effects of nuclear weapons, not unreasonable assumption -- that the number of nuclear weapons required for deterrence is finite, indeed quite limited, and to a large extent, static. Given the millions of casualties involved in an exchange of even ten or a hundred nuclear weapons, the present practice of tying the requirement for strategic forces to the growth of the Soviet economy and military would seem to be a gross exaggeration of what is necessary for deterrence. How can it be that the present 9200 weapons -- representing 1434 surviving EMT under the most pessimistic assumption of a Soviet surprise attack on U.S. forces on "day-to-day" alert -- are required when it has been calculated that the equivalent of 400 one-megaton weapons would end the USSR's existence as a modern industrial nation.

The larger number derives from planning assumptions specifying the survival of an assured destruction capability in each leg of the TRIAD after a massive

Soviet surprise attack!* Even if one accepts the need for the diversity and technology hedging inherent in the notion of the TRIAD, one need not accept, and indeed there is no sound logical basis for accepting, the "requirement" that each leg of the TRIAD be independently survivable.

In 1974 Secretary of Defense Schlesinger suggested "a switch away from what I will call the canonical logic of the TRIAD....To some extent, I think the rationale of the TRIAD was a rationalization." In his posture statement for FY1975, Schlesinger noted that the Pentagon's purpose in continuing an appropriate mix of bombers, ICBM's and SLBM's "is not to provide an independent assured destruction capability in each element of the strategic forces, as some people have presumed," but rather to ensure that "the force as a whole is not inherently vulnerable to any one type of attack or any one type of defense."

This is not the current view of the Defense Department, judging by the very heavy emphasis which high level spokesmen have placed on the steady erosion of Minuteman's hypothetical post-attack retaliatory capability. The presumption seems to be that this state of affairs will soon deprive the Minuteman force of all utility, or worse yet, convert it into a positive liability.

It must be noted that this view cannot logically co-exist with the Pentagon's favorite scenario of a Soviet surprise attack on "U.S. prompt counterforce capability" only. As R. L. Garwin has observed, "For this purpose, unless the U.S. struck first, it would make no difference whether the missiles used by the Soviet Union were in a vulnerable or an invulnerable basing structure." For decades U.S. and NATO nuclear doctrine has emphasized the "nuclear umbrella" concept of potential first use of nuclear weapons. Naturally, it follows that if a nuclear weapon is to be used first, its deterrent value does not only come from its ability to survive an attack! In fact, one might argue the opposite -- that a technically vulnerable nuclear weapon system which is nonetheless capable, as Minuteman is, of being launched from under an attack, is very likely to make a potential enemy even more cautious about doing anything which might lead U.S. authorities to believe their force was in jeopardy. As Secretary Brown observed during congressional testimony last year, the relationship between increased survivability and deterrence is not as cut and dried as one might think:

> Certainly a survivable system, a system that can ride out attack, further reduces the incentive of the other side to strike at it. At the same time you have to recognize that you are paying for that extra dimension, and the knowledge that the U.S. might launch under attack also is a deterrence, a different kind of deterrent, and it is

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*See Appendix III.

> kind of hard to evaluate the two against each other. You might, for example, conclude that having a survivable system might encourage them to strike because they know we will not strike back so quickly, that we might think about it for awhile. It is this kind of speculation, and the speculative nature of this kind of examination, that makes it very hard to say how a nuclear war would go.

Summarizing the argument so far, the contention that Minuteman's technical vulnerability has deprived it of any utility as a deterrant ignores several factors:

1. The Soviets could not be at all confident of destroying the bulk of our missiles in a preemptive attack. Such uncertainty is in itself a powerful deterrent.
2. The Minuteman's capability for launch-under-attack greatly compounds this uncertainty.
3. Because Minuteman is embedded in a complex of largely survivable strategic forces, its theoretical vulnerability to attack does not hold out the prospect of significantly limiting damage to the Soviet Union from a retaliatory U.S. strike.
4. In view of the above considerations, it is a gross exaggeration to state that Minuteman's technical vulnerability "invites attack." Any targetable system -- particularly one located in the remote western desert where collateral damage from an attack would be lessened -- could also be construed as "inviting" attack.
5. To the extent that Minuteman's "prompt counterforce capability" plays a role in deterring lower levels of conflict by posing the threat of escalation or "first use," it still has a function to fulfill under current nuclear doctrine. Although this function may be judged by many -- this writer among them -- to be highly undesirable, it should be noted that Minuteman's purportedly more survivable replacement -- far from constituting a return to a purely retaliatory doctrine -- actually represents an <u>enhancement</u> of U.S. first strike capabilities.
6. In view of the deficiency common to both land-based survivable and launch-under-attack postures -- namely, that the systems are subject to attack <u>per se</u> -- an economical solution unavoidably presents itself: why not simply phase out land-based ICBM's altogether?

Unlike many MX proponents, top Department of Defense officials are well aware of the above arguments, so in recent months the emphasis in their defense of MX has shifted to the need to maintain the future deterrent value of the <u>other</u> legs of the TRIAD.

The Department of Defense argues in its FY 1981 Report that "acquiescence" in Minuteman vulnerability would encourage the Soviets to "transfer resources from their ICBM program" into efforts "to neutralize the effectiveness of the bomber and SLBM legs" of the TRIAD. "In other words, if we stand still, and do not repair the vulnerability of ICBM's, we may find that the bombers and then the SLBM's have become vulnerable as well," warns the FY 1981 Annual Report.

There are a number of things wrong with this formulation of the problem. It is entirely in the realm of speculation whether the Soviets will be tempted to greatly expand their efforts to "neutralize the effectiveness of the bomber and SLBM legs." What precisely the Department intends this phrase to mean is not clear. Does it imply that, absent the bulk of Minuteman's 2000 warheads -- itself a highly suspect assumption -- the Soviets would be able to cope somehow with the thousands of incoming SLBM warheads and cruise missiles? Or does it mean that the Soviets will suddenly develop a global anti-submarine warfare capability sufficient to "neutralize" the tenfold expansion of patrol area represented by deployment of the TRIDENT SLBM?

On April 24, 1980, Undersecretary Perry told a nationwide public television audience that "he had no reason to believe that the Soviets will not be able" to "detect and locate" U.S. submarines at sea "by the 1990's." But only a week before, a rather different picture emerged during a closed session of the House Defense Appropriations Subcommittee:

> Mr. Robinson (Rep., Virginia). Mr. Secretary, one of the arguments for the MX goes as follows. Our land-based ICBM's are growing more vulnerable to Soviet attack. If we do nothing to counter that vulnerability, the Soviets will not need to increase their ability to attack our land-based forces, and they will therefore have more resources to devote against other parts of our triad. Therefore, the argument goes, our sea based SLBMs may become more vulnerable.
>
> Now, what do we know in specific terms of Soviet ASW capabilities and specifically how does this argument apply with regard to the SLBM?
>
> Dr. Mann (Assistant Sec. of the Navy, Research and Engineering). Mr. Robinson, to begin with I would say that the argument has inserted within it a premise that I do not accept at all. The fact that the Soviets have more resources, in principle, to devote so to speak to our SSBN force does not, in my judgement, imply they will be any more successful in dealing with it than they are now. Something times zero is still zero.

Mann went on to testify that the United States has at least a ten year lead over the Soviet Union in ASW capabilities. In fact, the U.S. ability to detect and locate Soviet submarines is based on a combination of geographic, political, force-structure, and technological advantages which could only be duplicated by

the Soviets -- to the extent this were possible at all -- by a phenomenal build-up costing many billions of dollars over a period of many years. Thus it seems ironic, if not completely self-serving, for the Pentagon to be justifying the MX by hypothesizing Soviet breakthroughs in the very area of the arms race in which the U.S. leads by the widest margin! Even from the perspective of the ever "prudent" Pentagon planner, "hedging" the possibility of such a Soviet breakthrough does not logically require the immediate construction of an enormous missile system in the middle of the western desert, but rather only the maintenance of a number of possible deployment options in research and development. Should the Soviets actually develop a capability to detect U.S. submarines some time in the next decade, it would still be at least eight to twelve years before they could deploy it in sufficient quantity to threaten a significant fraction of the submarine force, leaving plenty of time to deploy appropriate countermeasures, a new land-mobile missile, or some other system.

The Soviets, on the other hand, have had reason to be concerned since the day they built their first missile launching submarine. The overwhelming advantage which the U.S. has maintained in ASW has probably played a major role in Soviet force planning decisions, particularly the decision to proliferate land-based missiles as the major component of their strategic forces. We don't need the MX, as it's proponents would have us believe, because the Soviets are getting better in ASW. The reverse is probably closer to the truth. We're getting the MX because we're so good in ASW, effectively discouraging the Soviets from moving a larger percentage of their nuclear deterrent "out-to-sea," in the form of smaller, (historically) less-accurate submarine-launched missiles which would not pose the paper first-strike threat to U.S. missile silos which so agitates Congressional hawks. In fact, limiting the growth of the Soviet heavy missile force and "moving the Soviets out to sea" has been one of the avowed goals of the U.S. SALT negotiating position. Given the continuing massive investment by the United States in improved ASW forces since the mid-sixties, the sincerity of this position is open to question. Why should the Soviets move to sea, if our hunter-killer submarines and sub-hunting aircraft are there to greet them?

Future Soviet improvements in conventional air defense are already sufficiently well-hedged by the present generation of cruise missiles now going into production, much less by the potential supersonic version already on the drawing boards (ASALM). Possible deployment of a nationwide Soviet ABM defense is (a) prohibited by treaty; (b) well hedged by an extensive research and development program in penetration aids and maneuvering reentry vehicles; (c) highly

improbable given the current and projected technological impossibility of mounting a "leakproof" nationwide defense against thousands of incoming reentry vehicles.

Moreover, the suggestion that the failure to build the MX would encourage the Soviets to transfer resources from their ICBM program to ASW and cruise missile defense programs is quite beside the point, as the Department has failed to show that the Soviets would not invest the same, or even greater amounts in these areas if the MX were constructed. It is also tantamount to saying that forcing the Soviets to spend more on defense is good for American security -- a dubious assumption.

In fact the actual corrollary of the DOD's view is that building the MX would encourage the Soviets to keep investing their resources in their ICBM program. What possible U.S. security interest would be served by this development, particularly when the growth of this force is cited as the primary reason for building the MX in the first place?

When examined in the light of the actual realities of the Soviet-American strategic balance, the Pentagon's case for the MX, as set forth in the FY 1981 DOD Annual Report, appears shot through with questionable assumptions and misleading presentations of the data.

> "Although MX could place a large percentage of the Soviet strategic force in jeopardy, Soviet ICBMs are a large percentage of a very large total force....The Soviets would not be disarmed any more than we would be by the loss of their ICBMs. At a minimum, hundreds of their SLBM launchers would survive, and these launchers will soon be capable of carrying thousands of warheads."

It is simply not true that the Soviets "would not be disarmed any more than we would by the loss of their ICBMs." ICBM's account for 75% of Soviet deliverable warheads, but only 24% of U.S. deliverable warheads. Although Soviet dependence on ICBM's is expected to diminish somewhat with the deployment of the MIRVed SS-N-18 and a possible follow-on SLBM, it is unlikely that ICBM's will account for less than 60% of Soviet deliverable warheads for the foreseeable future. Aside from internal political considerations -- such as the bureacratic clout of the Soviet Rocket Forces -- the primary factors in this decision, apparently, are SLBM technology limitations and the serious threat to Soviet SSBN's posed by U.S. anti-submarine warfare capabilities.

It is by no means guaranteed that, "at a minimum, hundreds of their SLBM launchers would survive." The U.S. Navy, for one thing, is spending seven to eight billion dollars annually with the intent of denying this degree of assurance to the Soviets, who maintain a comparatively low at-sea rate for their

ballistic missile submarines of about 15% of their operational fleet. This means that on any given day, only about 10 of their 62 "modern" SSBN's are on patrol, compared with the roughly 22-25 U.S. SSBN's on patrol. Yankee Class submarines, carrying the 1600 nautical mile range SS-N-6 missile, comprise roughly half the present Soviet submarine force. To come within firing range of the United States, they must transit a series of ASW barriers where they are vulnerable to detection, tracking, and preemptive destruction. Realizing their vulnerability to U.S./NATO ASW barrier, area search and "trailing" operations, since 1973 the Soviets have pursued a strategy of equipping their newer Delta-class submarines with the 4300 nautical mile range single warhead SS-N-8 and MIRVed SS-N-18 missiles and deploying them under a cover of "protective ASW" in two "sanctuaries" close to home -- the Barents Sea in the northwest and the Sea of Okhotsk in the east. Even under the most generous assumptions for the late 1980's -- that all Soviet submarines on patrol in the sanctuary areas are 16 tube Delta III's carrying the SS-N-18 with seven MIRVs -- the Soviet submarine force surviving a U.S. first strike (on missile silos, submarine ports, and bomber bases) would amount to 176 rather than "hundreds" of launch tubes and 1232 rather than "thousands" of warheads.

The question remains, however, whether these sanctuary forces are themselves immune from attack. By 1989, the year MX is expected to reach its full operating capability, the U.S. Navy is expected to have somewhere between 80 and 90 nuclear attack-submarines, of which as many as 35 may be the Los Angeles class submarine, the most advanced "hunter-killer" submarine in the world designed specifically for "trailing" Soviet SSBN's (ten are currently in service).

The Soviets have no reason to be confident that the U.S. will refrain from using these submarines to penetrate their SSBN sanctuaries. [In fact, the Navy is already doing so.] Although evidence of a U.S. first strike capability against Soviet SSBN's is not conclusive, by military planning standards it is significant enough, (when coupled with the MX/MINUTEMAN III first strike potential against Soviet ICBM's) to undermine Soviet confidence in their surviving retaliatory capabilities.#

The Pentagon can not have it both ways, inferring from Soviet capabilities a "practical threat" to U.S. ICBM's while discounting the threat to the Soviets posed by U.S. programs merely because such programs are "intended" for retaliation only. If intentions are to be inferred willy-nilly from capabilities, then the argument must be allowed to work in both directions.

> "If the Soviets should feel they need more, they can (like us) spend the large additional resources required to restore the survivability of their ICBMs. Such a situation would be more conducive to stability than to

#See "Comments Received" at end of paper.

> allow them onesidedly to make our ICBMs vulnerable, and having succeeded on that score, transfer resources to other and even less benign programs."

The Secretary's statement asserts that forcing the Soviets to spend additional resources to restore the survivability of their ICBM's would create a situation more "conducive to stability" than allowing the Soviets "onesidedly to make our ICBM's vulnerable." What guarantee is there, however, that the Soviets actually would spend the money to make their ICBM force survivable -- rather than simply place a portion of their force in a launch-under-attack posture -- or even if they did move toward a mobile or multiple aimpoint (MAP) system, what guarantee is the Pentagon offering that this new system will be 1) no larger or more threatening than the existing force, and 2) verifiable under future arms control agreements. Secretary Brown assured the Congress, "Were the Soviets to deploy a MAP system, under the provisions of the SALT II Treaty, they would be required to insure adequate verification of the number of launchers deployed. We will insist that any Soviet deployment meet this standard." Obviously, in the absence of a SALT II agreement, such a "cooperative measure" will not necessarily be forthcoming. Furthermore, as Secretary Brown noted before the postponement of the Treaty's ratification, "we have no basis to assume that the USSR would choose to deploy the same type of mobile system as the U.S. They have thus far pursued another type of mobile system" (i.e. off-road truck mobile).

Even in the case of both sides deploying an MPS (Multiple Protective Structure) system within the constraints of the SALT II agreement, there was still a question, Brown noted, "whether verification can be mutually assured," and, in the case of the United States, whether we could "adequately bound the threat to ensure survival of MPS. Our confidence in achieving either or both of these with MPS has been seriously questioned both within and without DOD."

Why forsake the certainties of the present silo-based deployments for the uncertainties of MPS? The advantage of this heightened uncertainty for our national security planning has never been explained by the Department of Defense.

> "Moreover, by having an efficient, time-urgent, hard-target kill capacity -- such as will be provided by MX -- we should reduce Soviet incentives to expand their silo-based forces in the absence of SALT."

This amounts to a rather feeble ad hoc attempt to find a silver lining in the cloud which has descended over the SALT II agreement. Using precisely the same logic, the Soviets might reason that it is in their interest to force the United States to invest "additional resources" in the MX to prevent the transfer of these

resources to other programs, promoting political dissension, delay, waste, and environmental disruption in the process. Furthermore, building additional silos -- "vertical shelters" with mobile canisters defined as the "launchers" -- indeed, thousands of them, is the very essence of the vertical MPS system, the one the Soviets would be most likely to adopt (because of their liquid fuel technology) if they were to move in the direction of a multiple aimpoint deployment. And asserting the MX will induce the Soviets not to expand their ICBM force is hardly consistent with the prior argument that the MX will keep them from transferring resources out of their ICBM programs.

> "Just as we consider conservatively designed, second-strike, countervailing forces to be essential to the security of the United States and its allies, so we accept the same need on the part of the Soviet Union. Because our own goals are essentially defensive in nature, we can accept a relationship of mutual deterrence. We do not seek to take away from the Soviets their basic second-strike capabilities. But we will not permit them to take away ours. We insist on that kind of essential equivalence, and are dedicated to achieving it through the mutual constraints of arms control, or if necessary, by unilateral means; hence the MX program."

How do we expect the Soviets, or ourselves, for that matter, to distinguish between "conservatively designed, second-strike countervailing forces" and forces technically capable of carrying out a first strike? Undoubtedly the Soviets take an equally benign view of their "conservatively designed" ICBM capabilities, which have caused the current unease over Minuteman vulnerability.

The DOD contends that the United States does "not seek to take away from the Soviets their basic second strike capabilities." In light of the evidence, this statement is simply not credible. If the purpose of the MX is not to preemptively attack Soviet ICBM's, as we have so often been assured by Secretary Brown and others, and if the purpose is not to suppress a Soviet second strike, then what is the purpose of the MX? In fact, the Pentagon has reiterated numerous times that the purpose of the MX is a "damage limiting" or "war terminating" retaliatory strike on their "residual ICBM's" -- i.e. their second strike ICBM capability. The only other kind of Soviet second strike capability is that left over from a U.S. first strike, but here the Secretary disclaims a disarming attack motivation. Thus his statement amounts to an implied promise along the lines of, "If we do launch a first strike on your forces, we'll do a sloppy job so you'll be sure to have some missiles left over," which, of course, is equally ridiculous. (Brown might also have been referring to the rather esoteric preoccupation of some military planners that the Soviets would be able to "reload" their silos after launching their initial attack, leading to a U.S. requirement (MX) for countersilo retaliation. This ignores the fact that these reserve stocks of missiles could be more quickly and easily surface-launched from their storage areas -- see "Comments Received.")

A more likely interpretation is that Brown was referring to the Soviets' long-range SLBM capabilities. In this case, the Navy would be most interested in knowing that the mission of "taking away from the Soviets their basic second strike capabilities" is no longer applicable. If recent Congressional testimony is any guide, both the Admirals in charge of the Navy's multi-billion dollar strategic ASW effort as well as the legislators who fund it, have not gotten the word.

The preferred operating mode of U.S. hunter-killer subs against Soviet SSBN's heading for the open ocean is to lie in wait at barriers or key choke points monitored by SOSUS* or aerial reconnaisance. When given the general location of the Soviet sub indicated by these systems, the U.S. hunter-killer will turn on its passive (i.e. non-radiating) sonar, move to intercept it, and "trail" the submarine without its knowledge. If contact cannot be maintained by this method, the U.S. SSN can turn on its powerful active search sonar, making it virtually impossible for the Soviet SSBN to "break trail."

The Department of Defense rarely acknowledges that it is in the business of hunting down Soviet ballistic missile submarines, but such a large scale operation, involving many billions of dollars, is impossible to disguise completely. In commenting on a GAO Report on the need for the proposed Extremely Low Frequency (ELF) communications system with submerged submarines, the Department of Defense stated that "...it is when the SSN is in the trail posture that effective, reliable communications from the operational authority to the submarine are most critical in time of crisis..." According to the GAO's Jerome Stolarow, "the trail mission was the main mission cited by the Navy in justifying ELF..."

Rear Admiral Jeffrey C. Metzel, Jr., the Director of the ASW Division in the office of the Chief of Naval Operations, told Congress last year that an attack submarine air defense weapon would be needed in the future because "our projections show that the threat posed by enemy airborne forces will be a significant factor for our forward-deployed attack submarines operating where the Soviets have airspace control, and where no other U.S. forces are present." There are only two bodies of water in the world that meet this description -- the Barents Sea and the Sea of Okhotsk, the Soviet SSBN sanctuary areas.

Although the case may well be that the United States is unable, despite its massive ASW effort, to deprive the Soviets of their sea-based second strike capabilities, this is a far cry from the official contention that the military establishment is not seeking to do so.

As is well known, the United States has been improving its counterforce capability on all fronts. The only qualification one might add to soften this

*SOSUS - The underwater Sound Surveillance System

assessment is that work is probably not going forward at the rate which could be attained if broad-based consensus existed on building a disarming first strike capability.

Senior officials compounded the confusion by suggesting, as Brown did to the House Defense Appropriations Subcommittee last year, that what the MX "may do is drive them more toward sea-based systems which would be very good for everybody around." In view of U.S. ASW capabilities the Soviets may be understandably less enthusiastic about this option than Secretary Brown. "I think that a situation in which they can knock out all our silos and we cannot knock out theirs is worse for us than one in which each of us can knock out the other's silos." Brown testified, "They will still have plenty of other capability left to deter us with."

Needless to say, this statement was completely at odds with the Carter administration's refrain that survivability is the key to the requirement for MX. If symmetry in the capability to knock out each other's silos is really all that is required, why go to the enormous trouble and expense of building 4600 concrete bunkers in the Western desert? On the other hand, if survivability is important, and the Nevada-Utah MPS system is constructed, then the situation in which "each of us can knock out each other's silos" will not be preserved. Either the U.S. will regain its traditional advantage in this area, or the Soviets will deploy a similar system, making the issue moot unless one or both sides embark on a warheads-shelters-ABM race to overwhelm the basing system of the other. Neither eventuality conforms to Secretary Brown's characterization of the situation.

The Secretary contended that we will not permit the Soviets to take away our second strike capabilities, noting that we insist "on that kind of essential equivalence" and intend to achieve it mutually, through arms control, or unilaterally, with the MX. First, to the extent that the imposing Soviet counter-silo potential is matched by the current combination of considerable U.S. counter-silo and ASW capabilities, then essential equivalence is not endangered, and maintaining it does not require any such gargantuan development like the MX. Second, to the extent that U.S. retaliatory capabilities are identified with the invulnerable sea-based leg of the TRIAD, then the Soviet threat to Minuteman does not "take away our basic second strike capabilities." Present and projected Soviet ASW poses no threat to the global deployment of U.S. ballistic missile submarines. Third, preventing the Soviets from taking away our second strike capabilities does not logically entail attacking theirs, but merely assuring that a substantial fraction of our total force is based in a survivable mode.

As for the "mutual restraints of arms control," it is sufficient to note here that when U.S. officials complain that the negotiated SALT limits do not obviate the need for a new ICBM, they have only themselves to blame. To achieve major reductions in Soviet ICBM's, something must be given up in return. Heavy ICBM's have been the Soviet's big equalizer in the arms race. The United States must be willing to place one or more of its innovative systems -- cruise missiles, counterforce SLBM's, hunter-killer submarines -- on the chopping block before the Soviets can be expected to agree to "deep cuts" in their ICBM force.*

Regardless of the exact characteristics of the deployment plan ultimately decided upon -- if indeed, a final decision is ever made -- the multiple aim-point schemes heretofore proposed share a number of crippling defects.

1. No real protection. MX proponents state that MAPS would once again make ICBM's invulnerable to a Soviet attack. This assertion is somewhat misleading. MAP basing does not effectively protect ICBM's from the effects of a nuclear attack. In fact, with multiple shelters hardened to 600 pounds per square inch or less -- it would be extremely expensive to harden all 4600 shelters much beyond this point -- the MAPS offer less real physical protection to the missile than the present silos hardened to 2000 psi. Rather than withstanding the effects of a nuclear attack, MAP is designed to make such an attack prohibitively expensive to conduct, by forcing the Soviets to expend many more warheads in an attack than they could expect to destroy. "Thus," testified Secretary Brown, "a rational enemy, if starting from a position of near parity, would be deterred from attacking pre-emptively since one result of such an attack would be to shift the relative balance (in remaining warheads) against him."

If this crude economistic model of deterrence is indeed the real rationale for MAPS, then it is very difficult to see what MAPS adds to the deterrent equation that is not already provided by the far more tangible prospect of devastating retaliation by the many survivable components of the existing TRIAD of strategic forces.

The official justification for MAPS amounts to a tautology. An allegedly "rational" enemy not already deterred by the enormous uncertainties surrounding the outcome of any nuclear attack, as well as by retaliation from other strategic forces, would be classified, almost by definition, as irrational, and therefore oblivious to the allegedly "unfavorable" cost-exchange scenarios posed by MAP systems. Indeed, the deficiency of any system composed of fixed land targets is

*See Appendix IV

that it can be attacked per se! In the case of the proposed baseline MX system, this deficiency is magnified by the possibility of detecting the relatively small number of missiles within the complex of individually vulnerable multiple shelters, in which case the system would be more vulnerable to a "limited" preemptive attack than the present system of hardened silos. If high confidence in the preservation of location uncertainty can not be guaranteed -- and the provision of various mobility options indicates that there is already some doubt on this score -- then whatever adverse political consequences are now alleged to ensue from Minuteman vulnerability would soon be replicated -- indeed, magnified, given the scale of the investment -- by the proposed MX/MAPS system.

There is considerable irony in this situation. MX advocates tell us that Minuteman is threatened by a massive yet technically vulnerable Soviet ICBM force. They propose to construct a system which, when deployed against the existing Soviet force, would have a nominal first strike capability of its own, stimulating the Soviets to construct a potentially larger and more survivable system which, in turn, could plausibly threaten MX. At a cost of some 70 billion, then, the Pentagon is proposing that we exchange the present level of instability for the same or greater degrees of instability at higher force levels. There is very little evidence for the Pentagon's implied belief, infrequently stated, that the Soviets will voluntarily "bound the threat" at a level conducive to strategic stability and MX survivability. The record of Soviet-American arms competition gives no cause for optimism on that score.

Even senior Air Force officials suggest that over the long term, deterrence based on the survivability of strategic land forces will probably give way to technological advance before the end of the century. Air Force Secretary Hans Mark, for example, told an Air Force Association Meeting last year that "technology to find things will become better, more rapid than the technology to hide things, and therefore, the notion that stability comes from a strategic force which is structured to accept a strike may have to be abandoned."

Indeed, requiring that strategic forces be structured to accept a strike has been one of the Pentagon's preferred methods for documenting the need for ever growing numbers of nuclear warheads. One may easily imagine a similar argument being made by those responsible for the awesome growth in recent years of the Soviet Rocket Forces. Clearly this so-called requirement is one of the primary levers of the nuclear arms race, despite the fact that it is entirely divorced from those real operational factors which, when push comes to shove, actually ensure deterrence. (This question is further discussed in Appendix III.)

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2. Invites Saturation Attack. Even granting for a moment the supposition that MAP basing would strengthen deterrence of an attack against U.S. ICBM's, one must then pose the Pentagon's perennial question, "What are the consequences of this system should deterrence fail?" MAP basing invites a saturation attack on a central portion of the continental United States, more than tripling the scale of the attack over what would be required to attack just the current Minuteman system. The 4600 ground burst warheads required to attack the base-line MX system deployed in the arid Great Basin environment would generate huge radioactive dust clouds which would, depending upon prevailing weather patterns, spread lethal fallout over wide and densely populated areas.

The Office of Technology Assessment has calculated that between 2 million and 20 million Americans would die within the first 30 days after an attack on the present Minuteman and Titan silos. "This range of results is so wide," the OTA study noted, "because of the extent of the uncertainties surrounding fallout."#

In 1975, the Department of Defnese itself estimated that an attack consisting of two 550 kiloton warheads against each of 1054 U.S. ICBM silos would result in 4,000,000 to 5,600,000 fatalities. During hearings before the House Interior Subcommittee on Public Lands in January 1980, Utah Representative Dan Marriot observed, "One of the big issues we continue to hear from those who are against the system is that what this system is going to do is make Utah a red dot on the Soviet's target list and, as a result, the entire state could be destroyed if in fact the Soviets decided to try to knock out all those missiles. Can you respond? ....What would be the loss in the State of Utah in terms of our citizenry?" Marriot's query was followed by successive official attempts at obfuscation.

Undersecretary of the Air Force Antonia Chayes stated, "I do not think that the positioning of the MX system in Utah or Nevada or any other place is going to make a great deal of difference in terms of vulnerability." Dr. Seymour L. Zeiberg, the Deputy Undersecretary of Defense for Strategic and Space Systems, went on to note that the presence of the Dugway Proving Ground, Hill Air Force Base, and other installations in Utah "would create sufficient motivation for the Soviets to target the area in the case of a general war of the scale associated with attacking our land-based ICBM's." While venturing an estimate that the number of fatalities from an attack on MX would be "somewhat larger than the 20 million" suggested by the OTA's Minuteman attack study, Zeiberg hastened to add that he did "not believe that looking at the problem in isolation is meaningful. I believe if the Soviets would attack Minuteman or attack MX, they would at the same time attack all other important military facilities that we have."

#See "Comments Received" at end of paper.

When Rep. Jim Johnson of Colorado pointed out to Zeiberg that "you are not in agreement with the theory of the preemptive strike which would be limited to the Minuteman, which is one of the justifications for building the MX," Zeiberg replied,

> "By no means is that a justification. Nobody thinks that the Soviets would pinpoint Minuteman over all of our military assets and say I will go shoot that out and thereby gain a military advantage. Part of the story gets somewhat misrepresented.
>
> The important feature of that part of the story, however, is that it provides the Soviets with a strong political motivation to be adventurous, and that by knowing a major portion and the most responsive portion of our Triad is at risk, we would be less inclined to face them down under certain political circumstances.
>
> The idea of an isolated attack on Minuteman is not held to be credible by me or other senior people in the Defense Department or the administration."

It should be obvious to even the most casual student of the subject that the above testimony is inherently contradictory, and yet another example of the Pentagon's attempt to square the circle in its defense of MX. It is simply untrue that the MX will fail to add significantly to the hazards of radioactive fallout from a nuclear attack. In the absence of the MX, for example, Hill AFB is the only strategic counterforce target in Utah. It could be destroyed with one low-yield nuclear weapon. There are currently no such targets in Nevada, five SAC bases in California, none in Oregon, three SAC bases and a submarine base in Washington, one SAC base in Idaho, and 18 Titan missiles in Southern Arizona based in unhardened silos. In other words, the present number of strategic counterforce targets west of the Rockies could be destroyed with about 60 relatively low-yield warheads.[6] Locating the MX in the Great Basin would increase the weight of this attack at least a hundred fold.

Moreover, Zeiberg's assertion that "part of the story gets somewhat misrepresented" is disingenous, since one does not see either him or his colleagues and predecessors at the Pentagon rushing to amend the public impression, fostered by official statements and friendly journalists, that U.S. "prompt hard target counterforce capability" (i.e., Minuteman) might be the object of a limited Soviet counterforce attack. Indeed, over the last decade high officials have worried repeatedly in public that: the Soviet Union could develop forces aimed at destroying "vital elements of our retaliatory capability (Nixon, 1971);" that there were "many ways other than a massive surprise attack in which an enemy might be tempted to use his strategic forces... (Schlesinger, 1974);" that "threats...to a portion of our forces are certainly conceivable...we cannot count on others to refrain from inventing ways to attack a limited but vital set of targets... (Rumsfeld, 1976);"

[6] See comments received at end of paper.

or that "no enemy should be left with the illusion that he could disable portions of our nuclear forces... (Brown, 1979)."

In short, the Pentagon is trying to have it both ways, raising the spectre of limited counterforce attacks in order to justify acquisition of the MX, and then denying the plausibility of such attacks when citizens and legislators express concern about their possible consequences.# Moreover, the contention that all Soviet counterforce attacks would be full-scale conflicts with Zeiberg's own assessment of the adverse political consequences flowing from the knowledge that "a major portion of the most responsive portion of our TRIAD is at risk." According to the Chairman of the Joint Chiefs of Staff, a bolt-from-the-blue attack on U.S. strategic forces is adequately deterred by the "substantial retaliatory capability that would survive such an attack," quite apart from Minuteman. Hence the adverse political consequences feared by Zeiberg and others must derive from the impact of Minuteman vulnerability on the outcome of some lesser nuclear exchange. In Zeiberg's words, "we would be less inclined to face down" the Soviets (i.e. threaten nuclear first use) if our capability for executing limited strategic nuclear options could be destroyed in a preemptive attack, or in retaliation, if such "LNO's" were ever implemented.

To the extent that a "limited" nuclear exchange, growing out of a severe foreign policy crisis involving conventional and theater nuclear forces, is considered a more probable threat than an all out attack on opposing strategic forces, then deployment of the MX in the Great Basin of the western United States increases both the probability and severity of a nuclear attack on this region.

3. Open-Ended Committment. By the 1990's the Soviets could deploy, in theory, some 6160 MK.12-A equivalent (400/lbs/340KT) warheads by "fractionating" the roughly 8000 lbs. of payload available for warheads on each heavy SS-18 missile (308 SS-18 x 20 RV's per missile). This means a nuclear packing density of 1.218 equivalent megatons per kilopound (EMT/kp), a considerable improvement over the estimated 0.712 EMT/kp of the current SS-18 Mod 2 carrying eight 600KT MIRV's, but still considerably less than the 1.597 EMT/kp of the U.S. Posiedon SLBM.

Such fractionation, then, can not prudently be assumed to be beyond the reach of warhead technology in the Soviet Union during the late 1980's. Likewise, assuming Soviet 1990's accuracy equivalent to forecast accuracy for the MX (400 ft. CEP) the Soviets could achieve a Single Shot Kill Probability (SSKP) of .99 against MX shelters hardened to 600 psi, the design hardness of the Carter administration's horizontal shelter scheme. Assuming an 80% reliability for Soviet

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missiles, the Soviets could expect to destroy 79% of the shelters and therefore all but 42 of the MX missiles. Compensating for 20% unreliability of the initial strike by targeting an additional 920 warheads, and distributing them uniformly across the MX fields, would further reduce the numbers of survivors, although it would not eliminate them completely. Unlike a silo based system, in which each target is both hardened and contains a missile, the MAP system does not require a two-on-one attack to overcome the effects of hardness and unreliability. Since there is only a roughly 4% chance that each surviving shelter contains a missile, the penalties for failure in the MPS system are considerably diminished. Similarly, a 100% degradation in accuracy in this case (from 400 to 800 ft. CEP) yields a 20% decline in SSKP against shelters but a 42% decline against silos.#

Twenty to 40 missiles -- the number which could be expected to successfully "ride-out" the above postulated attack -- is less than 4% of today's silo-based ICBM force. This number of survivors is worse than that generated by the most pessimistic scenarios of silo-based ICBM vulnerability. In the case of the DOD's example of a two-on-one 500 KT attack on Minuteman, using the same accuracy and reliability assumptions as the MAP case above, some 57 missiles would survive. In terms of warheads, twenty to forty surviving MX is equal to 101 to 202 surviving Minuteman. In other words, when measured against an expanded Soviet threat, the baseline 1989 MX system is equivalent to a mere 4-14% improvement in the survivability of the current silo-based ICBM force. Clearly, without the payload fractionation and heavy missile limits imposed by SALT II, the baseline MAP system does not offer a degree of protection, against feasible increases in the Soviet counterforce threat, commensurate with its immense cost and environmental impact.

The baseline system would be obsolete even before it is completed, requiring additional deployments of shelters and missiles, or a "preferential" ABM defense of those shelters containing the MX missiles. Thus a commitment to the MAP basing mode would be building a future vulnerability into the U.S. defense posture, a vulnerability which already is generating strong pressures toward abrogation of the ABM treaty, the last remaining barrier to an all out arms race. In the words of Brigadier General Guy Hecker, the Air Force's former Special Assistant for MX Matters,

> "another step we could go...before we go to (more) shelters... would be adding a ballistic missile defense device using existing shelters as a home. That is, an interceptor missile, but using all the existing facilities that we have in the deployment area there. That would only come about if SALT was totally obviated, and I hope that does not happen, but should it be obviated, then the arms race could go on to proportions the whole nation would be astounded by."

See "Comments Received" at end of paper.

4. Verification Problem and "Breakout" Potential. During a Congressional hearing in 1979 Secretary Brown was asked why the DOD was still pursuing various airmobile basing schemes if the MAP system was indeed permitted by SALT, as the administration contended. Brown responded that the key question was not "whether MPS is permitted by SALT, but rather whether verification can be mutually assured assuming both sides deploy a MPS system, and, in our case, can we adequately bound the threat to ensure survival of MPS.

> Our confidence in achieving either or both of these with MPS has been seriously questioned both within and without DOD. For that reason, we think it was and is prudent to develop an additional option to MPS."

A year later the Air Force provided the following assessment of the verifiability and breakout potential of a Soviet horizontal MPS system:

> "Without the incorporation of cooperative measures such as verification ports and procedures for the observable assembly and introduction into the deployment area of missiles and associated launch equipment, the Soviets could readily deploy additional launchers and missiles covertly into their multiple protective structure in a SALT II environment. Even with SALT cooperative measures, the possibility would exist for the covert stockpiling of additional missiles that could be overtly deployed following the abrogation or expiration of a SALT agreement."

With or without the SALT constraints currently awaiting ratification, the Soviets would be free to construct a MAP or some other mobile system of their own, and to unilaterally assert, as has the United States in the case of MX/MPS, that it is verifiable. Whether it actually would be verifiable is another matter, as numerous defense experts have testified.

Moreover, in view of the current anxiety over Minuteman, if a Soviet MAP or mobile ICBM system were built under the constraints of a SALT agreement, there would probably be no way to assure today's MX advocates that the Soviet Union would stay at the agreed upon force levels after the expiration of the agreement. In the case of the MAP system, where procurement of additional missiles is a relatively small percentage of total system cost, there could well be tremendous pressures on both sides to deploy more missiles in the already constructed shelters, heightening the threatening postures of the opposing systems while adding nothing to their survivability.

Police State in the Desert?

To maintain location uncertainty, the Air Force is planning an extensive electronic surveillance system "interconnected to Security Alert facilities

distributed throughout the deployment area." Each Security Alert Facility "Will be located within the specified security police response travel time to the various protective structures." Although the Air Force claims that "a basic principle guiding MX program planning is to permit public use of the MX system road network," it also notes that the security system will require "monitored access to the areas outside the fenced protective structures. Some constraints on public access are anticipated during launcher movements which are undertaken to ensure preservation of location uncertainty." In other words, while promising the public that measures to protect the MX will be confined to "point security," the Air Force is privately considering the imposition of "area security" measures to insure against the breakdown of system secrecy.

In the event of a security alert, Gen. Hecker testified, access to the roughly 14,000 square miles encompassed by the deployment area "could be operated in a staged manner so all the people who have traditionally done business in there could be issued passes and could continue to operate." Other persons "from outside or inside the State, with or without beards, would be denied access."

Uncertainty of the "Rideout" Scenario

According to the usual Pentagon criteria, the deterrent value of a system should be assessed not only by the results of computer generated counterforce exchanges but also by the degree of confidence which can be placed in these results. Unlike submarine-launched missiles, 55 - 66 percent of which are "on-station" and thus assured of surviving a surprise attack by virtue of their concealment in the world's oceans -- the MX system's survivability is predicated on a purely hypothetical ability to "ride-out" a nuclear attack. Since the system can never be tested, even partially, under actual operating conditions, a large measure of uncertainty surrounds estimates of the ability of both components and the overall system to withstand nuclear effects -- radiation, blast, heat, ground shock, debris, and electromagnetic pulse (EMP). Consider, for example, the question of how far apart MX shelters must be located in order to withstand the effects of explosions at neighboring shelters. According to General Hecker, "there is a wide range of uncertainty as to the exact effects of a one-megaton weapon detonated at ground zero. Since we do not have atmospheric testing, it is hard to garner this data against the hardness of a particular silo. The nuclear effects community is that many on this side and that many on that side."

The Carter administration's August 1979 racetrack system proposal called for

an initial 7000 ft. spacing between shelters to allow for future "backfill" spacing of 3500 ft. in the event the Soviets fractionated their existing high-yield payloads to mount an attack on all the shelters. Since the attacking RV's would be of lesser yield, the Air Force reasoned, the spacing between shelters could also be proportionally less. In October the initial distance between shelters was reduced to 6000 ft., and the backfill spacing to 3000 ft. In May 1980 the initial spacing was reduced still further, in response to environmental pressures, to 5200 ft. But with the latter spacing, testified Gen. John W. Hepfer, Director of the Air Force's Ballistic Missile Office, "electromagnetic pulse does become an area of concern, and we need to take a good look at that. There is an effect that when you get near the detonation, which we will be, there is what they call source region EMP. And there is an EMP concern relative to that effect." The Air Force is concerned that the buried power lines which supply electricity to the shelters will conduct the EMP surges associated with nuclear explosions into the missile power supply, damaging various electronic components.

A Word About ABM

In contrast to straightforward hardsite defense along the lines of the old Sprint/Spartan program, the Low Altitude Defense System (LoADS) is at least viable in concept. But all it is designed to do is force the Soviets to double-up their initial attack. The chief Soviet incentive to conduct such a massive initial attack is to gain the advantage of surprise and destroy the MX system before the U.S. warning and control system has time to react. But the Soviets might refuse to cooperate. They might just as easily make the assessment that the chance of beating the U.S. "assessment-decision-action loop" in this fashion is practically nil, giving up, as it does, any ambiguity as to the Soviet Union's ultimate intentions. Instead, they might elect to attack the MX system in a piecemeal, and therefore highly ambiguous, fashion, having concluded that the design of the MX system itself indicated a strong predilection to withold a retaliatory attack until the full dimensions of the conflict became known. In this case, two severe technical deficiencies of the LoADS system would be exposed. In the wake of a relatively "light" precursor attack the LoADS mini-radars might not be able to see the actual killer round coming in through the heavily ionized atmosphere. Second, the radars themselves probably would not survive the effects of nuclear detonations at undefended neighboring shelters.

In recent months portions of the defense community have developed an un-

critical enthusiasm for LoADs on technical grounds without giving the least thought to what will be given up if it is deployed. It can not be accomodated under the provisions of the 1972 ABM Treaty, an agreement of "indefinite duration" which represents the major achievement of Soviet-American arms control efforts. To deploy LoADS, the Treaty will have to be modified or simply abrogated. ABM proponents assume that an easy distinction can be drawn between hardsite and city or "area" defense, and therefore, that the treaty can be modified in unambiguous ways to accomodate this distinction, all the while preserving both the reality and perception of mutual "assured destruction" capabilities, which constitute the bedrock of deterrence.

But the Pentagon fretted for years about possible Soviet upgrading of their primitive SA-2 air defense missile for use against slow-flying, high altitude bombers. Imagine the mutual fears of upgrading surrounding far more capable mobile ABM's specifically designed to shoot down re-entry vehicles. Moreover, hardsite defense includes the concept of an "overlay" defense, which is inherently ambiguous in its application. Thus mutual fears of clandestine upgrading to city defense would be almost certain to arise within the confines of a treaty modified to permit hardsite or point defense. Modification, in effect, is merely a backhanded route to abrogation.

As for outright abrogation, it is a sad reflection on how far removed from reality some of our policymakers have become that one now feels compelled to reiterate the enormous and unqualified advantages this treaty has afforded both our own and global security. By prohibiting <u>significant</u> ABM deployments of any type, the treaty has eliminated the perceptual uncertainties, dangerous instability, and phenomenal cost of an unbounded interactive offensive-defensive arms race. While the arms race has continued, due largely to the ABM Treaty it has not seriously undermined perceptions of mutual deterrence. To argue, as some ABM proponents do, that the offensive strategic arms race has continued in any event, in no way invalidates the substantial contribution of the ABM Treaty to circumscribing the strategic arms competition, lessening fears and tensions, and limiting significantly the economic burden of the arms race.

As for those who say we have nothing to fear because the U.S. would run away with any ABM race, they themselves know (or should know) that it is far too early to tell whether the fantastic tracking and discrimination problems of an overlay/underlay defense can be solved.

And with respect to laser and particle beam systems for a comprehensive space-based defense against ballistic missiles, to suggest -- in lieu of the

constraints of the ABM Treaty -- that this will be a realistic option before the end of this century is simply foolish and irresponsible, and, in fact, hazardous to the national security precisely to the degree that such belligerent utopian techno-fantasies are allowed any influence whatsoever over our long-term defense planning.

In conclusion, then, any plan for land-based MX in a MAP deployment is seriously flawed because:

* It invites a massive saturation attack, as well as more limited attacks, on the central continental United States far in excess of what would occur at present should deterrence fail

* In the event of a breakdown in the system for preserving location uncertainty, the MX could be more easily destroyed than the current Minuteman system; moreover, the mere suspicion that such a development had occurred would give rise to the perception of vulnerability, with all its attendant (and purportedly pernicious) political consequences

* In the face of Soviet threats well within the scope of "worst-case" planning assumptions, the MX-MPS system would have to be expanded to retain its effectiveness, or else defended with an ABM system, which would require abrogation of the ABM treaty and ignite an interactive offensive-defensive arms race of unparalleled dimensions and expense

* It requires elaborate and prolonged deception in order to maintain missile survivability, an operating mode whose secrecy and security demands are incompatible with the norms of an open and democratic society; secrecy is the Soviets' long suit, not ours

* It is difficult to verify with any high degree of confidence, and, with its tremendous sunk costs in deployed launch points and command and control systems, it encourages mutual fears of destabilizing "breakout" from treaty limitations and historic levels of deployment

* It is subject to the same severe operational uncertainties as any other system saddled with the task of "riding out" or "absorbing" a nuclear attack, and thus does not significantly increase confidence in the number of post-attack retaliatory forces.

* To the extent that enhancing the capability to threaten limited strategic nuclear escalation increases the willingness of U.S. policymakers to employ U.S. conventional forces abroad, then building the MX will contribute to a more combative foreign policy and increase the risk of war.

Some Concluding Thoughts: Toward a New Nuclear Realism

Two years ago, in his annual report for FY 1980, Harold Brown noted that there were important questons about MPS basing which required "careful consideration before we make a final committment to it." These included:

- ability to bound the threat in terms of the number of accurate Soviet RVs available to attack MPS
- adequate verification if the Soviets deployed a similar system
- credibility and effectiveness of concealment
- environmental aspects
- costs, including the effect on costs of any potential Soviet increases.

Suffice to say, none of these questions has been resolved with any degree of assurance. Indeed, uncertainty about many of them has increased during the past year. MX has been in development now for almost a decade. The continuing controversy over how the missile should be based suggests that there may be fundamental flaws in its basic conception. Among the scientific community, support for the MX-MPS system is very low. In the view of many scientists, it violates basic design principles of simplicity, reliability, and economy.

Former Secretary Brown and other knowledgeable defense officials admit that they do not have a clear view of what the targets and capabilities of our strategic forces should be. Although they reject the view that an "assured destruction capability" is all we need for deterrence, they freely admit that they do not know how much counterforce capability the United States should acquire, or what we should do if we acquire it. As Secretary Brown noted two years ago, "this kind of targeting, by forcing the other side to respond with redesigned capabilities, is bound to affect long term stability..."

Pending completion of a thorough examination of this question, perhaps by a high-level Hoover-type commission of qualified, respected individuals from a wide-range of disciplines -- followed by equally thorough public debate of this Commission's recommendations -- I believe the need for the MX needs to be re-assessed and balanced against the hypothetical hard target kill capability which will soon be available in our cruise missile and submarine forces. The simultaneous acquisition of nominal counter-silo potential in all three legs of the TRIAD, coupled with the maturation of U.S. ABM technology and our multi-billion dollar a year effort in strategic anti-submarine warfare, may be fairly viewed by the Soviets as destabilizing, and indeed, quite threatening to them. Facing-up to the nuclear-facts-of-life requires recognition that not only the Soviets, but we also, have reason to fear these developments.

Before plunging headlong down the counterforce road, we would be wise to step back and try to reassess whether such a move is really consistent with our own national security, global stability, and progress toward our most important

goals as a nation -- economic prosperity and peace. We must guard against allowing recent frustrations with the relative decline in America's global economic power and political influence to propel us into economically burdensome military programs whose ultimate consequences for the national security have not received the attention they deserve.

The large-diameter land-based MX is just such a program. We must reject the spurious equation -- of a rise in Soviet military power with the loss of American influence -- on which it is based. The determinants of this country's fate in world affairs are far more complex than the Politburo's resolve to increase Soviet military spending, and the MX will do nothing to limit this spending in any case. On the contrary, it will stimulate it.

We would be foolish to ignore the lessons of the last decade. Today we are reaping the fruits of the Nixon administration's facile rejection of arms control in favor of unrestricted deployment of MIRVs. But within five years the Soviets were able to mimic our innovation, and then throw it back at us in quantities which now make us feel more, not less, insecure. As the ungainly offspring of this development, the MX itself is proof of the futility of taking refuge in military technology as the primary means of guaranteeing our security. With the MIRV experience under our belt, perhaps we ought now to be somewhat less enthusiastic about the prospect of forging blindly ahead and so blandly shooting ourselves in the foot.

The marginal utility of new nuclear weapons to our national security at this late stage of the arms race is negligible. The nuclear arsenals have long since passed the stage of "saturation parity" when rationally applied against the relevant target systems of the opponent. There are simply no additions to the nuclear forces on either side which could measurably strengthen deterrence or significantly limit damage if deterrence fails. Arms control thus remains more fundamental to the national security than any new strategic weapons we could reasonably hope to deploy. In fact, over the next decade, the balance of opportunities for rapidly deploying such weapons distinctly favors the Soviets. There is really nothing we can, or should, do over the near-term to alter this situation. The continuing militarization of the Soviet economy is, by their own admission, a major factor in their current economic and political weakness. We would be wise, from the perspective of assuring the future health of the economic and political components of our national security, to refrain from pursuing the Soviets any farther down the road to a militarized economy than we already have. In this context, the contribution of arms control becomes even more, not less, relevant.

A candid assessment of our national security needs for the 1980's and beyond demands acknowledgement by our national leaders that new nuclear weapons will not extricate Americans from any of the hazards facing them in the future. Indeed, it is difficult to see how the MX or any other new strategic weapon will make even a minor contribution to meeting these threats. If solutions, or even the more mundane day-to-day-management of the major global issues confronting us today -- energy, food supply, economic development, nuclear proliferation, human rights -- have a military component at all, it is almost certainly a conventional one. And if, as is the case with certain countries, proliferation of nuclear capabilities threatens to invalidate this assessment, then all the more reason to seek a negotiated end to the superpowers nuclear race, so that they might, for the first time, erect credible barriers against the proliferation of nuclear capabilities, and credible sanctions against the first use by any nation of nuclear weapons.

I strongly urge that any decision concerning the future of the MX or its alternatives should take into account the negative economic consequences of military expenditures in comparison with other forms of public and private spending.

Spending on strategic forces is only one of several budget priorities which conceivably could affect national security. It is alleged, for example, that a "nuclear umbrella" strengthened by MX would help deter the Russians from further military adventures in the Middle East and thereby help secure our access to badly needed Middle East energy supplies. It is also true, however, that investing that same $68 billion in tax credits for energy conservation improvements, solar energy development, and fuel efficient technologies would have a strong chance of lessening or even eliminating our dependence on Middle Eastern oil.

Inflation, unemployment, productivity growth, and the rate of investment are also factors which have an obvious impact on the state of our national security. While spending $68 billion dollars on the MX might one day yield a marginal -- (but very likely unmeasurable and therefore unknowable) -- increase in the U.S. ability to influence Soviet behavior in a crisis, is this quest for leverage over the Soviets worth the price of slow productivity growth, high inflation, and continuing unemployment? Even from the strict vantage point of national security, might not that money be better spent on special tax incentives to foster a new wave of innovation in the civilian economy?

Piling on improvements in the strategic forces is only one -- and probably

the least effective -- path to improving our national security.

Above and beyond the question of the MX-MPS system's effectiveness, cost, and environmental impact -- which alone disqualify it as a plausible basing alternative -- there remains the issue of possibly dangerous consequences ensuing from deployment of the MX itself, regardless of the basing mode ultimately chosen. The issue is not simply a matter, as frequently suggested by Secretary Winberger, of where to base the missile. Strategic doctrine, engineering requrements, and arms control considerations intrinsically link the current missile with its previously chosen basing mode. Under existing doctrine, the large diameter MX, for example, can not be deployed in existing Minuteman silos without increased reliance on a launch-under-attack system or construction of a (only partially effective) hardsite ABM defense. Both alternative postures would culminate in increased rather than diminised threats to the security of the United States, by undermining strategic nuclear stability and perceptions of mutual deterrence during periods of heightened tension, proxy conflict, or lower-level conventional confrontation between the two superpowers.

Since the large diameter missile will not fit in the Trident submarine's launch tubes, sea-basing would require some form of horizontal encapsulation or floating launch. Although it obviates incentives for LUA and ABM systems, and therefore is the least damaging basing alternative from the perspective of limiting the threat to the national security posed by an unconstrained arms race, sea-basing does not eliminate the counterforce capabilities of the missile itself, and therefore possible Soviet adoption of the LUA posture or further proliferation of their (perhaps mobile) ICBM force in response to the increased American threat. However, <u>if one is willing to ignore these dangers,</u> the decision to go to sea does present an opportunity to effect significant economies with no loss of the hypothetical military advantages so earnestly desired by the military establishment and the present administration. <u>One</u> of the following -- Improved Accuracy Trident I, Trident II, or MX -- could be deployed in a SUM-type system, the Trident submarine program dramatically scaled down or completely eliminated, and a Service Life Extension Program (SLEP) undertaken for the Lafayette class subs retro-fitted with the Trident I missile.

In concert with an upgraded bomber-cruise missile force and the NS-20/Mark 12-A improvements for Minuteman, such an SLBM force would ensure both mutual deterrence and a capability for inflicting a full range of "limited" nuclear options well beyond the year 2000, while preserving some measure of crisis stability and verifiability (submarines are very easy to count) and forestalling

an interactive offensive-defensive arms race towards bankruptcy, heightened tensions, miscalculations, and eventual disaster.

It is the height of folly for national leaders to press for further deployment of offensive and defensive nuclear arms without at least acknowledging publically the risk that this process could end in disaster, not necessarily mutual annihilation, but a nevertheless devastating nuclear exchange arising from some volatile mixture of fear, bluff, threat, miscalculation, and accident. Unprecedented disasters, exceeding all prior bounds of comprehension of their participants, have been known to occur. At the Battle of the Somme in 1916, France lost 50,000 men in a single day. Some 6 million Jews were annihilated by the Nazis in a five year period. Twenty million Soviet citizens lost their lives over roughly the same period defeating Hitler's armies. One-hundred fifty thousand lives were snuffed out in a few brief seconds at Hiroshima and Nagasaki. Some 750,000 Balinese and Javanese villagers were hacked to death in just a few weeks during the anti-communist frenzy which swept Indonesia in the wake of a U.S.-inspired army coup in 1965. And during the four years' terror of the Pol Pot regime, some 2 - 3 million Cambodians perished. Clearly, unspeakable barbarism remains part of the human experience.

The belief that the two superpowers, now increasingly being joined by other nations, can continue accumulating nuclear weapons, and refining the means of delivering them, ad infinitum without increasing risk to themselves as well as to their enemies, is a form of latent madness which will one day manifest itself in catastrophe.

Appendix I - The SLBM Option

Hard target accuracy for SLBM's could be obtained by fitting the Trident I missile with an inertial guidance package which would accept radio signals, possibly encoded, from the NAVSTAR Global Positioning System (GPS), a satellite based navigation system currently being tested. This unit would locate the missile in space to within 10 meters prior to the release of the warheads, virtually eliminating ballistic trajectory error and leaving only a smaller error introduced by the "wander" of the warhead during reentry. An accuracy as low as 150 - 300 ft. appears theoretically obtainable over the near term, converting Trident's 100KT warhead into an effective counter-silo weapon.

Assuming destruction of NAVSTAR during a Soviet first strike, enduring guidance for second and subsequent strikes could be provided by proliferating redundant backup systems, such as the "inverted GPS," or Ground Beacon System. The key difference, according to the Pentagon, between ICBM's and SLBM's is that fixed silos make ICBM's more accurate than submarine based missiles. But even without NAVSTAR, SLBM's will become more accurate as new submarine navigation systems improve the determination of initial position. In addition to NAVSTAR, (which is obviously also useful for submarine navigation) a number of such systems -- Omega, VLF, sonar beacons, and ocean-bottom TERCOM (terrain counter mapping) -- already exist, and undoubtedly more could be developed if higher levels of accuracy and redundancy were found to be necessary. Obviously, improvements in purely inertial guidance systems, such as MX-AIRS, as well as further refinements of the current stellar inertial update approach, are also applicable to the counterforce potential of SLBM's.

Finally, there is the possibility that when judged by the most rigorous (and abstract) counterforce criteria, some 4300 warheads surviving in the U.S. force (about 5000 including SRAMs and gravity bombs) might not be considered enough. If, for example, the Soviets used only a sixth of their maximum projected 1985 force of some 12,000 warheads in a preemptive attack, that would leave them with a bit more than twice the U.S. force. In a continuing series of limited exchanges, the Pentagon fears, we might run out of "limited options" before the Soviets and "lose" the war. In this case, the SLBM force, since it is survivable, could adopt a stance of asymmetric response -- responding, as it were, to every second warhead and choosing targets accordingly to inflict equivalent damage. Obviously, such scenarios teter on the brink of credibility, but it is interesting to note that even in these rarified "worst-case" analyses, the SLBM force can be made to fill the bill.

Although President Reagan could possibly plead ignorance of these Soviet initiatives, as the presumed beneficiary of advice from a cabal of purportedly well-informed SALT II critics, he could hardly have been ignorant of the fact that Brezhnev's signature can be found right alongside former President Carter's on a SALT II document, signed June 18, 1979, entitled "Joint Statement of Principles and Basic Guidelines for Subsequent Negotiations on the Limitation of Strategic Arms."

"Convinced that early agreement on the further limitation and further reduction of strategic arms would serve to strengthen international peace and security and to reduce the risk of outbreak of nuclear war....The Parties will continue to pursue negotiations, in accordance with the principle of equality and equal security, on measures for the further limitation and reduction in the numbers of strategic arms, as well as for their future qualitative limitation," the statement noted.

While regretting that "openly bellicose calls and statements have resounded from Washington" since the change in leadership in the White House, Brezhnev expressed the hope that "those who shape United States policy will ultimately manage to see things in a more realistic light." The principle components of such a realistic approach, he said, would be recognition that the prevailing "military and strategic equilibrium," between both the USSR and the USA and the Warsaw Treaty and NATO, "objectively serves to safeguard world peace," and that attempts to talk to the USSR "from positions of strength are absolutely futile."

Disavowing any Soviet intent to attain military superiority over the United States, Brezhnev acknowledged that "a war danger does exist for the United States, as it does for all the other countries of the world." The source of this danger, however, was not "any mythical Soviet superiority" but the arms race itself and "the tension that still prevails in the world." Brezhnev offered to combat this danger "hand in hand with the United States," adding that "to try and outstrip each other in the arms race or to expect to win a nuclear war is dangerous madness."

In addition to reaffirming that previous Soviet proposals remain in force, Brezhnev offered to open negotiations on a wide range of specific measures:

- Strategic arms - "Limitation and reduction of strategic armaments is a paramount problem," Brezhnev stated. "For our part, we are prepared to continue the relevant negotiations with the United States without delay, preserving all the positive elements that have been achieved in this area...all the other nuclear powers should join these negotiations at the appropriate time." Brezhnev reminded his listeners that at the beginning of the SALT II negotiation the USSR offered to ban the development of new large ballistic missile submarines. "The proposal was not accepted. As a result, the United States has built the new Ohio submarine armed with Trident 1 missiles, while an analogous system, the Typhoon, was built in our country. So, who has stood to gain? We are prepared to come to terms on limiting the deployment of the new submarines....We could also agree to banning modernization of existing and the development of new ballistic missiles for these submarines."

- Theater nuclear weapons in Europe - "...a moratorium should now be set on the deployment in Europe of new medium-range nuclear missile weapons of the NATO countries and the Soviet Union, that is, to freeze the existing quantitative and qualitative level of these weapons, naturally including the U.S. forward-based nuclear weapons in this region. The moratorium could enter into force at once, the moment negotiations begin on this score, and could operate until a permanent treaty is concluded on limiting, or better still, reducing such nuclear weapons in Europe."

- Neutron bomb - "For our part, we declare once more that we will not begin manufacturing it if it does not appear in other countries and that we are prepared to conclude an agreement banning the weapon once and for all."

- Military detente in Europe - "...participants in the European Conference should undertake not to use either nuclear or conventional arms against each other first...existing military blocs in Europe and on other continents should not admit new members, and...no new blocs should be set up." Brezhnev joined the French in calling for a European Disarmament Conference, and endorsed the extension of the Helsinki East-West confidence building measures "to the entire European part of the USSR, provided the Western states, too, extend the confidence zone accordingly." Referring specifically to China and to U.S. military bases in the Western Pacific, Brezhnev stated that the USSR "would be prepared to hold concrete negotiations on confidence building measures in the Far East with all interested countries."

Undoubtedly, Soviet peace proposals have ulterior motives, such as diminishing the extent of U.S. influence over Western Europe. But does this automatically

mean that they are also devoid of real content? Must we perpetually "Beware the Bear Hug," as one newspaper recently editorialized, in order to assure that "any diplomatic gambit by Moscow is carefully screened for its propaganda content and self-serving purposes." One would hope that the diplomatic initiatives of all countries, not just the Soviet Union, are subjected to such scrutiny by the State Department. Obviously, ritual caveats about ulterior motives say nothing about the merits of particular Soviet proposals, and yet these caveats are frequently served-up by press and government alike as sufficient explanation for the U.S. failure to respond.

If lack of "propaganda content" and "self serving purposes" are taken as the standard for negotiability, then the Soviets should have stopped talking to us long ago. In fact, barring any significant change in U.S. global strategic objectives, meaningful arms control -- much less disarmament, in which the United States at one time also professed an interest -- will remain elusive. No doubt Soviet officials recognize this fact just as well as American officials do, and it is with this context firmly in view that U.S. spokesmen condemn Soviet proposals as "self-serving."

Indeed, a review of the predominant U.S. stance in international arms negotiations during the three-and-a half decades since Hiroshima reveals a profound ambivalence toward the very idea of nuclear arms control and disarmament, and an equally profound attachment to the idea of using nuclear weapons as an all purpose deterrent in the conduct of U.S. foreign policy. While the particular manifestation of this ambivalence has changed over the years, the underlying attitudes have not. For over two decades, until 1968, the U.S. stonewalled not only Soviet disarmament initiatives, but even the efforts of its own allies and non-aligned countries, indeed any negotiation, which would have had the effect of seriously constraining the growth of the U.S. nuclear arsenal. Although formal arms limitation talks finally got under way in 1969, and continued more or less steadily throughout the decade, this did not mean that U.S. policy-making circles had overcome their ambivalent attitude towards arms control. On the contrary, this ambivalence has become institutionalized, not only bureaucratically, in the form of competing agencies with disparate attitudes towards arms control, but also ideologically, in the form of a nuclear forces planning doctrine which espouses the twin goals of "essential equivalence" and "effective" or "extended" deterrence.

The former requires that the United States maintain nuclear forces that are roughly equal -- rather than explicitly superior -- in overall size and capability to those of the Soviet Union. This formal acknowledgement of "essential equiva-

lence," or parity, with the Soviet Union was and remains the minimum condition for arms control agreements of the SALT variety, once described by former Vice-President Mondale in a brief moment of cynicism as "a stapling together of the weapons programs of the two sides."

"Effective deterrence," however, requires, in former Defense Secretary Harold Brown's phrase, a "countervailing strategy" designed to "convince the Soviets that they will be successfully opposed at any level of aggression they choose, and that no plausible outcome at any level of conflict could represent 'success' for them by any reasonable definition of success." Since there are many areas of the world where the use or threat to use American conventional forces could not alone guarantee this outcome, the "countervailing strategy" calls for the use of nuclear weapons and threats in a wide range of possible crises and confrontations.

It is somehow assumed, although it is far from clear, that a force designed to confer "crisis leverage" and "escalation dominance" can also be compatible with a force constrained to "essential equivalence" at the conference table. On this paradox rests much of the squabbling and abrupt U.S. turnabouts which plagued the SALT II negotiations. No small amount of forked-tongue diplomacy is required to disclaim nuclear superiority at the conference table even as one continues to rely on it, or more accurately, the illusion of regaining it, as the bedrock of U.S. defense strategy, all the while assuring one's allies and adversaries alike that "real arms control" is your ultimate aim.

Appendix III - The Warhead Surplus

Secretary Schlesinger had an alternative explanation for the persistence of such highly improbable surprise attack scenarios. They were useful, he said, "in testing the design of our second strike forces."

> We have arrived at the current size and mix of our strategic forces not only because we want the ultimate threat of massive destruction to be really assured, but also because for more than a decade we have thought it advisable to test the force against the "higher-than-expected" threat. Given the built in surplus of warheads generated by this force sizing calculation, we could allocate additional weapons to non-urban targets and thereby acquire a limited set of options, including the option to attack some hard targets."

In other words, the primary function of the surprise attack scenario is to generate a "surplus" of warheads which can be assigned to a set of hard target attack options! Since alleged deficiencies in surviving ICBM warheads after a massive Soviet surprise attack are the very foundation of the requirement for MX, it is worth reviewing this fanciful force sizing calculation in some detail.

TOTAL FORCE = FORCES LOST IN SOVIET FIRST STRIKE + COUNTERFORCE RETALIATION + ASSURED DESTRUCTION RESERVE + POST-WAR RESERVE

What this equation says is that the United States should have a strategic force large enough to absorb a first strike, retaliate against Soviet military targets while holding an "assured destruction" capability in reserve, and then if the latter should be required, finish the war with a certain percentage of the force intact. Obviously, by this calculation, the requirement for warheads, and new systems to deliver them, can be made virtually open-ended. By simply increasing the weight and effectiveness of the hypothetical Soviet attack which must be "absorbed," for example, the requirement for additional weapons is easily established. In recent years this has been the preferred method of documenting the requirement for MX. A few years ago, however, the requirement was said to derive from increasing numbers and hardness levels of Soviet targets which needed to be attacked in order to preserve deterrence.

Another method of achieving the same result is to increase the damage criteria which define "assured destruction" i.e., "70% of economic recovery resources." In the case of both economic recovery and countermilitary targeting, since the criteria is set as a percentage of an expanding whole rather than as some finite number, Soviet economic and military growth automatically generates a requirement for

additional warheads. Arbitrary and even marginal increases in the "confidence level" with which targets must be destroyed also produces dramatic increases in the "requirement.". While one warhead on a hard target may yield a 65% overall probability of damage, to achieve 95% might require three, a situation of very obvious diminishing returns. Nevertheless, 5% of, for example, 1000 MIRVed missiles with an average of six 750 KT warheads each leaves 300 warheads bearing 250 EMT , a force still large enough to devastate the 100 largest U.S. cities. To reduce the effect of this surviving force, a strategic planner might want to target another round. Targeting an additional 1000 warheads would leave 15 missiles, another 2000, five missiles, still sufficient to devastate the 15 largest cities in the U.S.

Obviously, taken together such force sizing criteria can, and do, generate a bottomless pit for warheads. While the severe operational uncertainties surrounding any prospective nuclear conflict inhibit translation of this superfluity of warheads into any militarily meaningful strategic nuclear advantage, it is sometimes argued that the continuing growth and/or modernization of the strategic nuclear forces can contribute to a freer operating environment for our conventional forces. With larger numbers of more accurate warheads, we are told, the U.S. could threaten primarily the Soviet command structure and its nuclear retaliatory forces, thereby avoiding "automatic" escalation to full scale nuclear annihilation. U.S. possession of such a purported "prompt hard target kill capability" would suggest to the Soviets that the U.S. believed it had the ability to limit damage to both the Soviet Union and itself. Persuaded in this fashion that the U.S. feared the consequences of nuclear escalation less than they, the Soviets would come to believe that we would be willing to use our nuclear weapons first. Recognizing this, they would hesitate to employ their conventional forces in a way which might provoke a nuclear response from the United States, and the U.S. would gain a correspondingly freer hand in using its conventional forces to assert its global interests.

In other words, this rationale for additional nuclear forces seeks to ensure the prevalence of U.S. over Soviet interests in any serious confrontation by shifting the burden of rational, and indeed, moral behavior to the Soviets. In this regard, quite apart from the possibility that the Soviets may be more impressed with the real operational uncertainties surrounding any nuclear conflict -- and therefore less likely to be intimidated by the appearance of U.S. first strike capabilities, raising the possibility of grievous miscalculation -- I find this so called "strategy" to be as morally repugnant as the Soviet behavior we are trying to deter. The fact that we have so far managed to endure this dilemma for three decades in defense of Europe does not argue in favor of its being made a universal and permanent feature of our military planning.

Appendix IV - Silo Vulnerability and SALT: A Self Inflicted Wound

If our situation promises to be so favorable with SALT, why is such an issue being made over Minuteman vulnerability, and why do we need to go to the expense of the mobile MX ICBM, particularly a MX with a significant hard-target kill capability of its own?...We would have preferred to see both sides retain their fixed hard ICBMs in a survivable state. And in our SALT proposals of early 1977 we specified offensive limitations and reductions that might have been able to minimize ICBM vulnerability for some years to come. The Soviets saw fit to reject those proposals. Now both sides...not just the United States -- must be made to face the consequences of that rejection. Essential equivalence requires no less.

-- Secretary of Defense Harold Brown, January 1980

During his election campaign, and since taking office, President Reagan has stated repeatedly that despite the existence of (as yet unexplained) "fatal flaws" in the SALT II Treaty, he would be willing to resume negotiations with the Soviets on strategic arms as long as the goal was a genuine reduction in nuclear weapons on both sides.

"Well, one of the things -- you say conditions -- I think one of them would be some evidence on the part of the Soviet Union that they are willing to discuss that (a reduction in nuclear weapons)," Reagan told Walter Cronkite during a March television interview.

"So far," Reagan said, "previous presidents, including my predecessor, tried to bring negotiations to the point of actual reduction -- and the Soviet Union refused. They refused to discuss that. I think that we would have to know that they are willing to do that (before agreeing to a summit)."

When the President of the United States rewrites history on television, there is little one can do to prevent it. The lie is transmitted instantly, into millions of homes, to become part of the myth of American righteousness versus Soviet intransigence which has sustained previous American military buildups and which the Present is apparently counting on to sustain the current one. But the facts are there, a part of the historical record, for those who feel the truth is still worth knowing.

The sad, maddening reality about the entire problem of Soviet MIRVed ICBM "superiority" is that it is largely the product of our own military establishment's reluctance to accept limitations which would interfere with its own ongoing programs. During the waning months of the Johnson administration, the Pentagon successfully opposed any suspension or slowdown in the MIRV test program,

despite the fact that its own hardly disinterested computer analyses revealed that suspension of MIRV testing for as long as one year would not prejudice U.S. retaliatory capabilities during the mid-seventies.

During the spring of 1969, as the new Nixon administration began to formulate its approach to the first round of strategic arms limitation talks, top officials of the State Department's Arms Control and Disarmament Agency pressed for a MIRV ban as part of a broader initial U.S. position for the SALT Talks called SWWA, "Stop Where We Are." This proposal involved not only stopping U.S. MIRV testing but also a halt to Soviet ICBM and SLBM launcher construction programs. "SWWA was based on a simple concept that the way to stop arms competition was to stop strategic construction programs on both sides," recalls former chief negotiator Gerald Smith in his recently published account of SALT I. "Instead of trying to elaborate agreed levels for strategic forces and other complex arrangements, why not just freeze things at the 1969 level?"

"It was not at all clear that the U.S.S.R. would accept such a proposal, but by proposing it we could take the 'high ground' psychologically and, if necessary later, move to something more modest if that was the most the Soviets would accept." Moreover, the Nixon administration was professing to be particularly concerned with the growing threat to American ICBMs posed by large Soviet missiles, particularly as they came to be MIRVed.

Was the Nixon administration interested in seizing the "high ground" from the "peace-loving" Soviets while at the same time lessening a major threat to the security of the United States? Not at all. "The President seemed to think that SWWA was intended as propaganda," Smith recalls, and the Joint Chiefs argued that "the United States should not and in fact could not stop the march of technology."

In the "should not" department, the chiefs' SALT delegate argued that America's greatest military advantage was its technological superiority, and that this advantage could be maintained. Even if MIRVs were no longer needed to penetrate a Soviet ABM system outlawed by treaty, they would still be required for better "target coverage" and as "insurance" against Soviet "breakout" from the treaty. As for the "could not," the Pentagon alleged that a MIRV ban was not verifiable by national means and would therefore require on-site inspection. The Soviet air defense system could be secretly upgraded to have an ABM capability. The Soviets could secretly develop MIRVs and test them at short ranges, in space, or with numerous

clandestine techniques, and then deploy them clandestinely. The generals even went so far as to argue that the Soviets could complete testing after sudden abrogation of the agreement with a significant MIRV force already deployed!

All this was sheer fantasy. The CIA informed Nixon that Soviet SAMs could not be turned into an ABM system without detection by U.S. intelligence systems, that the Soviets had yet to develop a MIRV, and that if they ever conducted the flight tests essential to such a program, these would be detected. The Pentagon's fears were scarcely plausible. The Soviets would hardly risk replacing their existing warheads with partially tested MIRVs and then rely on these systems to deliver the pinpoint accuracy for a surprise attack on U.S. missile silos!

Although extremely reluctant to say much about limiting a weapon they did not have, there were a number of indications during the summer of 1969 that the Soviets were interested in a MIRV ban. In August Senator Hubert Humphrey wrote then Secretary of State William Rogers that during a recent visit to the USSR he had heard a leading Soviet academician say that he saw no obstacle to an early agreement to ban multiple warhead testing. Humphrey pressed for an immediate halt to further U.S. MIRV tests for as long as the Soviets refrained from beginning such tests.

By July 1969, some 113 members of Congress had sponsored MIRV moratorium proposals, and a subcommittee of the House Foreign Affairs Committee concluded after extensive hearings that "the executive branch should give high priority to obtaining a MIRV freeze during the forthcoming SALT negotiations."

The sentiment was ignored by the Nixon administration. During the initial Helsinki round of negotiations in November and December of 1969, Smith records the U.S. delegation was instructed to "raise the red flag of on-site inspection if the Soviets proposed a MIRV ban." If the Soviets presented a specific moratorium proposal, "the only thing the delegation was authorized to say was: "We will refer the matter to Washington."

In fairness it can be said that the Soviets did not vigorously pursue the MIRV issue either. There were several reasons for this. The Soviet delegation was anxious to prove to its superiors in the Kremlin that SALT was going to be a serious negotiation, free of the polemic which had characterized previous arms control efforts. In particular, they were acutely sensitive to the charge -- frequently employed by the U.S. to sandbag previous attempts

at arms control -- that only the Soviet mania for secrecy stood in the way of disarmament. They anticipated -- correctly, it seems -- that a forthright approach to a MIRV ban on their part would elicit U.S. demands for on-site inspection, thereby leading the negotiations back into the very rut they were hoping to avoid. They may also have been concerned that a Soviet call for a MIRV test moratorium would have led to a U.S. demand for suspension of Soviet construction of SLBM and ICBM launchers, and that such an "unequal" quid-pro-quo would have prejudiced the Kremlin authorities against the negotiations from the start. Whatever the reason, little was said, and absolutely nothing was done, about MIRV during the first Helsinki round, and the U.S. began to deploy MIRVs in earnest on its Poseidon and Minuteman missiles.

Going into the next round of the SALT negotiations, scheduled for mid-April 1970 in Vienna, the Nixon administration could no longer sidestep the MIRV issue. Public and congressional pressure was building in favor of a MIRV test moratorium and negotiations leading to a permanent ban, and the U.S. could not be sure that the Soviets would continue to avoid the issue and not call the U.S. bluff, as they had called Eisenhower's in the spring and summer of 1955. On April 9, the Senate passed Resolution 211 by a 72-6 margin, expressing the "sense of the Senate" that the President should propose an immediate freeze on the further deployment of all offensive and defensive strategic weapons on both sides, subject to the establishment of adequate means of national verification or such additional measures as might be required.

Nixon reportedly remarked that the resolution was "irrelevant," and a week later the Nixon administration presented its own "MIRV ban" proposal in Vienna. It was transparently designed for failure. The proposal prevented the Soviets from developing a MIRV technology through a MIRV test ban, but allowed the United States to manufacture and stockpile, though not deploy, its own MIRVs. On top of this lopsided limitation was heaped a requirement for on-site inspection of missiles and anti-aircraft missile sites, and the destruction of early warning radars which, the Pentagon maintained, could be secretly upgraded and integrated into an ABM defense network.

"Contrary to published accounts," former SALT I negotiating team member Lawrency Weiler noted in December 1974, "the Soviets, while never accepting --

nor specifically rejecting -- a MIRV test ban, continued to advocate a MIRV production and deployment ban during SALT I." The Joint Chiefs of Staff weighed-in with the view that if a MIRV production ban was to be tacked-on to the U.S. MIRV ban proposal, it should be coupled with even more stringent (i.e. unacceptable) surface-to-air missile controls, including the actual destruction of a sizable portion of the Soviet anti-aircraft missile force.

In the end, the Nixon administration could not bring itself to offer even this misbegotten scheme, so it proposed that both sides abandon efforts to achieve qualitative restrictions on offensive weapons during SALT I.

During the early months of the SALT II negotations, the Soviets proposed a freeze on new strategic weapons, directing their attention at the U.S. B-1 bomber, Trident submarine, and strategic cruise missile programs. "No effort was made," Weiler notes, "to see if a temporary halt on new programs could have been used as a negotiating basis (by holding in check new Soviet missile programs designed to carry MIRVs) for either a MIRV ban or a serious restriction on MIRVed forces." The unfortunate and inconvenient truth of the matter seems to have been that those in charge of U.S. arms control policy were not seriously interested in limiting Soviet MIRV programs if that required forgoing the Trident, MX, B-1, or cruise missile programs, or terminating the Minuteman III and Poseidon MIRV programs below their programmed levels.

In the two and a half years between the Interim Agreement and the Vladivostock Accord, U.S. SALT negotiators focused their attention on limiting potential Soviet MIRVed throw-weight advantages, while the Pentagon deployed an additional 1800 MIRVs. Over the same period, the Soviets deployed about 230 new missile warheads, none of them MIRVs, but conducted their first MIRV tests. As of June 30, 1974, the total number of warheads on U.S. missiles and bombers stood at 7650. The corresponding figure for the Soviets was estimated to be 2500.

Because of the already greater than two-to-one advantage in missile warheads -- 5,678 vs. 2218 -- as well as the U.S. lead in missile accuracy and nuclear yield/weight ratios, U.S. proposals to severely restrict Soviet MIRVed throw-weight potential were inevitably rejected by the Soviets.

Henry Kissinger realized, even if the Pentagon did not, that limitations on Soviet MIRVs low enough to assure Minuteman survivability were negotiable only if the United States made deep cuts in its already deployed MIRV forces and abandoned most if not all of its programmed force improvements. Since "de-MIRVing" was both politically very difficult and difficult to verify --

once a missile is tested in a MIRVed mode, all such missies are regarded as MIRVed -- Minuteman's technical vulnerability to attack became a foregone conclusion. Whether in fact Minuteman would be attacked was perceived as a function of the condition of the other two legs of the TRIAD, and here Kissinger correctly noted that the U.S. was in a far better position than the Soviets. Left unstated was the overwhelming U.S. superiority in survivable forward-deployed submarine-based missiles, the far greater vulnerability of comparable Soviet forces to U.S. ASW, U.S. superiority in intercontinental bomber forces, and the existence of hundreds of U.S. forward-based aircraft capable of deliverying nuclear weapons to the Soviet Union which were not balanced by any corresponding Soviet capability.

Althought the Vladivostock Accord itself did little to halt the arms race beyond placing limits on some important dimensions of its future growth, it did create a situation of formal equality within which mutual and balanced reduction could theoretically be negotiated, perhaps even before the overall ceilings had been reached by both sides. The latter possibility was obviously heavily influenced by how each side assessed the scale and intent of the other's ongoing programs.

Not long after the negotiations resumed in Geneva, the Ford Administration issued a unilateral declaration to the effect that the air-launched missile limitation agreed upon at Vladivostock was intended to cover ballistic missiles only, with the clear implication that the newly developed U.S. strategic cruise missile was not covered by the agreement. The Soviets were outraged, arguing (justifiably) that the U.S. was reneging on the terms of the deal struck at Vladivostock -- comprehensive and equal num erical limits on the size of strategic nuclear arsenals. The United States claimed that cruise missile restrictions had not been specifically discussed at Vladivostock, and therefore the Vladivostock ceilings did not apply to them.

"We resolutely objected to this attempt," Soviet Foreign Minister Gromyko later observed. "At Vladivostock the question was posed differently. No green light was given there to the cruise missiles. The question was posed thus -- to achieve such an agreement that would shut off all channels of the strategic arms race and reduce the threat of nuclear war."

To legitimate the U.S. defection from the Vladivostock guidelines, and to generate some bargaining leverage for a compromise over the cruise missile issue, the United States began complaining loudly and publically about the range characteristics of the Soviets TU-26 "Backfire" bomber, a new swing-

wing "peripheral-attack" aircraft with a maximum combat radius on internal fuel of some 2,110 miles. On a one way mission, or when equipped for aerial refueling, the Backfire "constitutes a potential threat to the continental United States," the Joint Chiefs warned. Whether or not this was true, it was beside the point. The United States had insistently refused to include medium-range nuclear systems capable of reaching the USSR as part of the SALT II negotiations. Finally, the Soviets had conceded the point. Now the U.S. was not only dragging Soviet medium-range weapons into the negotiatons again, but also proposing to exclude both cruise-missile equipped strategic bombers and forward-based systems, which themselves might be augmented with ground and sea-launched cruise missiles!

In 1976 Secretary of State Kissinger began exploring a formula which would have exchanged upspecified "restrictions" on the Backfire for the inclusion under the MIRV ceiling of bombers carrying cruise missiles with ranges over 360 miles. But according to newspaper accounts, the Ford administration, divided on the subject, decided not to pursue that approach and instead proposed a treaty that left the cruise missle and Backfire to later negotiations. Needless to say, the Soviets unhesitatingly rejected any approach which failed to include the cruise missile.

Soon after taking office, President Carter ordered a new proposal prepared, one which would, in Dr. Brzezinski's words, "obtain a significant reduction in the level of strategic confrontation.

> ....We attempted very deliberately to forgo those elements in our strategic posture which threaten the Soviets the most, and we made proposals to them that they forgo those elements in their strategic posture which threaten us the most. We felt particularly by concentrating on the land-based ICBMs that are MIRVed we would take into account the greatest sources of insecurity on both sides."

The so-called "Deep Cuts" proposal was presented to the Soviets by Secretary Vance in Moscow on March 28, 1977. It reportedly contained the following points:

> --a reduction in the 2400 launcher total force level to between 1800 and 2000
>
> --a reduction in the number of Soviet "modern large ballistic missiles" from 308 to 150 SS-9s and/or SS-18s
>
> --a reduction in the number of ICBM and SLBM MIRVed launchers from 1320 to between 1100 and 1200
>
> --a limit of 550 MIRVed ICBMs; Minuteman III's on the U.S. side and SS-17s, SS-18s and SS-19s on the Soviet side

--a ban on modifications to existing ICBMs and the deployment of new types

--a limit on flight tests for existing ICBMs, and SLBMs, to six per year

--a ban on mobile ICBMs

--a ban on cruise missiles of "strategic range," reportedly defined as any range in excess of 2500 kilometers (1550 miles); air launched cruise missiles with ranges between 600 km (372 miles) and 2500 km could be launched from "heavy bombers" only; no mention was made of land or sea-launched cruise missiles, but heavy bombers equipped with cruise missiles would be counted within the MIRV aggregate

--exclusion of the Backfire if the Soviets agreed to certain unspecified restrictions.

Actually, before presenting the "Deep Cuts" proposal, the Carter administration's "preferred option," Secretary Vance outlined an alternative proposal in the event the Soviets proved unwilling to junk the Vladivostock Accord. This was the so-called "fallback position," reportedly identical to the Ford administration's plan for a treaty based on the Vladivostock numbers but excluding the cruise missile and the Backfire bomber.

Examining the interaction between these two proposals provides a somewhat different view of the Carter administration's "giant step" towards arms reductions. The "fallback position" was reportedly presented as a "take it or leave it" proposition, virtually compelling the Soviets to negotiate on the basis of the Deep Cuts proposal in order to obtain any restrictions on U.S. long-range cruise missiles. In other words, the "fallback position" was not so much a least common denominator compromise in the spirit of Vladivostock as it was a tacit threat to drive the arms race through the ceiling if the Soviets refused to negotiate on the basis of the Carter administration's preferred option.

From the Soviet perspective, the Deep Cuts proposal was simply another U.S. maneuver for unilateral advantage masquerading as disarmament, as the deep cuts exclusively involved Soviet forces. At a rare press conference on March 31, 1977, Soviet Foreign Minister Gromyko expressed his government's feeling that the Carter administration was trying to win kudos at Soviet expense:

> A version is now being circulated in the U.S.A., alleging that the U.S. representatives at the Moscow talks proposed some broad program for disarmament, but the Soviet leadership did not accept this program.

I must say that this version does not accord with reality. This version is essentially false. Nobody proposed such a program to us.

As Gromyko noted, the proposal was in fact far more narrowly based than the Carter administration's somewhat inflated rhetoric implied. Its primary goal was assuring the survivability of Minuteman by effecting major reductions in Soviet MIRVed ICBM's:

--the numbers suggested for total launchers were 58-258 below the then current U.S. total, with the difference accounted for entirely by bombers, but the Soviets would have been required to destroy 454-654 (mostly missile) launchers

--the proposal called on the Soviets to destroy 150 of their most capable missiles, with no corresponding U.S. reductions, not even the 54 Titan II's, as these were not classified as "modern" large ballistic missiles

--with the U.S. deployed MIRVed-systems advantage and superior MIRV technology, the sublimit of 150 heavy Soviet ICBMs and the combined MIRVed launcher total of 1100-1200 perpetuated the roughly two-to-one U.S. advantage in the overall number of warheads

--while the above limitations would have imposed severe cuts on the Soviet ICBM program, with the intent of driving the composition of the Soviet force toward less powerful and less accurate SLBMs, the combined limit on flight tests to six per year would have had the effect of slowing down Soviet MIRVed SLBM deployments, effectively freezing the U.S. MIRVed SLBM advantage

--the proposed ban on land missiles, while eliminating the prospective MX -- "which in its consequences," Brzezinski noted, "given its accuracy and so forth by the early eighties, could be extremely, extremely, threatening to them" -- also would have done away with the mobile SS-16, a lighter, less threatening missile than the SS-18 and the Soviets only solid fuel ICBM, from which is derived the mobile SS-20.

--the proposed restrictions on cruise missiles were insufficient to prevent the emergence of a significant U.S. advantage in this area; the proposal did not include restrictions on the transfer of the new technology to U.S. allies, a subject of intense Soviet concern; nor did it place any restrictions on air or sea-launched cruise missiles, leaving an enormous loophole for the rapid and largely unverifiable proliferation of nuclear warheads throughout U.S. land and sea-based forces, especially on attack submarines;

--SLBM forces -- the area of greatest U.S. relative advantage in terms of warheads, accuracy, and survivability -- were restrained only indirectly through their inclusion in the total launcher and MIRVed launcher limits; under the proposal, the United States would

> have been free to proceed with the Trident I and II programs, thereby simply relocating rather than eliminating U.S. first strike potential against a now much reduced Soviet ICBM force; by driving the arms race to sea, the Carter proposal was playing to the United States' greatest strength, and the Soviets' greatest weakness, not exactly the formula for an equitable arms limitation agreement.

Even more remarkable, in view of the Carter administration's avowed intention of assuring Minuteman survivability, is that the "Deep Cuts" proposal would not have accomplished even this objective. Recent statements by a number of Secretary Brown's top ranking subordinates are not in accord with his statement cited above on the relationship between MX and SALT.

In February 1979, for example, Undersecretary Perry informed the Senate Armed Services Committee, "The original March proposal would not solve the problem of vulnerability of Minuteman." As Dr. Seymour Zeiberg, Perry's Deputy for Strategic Programs, explained:

> The number of accurate MIRV's permitted by the March 1977 proposal would still have exceeded the number of silos we have by a considerable amount, so the effect of a counterforce attack on Minuteman would have been achieved within the provisions of the 1977 proposal.
>
> These proposals, however, would simply truncate the evolution of threats to a future system that we might develop in response to the current ongoing Soviet force projections, for example, MPS (Multiple Protective Shelter) or airmobile (MX).

In conclusion, then, it would seem at least peculiar, if not hypocritical, for high officials to publically upbraid the Soviets for their rejection of proposals which allegedly would have spared us the MX, when the Department of Defense itself believes that Soviet acceptance of these proposals would not have solved the problem of Minuteman's technical vulnerability. Responsibility for that development rest squarely with the mismanagement of U.S. arms control policy by the Nixon, Ford, and Carter administrations.

Senator PROXMIRE. I understand, Mr. Sharfman and Mr. Staffin, you have a joint statement; is that correct?

STATEMENT OF PETER SHARFMAN, PROGRAM MANAGER, INTERNATIONAL SECURITY AND COMMERCE, OFFICE OF TECHNOLOGY ASSESSMENT, WASHINGTON, D.C., ACCOMPANIED BY ROBIN STAFFIN, ANALYST

Mr. SHARFMAN. That's correct. Our prepared statement would have run about half an hour, so I will condense it and submit the entire statement for the record.

Senator PROXMIRE. We'd appreciate that very much. All of your prepared statements will be printed in full in the record. Mr. Paine and Mr. Gold have also skipped a couple parts of their prepared statements.

Mr. SHARFMAN. Very well. The Office of Technology Assessment was requested by the Technology Assessment Board to carry out a year-long study on the subject of MX missile basing. The course of this study, which is now in its final stages, looked in depth at both the so-called baseline system and at the various possible alternatives. The baseline is the system of 200 MX missiles hidden among 4,600 shelters in Nevada and Utah, which was approved by President Carter and which has been under full scale engineering development by the Air Force for well over a year.

COST OF MX BASELINE SYSTEMS

Our findings on the issue of the cost of the baseline system are the subject of our testimony today. The purpose of the study was to support a comparison of various ways in which MX missiles could be based. Consequently, our review of the costs of the Air Force baseline was directed primarily at understanding the basis on which the Air Force made its cost estimates. OTA had an independent cost assessment conducted of the Air Force baseline system. The cost was estimated for all stages of the system from development and investment through operation and support. Some parts of our effort were facilitated by cooperation with the Congressional Budget Office and the General Accounting Office, and we are grateful for their assistance.

In determining system costs, it should be understood that the baseline configuration for multiple protective shelters, MPS, is not yet firmly fixed and the Air Force is still considering certain technological tradeoffs. The Air Force is in the process of obtaining costs, as you mentioned in your initial statement, Senator, but until the baseline configuration is finalized, new estimates are considered internal Air Force data and were not made available for OTA's analysis.

In lieu of this data, the Air Force provided detailed briefings covering methods used to estimate costs and provided substantial backup material to support their previous estimate of $33.8 billion fiscal 1978 dollars. In addition, the draft environmental impact statement, particularly its technical appendices, contains additional information useful for estimating costs.

We also incorporated some of the design changes resulting from a late 1980 design review. Therefore, a systems configuration was selected

as a basis for cost analysis that is compatible with the Air Force plans but which is slightly different in detail from the configuration used for the previous Air Force estimate.

There is some confusion about the Air Force baseline estimate. A cost of $33.8 billion is often quoted. This dollar figure refers to the baseline estimate in constant 1978 dollars, and includes acquisition costs and operating and support costs through construction completion, plus 10 years of operating and support at the full operating capability. This figure, when escalated to 1980 dollars, is $39.9 billion life cycle cost, of which acquisition cost is, by a coincidence, $33.8 billion. This estimate excludes the cost of impact mitigation which would be borne partly by the Defense Department and partly by State and local governments in the deployment area, and it also excludes the cost of the warheads on the missile, an item which is found in the Department of Energy, rather than the Department of Defense budget. Ten years of operation is used in order to permit a comparison of systems and does reflect an estimate of the actual lifetime of the system, which would probably be considerably longer. The Air Force's estimate for 4,600 shelters is shown in table 1.[1] Because these estimates are controversial, it is important to understand the conditions under which they were developed and their degree of accuracy.

The MX program, that's the Air Force MX program, considered a wide variety of basing modes including silos, trenches and air mobile, in addition to their present plan. For each basing mode several configurations were studied and costed. In order to have a quick response estimating capability with a reasonable degree of accuracy, the Air Force developed a cost model. This model was and is parametric, and cost factors were developed for specific characteristics or parameters that describe a particular function, and required resources such as transportation and handling costs. It is this model, rather than a detailed line item by line item, bottom-up calculation that was used by the Air Force to develop their official estimate.

Now, we have been given to understand that when the time comes that the Air Force submits a SAR, a selected acquisition report, it will be based on such a bottom-up calculation, rather than on this parametric model, but that work has not been completed, which is why there is not a SAR. Furthermore, any cost estimate at this time must contain a high degree of uncertainty. Deployment is planned for a very remote, sparsely populated area that does not have the necessary infrastructure to supply adequate support to the construction activities required or to absorb easily the influx of service and contractor personnel required to operate and maintain the system, once in place.

In addition, some of the deployment area is of historical and archeological interest, imposing limits on the siting and construction of facilities and roads. These conditions have impacts on the cost of the system. Construction and check-out of facilities and equipment present a most severe problem in cost estimating. While it is not too difficult to estimate the construction cost of a given structure, the estimating process becomes very complex under the conditions that exist for MPS.

Other areas where precise cost estimates are difficult include the cost of the missile itself, the cost of the missile decoy—the decoy is vital to the viability of an MPS deployment and is not yet fully

[1] See table 1, p. 132.

designed. There would be 4,000 of them, so that small design changes make a big difference. Also, there is the cost of the missile transporter, the cost of command, control and communications, the cost of hardening against electromagnetic pulse, or EMP. With the exception of construction issues, which are different because of the remoteness of the area and the missile decoy which is an unprecedented project, these uncertainties are normal for advanced and complex weapon systems at this stage of development.

If the earlier Air Force estimate of $33.8 billion has not properly assessed the support required to accomplish the construction program, the estimate could be substantially low. An error in estimating the cost of individual protective shelters is greatly magnified because each error is multiplied by 4,600. Similarly, inadequate consideration of resources required to support the construction effort will be magnified because of the remoteness of the deployment area. Notwithstanding these uncertainties, a comparison of the Air Force baseline estimate to OTA's estimate has been made.

As appears in table 2 [2] of the prepared statement, OTA estimates the total acquisition cost for the Air Force baseline with 4,600 shelters at $37.2 billion—fiscal year 1980 dollars—and a total cost——

Senator PROXMIRE. Table 2?

Mr. SHARFMAN. Yes, sir.

Senator PROXMIRE. Thank you. Go ahead.

Mr. SHARFMAN. As previously mentioned, the OTA estimate is $3.5 billion greater than the 1980 baseline estimate developed by the Air Force. This differential includes $0.6 billion in schedule contingency for missile R.D.T. & E., due to schedule delays; $0.7 billion for engineering changes in system components; $0.6 billion in construction costs primarily associated with increased life support costs; $0.7 billion in assembly and checkout costs reflecting military pay for the Air Force personnel involved in this activity; and a total of $0.9 billion in other adjustments.

The Air Force has also not budgeted costs for program management and the site activation task force. Also, as noted above, the proposed 4,600 shelter system represents a base—line scenario. However, MPS basing might require as many as 8,250 shelters by 1990 and 12,500 shelters by 1995 in response to an expanded Soviet threat. If it becomes necessary to expand the system by building these additional shelters and missiles to keep up with an expanded Soviet threat, there would be a significant impact on costs and schedule for the MPS system.

These projections essentially were that the Soviet buildup of warheads per year would be as rapid in the 1980's as it was in the late 1970's. In other words, we straightlined what the Russians have been doing. We estimate costs for an MPS expansion under the following assumptions. A total of 8,250 shelters can be deployed in the Southwest by 1990, retaining the ratio of one missile to 23 shelters and 1 mile spacing between shelters. A total of 12,500 shelters can be deployed by 1995 in the Southwest, retaining the same 23 to one ratio and 1 mile shelter spacing. In addition, we assume that clusters would not be backfilled, in order to enhance survivability. In other words, it would be possible to pack the shelters in more densely in the existing clusters

[2] See table 2, p. 138.

at some risk to their survivability, and we have assumed that this risk would not be taken.

It does seem possible to achieve the first goal, 8,250 shelters in operation by 1990, provided that there are no serious missile or site development problems and that a decision to proceed is made in the near future. I might remark that this decision to proceed would have to be made before there was unambiguous intelligence about what the Russians actually will have by 1990.

A shelter completion rate of approximately 2,000 per year would be required. This role represents about a two-thirds increase in the presently planned construction rate of about 1,200 shelters per year. As in the baseline case of 4,600 shelters, some schedule slippage is likely. Because of the factors of leadtime, action authority, and increased adverse environmental impacts, the feasibility of this 1990 goal is highly dependent on the timing of the decision to proceed. OTA estimates based more on analytic judgment than on hard analysis say that a firm decision including needed management mechanisms must be in place by the end of calendar year 1982 or early in 1983, for the 8,250 shelter option to be feasible. This time frame is predicated on an almost immediate decision to proceed with the 4,600 shelter program in the Utah-Nevada area.

Completing 12,500 shelters by 1995 would not present problems if the 1990 goal of 8,250 shelters is achieved. If only 4,600 shelters are available in 1990, 7,900 additional shelters would be needed by 1995 and a shelter construction rate of 1,600 per year.

Leadtime considerations also affect the feasibility of this option, and OTA estimates that a decision would be required 2 to 3 years prior to the construction start, that is in 1987 or 1988. Split basing, that is, dividing the total number of shelters between Utah, Nevada, New Mexico, and Texas, should not impact either the feasibility of expansion or the required decision dates, but would increase costs by about 10 percent.

Table 3 [3] shows the estimated life-cycle costs associated with developing, constructing, deploying, and operating the MPS system to the year 2,005. Separate estimates are shown for 4,600, 8,250, and 12,500 shelters, and each estimate includes a minimum of 10 years of full operational capability. Again, 10 years is used as a point of comparison. The actual lifetime of the system is presumed to be much longer with a corresponding increase to total system cost, due to operating and support costs. It can be seen, therefore, that it will cost about $20 billion more to deploy and operate 8,250 shelters, and about $40 billion more for 12,500 shelters than the presently planned 4,600 shelters.

Costs were also estimated for the cases in which additional shelters would be backfilled into the original clusters by filling in the gaps of the original hexagonal array deployment. This approach, which does take some marginal risks with the survivability of the system, would reduce connect cost and other nonshelter facilities, roads, powerlines, et cetera, for the first additional 2,300 shelters. Afterward, additional clusters would need to be built to accommodate the additional shelters. For these cases, a 10-year life-cycle cost saving of $4.5 billion for the

[3] See table 3, p. 141.

8,250 shelter option and 5.3 billion for the 12,500 shelter option was estimated. Operating personnel requirements were based on a detailed analysis of personnel for the 4,600 shelter option provided by the Air Force, and then scaled up for the expanded options.

In conclusion, I would like to point out that OTA, in its analysis, compared a large number of basing modes in terms of cost and 10 other criteria, such as weapons effectiveness and survivability. OTA did not make any basing-mode recommendations. We concluded that each had its advantages, disadvantages, and risks. Since policymakers may differ on the weights to be assigned to the various criteria costs among them, the choice among basing modes is not simply a technical one.

Senator PROXMIRE. Thank you very much, gentlemen.

[The prepared statement of Mr. Sharfman follows:]

PREPARED STATEMENT OF PETER SHARFMAN

The Office of Technology Assessment was requested by the Technology Assessment Board to carry out a year-long study on the subject of "MX Missile Basing." In the course of this study, which is now in its final stages, we looked in depth at both the so-called "baseline" system and at the various possible alternatives. The "baseline" is the system of 200 MX missiles hidden among 4600 shelters in Nevada and Utah which was approved by President Carter and which has been under full-scale engineering development by the Air Force for more than a year. Our findings on the issue of the cost of the baseline system are the subject of my testimony today. I am accompanied by Dr. Robin Staffin, the member of the project team who had principal responsibility for our analysis of the baseline system, and with your permission I shall direct some of your questions to him.

The purpose of the study was to support a comparison of various ways in which MX missiles could be based. Consequently, our review of the costs of the Air Force baseline was directed primarily at understanding the basis on which the Air Force made its cost estimates. OTA had an independent cost assessment conducted of the Air Force baseline system. The cost was estimated for all stages of the system, from development and investment through operation and support. Some

parts of our effort were facilitated by cooperation with the Congressional Budget Office and the General Accounting Office, and we are grateful for their assistance.

In determining system cost, it should be understood that the baseline configuration for Multiple Protective Shelters (MPS) is not yet firmly fixed, as certain technological tradeoffs are still being considered by the Air Force. The Air Force is in the process of updating costs, but until the baseline configuration is finalized, new estimates are considered internal Air Force data and were not made available for OTA's analysis. In lieu of this data, the Air Force provided detailed briefings covering methods used to estimate costs and provided substantial backup material to support their previous estimate of $33.8 billion (fiscal year 1978 dollars). In addition, the Draft Environmental Impact Statement (DEIS), particularly its technical appendices, contains additional information useful for estimating costs. Also, some of the design changes adopted as a result of the late-1980 design review have been incorporated into the estimate. Inputs drawn from the backup material supplied by the Air Force have been used but appropriate adjustments have been made, based on information contained in the DEIS and other published sources. Therefore, a systems configuration has been selected as a basis for cost analysis that is compatible with Air Force plans but which is slightly different in detail from the configuration used for the previous Air Force estimate.

There is some confusion about the Air Force baseline estimate. A cost of $33.8 billion is often quoted. This dollar figure refers to

the baseline estimate, in constant 1978 dollars, and includes acquisition cost, operating and support costs through construction completion, and 10 years of operating and support after full operating capability. This figure when escalated to 1980 dollars is $39.9 billion lifecycle cost, of which acquisition cost is $33.8 billion. (This estimate also excludes the cost of impact mitigation.) Ten years is intended as a basis of comparison between systems, and not the lifetime of the system, which could be considerably longer. The Air Force's baseline estimate for the 4,600 shelter system is shown in table 1.

TABLE 1

AIR FORCE BASELINE ESTIMATE 4,600 SHELTERS (JUNE 1978)

(billions of dollars)

	FY 78 $	FY 80 $
Development (RDT&E)	$ 6.7	$ 7.9
Investment		
Aircraft procurement	$ 0.3	$ 0.3
Missile procurement	12.6	14.9
Military construction	9.0	10.7
Total investment	$ 21.9	$ 25.9
Total acquisition	$ 28.6	$ 33.8
O & S costs	$ 5.3	$ 6.1
Life-cycle costs	$ 33.8	$ 39.9

Because of the controversy of these estimates, it is important to understand the conditions under which they were developed, and their degree of accuracy. The MX Program has considered a wide variety of basing modes, including silos, trenches, and air mobile in addition to the present horizontal plan. For each basing mode, several configurations were studied and costed, an important consideration for each mode. In order to have a quick-response estimating capability with a reasonable degree of accuracy, a cost model was developed by the Air Force. This model was parametric, in which cost factors were developed for specific characteristics (or parameters) that describe a particular function, and required resources such as transportation and handling costs. This model was used to develop the Air Force's June 1980 estimate for MPS.

After reviewing the Air Force model in detail, it appears that the methods used in it are sound and reflect serious considerations of the major problems to be overcome in completing the MPS option. The estimates, therefore, have a reasonable degree of validity and accuracy, and it is possible that the acquisition process could be completed within the $33.8 billion estimate. For several reasons, however, OTA believes that the cost would be about $3.5 billion greater than this estimate. Program delays are already putting upward pressure on potential MPS costs, and additional delays in the construction process should be expected.

Furthermore, any cost estimate at this time must contain a high degree of uncertainty. Generally, it is hoped that an underestimate of

one item will be offset, at least partially, by an overestimate of another item. Conditions under which the MPS program is being conducted — optimistic schedule, massive scale, remote location, and new technology — put pressure for cost growth on almost all elements of the program. A clearer picture of the limits of expected costs can be obtained only after a number of significant issues are resolved.

Deployment is planned for a very remote, sparsely populated area that does not have the necessary infrastructure to supply meaningful support to the construction activities required or to absorb easily the influx of service and contractor personnel required to operate and maintain the system once in place. In addition, some of the deployment area is of historical and archeological interest, imposing limits on the siting and construction of MPS facilities and roads. These conditions have impacts on the costs of the MPS system. OTA's cost estimate, therefore, concentrates on detailing the resource requirements to develop, procure, construct, and operate the system. Construction and check out of facilities and equipment systems present a most severe problem in cost estimating. While it is not too difficult to estimate the construction cost of a given structure, the estimating process becomes very complex under the conditions that exist for MPS. First, the workers must be recruited outside the deployment area since the skills and numbers required probably do not exist locally. Because of this situation, temporary construction camps must be established and housing, food, recreation, and health care must be provided for the workers. Everything from construction materials to loaves of bread must be brought into the area over what is, at best, a

limited transportation network. In addition, the technical facilities must meet exacting standards to ensure survivability, post-attack launch capability, and to protect missile location uncertainty. Thus, in addition to construction workers, there must be managers and inspectors to ensure quality control, personnel to prepare food, truck drivers to provide transportation, clerks to receive and store materials, and a number of other supporting personnel. Solid and liquid waste must be disposed of in an environmentally acceptable manner.

Other areas where precise cost estimates are difficult include:

- MX missile. The decision for full-scale production is scheduled to be made long before the flight test program is completed, and before the missile/cannister combination has been tested. Such a program is feasible, but risks complications late in the test program causing design changes, delays, and production cost increases over those estimated.

- Missile Decoy. This system, vital to the viability of MPS, is not yet fully designed. Projected development and procurement costs are highly uncertain at this time.

- Missile Transporter. This transporter will be the largest truck-like vehicle ever constructed, and it includes highly sophisticated automatic controls, communications, and decoy systems.

- Command, Control, and Communications (C^3). Not all

portions of this subsystem have been specified at this time.

- Electromagnetic Pulse (EMP) Hardening. It does not appear that sufficient attention to quality control was reflected in the original Air Force estimate. Welds on the steel liners installed in the Safeguard ABM system for EMP purposes were found to be a problem requiring special inspection procedures. The MPS documents do not discuss the welds required on the steel liner installed in each shelter.

With the exception of construction issues and the missile decoy, these uncertainties are normal for advanced and complex weapons systems at this stage of development. If the earlier Air Force estimate of $33.8 billion has not properly assessed the support required to accomplish the construction program, the estimate could be substantially low. An error in estimating the cost of individual protective shelters is greatly magnified because a minimum of 4,600 shelters is required. Similarly, inadequate consideration of resources required to support the construction effort will be magnified because of the remoteness of the proposed deployment area.

Notwithstanding these uncertainties, a comparison of the Air Force baseline estimate to OTA's estimate has been made (see table 2). OTA estimates the total acquisition cost for the Air Force baseline, with 4,600 shelters, is $37.2 billion (fiscal year 1980 dollars), and a total lifecycle cost of $43.5 billion. As previously mentioned, the

OTA estimate is $3.5 billion greater than the 1980 baseline estimate developed by the Air Force. This differential includes:

- $0.6 billion in schedule contingency for missile RDT&E,
- $0.7 billion for engineering changes in system components,
- $0.6 billion in construction costs primarily associated with increased life support costs,
- $0.7 billion in assembly and checkout costs reflecting military pay for the Air Force personnel involved in this activity.
- $0.9 billion in other adjustments.

As indicated in table 2, the Air Force has not budgeted costs for the MX program for program management and its Site Activation Task Force.

COST AND SCHEDULE OF EXPANDING THE MX/MPS

As noted above, the proposed 4,600-shelter system represents a baseline scenario. However, MPS basing might require as many as 8,250 shelters by 1990 and 12,500 shelters by 1995 in response to an expanded Soviet threat.

TABLE 2

COMPARISON OF AIR FORCE AND OTA COST ESTIMATES
(billions of fiscal year 1980 dollars)

	USAF Baseline Estimate	OTA Baseline Estimate
Development		
Missile related	$ 5.025	$ 5.025
Base related	2.839	2.837
Other	.710	1.310
	$ 8.574	$ 9.172
Investment		
Nonrecurring production	$ 1.110	$1.110
Equipment procurement		
Missile system	4.990	5.226
Transporter/vehicles	1.634	1.634
Decoy	2.321	2.321
C^3	0.915	0.915
Ground power	0.542	0.758
Physical security	0.335	0.335
Support equipment	1.692	1.692
Aircraft procurement	0.350	0.439
Total equipment & spares	$12.779	$13.320
Engineering change order	—	$ 0.666
Facilities construction	10.035	10.649
Assembly and checkout	1.318	1.995
Program management	—	0.222
Site activation task force	—	0.037
	$25.242	$27.999
Operating and Support		
Replenishment spares	$ 0.647	$ 0.647
System modifications	0.187	0.234
Depot maintenance	0.227	0.227
Operations and maintenance	1.480	1.611
Military personnel	2.077	2.077
Civilian personnel	0.410	0.410
Training	0.192	0.192
Other	0.910	0.910
	$ 6.130	$ 6.308
Total lifecycle cost	$39.946	$43.479

SOURCE: Office of Technology Assessment

If it becomes necessary to expand the system by building these additional shelters and missiles to keep up with an expanded Soviet threat, there would be a significant impact on cost and schedule for the MPS system. In light of projections for Soviet warhead buildup, we estimate costs for an MPS expansion under the following assumptions:

- a total of 8,250 shelters can be deployed in the Southwest by 1990, retaining the ratio of one missile to 23 shelters and 1 mile spacing;
- a total of 12,500 shelters can be deployed by 1995 in the Southwest, retaining the ratio of one missile to 23 shelters and 1 mile spacing; and
- presently planned clusters are not back-filled in order to enhance survivability.

It seems possible to achieve the first goal, 8,250 shelters in operation by 1990, provided there are no serious missile or site development problems, and that a decision to proceed is made in the near future. A shelter completion rate of approximately 2,000 per year would be required. This rate represents about a two-thirds increase in the presently planned construction rate (approximately 1,200 per year). As in the baseline case of 4,600 shelters, however, some schedule slippage is likely. An expanded program schedule would also be in jeopardy unless funding and authority mechanisms are provided so that the required resources can be programmed and marshalled for use when required.

While OTA does not have the information available to detail all resource requirements for the expanded program, no resource constraints (construction materials, equipment, or skilled personnel) are anticipated provided that sufficient lead time is available between the decision to undertake the program and peak construction periods. The Nevada Power Co., for example, cannot presently meet peak demands for electric power and has existing purchase agreements with outside utilities. Long-term agreements with the company would be required if commercial power is to be used to support the construction and operations phases of the MPS program as planned. Other such commitments would be needed early in the program to ensure a successful building program.

These factors, lead time, action authority, and increased adverse environmental impacts, suggest that the feasibility of the 1990 goal is highly dependent on the timing of the decision to proceed. OTA estimates, based more on analytical judgment than hard analysis, that a firm decision including needed management mechanisms must be in place by the end of calendar 1982 or early 1983 for the 8,250 shelter option to be feasible. This time frame is predicated on a near-term decision to proceed with the 4,600 shelter program in the Utah-Nevada area.

Completing 12,500 shelters by 1995 should not present problems if the 1990 goal of 8,250 shelters is achieved. If only 4,600 shelters are available in 1990, 7,900 additional shelters would be needed by 1995, and a shelter construction rate of 1,600 per year. Lead time considerations also impact the feasibility of this option and OTA

estimates that a decision would be required 2 to 3 years prior to the construction start (1987 - 1988).

Split-basing, i.e., dividing the total number of shelters between Utah and Nevada, and New Mexico and Texas, should not impact either the feasibility of expansion or the required decision dates, but would increase costs about 10 percent.

Table 3 shows the estimated lifecycle costs associated with developing, constructing, deploying, and operating the MPS system to the year 2005. Separate estimates are shown for 4,600, 8,250, and 12,500 shelters, and each estimate includes a minimum of 10 years of full operational capability. Again, ten years is used as a point of comparison among basing modes. The actual lifetime of the system is presumed to be much longer, with a corresponding increase to total system cost due to operating and support costs. The number of years of full-scale operations included in the estimate are as follows:

TABLE 3

Number of Shelters	Period	Years	Life cycle cost (billions of fiscal year 80$)
4,600	1990-2004	15	$ 45.5
8,250	1990-2004	15	65.0
12,500	1995-2005	10	85.2

SOURCE: Office of Technology Assessment.

Referring to table 4, it can be seen that it will cost about $20

billion more to deploy and operate 8,250 shelters, and about $40 billion more for 12,500 than the presently planned 4,600 shelters. The estimate assumes that a third operating base (OB) will be required for the expanded system, and, in addition, that the OB will have the associated missile assembly and contractor support facilities for the 12,500 shelter option.

Costs were obtained by scaling up the baseline cost estimate for 4,600 shelters to the year 2000. The additional 5 years were considered so that 10 full years of operations for the 12,500 shelter option could be included.

Costs were also estimated for the cases in which additional shelters would be backfilled into the original clusters (by filling in the gaps of the original hexagonal-array deployment). This approach would reduce connector costs (roads, power lines, etc.) and other nonshelter facilities, for the first 2,300 additional shelters. Afterwards, entire additional clusters would need to be built to accommodate the additional shelters. For these cases, a 10-year lifecycle cost savings of $4.5 billion for the 8,250 shelter option and $5.3 billion for the 12,500 shelter option was estimated.

Operating personnel requirements were based on a detailed analysis of personnel for the 4,600 shelter option provided by the Air Force and scaled for the expanded options.

This method provides reasonable cost estimates for comparative purposes. However, final estimates contain a significant degree of uncertainty and further analysis is required before actual funding levels can be determined with precision.

TABLE 4

LIFECYCLE COST OF 4,600, 8,250, AND 12,500 SHELTERS
TO THE YEAR 2005
(billions of fiscal year 1980 dollars)

	Number of Shelters		
	4,600	8,250	12,500
Development			
Missile	$ 5.0	$ 5.0	$ 5.0
Basing	2.9	3.0	3.1
Other	1.3	1.4	1.5
Total development	$ 9.2	$ 9.4	$ 9.6
Investment			
Missile system	$ 5.2	$ 7.2	$ 9.5
Transporter/vehicles	1.6	4.5	3.6
C^3	0.9	1.5	2.1
Other equipment	5.5	9.1	12.9
Construction	10.6	16.3	23.1
A&CO	2.0	3.6	5.4
Other	2.2	2.6	3.0
Total investment	$28.0	$42.9	$59.6
Operating and support			
Recurring procurement	1.5	2.6	3.4
O&M	3.1	4.5	5.6
Personnel	3.4	5.2	6.5
Training	0.3	0.4	0.5
Total O&S	$ 8.3	$12.7	$16.0
Lifecycle costs	$45.5	$65.0	$85.2

SOURCE: Office of Technology Assessment.

In conclusion, I would like to point out OTA in its analysis compared a large number of basing modes in terms of cost and 10 other criteria such as weapons effectiveness and survivability. OTA did not make any basing mode recommendations. We concluded that each had its advantages, disadvantages, and risks. Since policy-makers may differ on the weights to be assigned to the various criteria, the choice among basing modes is not simply a technical one.

COST OF MX SYSTEM

Senator PROXMIRE. Mr. Gold, you claim that the MX costs might be as much as $232 billion at the outside. That's about seven times the official figure of $34 billion so often used. Explain briefly how the costs can go so high, and also the reasoning behind your judgment that inflation will double the cost of MX.

Mr. GOLD. The main reason why the estimate is so high is that it does include the effect of inflation. In addition, as I indicated, it's the outer estimate of a range. If there is any equivalent, it is the estimate of the 12,500-shelter level. It's also in this chart over here, that the Office of Technology Assessment has produced. That is roughly the order of magnitude that we're talking about, in constant dollars.

The rationale for assuming that when you add inflation the costs will double is simply the experience of agencies like the General Accounting Office that whenever they have tried to add an estimate of future inflation into their system costs, costs have roughly doubled; that is, the cost in current dollars turns out to be roughly twice the cost in constant dollars.

So as I said before, simply as a rule of thumb, that a doubling of the constant dollar costs would yield a current dollar cost in that range.

Senator PROXMIRE. Now, I realize that you have based your calculations on what the Air Force based their calculations on; that is, specific mode of deployment for the MX.

What if the administration decided to change the design, sea-based airborne or some mixed system of land based, sea based, and airborne? Would that be more or less expensive, in your opinion?

Mr. GOLD. I don't know of any data that can give a precise answer to that. But there's one piece of information I just came across a week ago. Secretary Weinberger testified before the House Defense Appropriations Subcommittee, and he was asked what it would cost to keep a C–5 flying 24 hours a day. At one of the prospective basing modes, an airborne basing mode, we keep a certain number of aircraft flying 24 hours a day. He replied it would cost about $11,000 an hour to keep the C–5 flying. Now, if you just simply extrapolate that 24 hours a day, 365 days a year, that comes out to a cost of almost $100 million to keep one plane flying. If you're talking about keeping 10 planes flying 24 hours a day, that cost goes up to $1 billion, and it escalates further. Now, that is simply that cost, actual cost, of having the plane flying. It does not include the spare parts, doesn't include base support costs, or anything like that.

What I think that indicates is that the operations and support costs, which for MX have been discussed in the range of being about maybe $6 billion or $8 billion in this estimate for the current baseline system, for a—in that estimate there, a 15-year life—what we're talking about with an airborne system would be a partial estimate of the operations cost, that would be, depending on the number of planes, $1 billion a year, or $2 billion a year for 20 planes.

In other words, I think we're talking about a much, much higher order of magnitude of operations costs, when you're dealing with airborne systems.

The acquisition costs, I think, are highly uncertain, because, particularly with the airborne system, you are dealing with a proposed new technology aircraft, which I don't know—I mean, I assume the Boeing Corp. has some cost estimates, but I haven't seen any on that kind of aircraft.

Senator PROXMIRE. Mr. Sharfman and Mr. Staffin, Mr. Gold has given us very disturbing cost analysis with shocking figures. Would you comment on his analysis of the costs, and say whether you disagree or agree with his findings?

Mr. SHARFMAN. Well, in the first place, we felt that it was essentially pointless to try to estimate then-year dollar costs for a system that would extend that far into the future. While it's true that those are the dollars that will be spent, unless you know what people's income is, measured in then-year dollars, you don't know what kind of a burden a given tax level places on them. And we felt that constant dollars provided a better sense of what the system costs relative to what the country can afford.

There is a possibility—and this has been a problem in weapons system procurement in the past—that the things which would go into an MX system would inflate their costs faster than the general rate of inflation. This is one of the things that produces real cost growth in weapons systems.

We did not find it possible to do a serious analysis of the likelihood that that would occur. There are some components of the MX that are likely to be in short supply. But they aren't huge, relative to the costs of the whole system. And there did not seem to be any basis for predicting that inflation would affect MX costs more than it would affect anything else, including the overall GNP, national budget, the tax burden, and whatever.

Now, discounting the inflation, our high number was $85.2 billion—assuming that construction can stop in 1995. This is assuming that the Russians go ahead and build for about 15 more years more and more warheads.

And in about 1995—well, somewhat before that, they get the idea that no matter how many warheads they build, we're going to keep expanding the MX system; that the more we expand the MX system, the more MX's there are aimed at the Soviet Union. They give the whole thing up as a bad job, and that 1995 is about the time when their warhead expansion stops.

On the other hand, if the Soviet warhead expansion continues to the year 2000, the system would have to be expanded further, and the costs would do up. So the key to the maximum cost figure has to do with an estimate, as to when the Soviets would decide that continuing to expand their missile force was a poor use of their resources—and, it is very hard to be particularly definite about that.

Senator PROXMIRE. I want to direct your attention to the big chart over here, 15-year and 20-year costs of proposed and expanded MX program. The data comes from your office, I understand.

Mr. SHARFMAN. That's correct.

Senator PROXMIRE. Would you explain the basis for these estimates, whether they were shown to the Air Force, and if so, the reaction of the Air Force.

Mr. SHARFMAN. I'd like to ask Mr. Staffin.

Mr. STAFFIN. This was done with the cooperation of the Air Force. They are aware of our estimates. We have discussed these estimates with them. I don't believe they find them unreasonable. I should point out that a cost estimate uncertainty of 10 or 15 percent is not considered unreasonable to either us or the Air Force.

Now, starting with the 4,600 shelter system costs, the costs for the expanded systems shown in the second and third columns, 8,250 and 12,500 shelters, show total 15-year costs to be $65 billion and $85 billion, which was more or less an extrapolation of the cost based——

Senator PROXMIRE. If you take that extrapolation for 12,500 Shelters total 20-year costs, $92.3 billion in 1980 dollars?

Mr. STAFFIN. 1980 dollars.

Senator PROXMIRE. In the inflated dollars that Mr. Gold was talking about that would be pretty close, wouldn't it?

Mr. STAFFIN. I would like to point out that I believe that the figure of $232 billion was based on fiscal year 1980 dollars of $116 billion, which was somewhat higher than our 20-year costs, for 12,500 shelters.

Senator PROXMIRE. He'd have $116 billion; you would have $92 billion, would you not——

Mr. STAFFIN. Add 10 percent——

Senator PROXMIRE. OK. OTA's estimate of support costs are roughly the same as the Air Force's. In your statement, you say some of the Government estimates were considered. Internal Air Force data were not made available for your analysis.

To what extent were you able to verify the Air Force's important costs estimates, and what degree of confidence do you have in those estimates? And also, to what extent are they based on experience with Minutemen?

Mr. STAFFIN. As far as operating and support costs, we did go through a number of line items including spares and modifications, the need for encryption, costs such as vehicle procurement, consumables, O. & M. for aircraft and vehicles, for total O. & M. over the period to 2000 to about $5 or $6 billion.

We found—we didn't find obvious problems with it, and we do note the uncertainties—we found that—that the uncertainties in the total cost estimate tended to come less from the O. & S. and more from construction costs because this would be built in a very remote area. The way the Air Force did their estimates on that—in that area of the costs, was to take the unit costs of concrete, say, and add a certain percentage to that in order to account for the remote location, and in order to allow for certain contingencies. All these came up to about 50 percent—I don't want to use the word "overrun"—but padding to the unit costs in order to account for these difficulties. But this was the area where we found the greatest uncertainty, and greatest area of possible cost growth, not in the operations and support. I'm afraid I just can't answer at this time how that agrees or disagrees with experience based on Minuteman.

Senator PROXMIRE. Thank you, Mr. Staffin. My time is up.

Congressman Richmond.

Representative RICHMOND. Thank you, Senator. Gentlemen, from your testimony and from the questions that Senator Proxmire has asked, I get the feeling that this is a one-quarter trillion dollar program which could have vast effects on our economy, because it's totally, totally worthless to the benefit of the American people as far as the economy of the United States goes.

It doesn't create anything. The program is not desired by most of the Governors of the States where they plan to install these housings. The program seems to be one gigantic unnecessary program. It's very much like the M-1 tank. It shouldn't be.

Now, have you gentleman any sort of suggestion of what we should be doing instead of the MX missile? Clearly, the MX missile isn't the way we should go toward defending the United States.

Have any of you thought of any alternatives that would make a little more sense to Members of Congress? There are obviously many, many Members of Congress—Republicans, Democrats, Members of the Senate, Members of the House—that are very unhappy with the MX missile, as are the people in those States where the MX missiles are supposed to be based. Now, what's the alternative?

Mr. PAINE. I would add that some——

Representative RICHMOND. Mr. Paine, you have all these Nobel scientists on your committee. What do they say?

Mr. PAINE [continuing]. FAS since 1946 has placed its primary emphasis on arms control as the correct approach to nuclear weapons. Over the years, we have emphasized command and control as an area which could stand improvement. I think it could stand improvement today.

Representative RICHMOND. What do you mean by "command and control?"

Mr. PAINE. Command and control over nuclear forces. Making improvements to make sure that—to the extent that one can assure that, and it's very difficult in an operational sense—there is positive control over nuclear forces.

Representative RICHMOND. In other words, instead of spending $1/4 trillion on a program which nobody really wants——

Mr. PAINE. Right. There's a fundamental principle here at stake, which is simply diminishing returns—which we reached so long ago in the arms race. You can only kill a target so many times, and both sides have acquired that. You can't kill hard targets reliably, and you cannot have the operational confidence to do that.

I would remind people of this—that Secretary Schlesinger back in 1974 stated that for the record several times, and I would like to read that at this point if I could.

Representative RICHMOND. Please.

Mr. PAINE. Why a high confidence counterforce capability is unattainable by other side. He said:

I can publicly state that neither side can acquire a high confidence first strike capability. I want the President of the United States to know that for all future years. I want the Soviet leadership to know that for all future years.

Then a few pages later in the record, he also stated:

We cannot and we should not put in the minds of any political leaders the notion that they have got a serious potentiality for a disarming, first strike.

He was talking about both Soviet leaders and our leaders. It seems to me the current campaign is geared more to convincing the Soviet leadership that they *have* a first strike capability, because the Soviets have repeatedly stated that they have no such intention and no such capability.

Representative RICHMOND. Mr. Paine, since it's Congress duty to appropriate money to defend the United States, certainly, I think, we have to assume that under a certain set of circumstances the Soviets might elect to strike us first.

Mr. PAINE. Indeed, we have—indeed, we make that assumption, and we have made that assumption in the design of our forces.

Representative RICHMOND. Let's assume for a minute that we want to protect the United States—and certainly, every Member of Congress wants to do that, no matter how liberal or conservative he or she is. Now, what are the alternatives? Why wouldn't a fleet of first-class nuclear submarines do a much, much better job at a much less cost?

Mr. PAINE. Indeed, we have a first-class fleet of nuclear submarines at the present time.

Representative RICHMOND. No; it's very small. We're just getting the first large submarine out of Groton now.

Mr. PAINE. I have done the calculations. We would have after a completely successful Soviet first strike, in a sense of fulfilling all the possible requirements that they could—knocking out 90 percent of our Minutemen, approximately half of our submarine force, and three-quarters of our bombers—we would still have in the range of 1,500 equivalent megatons surviving. That's more than three times the equivalent megatonnage that was calculated, in the mid-1960's, as necessary to reach the point of diminishing returns in targeting the Soviet society. In other words, you can't usefully employ more than 400 megatons to destroy the Soviet Union. So we already have three times that much remain after a completely successful surprise attack. How could we possibly need more?

Representative RICHMOND. These MX missiles wouldn't really keep the United States safe in case of the surprise attack, would they?

Mr. PAINE. No; there is no defense against nuclear weapons. You can't talk about being safe. You can't talk about degrees of deterrence, and all I am saying——

Representative RICHMOND. Let's say, Mr. Paine, we spent $\$1/4$ trillion and built 12,500 of these idiotic, unnecessary shelters, right? $\$1/4$ trillion. Just think what that could do to reduce poverty in the United States, make us a one-class Nation instead of a two-class Nation. $\$1/4$ trillion could make us into absolutely heaven, these United States, right?

Mr. PAINE. Right.

Representative RICHMOND. Let's say we spent this $\$1/4$ trillion on these missiles, on MX bases. What happens if the Russians elect to strike us first? Let's say the picture we spent $\$1/4$ trillion. We destroyed the economy of the United States. We destroyed the ecology of three or four States. We built these——

Mr. PAINE. I would say if we do build the system as it's originally designed, we will have finally given the Soviet Union a military use for the heavy throw weight missiles which they have been unable to find for 20 years. We will have finally given them a credible military purpose for using their missiles.

Representative RICHMOND. Let's say these shelters are in place. How does that keep the Russians from destroying the United States anyway.

Mr. PAINE. It does not.

Representative RICHMOND. Exactly. It does not keep the Russians from destroying us, anyway. It's a waste of $250 billion. We could take a fraction of that amount of money, build up a first-class nuclear submarine fleet—thank the Lord, our first major nuclear submarine is just coming off the ways now. We have a number of them planned, as you know.

Wouldn't that be a lot more intelligent way to defend the United States?

Mr. PAINE. Absolutely.

Representative RICHMOND. At a fraction of the cost.

Mr. PAINE. At a fraction of the cost.

Representative RICHMOND. Do any of you gentlemen have any opposite ideas? Is Mr. Paine saying these things without any sort of scientific background on it, or am I saying these things? Do you all agree that even with this $250 billion, we don't need it?

Mr. SHARFMAN. The $250 billion number is your number, it's not ours.

Representative RICHMOND. With inflation, it will be $250 billion. You and I know it.

Mr. SHARFMAN. Even that amount of money can't necessarily buy happiness.

Representative RICHMOND. Of course not. It could help the social conditions of the United States considerably, though.

Mr. SHARFMAN. I would say the existing nuclear submarines we have—the Poseidon submarines—are indeed first class. The Trident is a superboat. It's bigger and better in a number of ways.

Representative RICHMOND. In the next 20 years, we'll have a great fleet of Trident submarines.

Mr. SHARFMAN. I would agree with Mr. Paine in saying that the existing fleet of submarines represents a very substantial capability.

Representative RICHMOND. Right. And will represent a much better capability over the next 20 years, because our Trident submarine is certainly the finest submarine in the world.

Mr. SHARFMAN. When we approached our study, the terms of reference which we were given by our board were to assume for the sake of analysis that the MX missile was needed and look at the various ways in which it could be based—so we did not address directly the question of "Can the MX missile defend the United States?"

But obviously, what the MX missile——

Representative RICHMOND. What is it supposed to do?

Mr. SHARFMAN. What the MX missile is supposed to do is represent a capability to devastate the Soviet Union.

Representative RICHMOND. But Mr. Paine said we already can devastate the Soviet Union with what we have now.

Mr. SHARFMAN. That's correct.

But it is—the intention is that the Soviets should see first that in our MX missile force we have got a counterpart to their forces; and second, they should see that they are unable to destroy this MX missile force, so that they would not be tempted—so goes the argument—to strike first, by destroying it.

Representative RICHMOND. My time is up. Thank you, Senator.

Senator PROXMIRE. Do you want to complete your remarks, Mr. Sharfman?

Mr. SHARFMAN. I would continue to the extent of one additional sentence, that the purpose of building 12,500 shelters, if that's what it takes, is that the biggest attack the Soviets could mount would not succeed in destroying all of the MX missiles. And therefore, the Soviets would not try such a foolish venture in the first place.

Senator PROXMIRE. Mr. Gold, you mentioned the failure to include nuclear warhead costs in the estimate. Is this likely to be a large cost over the rest of the program? Or, can you give us some ideas as to how much might be spent for warheads during the life of the program?

Mr. PAINE. We didn't investigate that aspect thoroughly, but I can state that if producing warheads for an expanded MX system—perhaps even for the baseline system—if that production requires the expansion of our materials production, nuclear materials production, in the way of a new reactor and new facilities, in other words, to meet a certain timetable, we would have to expand our production capacity, then it could run into a substantial amount of money.

And so you have to look at the timetable and see——

Senator PROXMIRE. Can you give us some notion of what you mean by a substantial amount?

Mr. PAINE. Billions.

Senator PROXMIRE. $5 billion? $10 billion?

Mr. PAINE. These new reactors—I don't know the cost of them, but it's in excess of $1 billion. They contemplate investing—perhaps the fellows from OTA might be able to answer that.

Senator PROXMIRE. Mr. Sharfman, can you help us on that?

Mr. SHARFMAN. Well, the dollar figures for warheads are classified numbers, and in an open session I can't provide them to you.

Senator PROXMIRE. Would a global notion idea, whether it be $3 billion, $6 billion, whatever—would that be classified?

Mr. SHARFMAN. On a global basis, it wouldn't make a major impact on the costs listed there.

Senator PROXMIRE. Mr. Gold, you indicated in your study that other Federal as well as State and local agencies would incur expenses because of the MX.

Mr. GOLD. That's correct.

Senator PROXMIRE. Can you quantify those costs?

Mr. GOLD. I don't think it's possible at the present time, in part because it's obviously dependent upon the size and location of the system, but there's also the other factor, that, for example, putting the system in Nevada and Utah would both increase costs as well as increase tax revenues for local jurisdiction.

So there would be somewhat of a tradeoff. But I think it's fairly clear that the Governors and legislatures in those States are extremely worried about the burden and cost, the burden and cost for local services such as schools and very mundane things like sewage systems,

police protection, one thing and another, which they are going to be asked to bear.

Now, I don't know of any thorough investigation of that, but I think it's one thing that certainly should be investigated, because it is part of the cost of the system.

Senator PROXMIRE. Mr. Paine, you with the help of Representative Richmond and Secretary Schlesinger shift the argument into the refreshing world of logic and good sense, but wars have never been waged on that basis—you know? Nobody ever goes to war because it's reasonable. You go to war because—because of misjudgment and miscalculation and illogic.

Mr. PAINE. Precisely, Senator.

Senator PROXMIRE. That's right. Therefore, we have to think in other terms. We have to think in terms that even exceed the good sense. If this were a matter of logic, I think we would have agreed to a strategic arms limitation long ago and whatever reduced the colossal burden on us, we would have done it.

Mr. PAINE. The theory of deterrence is rational calculation, and that's precisely my point. Since war is an irrational act, you need to take other steps to constrain it.

Senator PROXMIRE. Churchill said, "Safety is the twin child of terror in the nuclear world."

Let me ask you, your study quotes the Pentagon officials in the Carter administration justifying the MX. Explain how officials in the Reagan administration view the MX, and has the justification changed?

Mr. PAINE. We haven't really received justification from the Reagan administration yet for the MX, a thoroughgoing one, other than sort of allusions to what the previous justifications were. They have—sort of have piggybacked on what the Carter administration's rationale was.

Senator PROXMIRE. Hasn't Secretary Weinberger spoken out on this?

Mr. PAINE. The most recent thing I saw in the newspaper, the other day, was when he was asked about the future of the MX missile itself. He dodged the question. He didn't want to get into it, because he is expecting the Towne's Panel recommendation.

He said previously he supports the missile. He is reinvestigating all the basing options. That's as much as I know about the Reagan administration position.

Senator PROXMIRE. Your argument, as I say, is highly logical, though it's similar to the old overkill thesis, that since we have more than enough arms to destroy the Soviet Union, additional efforts are superfluous and unnecessary no matter what the Soviets do. Is that your position?

Mr. PAINE. It's a component of it. Actually, I have set forth my position in much greater length, and I would submit it for the record if I might, in a memorandum to the Towne's Committee. It's an extensive document with amplification of this statement, where I try to look at every angle of this question. It's not merely a matter overkill and attacking civilian targets; it's a matter of strategic logic and sense.

For instance, if you examine the problems of a counterforce attack, you realize that the Soviet Union could just as plausibly threaten to destroy a limited set of targets, nonmilitary targets, in this country.

There's nothing to prevent them from doing that. For instance, our fuel supplies. Five 1-megaton warheads on the Sierra Nevada would ignite a forest fire which would consume California. They could destroy our food supplies during a drought with one or two weapons, large 50-megaton weapons that would ignite the Great Plains.

In other words, they have many, many options for limited attacks, and they don't need to consume their strategic force in attacking our weapons. It strategically doesn't make sense.

Senator PROXMIRE. Assume the Soviets continue improving and enlarging their strategic forces. They have got a lot of momentum going here. They have been doing it for a number of years. How should we respond? Would you simply terminate MX and say we have got enough—even if they greatly increase their capacity?

Or would you agree with Representative Richmond, who says to rely on our least vulnerable deterrent, which is the submarines, and that will do the job?

Mr. PAINE. Correct. I believe the number of nuclear weapons required for deterrence is finite—required for deterrence in both the military operational sense and in a psychological sense. In other words, I do not believe, nor do most of our members believe, that piling on improvements in strategic forces and buying additional weapons materially adds to deterrence of a nuclear attack.

Senator PROXMIRE. Say that again? I missed that part.

Mr. PAINE. Piling on nuclear weapons, piling on improvements in the nuclear force, does not materially, substantially add to deterrence. Deterrence is—in one sense, it's a practical thing, in which you can calculate what you can do to another society. In another sense, it's a psychological thing.

Senator PROXMIRE. Supposing we do not pile on nuclear weapons. Supposing we say we have got enough; we're going to stop; and the Soviets continue?

Mr. PAINE. As I said in my prepared statement, I think the main reason we pile improvements in nuclear weapons is not for military reasons; it's a psychological one, in that if we said that, for instance, we would not modernize our forces or would modernize them just to the extent that we could maintain a finite level of destruction on the Soviet Union, that might be read as, well, the United States is backing away from the first use of nuclear weapons. It's no longer really interested in threatening the use of nuclear weapons.

It indicates a certain timidity and change of heart with respect to our first-use nuclear doctrine. And that would have ramifications, perhaps, for our foreign policy in other areas in which we might have to change our conventional force structure.

Senator PROXMIRE. Did you say we shouldn't back away? If they continue to increase their nuclear capability, you would say to some extent—not necessarily the MX—but to some extent, we would have to continue to build up ours; is that right?

Mr. PAINE. No. Precisely the opposite. The point being that since it is a psychological phenomenon, what we're really talking about is our doctrine. The use that we make of nuclear weapons, what missions we want them to perform—it's not a question of surprise attacks out of the blue and survivability, and all the terms of this debate are completely wrong.

What we're buying the MX for is quite an irrational reason. It's to assure ourselves that we are still interested and willing to use nuclear weapons, and we want to demonstrate that to the Soviet Union, because there's no other plausible, logical military reason why we would want to buy the MX.

Senator PROXMIRE. Let's get away from the MX, then. I have tried to just ask, if the Soviet Union continues to build up their nuclear capability, would you say that we should be satisfied with what we have, because no matter how much they build it up, we have a deterrent which could wreak unacceptable damage on them; now we don't have to do any more?

Mr. PAINE. It's hard to know. You're talking the future. There might be changes, for instance, in our command or control structure. We might need to make changes in response to some Soviet weapons developments to make it more survivable. We might want to diversify the forces a bit more. What I am talking about as unnecessary is mainly the growth of the forces and the fact that what we need to do is calculate how much is enough, and we have done it in the past and this was a philosophy that was prevalent in the Department of Defense, for a decade, perhaps. We have quantified. We know what it takes to destroy targets. We know how many forces we need to survive a surprise attack in order to inflict a certain assured level of damage, and that's what we need to stick with, and we can maintain that. That could be maintained with far fewer weapons than we have today.

Senator PROXMIRE. My time is up.

Representative RICHMOND. Thank you, Senator.

Gentleman, let's start on the premise—as you know, I am a very liberal Members of Congress, but I still care about the defense of the United States. Let's start on the premise that the chemistry of the Soviet Union right now is to me very dangerous. They have got an aging Politburo, no member of the Politburo under 70, as you know. They've got a weakening economy. The people of the Soviet Union haven't—they have been promised all types of consumer goods over their many, many, many 5-year plans and they're still eating borsch and brown bread. The agriculture capability of the Soviet Union is declining year by year. As I learned years ago from Reid Breissen of the University of Wisconsin, one of the great meteorologists of our time, he says as the temperature in Kazakhstan drops, if it drops 1 more degree centigrade it is going to affect literally 40 percent of the Russian wheat crop, and it's dropping.

So you have an aging Politburo, you must have some young Turks that are chasing them. You have a very, very unhappy citizenry. You've got a weak economy, you've got a weak food supply. Those we know. You have a very strong army. You know what happens in a case like that; you very well might have war.

Now, what should we be doing in the United States, instead of spending a quarter of a trillion dollars on this MX missile program which really nobody wants. Nobody wants them in their neighborhood, particularly. I think even if Congress does vote the MX missile, God forbid they do, I don't think the Governors of the various States will allow them.

Now, what would be the alternative? What about a development of the Stealth airplane, the Trident submarine? How much would

that cost, and would that be a more effective deterrent if more deterrent were necessary? Mr. Paine says no further deterrent is necessary. What if we want to add to our deterrent? How much of an expanded Stealth program, an expanded Trident submarine program, and what other programs would we need in order to protect the United States properly? Because certainly every American, no matter how liberal or conservative, wants to make sure we are protected.

Mr. Sharfman.

Mr. SHARFMAN. I really don't think I am able to respond to that question in a satisfactory way. We were not asked to look at the question of how U.S. strategic forces would look into the absence of the MX missile.

Representative RICHMOND. Why don't you give us some off-hand information? How much would it cost to develop these two programs properly, as against the MX missile which nobody seems to want?

Mr. SHARFMAN. The Trident submarine program is being developed, I gather, at as fast a rate as existing shipyard capability can cope.

Representative RICHMOND. How much does the Trident cost?

Mr. SHARFMAN. I don't know offhand, but the point is, if you've spent twice as much money you wouldn't get twice as many products, because the shipyards are limited.

Representative RICHMOND. Let's build up our shipyards, rather than destroy the ecology of three States and give them things they don't want. What about building up our shipyards and really going into a mass production, based on the Trident?

Mr. SHARFMAN. Fair enough.

Representative RICHMOND. Senator Proxmire says it's $1½ billion a copy.

Mr. SHARFMAN. But building up shipyards costs more.

Representative RICHMOND. But look what you have once you build up a shipyard. You're really improving the defense capability of the United States. You're also improving the merchant marine capability of the United States. As you know, we've gotten to be one of the smallest maritime countries in the world today. Wouldn't it be better to build up our shipyards?

Mr. SHARFMAN. I have the impression—I hope this is responsive to your question. I'm not certain that it is, but I have the impression that if we were to say, let's scrap the MX and let's try to get a submarine capability which would be the military equivalent of the MX——

Representative RICHMOND. In other words, build up two or three Electric Boats instead of just one of them; right?

Mr. SHARFMAN. Right. Whether it was done by adding to Trident submarines or having several different kinds of submarines is immaterial, is immaterial that the dollar cost would be somewhat less than the cost of doing it with the MX.

Representative RICHMOND. Senator Proxmire says the Trident submarine is $1½ billion. Just think——

Mr. SHARFMAN. A Trident submarine carries 24 missiles. On the other hand, it's not at sea all the time and so you have to use a multiplier. You have to buy—if you want to have five Trident submarines

at sea at any given moment, you have to have somewhat more than five Trident submarines total.

Representative RICHMOND. How many? Let's say 50 percent. Let's say we need 10 submarines. We've now spent the great sum of $15 billion.

Mr. SHARFMAN. Sure.

Representative RICHMOND. Let's inflate that over the next 20 years. Let's call it $30 billion.

Mr. SHARFMAN. In the first place, you have got the operating and support cost question. Running a submarine costs very much more than keeping an MX missile in the desert.

Representative RICHMOND. Look at how much more effective it is.

Mr. SHARFMAN. You have a very highly trained crew. The Navy operates on a two-crew system now, where for each submarine there are two highly trained crews.

Representative RICHMOND. If we were really building up the defense capabilities of the United States, we'd be building up our shipyards, we'd be producing something that's clean, that's usable, what people want against something that people don't want.

Mr. SHARFMAN. Let me try to respond to your question. If you suppose that 4,600 shelters are enough, which eliminates all of those high estimates and keeps the cost even with inflation, down below $100 billon by I think any sort of calculation, then doing the same thing with submarines might be somewhat cheaper. It would however, probably take somewhat longer, more years, before we reach an equivalent level of military capability because in any event, building up new shipyards takes time.

Representative RICHMOND. Sure.

Mr. SHARFMAN. If you suppose the Soviet threat will continue to increase, and going with the MX, MPS means you need 8,250 shelters, or 12,500 shelters. But if you suppose that there is not an unforeseen breakthrough in antisubmarine warfare technology so that the submarines remain survivable, as we expect that they will, but we can't be 100 percent certain of that, then the submarine route becomes substantially cheaper, factors of two or three cheaper.

Representative RICHMOND. A lot more versatile, too.

Mr. Sharfman and Mr. Staffin, what do you think of the Stealth plane? I heard that it's a marvelous plane. Is it a distinct possibility, in your opinion? It's still on the drawing board, I take it?

Mr. SHARFMAN. The cliche happens to be true. All we know is what we read in the papers, as far as the Stealth airplane is concerned. We simply have not studied it.

Representative RICHMOND. Wouldn't the sensible way to defend the United States be to expand our Tridents and also expand our military aircraft capability, be it with Stealth or whatever else they have in mind? We have certainly proven our capability of designing excellent planes, no question about that. America knows how to build an awfully good plane.

Mr. SHARFMAN. If we went from, in effect, a triad of strategic forces to a dyad of strategic forces, we would be eliminating the costs and hazards associated with the MX. We would be eliminating the possibility of building a new land-based system that turned out to be vulnerable, after all.

Representative RICHMOND. Look what you get at the end. You now have additional scientific capability in the field of aircraft which has to benefit our commercial aircraft industry and which, thank God, that's one industry we're No. 1 in the world in. With building Trident submarines you then build up some more shipyards which we need desperately in the United States. You can start making America again to be a maritime power. Just think of the side benefits you get by a Trident Stealth program, as against your MX missile program which benefits nobody.

Mr. SHARFMAN. What you would be getting, however, is that the United States would not have a modern, land-based missile force, a survivable land-based missile force. And there are substantial arguments. It's not something that I—I'm not able to say whether we, the United States, needs land-based missiles or not. I am able to say that there is a significant school of thought that says we do, and I am able to report to you, if you wish, the reasons that they give.

Representative RICHMOND. Mr. Sharfman, didn't Mr. Paine just say that, in his opinion, the land-based missiles we now have are survivable? After all, he represents a lot of Nobel laureates and scientists, too.

Mr. SHARFMAN. On that point, it comes to a question of degree of certainty. We do not believe that it is possible to have confidence that the existing Minutemen would be survivable over the near future. Whether the Soviets have confidence that they could destroy them is a different question, has to do, among other things, with Soviet calculations which they keep secret and which we don't have access to.

If there were Americans sitting in Moscow doing these calculations, they certainly would not say we can guarantee to be able to destroy the Minuteman on a first strike. But we do not agree that it is possible for Americans sitting in Washington to be confident that the Minuteman could survive a Soviet first strike against them.

Representative RICHMOND. Thank you. Thank you, Senator.

Senator PROXMIRE. Thank you. I want to thank you gentlemen very much for your contribution to what promises to be a continuing controversy over the MX. As you know, this is the largest strategic initiative since the Trident program, but there are many unanswered questions about it. I plan to invite the Defense Department, Air Force to respond to the criticism we have heard today and to present their side of the story after the recess, when the administration will presumably have made a decision about the program.

Military issues aside, it's important that Congress understand the full cost of potential economic effect of the MX. You have certainly made a fine record today on which we can begin to make a judgment on it. Thank you very much.

The subcommittee will stand adjourned.

[Whereupon, at 11:55 a.m., the subcommittee adjourned, subject to the call of the Chair.]

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