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2. Let's examine the traids forcelled by those examine abstricts choose time and the ordinate, the total property of order to present the survival of Here we have plotted various levels of Soviet 2011 him potential.

3. How let's choose a point in time, any 1965 and the Soviets would devote only 0 of their blunting effect a MINUTERIAL Entering the curves with these values we find that a total of about 1200 MINUTERIAL ELECTRIC CONTROL OF SECURE OF SECURE O

A. These curves reveal a very clamificant trend which cample is imposed; that is, as easy expeditities increase with time, more and more allevants would have to be built to measure continued carrival of a given number. This, of the common way of stating this considerable is well as many expeditive increase with time, fixed hardward alless became here and a less officient many of assuring an excellent antional retalistory postupe.

5. We know the approximate cost of ereating and operating a POLARIS system of 45 SSE(H) and the necessary supporting thips and installations. If then we are able to create and support enough MISUTEMES to assure the survivability of at least 376 of them for less money than it costs to create and operate this POLARIS system, then MISUTEMAN has the better cost offectiveness for the point in time selected.

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POLARIS eyerem have been calculated. PHEVENAME CARSE Days been estimated by the Air Force and Sayy bare found that in the case of MINUTEMAN it was necessary to prepare a range of cations because of the lack of firm data. Both the Air Force and MINUTEMAN costs have been separately emissed arithmetically with the POLARIS costs in order to determine the so-called break-even points; that is, where should be been be bought and maintained to assure the survival of polaritation for the same amount of money required to bey and maintained a 45 SSP(N) system. The horizontal lines on these curves represent the break-even points.

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the Air Ferro low estimate is valid, Mistrian will have a better cost effectiveness than POLARIS through 1969 on the devoted to Historian. Conversely, if the Navy high cost established of Minutenas are used, Minutenas can never be now east effective than POLARIS. No matter which cost estimated is used, however, the trend is clear. From the stabilished in the investment, it is for better to invest in a sobiled system than one which is fixed.

CONCLUSIONS

- 1. The relative cost effectiveness of MINETERIA, compared to FOLKHIS, is very dependent on the time at which MINITERIAL can be produced:
- a. If KINUTERAN were evallable now, it would provide a system with better cost effectiveness than FULARIS.

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a. All Tracks missiles produced after 1965 will have a lower cost affectiveness than POLARIS, throughout their

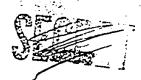
(These conditations are not altered even if fairly large Fully subscript attributed (25% of at-sea boats) is assumed.)

2. Although the above results are consult dependent on the level of enemy ICEM effort commed, the effect of recommend.

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caly des or two years.

- the MINUTELL System, which are based on cook the MINUTELL System, which are between them the factor for the large and the Easy. The differences is think the by the the conclusions.
- is superior to POLARIS EXELL about 1968, and a consequence of the second exercise of the plant o
- produced prior to 1963 will equal or exceed FOLDERS in
- contected believe the Air Force estimates to be valid. The estimate.
- MISSISSAB sust be produced before 1962 to equal or employed.
- POLARIS is always equal or superior.
- effectiveness study comparing POLARIS and MINUTESS of any cost jointly acceptable cost estimates can be obtained unless indicate the inadequacy of using cost effectiveness studies to analyse eyetoms of different operations area.
- S. Further, no cost effectiveness study yet has been able to the fixed based systems which
- a. Demand from our political leaders a "hair tringer"
- to counter it.



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- d. Lord to a constantly increased U. B. possible of levels for when the Soviets to persons an effective bluncing force, the U. D. must build may an order to retain the mosessary edge.
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Memorandum for Chief of Naval Operations

Via: Vice Chief of Naval Operations

Subj: Cost Effectiveness of POLARIS vs. MINUTEMAN (Assuming same target system, CEP and Yield) (U)

- 1. This is the first-cut summary in Op-51 of the study which has not yet been completed. RADM Masterson or GDR Backus will be available to elaborate on this, if required.
- 2. When the study is completed it will be circulated to the normal distribution.

- 1. Figure 1, attached hereto, shows on one graph the results of a study of cost effectiveness of POLARIS vs. MINUTEMAN. Here is plotted the number of MINUTEMEN missiles that would be required in a hardened (100 PSI) Base so that the missiles surviving an attack will equal the POLARIS missiles which can be kept on station constantly with a 45 boat FBM program. Since this amounts to about 396 FBM weapons always on station we must then have enough MINUTEMEN to absorb the Soviet blunting and still assure survival of 396. The number of MINUTEMEN that we must then have in tote is entirely dependent on the enemy ICBM capabilities at point in time selected. This total number of MINUTEMEN required to insure survival of 396 will increase steadily with time due to increasing enemy capabilities.
- 2. Let's examine the trends revealed by these curves. The abscissa shows time and the ordinate, the total number of MINUTEMAN required in order to assure the survival of 396. Here we have plotted various levels of Soviet ICBM blunting potential.
- 3. Now let's choose a point in time, say 1965, and assume the Soviets would devote only 2 of their blunting efforts to MINUTEMAN. Entering the curves with these values we find that a total of about 1200 MINUTEMAN must exist in order to assure the survival of 396 to retaliate.
- 4. These curves reveal a very significant trend which cannot be ignored; that is, as enemy capabilities increase with time, more and more MINUTEMEN would have to be built to assure continued survival of a given number. This, of course, means ever increasing expense to the United States. Another way of stating this conclusion is that as enemy capabilities increase with time, fixed hardened sites become more and more vulnerable and a less efficient means of assuring an effective national retaliatory posture.
- 5. We know the approximate cost of erecting and operating a POLARIS system of 45 SSB(N) and the necessary supporting ships and installations. If then we are able to create and support enough MINUTEMEN to assure the survivability of at least 396 of them for less money than it costs to create and operate this POLARIS system, then MINUTEMEN has the better cost effectiveness for the point in time selected.

- 6. The Navy costs for creating and operating a 45 SSB(N) POLARIS system have been calculated. MINUTEMEN costs have been estimated by the Air Force and separately by the Navy. Both the Air Force and Navy have found that in the case of MINUTEMAN it was necessary to prepare a range of estimates bec: of the lack of firm data. Both the Air Force and Navy estimates of MINUTEMAN costs have been separately combined arithmetically with the POLARIS costs in order to determine the so-called break-even points; that is, where enough MINUTEMEN can be bought and maintained to assure the survival of 396 of them for the same amount of money required to buy and maintain a 45 SSB(N) system. The horizontal lines on these curves represent the break-even points.
- 7. It is immediately apparent that a very great deal depends on which MINUTEMAN cost estimate is used (see figure 1). If the Air Force low estimate is valid, MINUTEMAN will have a better cost effectiveness than POLARIS through 1969 on the assumption that only 1/2 of the Soviet blunting capacity is devoted to MINUTEMAN. Conversely, if the Navy high cost estimates of MINUTEMAN are used, MINUTEMAN can never be more cost effective than POLARIS. No matter which cost estimate is used, however, the trend is clear. From the standpoint of long term investment, it is far better to invest in a mobile system than one which is fixed.

Conclusions

- 1. The relative cost effectiveness of MINUTEMAN, compared to POLARIS, is very dependent on the time at which MINUTEMAN can be produced:
- a. If MINUTEMAN were available now, it would provide a system with better cost effectiveness than POLARIS.
- b. An operational MINUTEMAN available in 1962-1963 would have approximately equal cost effectiveness with POLARIS.
- c. MINUTEMAN missiles produced after 1964 will have a lower cost effectiveness than POLARIS, throughout their lifeline. (These conclusions are not altered even if fairly large POLARIS submarine attrition (25% of at-sea boats) is assumed.)
- 2. Although the above results are somewhat dependent on the level of enemy ICBM effort assumed, the effect of reasonable change on this assumption is to vary the date in which MINUTEMAN becomes the less effective weapon by a matter of only one or two years.

- 3. The above conclusions are based on cost estimates for the MINUTEMAN system, which are between those provided by the Air Force and the Navy. The differences in these cost estimates are very large, and have a great influence on the conclusion.
- a. If the Air Force low cost estimate is used, MINUTEMAN is superior to POLARIS until about 1968, and a one-generation program is probably justified if the planned operational dates can be met.
- b. If the Air Force high estimate is used, MINUTEMAN produced prior to 1963 will equal or exceed POLARIS in cost effectiveness.
- c. Neither Op-51, SP, nor other outside technical groups contacted believe the Air Force estimates to be valid. The Navy certainly could not do MINUTEMAN for the higher Air Force estimate.
- d. If the Navy low estimate of MINUTEMAN costs is employed, MINUTEMAN must be produced before 1962 to equal or exceed POLARIS in cost effectiveness, while
- e. IF the Navy high estimate of MINUTEMAN costs is used, POLARIS is always equal or superior.
- 4. The above wide discrepancies limit the utility of any cost effectiveness study comparing POLARIS and MINUTEMAN-unless jointly acceptable cost estimates can be obtained and indicate the inadequacy of using cost effectiveness studies to analyse systems of different operational areas.
- 5. Further, no cost effectiveness study yet has been able to assign values to the cost to the United States of relying on fixed based systems which
 - a. Demand from our political leaders a "hair trigger" decision to retaliate.
 - b. Inflict bonus kills on our population by enemy efforts to counter it.

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- c. Create an unstable politico-military situation where we have U.S. and Soviet ICBM forces facing each other, one hidden the other known; an aggressor would be greatly tempted to strike first.
- d. Lead to a constantly increasing U.S. retaliatory force levels for whom the Soviets do possess an effective blunting force, the U.S. must build more in order to retain the necessary edge.
- e. Promote a spiralling arms race which the controlled Soviet economy can much better afford than ours.
- f. Require further depletion of our nuclear raw material reserves for the production of warheads to place on the extra missiles needed to absorb the enemy blunting attack.