NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

REFLEXIVE LAUNCH STRATEGIES

by

Kurt Allan Strauss

June 1980

Thesis Advisors:

Patrick Parker
D. Yost

Approved for public release; distribution unlimited

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Reflexive Launch Strategies		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis; June 1980
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Kurt Allan Strauss		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		12. REPORT DATE June 1980
		13. NUMBER OF PAGES 119 pages
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Naval Postgraduate School Monterey, California 93940		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Strategic forces, deterrence, warning, triad, Minuteman, ABM, SLBM.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Given the impending vulnerability of U.S. ICBMs, this thesis assesses the viability of countervailing reflexive launch strategies. Although capabilities are discussed, this thesis is non-technical and unclassified. Arguments are based on logical analysis of capabilities within the context of political realities.

This thesis establishes the relative utility of reflexive launch strategies as part of the total strategic deterrent posture.

DD FORM 1473 JAN 73   EDITION OF I NOV 68 IS OBSOLETE
(Page 1)   S/N 0102-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Presentation of evidence (logical; historical; quantitative) supports a case for specific reflexive launch options. The central thesis is that regardless of technical capabilities (e.g., warning systems of C^3 reflexive strategies are not substantial enough to act as a doctrinal shield for inherently vulnerable forces. Alternatively, it will be shown that within the context of existing/projected U.S. weapon systems (e.g., MX, ALCM), as well as Soviet Forces and perceptions, the capability for rapid retaliation prior to impact or immediately following an attack will remain an essential element of a credible deterrent. It is argued that survivable weapons simply shift vulnerability to the centers of political and economic power and do not obviate the requirement for deterring reflexive launch options.

REFLEXIVE LAUNCH STRATEGIES

by

Kurt Allen Strauss
Commander, United States Navy
B.S., University of Denver, 1965

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF ARTS IN NATIONAL SECURITY AFFAIRS

from the

NAVAL POSTGRADUATE SCHOOL
June 1980

ABSTRACT

Given the impending vulnerability of U.S. ICBMs, this thesis assesses the viability of countervailing reflexive launch strategies. Although capabilities are discussed, this thesis is non-technical and unclassified. Arguments are based on logical analysis of capabilities within the context of political realities.

This thesis establishes the relative utility of reflexive launch strategies as part of the total strategic deterrent posture. Presentation of evidence (logical; historical; quantitative) supports a case for specific reflexive launch options. The central thesis is that regardless of technical capabilities (e.g., warning systems or C^3) reflexive strategies are not substantial enough to act as a doctrinal shield for inherently vulnerable land-based forces. Alternatively, it will be shown that within the context of existing/projected U.S. weapon systems (e.g., MX, ALCM), as well as Soviet forces and perceptions, the capability for rapid retaliation prior to impact or immediately following an attack will remain an essential element of a credible deterrent. It is argued that survivable weapons simply shift vulnerability to the centers of political and economic power and do not obviate the requirement for deterring reflexive launch options.

4

TABLE OF CONTENTS

In later time periods, when we have many protected
and dispersed ICBM's it may be possible to fire
ICBM's on the basis of radar or other tactical
warning, since under these circumstances the enemy
must fire large numbers of missiles and thus possi-
bly be forced to give certain evidence of his in-
tentions. This is unlikely to be true in the
immediate future. For this and other reasons the
early ICBM's cannot now rely solely on quick
reaction for their protection. This does not mean
that we do not wish to have a capability to react
rapidly.[1]

<div align="right">

Herman Kahn
1960

</div>

I. OVERVIEW

Given the impending vulnerability of U.S. ICBMs, this thesis assesses the viability of countervailing reflexive launch strategies. Although capabilities are discussed, this thesis is non-technical and unclassified. Arguments are based on logical analysis of capabilities within the context of political realities.

This thesis establishes the relative utility of reflexive launch strategies as part of the total strategic deterrent posture. Presentation of evidence (logical; historical; quantitative) supports a case for specific reflexive launch options. The central thesis is that regardless of technical capabilities (e.g., warning systems or C^3) reflexive strategies are not substantial enough to act as a doctrinal shield for inherently vulnerable land-based forces. Alternatively, it will be shown that within the context of existing/projected U.S. weapon systems (e.g., MX, ALCM, as well as Soviet forces and perceptions, the capability for rapid retaliation <u>prior to impact</u> or <u>immediately following an attack</u> will remain an essential element of a credible deterrent. It is argued that survivable weapons simply shift vulnerability to the centers of political and economic power and do not obviate the requirement for deterring reflexive launch <u>options</u>.

A. REFLEXIVE LAUNCH STRATEGIES

The evolution of strategic weapon systems capabilities and vulnerabilities, within a symbiotic context of political relationships, has periodically necessitated development of quick reaction launch strategies. Reflexive launch strategies as discussed in this paper cover a spectrum of rapid response ICBM launch options ranging from a retaliatory response in reaction to initial warning, to a strategic force launch--as the "dust settles"--following an initial Soviet nuclear attack. The use of the word reflex as an analogue to describe these strategies is appropriate in several ways:

- The response is required for defense.

- The response is predetermined.

- Reaction time available requires bypassing the routine decision process/network.

- The ability to bypass the full decision process does not preclude inhibition of the response mechanism, or intercession during the response process.

All of these reflexive launch concepts share the following key characteristics:

- Dependence on a highly reliable warning network:

- A commitment to rely on unilateral information sources and decision processes: Due to time constraints the decision to launch would be made without consultation with allies or the Soviets. However, it is possible that corroborative information could be received from allied forces (e.g., direct attacks or mobilization of Warsaw Pact forces).

- Acceptance of (worst case) warning-to-launch-commitment times of from 15 to 30 minutes.

9

- Acceptance of a devolution of launch authority, if required, as a result of loss of the President or communication between the forces and the NCA.[2]

- Preplanned, rapidly reprogrammable, flexible response options: The idea that the decision maker selects from a previously developed "menu" of defensive/retaliatory attack packages. This preplanned response not only meets the demands of a small (i.e., less than 40 minutes) launch window, but also recognizes that even with survivable forces, major elements of the decision making and supportive information systems may be destroyed.

The above listed essential features of RLSs form the basis for the major argument against these strategies. That the response is made without careful consideration of enemy and friendly force status, political consultation with allies or post-attack development of a coordinated response plan. As F. P. Hoeber states,

> The question, "Launch against what?", is non-trivial: Against cities, and insure disaster? against Soviet silos, presumably partially empty? against some perhaps mixed, target set that may not turn out--after we had largely disarmed ourselves--to be an effective set? In short, do we want to escalate without thinking or negotiating?[3]

Hoeber's questions are interesting; however, they leave unstated a distinct set of questions regarding the alternative: If we delay launch, will we have the information or the level of competence required to make a "better" decision? Would delay permit uninhibited, irreversible Soviet attack momentum (e.g., conventional invasion of Western Europe)? Would a policy of "wait and negotiate" lead to a "rational" decision of negotiated (i.e., western block vital compromise)

settlement with no retaliation? Does such a logic pro-
gression ultimately render the U.S. nuclear <u>deterrent</u>
incredible?

II. THE THREAT

A. SOVIET COUNTERFORCE CAPABILITY

The essential nature of war as a continuation of
politics does not change with the technology of
armament. When atomic and hydrogen weapons are
employed surprise is one of the decisive condi-
tions for the attainment of success not only in
battles and operations but also in war as a
whole.

We cannot ignore the lessons of history and we
must always be ready for pre-emptive actions
against the perfidy of the aggressors.[4]

> Marshal P.A. Rotmistrov
> 1955

We do have a problem with regard to the surviva-
bility of the Minuteman force, and the options
are more limited than they were before; but that
is the price that we have chosen to pay in order
to put an upper limit on the total raw strategic
power in the Soviet ICBMs.[5]

> Dr. John S. Foster DDR&E
> 1972

Beginning with the "bomber gap" of the 50's, Soviet

counterforce potential has been an important issue. The

advent of MIRV technology provided the additional element

numerical advantage to the attacker. Soviet hardware,

such as the SS-18, and Soviet pronouncements have consis-

tently indicated a Russian drive to develop credible

counterforce capability. As Soviet Col V. Larionov states:

The white-hot culminating point will move to
the beginning period of the war---the surprise
mass use of nuclear rocket weapons can bring
utter defeat to an enemy in the shortest time.[6]

Although this paper accepts Soviet counterforce potential

as a "given",[7] three counterforce issues are relevant to

discussion of the role of reflexive strategies:

- The military and political (perceptual) value of
  counterforce capability.

- The uncertainties regarding real-world counterforce
  employment.

- The "side effects" of a counterforce attack.

B. THE POLITICAL UTILITY OF COUNTERFORCE CAPABILITY

Since both we and the Soviet Union are investing
so much of our capability for flexible and
controlled responses in our ICBM forces, these
forces could become tempting targets, assuming
that one or both sides acquire much more sub-
stantial hard-target kill capabilities than
they currently possess. If one side could remove
the other's capability for flexible and control-
led responses, he might find ways of exercising
coercion and extracting concessions without
triggering the final holocaust.[8]

James Schlesinger
1975

For the Soviets, the coercive value of counterforce

capability is <u>not united in its employment</u>,* but rather in

---

*There are three principal types of counterforce attack:

- An attack designed for <u>damage limiting</u> preceding
  a central nuclear war.

- An attack structured to <u>reduce U.S. limited nuclear
  option</u> (LNO) forces.

- An attack designed to achieve coercive advantage by
  significantly altering the strategic balance. See
  Congressional Budget Office, <u>Counterforce Issues for
  the U.S. Strategic Nuclear Forces</u> (Washington: U.S.
  GPO January 1978), p. 5.

its _political_ worth; Soviet compellent power is significantly enhanced as a result of their counterforce potential. Analysts such as Herman Kahn believe that although a substantial proportion of the U.S. retaliatory forces would survive a coordinated counterforce attack, it might be possible for the Soviets to deter a U.S. counterattack. The logic of his analysis is based on the mathematics associated with the remaining series counterattacks. As Kahn asserts:

> ...In this attack,* the attacker would try to destroy
> a significant portion of the defender's first-strike
> forces and even some of his second-strike forces, but
> would avoid as much as possible, civilian targets.
> This would make it disadvantageous to the defender
> to launch a counterstrike since the defender's
> damaged forces might be able to do only a limited
> amount of damage even with a countervalue strike,
> while the attacker might be able to deliver an
> annihilating blow in reprisal with his withheld and
> regrouped forces. The defender is also under
> pressure to negotiate since it is now probable that
> the attacker could threaten another attack, this
> one an all-out strike against the rest of the second-
> and first-strike forces.[9]

C. COUNTERFORCE UNCERTAINTIES

The basic problems in any discussion of attacks against ICBMs is the wide range of uncertainties in the calculation of success probability. At the lowest level, for example, is the fact that no one has ever fully tested** an ICBM. There is no operational (or even R&D experience) with the

---

*Kahn calls this a "constrained disarming attack."

**ICBMs have been fired and warheads have been detonated,
  but an ICBM with a live warhead has never been test
  fired. Additionally the effects of a polar trajectory
  are not fully tested.

coordination and launching of several hundred ICBMs, and the immediate and long term nuclear effects of rapid explosion of over 2000 high yield warheads is not fully understood. These uncertainties were emphasized during the March 1974 Senate Foreign Relations Committee Hearings:

> Secretary Schlesinger...As you know, we have acquired from the western test range a fairly precise accuracy, but in the real world we would have to fly from operational bases to targets in the Soviet Union. The parameters of the flight from the western test range are not really very helpful in determining those accuracies to the Soviet Union. We can never know what degrees of accuracy would be achieved in the real world.

> Senator Symington...People get the idea perhaps you would only kill a hundred people, when actually a tiny shift would make all the difference. I do not suppose anything has been more carefully engineered in world history than the astronaut programs--

> Secretary Schlesinger. Yes.

> Senator Symington (continuing). And yet, in fact, they have had many troubles many times; and just a tiny production error would destroy Kansas City when an enemy was going after Whiteman, you see. Great in theory, but in practice, I cannot follow the thought.[10]

Finally, the key issue of fratricide and the associated critical problems of timing and reprogramming* create considerable question as to the operational feasibility of a counterforce attack.[11]

These unknowns as well as those in Figure 1 result in a balancing element of deterrence to the possessor of

_____

*To replace launch of boost failures.

Figure 1

UNCERTAINTIES AFFECTING DYNAMIC MEASURES
OF STRATEGIC CAPABILITIES

1. **Uncertain Weapons Parameters**

    --Yield   --Launch rate
    --Accuracy   --Reprogramming
    --Reliability   --Retargeting time
    --Systematic bias error   --Support system performance
    --Availability   --Warhead loadings
    --Range   --Height of burst on airbursts

2. **Uncertain Force Employment Parameters**

    --Prelaunch survivability   --Command-control connectivity
    --Penetration probability   --Reconnaissance
    --Fusing/burst height   --Fratricide

3. **Uncertain Scenario Conditions**

    --Warning   --Attack timing
    --Alert level   --Attack objectives
    --Scale of attack   --Employment of reflexive strategies

4. **Uncertain Target Parameters**

    --Hardness/shielding   --Mobility
    --Size and shape   --Value
    --Location   --Climate conditions

5. **Uncertainties Due to Modelling Deficiencies**

    --Prompt effects   --Radiation level
    --Fallout effects   --Fratricide

counterforce potential. As Soviet Lieutenant Colonel

V. M. Bonduremko noted:

> The combat possibilities of <u>nuclear rocket weapons</u>
> which have been studied only under limited condi-
> tions of the testing range, in the opinion of many
> specialists are really not known to this day and
> this causes difficulties in determining the organi-
> zational form of army structure.*[12]
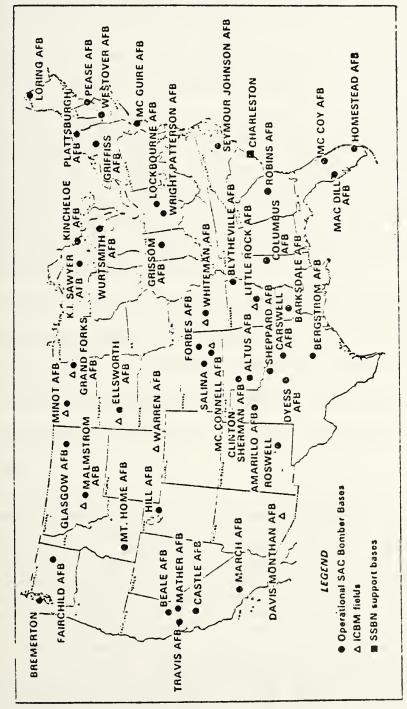
D.   SIDE EFFECTS OF COUNTERFORCE ATTACKS

Unfortunately, many dispassionate, analytical discussions

of postulated Soviet counterforce attacks attempt to project

an image of ICBM counterforce as a surgical disarming attack.

A cursory review of the map of U.S. counterforce targets

provides a different image. Not only are key U.S. targets

located near population centers, but they also virtually

cover the entire country. The argument is <u>not</u> against the

military value of counterforce weapons, but rather against

an unrealistic vision of the results of such an attack. As

Barry Carter states:

> Finally, some U.S. retaliation would seem very likely
> to the Russian leadership since tens of millions of
> Americans would be killed in any "Minuteman only"
> attack. In attacks against silos the bombs are set
> to explode as close to the ground as possible,
> thereby picking up much dirt and debris. The fall-
> out from the explosion of <u>thousands of megatons</u>* of
> nuclear weapons over the Minuteman fields would be
> tremendous, and winds would carry lethal contamina-
> tion over many major U.S. cities. Such calculations
> of fallout do not even include the possibility of
> a few Russian warheads going off source and directly
> hitting populated areas, not the collateral damage
> by Russian attacks against other targets, such as
> bomber bases, many of which are near cities.[13]

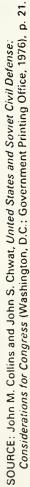*Emphasis added.

Figure 2

Counterforce Targets in the United States

SOURCE: John M. Collins and John S. Chwat, *United States and Soviet Civil Defense:*
Considerations for Congress (Washington, D.C.: Government Printing Office, 1976), p. 21.

18

Herman Kahn drew a similar conclusion:

> ...neither side might want to hit many, or any large
> cities early in the war....However, if there are a
> number of missiles fired at strategic bases it is
> more than likely that some will go astray; these
> could easily strike heavily and disastrously popu-
> lated areas.[14]

Sidney Drell and Frank von Hippel quantified these "side

effects" of a Soviet counterforce attack:

> The Defense Department's response of July 1975
> presented new casualty figures...A heavier strike
> with two three-megaton warheads, one a surface
> burst and the other an airburst, directed at each
> silo would cause <u>18.3 million fatalities</u>...A "com-
> prehensive" attack with two one-magaton surface
> bursts on each ICBM silo and strikes against the
> 46 Strategic Air Command (SAC) bases and the two
> bases for ballistic-missile submarines, would
> cause <u>16.3 million</u> fatalities....[15]

The problem of analyzing the potential vulnerability of

U.S. land-based ICBMs is a formidable one. It is a complex

interacting mixture of force potential, technical uncertain-

ties and most significantly, political goals and perceptions.

John Steinbruner and Thomas M. Garwin summarized the problem

as follows:

> ...the beginning of wisdom on this issue is to be
> found in realization of the inevitability of igno-
> rance and in acceptance of its consequences; that
> on the basis of technical information available--
> at whatever level of privileged access--calculations
> of vulnerability are indeterminate; that categorical
> assertions about vulnerability, which are frequently
> found in current political discourse, rest upon
> tacit assumptions more than technical fact; and, that
> the usual assumptions are not the only ones which
> ought to be made. <u>More succinctly stated, vulnera-</u>
> <u>bility of the land-based missile forces, to para-</u>
> <u>phrase Wolfgand Panofsky, is far more a state of</u>
> <u>mind than a physical conditions, but, nevertheless,</u>

<u>it is an extremely important state of mind, worthy</u>
<u>of the most exacting analysis.*16</u>

---

*Emphasis added.

III. DEFINITIONS

A. ATTACK MODES

1. Launch on Warning (LOW)

Most treatments of the subject of reflexive launch strategies center on launch on warning (LOW). This focus on LOW is based on its historical relevance as the original conceptualization of a reactive launch strategy, and the fact that all other such atrategies are essentially derivatives of LOW. The problem with LOW is that it is an imprecise, ambiguous term (i.e., what constitutes warning and what is the character of the response?). The problem, however, goes well beyond "squishy" sematics: the critical ambiguity is in the warning, not the words.

LOW is defined as "a launch in response to sensor indication of an attack on the continental United States (CONUS)"[17] and is essentially an extension of a traditional policy of launching strategic bomber forces on receipt of attack warning. The obvious difference is that while bombers are recallable, current U.S. strategic missiles are not. Irrevocability is a feature of all existing ICBM launch strategies, but it is most significant in the LOW scenarios. Although the definition of "warning" may be modified by political and technical factors, LOW is hierarchically a

21

a decision made with the minimum acceptable level of information; it is coincidentally a decision of potentially apocalyptic proportion. What makes LOW problematical is not only the myriad of associated technical issues, but also this "gut level" paradox of making a decision of the greatest import with the lowest (hierarchical) level of information (and ergo, confidence). In its simplest form, LOW could be considered a pre-emptive attack (e.g., "warning" being a small launch or even an aggressive force reposturing within the context of a crisis level political scenario) or an unintentional and premature escalation.

2. Launch Under Attack (LUA)

LUA is similar to the previously described LOW, but differs in two major respects. First, attack is defined as a massive assault on value and/or force. Second, the criterion for attack existence is a multiphenomenological (i.e., sensors, scenarios, intelligence) unambiguous correlation of information. The key to the LUA concept is the existence of several independent but corroborative indicators of a massive attack in progress. For example, the U.S. currently has four major systems for detecting strategic attack: early warning satellites; the Ballistic Missile Early Warning (BMEWS) network; PAVE PAWS (SLBM warning radar); and the Safeguard-developed Perimeter Acquisition Radar (PAR) at Grand Forks, North Dakota.[18] The idea is that sequential

22

and mutually substantiating attack reports will come from
these four independent warning systems.

Additionally, the origin, size, and general target
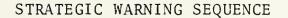area can be pieced together from these progress reports:

> Thus, if a large attack were made against our
> land-based missiles, the satellite detection
> system would count the attack, provide its
> approximate target area, and determine when
> the attacking missiles would be seen by BMEWS
> radars in Alaska and Greenland. Approximately
> ten minutes later these radars would observe
> the missile re-entry vehicles (at the time that
> the satellite system forecasted), verify the
> size of the attack and its likely targets, and
> predict when the PAR radar in North Dakota would
> see the attack. Finallly, again at the expected
> time, the PAR radars would verify information
> previously provided by the other sensors and
> determine precisely what targets were being
> attacked.[19]

3. <u>Launch Under Attack Assessment (LUAA)</u>

This mode is virtually identical to the above described
LUA. LUAA is in fact a politically motivated redefinition of
LUA. The implication of LUAA is two-fold. First, it implies
considered analysis of the existence of an attack (and im-
plicitly the choice of response) and, secondly, it includes
the ability to carefully define attack size, target(s) and
origin. SAC Commander Gen. Richard Ellis, however, has serious
reservations about the time and technical capability available
to make LUAA (as opposed to LUA) a reality. According to
General Ellis, "time is equally crucial for attack assessment
of incoming ICBM's and SLBM's. Yet the existing system will

Figure 3

STRATEGIC WARNING SEQUENCE

Source: A. Hall, "The Case for an Improved ICBM,"
          Astronautics and Aeronautics, February 1971.

24

Figure 4

CHRONOLOGIC INDICATIONS

OF A COORDINATED ATTACK ON MINUTEMAN

not accurately assess an ICBM/SLBM attack under all conditions because the time is inadequate."[20]

Proponents of LUAA attempt to project an image of "lightning fast" computer analysis of multiple inputs coupled to an instantly reprogrammable highly responsive attack force controlled by an inhibiting Presidential (NCA) permissive action link (PAL). The argument becomes significantly more compelling if the "bolt out of the blue" surprise attack is discounted. The effectiveness and credibility of any military response cannot be separated from the total political-military situation.
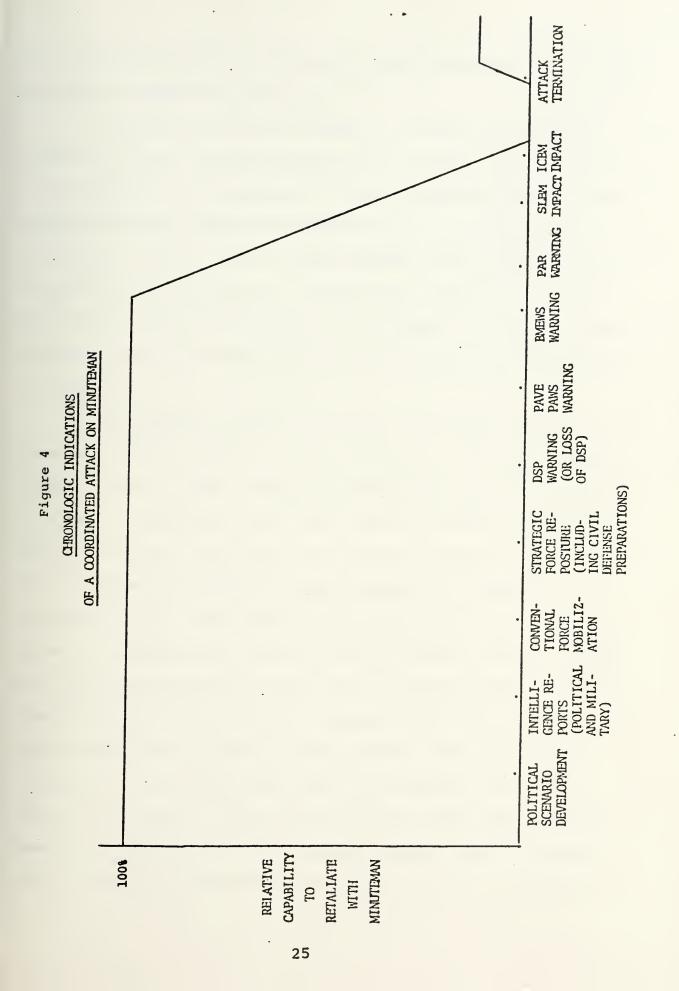
The argument is that "rational" strategic attacks would have telegraphed precursors far in excess of infra-red signatures and radar blips. Those who postulate a real possibility of a Soviet strategic attack must see its reality coupled not only to war aims, but also to extensive (visible) military and civil defense mobilization. What emerges is essentially a paradox of time. Those who build a case for Soviet strategy based on counterforce, warfighting and damage limiting, state with equal assurance that reflexive launch strategies are not feasible due to the paucity of response time (10 minutes for SLBM attack; 20 minutes for ICBM attack). What they fail to explain is how the Soviet Union can disperse its people, shelter key cadres, batten down critical industries, destroy western satellites and intelligence sources, mobilize troops on the western and southern flanks and scramble air defenses

26

all within less than one hour and all without alerting the United States.

Essentially, current technical limitations and ultimately finite human limits make a literally defined launch-under-assessment (emphasis on assessment) in response to an irrational surprise (to <u>both</u> sides) attack improbable. This type of attack favors analysis such as William Schneider's:

> The 'launch on assessment' concept is obviously fraught with uncertainties and risk--particularly the risk of accidental conflict--and there is little indication that it is considered seriously within the U.S. Administration. Nevertheless, it does represent one conceivable answer to the problem of Minuteman vulnerability--albeit a dangerous answer.[21]

However, for other scenarios, encompassing deteriorating political relations and/or escalating military attacks/preparations, the LUAA concept becomes technically more feasible and politically more credible.

4. <u>Launch on Impact (LOI) or Launch Through Attack (LTA)</u>

LOI assumes that reflexive launch would not take place until actual nuclear detonation(s) occur in or above the target area. On the surface LOI appears to be the most attractive reflexive strategy due to its greater uncertainty that missiles are only fired in response to a "<u>real</u>" attack; but LOI (sometimes known as Launch Through Attack) entails severe conceptual and technical problems. Although it takes about twenty minutes to attack a Minuteman field due to fratricide effects, the same effect acts to limit launch during or through an

27

attack. (ICBM's would be vulnerable to blast and radiation during boost phase.)[22] The distance between northern and southern Minuteman silos equates to an approximate 5 minute warning advantage for the southern targets.[23] However, a strategy depending on impact for assurance could easily be negated by the use of simultaneous arrival times (on northern and southern fields) instead of a simultaneous launch of the initial attacking forces. This tactic augmented by use of SLBM's for pin down* and/or attacks on the National Command Authority (NCA) could thwart a true LOI or Launch Through Attack strategy. In fact when viewed within the range of strategies LOI is the most demanding reflexive response since it required information (e.g., sensor detection[24] or human report of detonation) and commitment (to launch) in the most demanding trans-attack period. LOW and LUA permit attack with the full C^3I and retaliatory force intact; Launch-After-Attack (LAA) allows for some assessment of the force status and the nature of the total attack; LOI conversely provides neither the pre-attack C^3I force integrity of LOW/LUA nor the considered situation assessment of LAA.

   5.   Launch After Attack

As defined here, Launch after Attack (LAA) is a re-flexive response that could be employed in two cases. The first would be an immediate launch of all ICBM's remaining after a partially successful first wave counterforce attack. The second would be an immediate reflexive launch in response

_____
*See page 73.

28

to an attack on government, economic or military targets. This second case is predicated on having survivable forces (e.g., MX), but vulnerable centers of political, economic and military power. The concept in this scenario is not a launch to protect strategic forces (or a _deterrent_ threat of such a response to counterforce attack), but rather a sure (virtually automatic) and _immediate_ retaliation that is _not_ dependent on survival of the NCA or even the entire Washington Politico-Military establishment. LAA differs from other reflexive launch strategies in that, unlike the others that play both deterrent and defensive roles (protection of the missiles), LAA is principally a deterrent posture. It removes any doubt (however limited) that a successful massive attack on U.S. centers of government, military and economic power would so cripple the country that a retaliatory attack might appear counter-productive.

6. <u>Flush on Warning (FOW) Modes</u>: <u>Delayed Arm Commit and Launch into Holding</u>

Flush on Warning reflexive strategies differ from the above described attack modes in two primary aspects:

- FOW ICBMs are <u>not committed</u> to destroying enemy targets at launch.

- Because FOW forces are not committed, they can be launched earlier and with less information about the nature and origin of the attack.

Two general FOW concepts have been suggested, neither of which has been developed or deployed. These FOW categories are Delayed Arm Commit and Launch Into Holding.

a. Delayed Arm Commit

This concept, as described by Richard L. Garwin, involves employment of a secure, jam-resistant command link to arm or disarm a missile in flight. Garwin urges a further hedge by launching no more than 50 percent of the force. Two primary advantages derive from a system with an inflight arm command capability:

- A time advantage of approximately 15 additional minutes to commit to target destruction. This time advantage is, however, more than just 15 minutes of assessment and decision process time: these 15 minutes roughly equate to the flight time of an SLBM pin down of C^3 attack. Additionally, these 15 minutes allow for the occurrence of unambiguous nuclear detonation (in the Minuteman fields or elsewhere) prior to an irrevocable U.S. commitment to nuclear attack. In other words, this system allows the advantages of both Launch on Warning (fast reaction) and the other extreme of Launch on Impact (greatest certainty).

- The inclusion of an additional safety link in the attack system (the command arm link). This safety link provides an important spin-off by permitting development of a more highly responsive attack assessment NCA launch system.

This system, when tied to an operational policy of launching only a fraction of the force, would also eliminate the problem of an accidental launch that is subsequently not armed but effectively disarms the U.S. by emptying all the Minuteman and Titan silos.

The delayed arm commit system, though neat theoretically, is fraught with serious pragmatic problems. Regardless of the myriad arguments concerning time factors,

30

deterrence, targeting, etc., the key fallacy in the logic
of this approach is the requirement for a 100 percent re-
liable arm/disarm command link to the missiles.

If the arm inflight mode is chosen, then there
is the possibility of system failure or military vulnera-
bility.[25] The alternative of the option to disarm in flight
is even more problematic; for if it is needed to redress
an inadvertent launch, then it must be failsafe (i.e., all
missiles must respond to the disarm signal). As has been
shown by nuclear power plants and other exhibits of state-
of-the-art technology, "fail safe" systems are politically
public perceptions), if not technically, impossible to
construct.

b. Launch into Holding

Launch into holding systems differ from the
above Delayed Arm Commit concepts in two ways:

- The decision time is significantly expanded
  allowing earlier launch (by lower echelon
  authority) and protracted attack assessment
  and force commitment time.

- The weapons may be totally or partially re-
  covered and in some systems, reused (after
  refurbishment) in the event of an inadver-
  tent or excessive force launch.

Two such systems have been recently proposed for technical
analysis and possible deployment to supplement the MX
system,[26] launch (on warning)-into-orbit and the cruise-
ballistic-missile.

c.   Launch (On Warning) Into Orbit (LIO)

This system involves modification of Minuteman II or III to provide increased boost thrust, a variable thrust, restartable upper stage, enhanced navigation system and a secure jam-proof communications link. Under this concept, on initial Defense Support Satellite warning, a portion of the force would be launched into parking orbits to await release by the NCA or a recall order. Orbital mechanics and velocity correction could allow for inflight target selection or reprogramming. Key to this system is a network of ground stations used for communications and guidance update to the missiles.[27]

It is this reliance on ground communication and the added complexity that, in addition to political problems, are the main deficiencies of the system. Among the principal advantages of standard ICBMs are autonomy after launch and relative simplicity of operation. Autonomy eliminates the need for vulnerable ground links while simplicity of operation enhances reliability. Under optimum conditions, maintaining coordinated control of one hundred or more orbiting missiles would be a formidable task; performing this task during/after a massive Soviet attack becomes questionable. Additionally, these warheads would be vulnerable to anti-satellite attack (ASAT). Spin-off advantages of LIO include:

d. Cruise Ballistic Missile (CBM)

The concept involves a hybrid vehicle consisting of a huge (90 foot wingspan) cruise missile tied to a Minuteman III ICBM. On warning, this combined vehicle would be cold-launched, boosted to about 20,000 feet and then loiter in the aerodynamic cruise mode awaiting orders from the NCA. The vehicle could remain aloft for extended periods, land to be refueled or on command launch its Minuteman III.[28] This system faces the same technical drawbacks as the Launch Into Orbit system but has the added hazard of live warheads cruising over the United States in unmanned vehicles. It can be argued that in a nuclear war political problems of unmanned nuclear vehicles are not a consideration and that the risk of crash and/or compromise are acceptable in an actual war. However, an unresolved paradox is present in this logic: If the risk is acceptable because the system is only used in an actual nuclear war, then why is it needed at all? Why not just employ LUA/LUAA?

B. REFLEXIVE MODE COMPARISON

The preceding RLS definitions are significant to any examination of this issue. The convention in strategic literature to characterize all reflexive launch strategies as "Launch on Warning" is deceptive. It is easy to dismiss the employment of any reflexive option under any circumstance if all are characterized as automatic, instantaneous

33

and complete counter-value spasms released in response to
a "bolt out of the blue" signal from a single early warning
satellite. However, if the scenario is redefined, a different
conclusion is apparent. If the reflexive response is a
surgical, counter-military attack and is launched during
a crisis (e.g., the beginning of a Warsaw Pact invasion
of Western Europe) in response to sequential, corroborative
warning indications culminating with precise PAR indication
of counterforce targeting, then a Launch Under Attack becomes
a credible choice.

IV.   <u>TECHNICAL ISSUES</u>

Although this paper owing to classification and scope
cannot present an indepth analysis of all technical issues
pertinent to Reflexive Strategies, it is necessary to examine
the principal technical elements that preclude or enhance
the employment of reflexive postures.   Two topic areas are
of primary concern in assessing the impact of technical
issues:

- <u>Operational Requirements</u> - Those things that are needed to construct a credible RLS system.

- <u>Technical Advances</u> that have changed assumptions regarding and requirements for RLS systems.

A.   OPERATIONAL REQUIREMENTS

...timely and reliable warning and assessment of an
attack is essential to our offensive forces.   Such
warning and assessment increase the survivability of
our retaliatory and C^3 resources and add credibility
to our statements that the Soviets cannot count on
finding our increasingly vulnerable ICBM's still in
their silos during any first-strike attempt.[29]

Harold Brown
1980

To have a viable capability for reflexive commitment, Richard

Garwin has stipulated that a force have the following elements:

- A sensor or set of sensors adequate to detect the launching of the potentially disarming attack and to assess its severity, and sufficiently reliable not to indicate such launch when it had not taken place.

- The communications means to connect the sensors to the decision-making authority for the United States, (the "NCA," or National Command Authority).

- Time to establish that a disarming strike had been launched by the other side.

- People, equipment, and procedures to use the communicated sensor information to authorize the launch of a portion of the U.S. ICBM force, against an appropriate target set and with some choice of warhead arming--irrevocable, command-arm or command-disarm.

- The communications means to carry this decision to the force to be launched.

- Sufficiently rapid fly-out of the launch-under-attack missiles, so that they are not caught in or near their silos after receipt of the order to launch.

- System components sufficiently <u>robust</u> so that the launch-under-attack capability cannot be denied the United States by the expenditure of resources very much less than those required to destroy the ICBM silos (unless those measures are unambiguous and themselves such as to cause launch of the ICBM force).[30]

Critics of the practicality of employing an RLS doctrine state, essentially, that each of the above listed requirements represents a potential weak link in the chain, that there are unresolved technical and "operational" (i.e., man in the loop) questions, and that there is too little time available to provide assurance that each of these requirements could be satisfied. The statement of William Graham and Paul Nitze exemplifies these technical reservations:

> The survivability of our land-based missile force under a launch-on-warning concept would require that our early warning systems had not been neutralized, and would be totally dependent upon the high reliability of our warning systems to detect and comprehend an actual attack, whatever action the attacker chose to take. At the same

time, exceptionally reliable interpretation and
rejection of erroneous information indicating
that an attack was underway would be essential.
Both of these requirements, as well as the problems
of avoiding pin-down and of maintaining continuity
and nearly instantaneous response in the chain of
command in the face of a carefully coordinated
attack, pose extremely formidable technological
and other difficulties.[31]

A key question of technical capability is the vulnerability

of the warning systems themselves.

Early-warning satellites (which contain infrared
sensors, visible light detectors and particle and
radiation sensors) might be blinded or attacked:
Would such action be judged to be the equivalent
of early warning or a missile attack? Simultan-
eously, one or more of the three Ballistic Missile
Early Warning System (BMEWS) facilities could be
destroyed....[32]

Colin Gray's statement is supported by Deputy Under Secretary

of Defense Zeiberg's statement that "While we continue to

maintain the capability to launch our ICBM force on warning

of an attack we cannot rely on such an option since it lacks

the stability required in a crisis and depends on warning

systems which may themselves be vulnerable."[33] Gray's

further analysis that an attack of the DSP satellites and

one of the BMEWS radar would leave "...the United States

with no* reliable early warning capabilities vis-à-vis

the principle missile threat window"[34]   is, at the least,

hyperbole. This frequent criticism of the viability of

_____

*Emphasis added--this statement ignores the PAR system.
While PAR does not provide the early warning margin of the
DSP satellite, it does provide time-sufficient attack analysis.
Early warning, however, would be provided by aggressive
destruction of the DSP and/or the BMEWS: Explosive destruc-
tion of BMEWS provides a far less ambiguous indication of
potential attack then blips on a radar scope.

substantial effort is being expended in diversifying, moder-

nizing Reflexive Launch concepts ignores two major considera-

tions. First, the U.S. Warning network consists of more

than the Defense Support Satellites and BMEWS radars.

Additionally, substantial effort is being expended in diversi-

fying, modernizing, expanding and hardening the United States'

strategic surveillance and warning system:

> We have begun a number of efforts aimed at enhancing
> the survivability of our missile attack warning
> systems and improving the quality of attack assess-
> ment information supporting NCA response option
> selection (including maintaining the option of a
> Presidential decision to launch our missiles when
> they are under attack). We are planning both near-
> term and long-term improvements in the early warning
> satellite system, for early warning of ICBM and SLBM
> attacks. Evolutionary improvements to increase
> the survivability and capability of the satellite
> systems continue to be incorporated during the
> production cycle for replacement satellites.

> Our ground-based radar systems would confirm satel-
> lite warning of ICBM or SLBM attacks. For the
> northern approaches, we depend on the Ballistic
> Missile Early Warning System (BMEWS) radars at
> sites in Greenland, Alaska, and England to confirm
> an ICBM attack. Programmed improvements of the
> Greenland BMEWS radars, which view the missile
> approaches to central CONUS, will produce better
> estimates of attack size and impact points that
> should be sufficient to verify an attack on our
> MINUTEMAN force. We also plan to complete the
> replacement of obsolete computers at all three
> BMEWS sites. The Perimeter Acquisition Radar
> Characterization System (PARCS), a converted ABM
> radar, will act as a backup for BMEWS coverage
> of ICBM attacks against central CONUS until the
> BMEWS improvements are completed. The PARCS is
> being upgraded to provide more timely and accurate
> impact point prediction for a larger number of RVs.

Ground-based surveillance radars along our coasts
would confirm satellite warning of an SLBM attack.
Two new PAVE PAWS phased-array radars will replace
all but one of the FSS-7 SLBM warning radars. PAVE
PAWS radars provide improved coverage along the
east and west coasts. In addition to PAVE PAWS,
we will continue to operate the older FPS-85 phased-
array radar and one FSS-7 in Florida to cover possi-
ble SLBM launch areas southeast of the United
States.[35]

The second major problem with RLS critiques that center

on warning systems vulnerability is that these arguments

are too narrow in focus. These discussions do not present

a complete scenario including the state of the East/West

political-military relationship. If a crisis developed

and/or if we noted Soviet civil defense and military mobi-

lization combined with aircraft dispersal and increased

Soviet Naval SSBN and surface combatant deployment levels,

and if all of this was followed by "mysterious" loss of

one or more of our DSP satellites, then it is difficult to

argue that we have "lost our early warning capabilities."

B. COMMUNICATIONS

Reservations regarding the ability to maintain

communications between the NCA and the strategic forces

equal those concerning warning system vulnerability. SAC

Commander General Ellis has said: "Whether communications

can be maintained through this trans-attack period is

problematical. We know how to restore communications after

the trans-attack period, but this takes time. Minuteman

survivability depends upon communications: MX does not."[36]

Figure 5
RLS
OPERATIONAL REQUIREMENTS

RLS MODE	HIGH DEGREE OF CERTAINTY PRIOR TO COMMITMENT	LONG DECISION TIME[1]	LOW VULNERABILITY TO PIN DOWN	LOW DEMAND ON WARNING SYSTEM	LOW DEMAND ON C^3	HIGH DETERRENT CREDIBILITY
LOW	1	1	3	1	1	1
LUA	2	2	2	2	2	2
LUAA	2	2	2	2	2	2
LOI	3	3	1	3	1	3
LAA[2]	4	4	4	4	2	4
DAC	3	2	3	1	1	2
LIO	4	3	3	1	1	3
CBM	4	4	3	1	1	3

Note : Numbers 1 through 4 indicate relative capability of fulfilling requirements: 1 indicates least capable 4 indicates most capable

LOW - Launch-On-Warning

LUA - Launch-Under-Attack

LUAA - Launch-Under-Attack-Assessment

LOI - Launch-On-Impact

LAA - Launch-After-Attack

DAC - Delayed Arm Commit

LIO - Launch (On Warning)-into-Orbit

CBM - Cruise Ballistic Missile

---

[1]Decision time prior to commitment to attack (not launch)

[2]LAA is defined as a launch of surviving forces (or survivable forces) immediately following an initial attack

Dr. Harold Brown supports this analysis:

> Our deterrence strategy requires that strategic C^3 should be capable not only of supporting assured retaliation after an initial surprise attack, but also of managing our strategic reserve forces throughout a protracted nuclear war. The survivability, flexibility and endurance of these C^3 systems should be at least comparable to that of our strategic forces. They should be capable of operating in environments disrupted by electromagnetic, nuclear and chemical/biological effects. At present, our ability to meet these objectives falls considerably short.[37]

These current deficiencies have a much greater deleterious effect on post-attack retaliation or Launch Through Attack/Launch on Impact policies than on Launch on Warning. Additionally, there are no serious technical barriers to hardening the present C^3 system. As Dr. Brown states:

> The land-based ICBM's are becoming increasingly vulnerable and tactical warning is as a consequence, increasingly important to the mission accomplishment of this leg of the TRIAD. Our programs will reduce the vulnerability of our strategic communications to physical attack, jamming and nuclear effects.[38]

C. TECHNICAL ADVANCES

> "The flight testing by the Soviets in 1977 of an improved post-boost guidance and control system for the SS-18 MOD 4 suggests that the Soviets are capable of deploying ICBM-based re-entry vehicles with a yield and accuracy combination sufficient to destroy the hardest Minuteman silo or its associated Launch Control Center."[39]

> "Our warning systems have progressed considerably further. U.S. satellite systems can now detect the launch of Soviet ICBM's and estimate their targets within a few minutes of the launch."[40]

Figure 6

THE EFFECTS OF SOVIET COUNTER FORCE
ON MINUTEMAN SURVIVABILITY

Source: DOD Annual Report FY 1980

The above quotations illuminate the two major technical advances that have increased the requirement for, and altered assumptions regarding Reflexive Launch Strategies.

1. Accuracy

As described in the threat section, significant accuracy improvements have increased the vulnerability of U.S. ICBM forces and proportionately increased the desirability of countervailing reflexive launch strategies. Additionally, significant U.S. accuracy and reliability improvements, achieved with the MM III, the Mark 12A reentry vehicle, the improved target modeling program, and the high speed retargeting system (Command Data Buffer),[41] have made Reflexive options more credible. Accuracy and reliability enable adoption of a 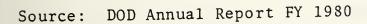countermilitary targeting policy for missiles launched during an attack. This not only insures highest use of land-based assets, but also avoids unintentional countervalue escalation (i.e., "city busting") and mitigates the consequences of an excessively lethal reflexive response to a limited, inadvertent/"accidental" Soviet counterforce attack (Hammurabi rules apply).

2. Potential for Secure Inflight Command Arming for RLS ICBMs

Unlike other technical advances (e.g., warning satellites) that have modified the assumptions about RLS viability, the existing technology to construct a secure inflight command

43

arm system has significantly altered the capabilities of RLS

systems.   During the 1970 ABM Congressional debate, this

alternative was discussed by Paul Wolfowitz, who discounted

the idea on technical and conceptual grounds:

> Disarming our missiles in flight: Senator Gore,
> during a March 26 hearing, suggested that we
> might arrange some signal for disarming our
> missiles in flight, and "if it were discovered
> that an error had been made then the MINUTEMEN
> themselves could not be continued on their
> missions." This creates the problem that an
> enemy might discover the signal to disarm our
> missiles and use it; more important, there
> would be disasterous consequences, including
> possibly nuclear war, if one or two signals
> failed to get through after an accident launch.
>
> Arming our missiles in flight: An earlier
> suggestion (by Senator Symington, in a hearing
> March 21) that we might launch our ICBMs "without
> arming them and arm them in the air," presents
> other difficulties. i) If our missiles were
> launched in a false alarm--even one deliberately
> triggered by an enemy--or if communications to
> them were blacked out in an attack, then we
> would be effectively disarmed. ii) If we could
> not convince the Russians that our missiles,
> launched by accident, were unarmed, the result
> might be nuclear war--particularly if they also
> followed a "launch on warning" policy.[42]

Technical evolution since 1970 has changed some of the

assumptions in the above argument; as Dr. Garwin has stated:

> ...encryption algorithms and hardware exist now
> in abundance so that it can be made entirely im-
> possible for any individual or nation to mimic
> the arming or disarming signal without actually
> capturing that signal. Furthermore, even one
> use of the signal for arming or disarming a
> portion of the Minuteman force can be arranged
> not to reveal a signal useful for another portion
> of the force or for use at a later time. Finally,
> given the survival of the assumed ground-based,
> mobile, powerful radio transmitters and the

44

special ("anti-jam") characteristics available
to the communicator who needs to communicate
reliably only a single "yes-no" decision, it
can be made entirely infeasible for the Soviet
Union to deny the accurate reception of such a
signal.[43]

Such a secure communications system is similar to that

conceived for a Launch Into Orbit RLS system:

> ...downlink jamming would be difficult because
> the jammer would have to be within 30 miles of
> the missile. The downlink pulse would have a
> unique signature of 1000 bits, further limiting
> jamming all communications without the anti-
> jamming pattern would be ignored.[44]

Contemporary electronic encryption and antijam techniques

combined with dispersed mobile transmitters make feasible

construction of a credible inflight Command Arm/Disarm

system. Additionally, a policy of launching only a limited

portion of the force would preclude the possibility of in-

advertently (false alarm) disarming ourselves or being

disarmed by a deliberate/inadvertent Russian feint.

The above technical and operational solution still

leaves two major problems unresolved.

- A launch armed, command disarm inflight system
  would have to be not only technically feasible,
  but also operationally 100% fail-safe to be of
  advantage over LUA/LUAA. (All missiles would
  have to respond to a disarm signal.) Although,
  as stated earlier, such a system coupled to
  "surgical" counter-military targeting would be
  safer than a pure (irrevocably armed) LUA/LUAA
  system, the possibility of inadvertent detona-
  tion of even one set of 3 Minuteman III warheads
  presents a formidable risk.

- If the idea of a Command Arm/Disarm system is to
  allow for attack assessment error and/or faster
  response than the problem becomes as, Dr. Wolfowitz
  states: How do we convince the Soviets that the
  300 or so incoming Mark 12 reentry vehicles are
  not armed? What if the Russians also rely on LOW
  or LUA?* If we believe that the Russians would
  accept assurances (particularly during a crisis)
  that incoming warheads are not armed, then how
  could we believe that the United States would
  Launch Under Attack if the Russians gave us
  similar assurances? The Inflight Command Arm
  System (a concept designed to allow for "balks")
  presents as many new problems, complication and
  uncertainties as it attempts to resolve.

D. ALTERNATIVES TO REFLEXIVE STRATEGIES

The value of adoption of a reflexive launch strategy must
be examined within the context of existing or potential al-
ternatives. In addition to reflexive launch strategies,
three major possibilities exist for resolving the impending
vulnerability of land-based ICBMs.

- Develop a survivably based follow-on land-based ICBM
  system (e.g., canisterizing Minuteman III for deploy-
  ment in vertical multiple protective shelters, and/or
  MX).

- Adopt a Dyad strategy employing bombers/ALCM carriers
  and SLBMs.**

- Develop an ICBM active defensive system (i.e., ABM).

Technical evolution has altered the capabilities of potential
system alternatives and attendant assumptions regarding their
utility.

---

*The USSR has 70% of its total throw weight and 75% of its
total (6000) warheads in fixed land base ICBMs that represent
56% of their total Bomber/Missile launch force. Source: DOD
FY81 Annual Report.

**SLBM is used here to include both existing Trident/Poseidon
forces, as well as proposed systems such as the Shallow Under-
water Mobile (SUM).

1. Survivably Based ICBM

In assessing the relative utility of employing the Minuteman system in an RLS posture as a solution to force vulnerability, the value of the basic weapon must be considered. An examination of the issues reveals that a replacement for Minuteman is desirable for reasons beyond pre-launch vulnerability.

In addition to the need for survivable basing, a new ICBM system is required for two main reasons:

- Military Capability - Increased throw-weight and accuracy are required to provide time urgent hard target kill potential (counterforce/countermilitary).

- Force Modernization - Minuteman 1 was first flown in February 1, 1961; Minuteman 2 achieved initial operational capability (IOC) in 1965 and Minuteman 3 IOC was 1970.[45] Force modernization is necessary not only to replace aging equipment that is increasingly more difficult to support, but also to take advantage of advanced in state-of-the-art reliability, maintainability, and total system operational effectiveness.

Any discussion of the use of pre-impact RLS as a "cost effective" alternative to a survivably based MX must include consideration of the fact that the Minuteman system is a 1960's era system facing a mid-1980's mission and threat.*

2. SLBM and Bomber/ALCM Dyad

An obvious "solution" to the problems of Minuteman/ vulnerability is to eliminate the target and shift forces

_____

*See "RLS vs. MX Capabilities Comparison" (Figure 7).

47

Figure 7

RLS (EXISTING FORCES)

VS.

MX (MAPS)

CAPABILITIES COMPARISON

	RLS	MX
COST	+	-
ENVIRONMENTAL IMPACT	+	-
ABILITY TO REPLICATE THE CAPABILITIES OF THE ALTERNATIVE SYSTEM (e.g. MX CAN BE USED IN AN RLS MODE)	-	+
CERTAINTY IN REDUCING ICBM VULNERABILITY	-	+
EMPLOYMENT FLEXIBILITY (i.e. TIMING, ETC.)	-	+
MILITARY CAPABILITY: GROSS THROW WEIGHT, ACCURACY, RELIABILITY, EMT	-	+
SOLUTION TO THE PROBLEM OF FORCE MODERN-IZATION (i.e. MINUTEMAN SERVICE LIFE; EMPLOYMENT OF STATE OF THE ART MILITARY CAPABILITY, RELIABILITY, AND OPERATING COSTS)	-	+
CRISIS STABILITY/INCENTIVE TO PRE-EMPT	-	+
DEMAND ON C^3	-	+
DEMAND ON WARNING NETWORK	-	+
DECISION TIME	-	+
VULNERABILITY TO PIN-DOWN[*]	-	+

<u>RLS (EXISTING FORCES)</u> (con't)

<u>VS.</u>

<u>MX (MAPS)</u>

<u>CAPABILITIES COMPARISON</u>

	RLS	MX
CERTAINTY IN THE DECISION TO ATTACK	–	+
SAFETY/FREEDOM FROM MISCALCULATION OR ACCIDENTAL LAUNCH	–	+
TOTAL FORCE AVAILABILITY FOR LAA	–	+
ADVERSARY AND ALLIED <u>PERCEPTION</u> OF NATIONAL POWER AND WILL	–	+
AGGREGATE MILITARY CAPABILITY AND DETERRENT CREDIBILITY	–	+

NOTE: Signs (+ and -) indicate the comparative capability of the two systems. Although + is assigned to the superior system regardless of the degree of advantage, in most cases the marginal advantage is significant.

---

*Although MX is vulnerable to pin-down, this vulnerability does not effect its employment after an attack. Pin-down is normally conceived of in the context of "pin-down and destroy", however, it could be used to prevent (<u>temporarily</u>) employment of MX counter-military or counter-silo capability.

to a bomber/ALCM and SLBM dyad. Such a decision would have to consider both the survivability (existing and potential) of land-based ICBMs as well as their offensive capability. Assumption of a dyad strategic posture could occur in two ways:

- Phasing out land-based ICBM's (possibly substituting air launched or sea-based alternative systems).

- Taking no action and allowing land-based ICBMs to become increasingly more vulnerable.*

The effect of either of these approaches produces the same result--a loss of both perceived and actual military capability. Although the unique capabilities of ICBMs are detailed in Figure 8, one area deserves specific attention. Of greatest significance in any consideration of the value of land-based missiles is their synergistic role within the Triad. Because ICBMs have a distinct survivability mechanism, they--by complicating the Soviet's R&D and operational systems efforts--increase the survivability of the other two legs. As Colin Gray has stated:

> Soviet leaders might come to believe that a counter-force first strike on a United States with a dyad would stand a reasonable chance of achieving a clear political victory. (It is not implied that the Soviet Union would seriously aspire to effect a total counter-force strike-- only that Soviet bargaining strength for intrawar deterrence should be very great indeed after a surprise attack on an American dyad of SSBN and manned bombers.) Soviet leaders would, of course, need to calculate that the United States would

---

*This approach could be based on one of two theories: (a) the threat to land-based ICBMs is theoretical, but not actual; (b) ICBMs act as a diversion or "sponge" for large numbers of Soviet missiles. Both of these arguments are weakened by their reliance on unsubstantiated assumptions. Additionally, this alternative would undermine the perception of U.S. strength.

Figure 8
ICBM

ADVANTAGES AND CAPABILITIES

. DISTINCT VULNERABILITY

  - survival mode is different than SLBMs or bombers

. ENDURANCE

  - the ability to indefinitely maintain the highest
    state of pre-conflict readiness

. ENDURING SURVIVABILITY/AVAILABILITY

  - the ability to be selectively withheld or employed
    throughout protracted conflict.[1]

. ACCURACY

  - provides hard target kill capability and attack
    of select targets with minimal megatonnage and low
    collateral damage

. C^3 SIMPLICITY, RELIABILITY AND REDUNDANCE

. HIGH THROW WEIGHT

  - large payload allows for multiple, hard target
    capable warheads and penetration aids

. HIGH OPERATIONAL RELIABILITY

  - missiles are: stored in a benign pre-launch environ-
    ment; supported by extensive ground test equipment;
    continually accessible for maintenance; and fired
    under stable controlled, conditions

. HIGH ALERT RATE/FORCE AVAILABILITY

  - at any time, virtually the entire force is available
    for launch

. CAPABLE OF COMPLEX, COORDINATED ATTACKS AND HIGH SPEED
  RETARGETING

  - provides effective counter force/counter military
    potential.

. LOW OPERATING COST

  - low personnel, upkeep and basing costs

. <u>SOVEREIGN BASING</u>

- Sovereign basing provides three advantages:
peace time security and safety; freedom from
dependence on neutral or foreign operating
and basing areas; an attack on the force is
unambiguous and requires violation of national
sovereignty.

. <u>MUTUAL SUPPORT</u>

- provides increased survivability for bombers[2]

Source: Author's assessment--see also: <u>The FY 1981</u>
<u>Department of Defense Program for Research,</u>
<u>Development and Acquisition,</u> Part VI, p. 2;
William R. Van Cleave, "The Strategic Triad,"
<u>The U.S. War Machine,</u> ed. James Dorman, Jr.
(New York: Crow Publishers, Inc., 1978),
p. 62; Gen. Lew Allen, USAF, Chief of Staff
to Hon. Melvin Price, Chairman Committee on
Armed Services U.S. Congress, House, 29 Dec
1978, Files Department of the Air Force;
Colin S. Gray, <u>The Future of Land-Based</u>
<u>Missile Forces</u> (Adelphia Paper Number 140)
(London: The International Institute for
Strategic Studies 1977), p. 3.

---

[1] ICBMs are not susceptible to attrition during conven-
tional conflict; they don't require refueling or replenish-
ment and are not exposed to attack by a need for periodic
return to vulnerable bases (as is the case for FBM submarines
and strategic bombers).

[2] An SLBM attack on bomber bases would give adequate
warning of an imminent attack on ICBMs; conversely, an ICBM
attack on Minuteman launched to arrive simultaneously with
an SLBM attack would provide adequate warning for the bombers.
See--statement of Jan M. Lodal, in <u>Hearings before the Committee</u>
<u>on Foreign Relations United States Senate Ninety-Fifth Congress</u>
<u>First Session</u> 14, 19 January and 16 March 1977, ("United States/
Soviet Strategic Options)) (Washington: U.S. GPO), p. 92.

cooperate and choose to be deterred in such a
situation; however, they could aim to achieve
a nuclear Pearl Harbor against the 40 percent
or more of the Poseidon-Trident fleet that is
always in its home ports or at forward bases
(Holy Loch and Guam) and hope to catch a large
fraction of the B52/FB-111A force before it could
reach its safe escape points, thus leaving the
United States Government in a terrible dilemma.[46]

The essence of the argument favoring land-based ICBMs

is not that they are inherently invulnerable, but that they

possess vulnerabilities different from those of bombers/

ALCM and SSBNs. This difference assures that all three

systems cannot be nullified by concentration on a single

technological defense solution. Additionally, ICBMs provide

unique military capabilities such as secure C3, high alert

rate, and superior operational accuracy.

3. Advanced Sea-Based Alternatives

Technological evolution promises to alleviate three

of the major comparative deficiencies of SLBMs:

- Range/throw-weight - Trident I (C4) and Trident
  II (D-5) if developed) vastly increase the range
  of SLBMs.[47]

- Accuracy-Trident I (C-4) has significant accuracy
  improvement and the MK500 MARV (under development)
  has the potential to provide SLBMs with counter-
  force capability.[48]

- C3 - Construction of the Extremely Low Frequency
  (ELF) communication systems would improve surviva-
  bility by not forcing Trident subs to trail antennae
  or operate near the surface. Additionally, advanced
  communications systems such as satellite-laser
  systems could enhance SSBN C3.[49] The problem is that
  neither of these complementary SSBN communications
  systems presently exist nor are they in the budget:

53

> Serious political problems have virtually
> blocked plans to build the ELF systems[50] and
> the blue-green laser system hasn't even been
> tested.*

These and other less dramatic advances in existing
and potential technologies have changed some of the major
assumptions regarding the military capability of sea-based
systems. However, as stated earlier and as seen in Figure 8
ICBMs have a significant number of distinct advantages rela-
tive to the other two legs of the Triad. Technological
advance is a two-edged sword and the same phenomenon of
geometrically enhanced technological progress that promises
significantly more capable sea-based ballistic missile
systems, could result in increasing detectability and vulner-
ability.

One recently proposed solution to the problem of
land-based ICBM vulnerability is deployment of a Shallow
Underwater Mobile (SUM) sea based ballistic missile.[51]
This system would consist of two ICBMs strapped outside the
pressure hull of each of a fleet of small diesel powered
submarins. The SUM system would solve the accuracy and C3
problems of sea systems through dependence on shore-based
navigation and communication facilities. Figure 9 presents
an MX/SUM comparison. The key problems with such a system
include vulnerability to underwater nuclear effects (on the

_____

*The Defense Advanced Research Projects Agency plans to
award two contracts for developmental efforts for this system.[52]

54

Continental Shelf), lack of distinct vulnerability, alert

rate, and operating cost. As Lt Gen Kelly H. Burke (DCS

Research, Development, and Acquisition) states,

> A sea-based system now being suggested by a few
> individuals outside the Department of Defense is
> the SUM, or shallow underwater missile system.
> A careful evaluation of the concept shows these
> submarines are neither as small nor as inexpensive,
> nor as readily available as first thought. In any
> event SUM is simply another ballistic missile sub-
> marine without the characteristics of land-based
> ICBMs and as such should logically be considered
> as an alternative to the Trident, not to the MX.[53]

In a later statement Burke added:

> ...Among these schemes are deploying a mobile
> Minuteman force, putting ICBMs on small German-
> built diesel-powered submarines operating along
> the Continental Shelf, or deploying MX in the
> Great Lakes....
>
> In the second case, the so-called SUM "bottom-
> crawling-submarine" would not be available until
> the 1990's and would be highly vulnerable to tidal
> waves, known as the Van Dorn effect, that could be
> induced by a Soviet barrage bombing of the Conti-
> nental Shelf area. This tidal wave in shallow
> water would crush any sub in its path. Once aware
> of this phenomenon, the proponents of this
> approach switched to a "Deep Underwater Missile,"
> or DUM, which would make such a weapon an alter-
> nate for the Trident SSBN, rather than for the
> ICBMs. In case of MX ICBMs deployed in the Great
> Lakes, barrage bombing, in a similar manner,
> would rapidly and surely destroy such a force.[54]

This view is supported by the Under Secretary of the

Air Force, Antonia Chayes, who states:

> ...Besides, we looked very hard at this so-called
> Shallow Underwater-Missile System* and have con-
> cluded that there are defects. It cannot operate
> from the Continental Shelf--as its advocates argued

---

*This system (SUM) is called Shallow Underwater Mobile
(not Missile) by its principal supporter, Dr. Sidney Drell.

Figure 9

SHALLOW UNDERWATER MOBILE (SUM)
...SOME PROBLEMS

	SUM	MX
ALERT RATE/ENDURANCE	3	1
DISTINCT VULNERABILITY	3	1
POTENTIAL NEAR TERM VULNERABILITY (EXISTING ASW TECHNOLOGY AND NO SITE DEFENSE)	1	2
OPERATING COST (PERSONNEL, OVERHAUL, FUEL, ETC.)	2-3	1
PROCUREMENT COST	?	?
LOW DEVELOPMENT RISK	3	1
C^3 SIMPLICITY/VULNERABILITY	3	1
OPERATIONAL RELIABILITY	3	1
MILITARY CAPABILITY (ACCURACY, PAYLOAD, FLEXIBILITY, CONTROL)	3	1
NAVIGATIONAL AUTONOMY (SIMPLICITY/VULNERABILITY)	3	1
SOVEREIGN BASING/PEACE TIME SECURITY	2-3	1
DOMESTIC/ENVIRONMENTAL IMPACT	1	3

COMPARATIVE SYSTEM RATINGS

1 CLEARLY SUPERIOR
2 SOME ADVANTAGES
3 CLEARLY LESS CAPABLE

56

originally. It would be vulnerable there to the
effects of an attack that would create a tidal
wave.

Also, an analysis of the equipment required to
keep these submarines stable would indicate that
quite big submarines would be needed. So it
becomes a very expensive proposition and offers
no savings over the MX system for the same number
of warheads.[55]

Finally, as an alternative to Reflexive Strategies,

the SUM system shares with other new/derived technologies,

the problem of development and deployment time. As Bernard

T. Feld and Kosta Tsipis state:

Such a coastal submarine-based system could not
be ready for deployment in the next decade or so.
Therefore this system shares with the air-mobile
and the multiple-shelter basing mode the disad-
vantage that its unavilability for many years
might mandate the need for immediate remedial
measures (such as local defense for Minuteman
silos), which would add to the overall cost of
restoring invulnerability to the ICBM component
of the U.S. strategic triad.[56]

While a case can be made that a SUM system could be

deployed in less than a decade, it cannot solve near term

(mid-1980's) land-based ICBM vulnerability.

4. ABM Alternative

In addition to survivably based system, the other

major alternative to pre-impact reflexive launch strategies

is a missile site defense ABM. Several concepts have

evolved involving the use of non-nuclear kill mechanisms

and state-of-the-art simplified multi-target-track fire

control systems.[57] One of these programs, Homing Overlay

Experiment (HOE) is scheduled for testing in 1982. DOD is
also examining several variants of a Low Altitude Defense
(LoAD) system for terminal defense of missile silos. [58]
Although these ground-based (and future space-based) defen-
sive systems appear practical, they have three major
problems:

- Most ABM proposals would require abrogation or
  restructuring of the existing ABM accords.[59]

- Unless a massive effort is undertaken, they would
  not resolve Minuteman vulnerability before the late
  1980's.

- Unlike a passive defense (i.e., survivable basing),
  ABM systems would always be potentially vulnerable
  to countermeasures and uncertainty* would always
  exist relative to their (untestable) full scale
  operational capability.

---

*This uncertainty, however, is a "two-way street:" the
Soviets (regardless of developed countermeasures) would have
uncertainty regarding their ability to successfully attack
the system.

V. THE CURRENT ROLE OF REFLEXIVE STRATEGIES

...Nor could they be sure that we would not launch
our ICBMs on warning or under attack (as we would
by no means wish to rely on having to do).[60]

Harold Brown
January 1980

...the second option toward which the United States
is edging, faute de mieux, is to adopt the ICBM
firing tactic of launch on assessment (LOA). Senior
Carter administration defense officials have been
uttering more and more friendly references to this
tactic. For a country with a $2 trillion GNP and
a defense budget of more than $120 billion--after
nearly a generation's warning that the silo-vulnera-
bility problem was coming--to be compelled even to
think very seriously about LOA is little short of
a disgrace.[61]

Colin S. Gray
July 1978

A review of recent formal and informal official state-

ments concerning employment of reflexive launch strategies,

creates an initially ambiguous--even paradoxical-picture

of U.S. policy. For example, in his 1980 DOD report,

Harold Brown said, "...But that does not mean we should

abandon the features contained in the ICBM force or make

its survival a function of launch-on-warning."[62] However,

in a later section of the same report he adds: "Very low

survivability of ICBMs in the early 1980s will leave

us with very little effective quick response

hard target kill capability unless we were to adopt a

59

launch-under-attack policy."[63] He further states "...In addition, the USSR can never be sure that our ICBM force would not be launched under the attack, increasing the number of U.S. delivered warheads still further."[64] Similar statements have been made by other administration officials. According to William J. Perry (Under Secretary of Defense Research and Engineering), "An attacker could not be certain that the Minuteman force would be launched before it was destroyed, though we do not want to depend on that uncertainty."[65] Under Secretary of the Air Force Antonia Chayes in a recently quoted statement indicates that we do not have a launch-under-attack doctrine, but could adopt one:

> We could ignore the vulnerability and basically change our strategic doctrine. We could move to a launch-under-attack doctrine--that is, we could launch our ICBMs as soon as we detected evidence of a Soviet attack.

> Secretary of Defense Harold Brown only the other day explained why we would not wish to rely totally on that doctrine. He pointed out that so much can go wrong, we would not want to go to war by computer.[66]

The above statements of DOD policy--as well as those quoted earlier in this paper--seem to provide ambiguous and conflicting positions. Most of this ambiguity can be resolved by recognizing three factors:

● Reflexive launch strategies include a wide range of options* within a framework of an infinite number of political/military scenarios. In other words, it is not enough to ask, "Do we want (have) a policy of "launch-on-warning?" Rather, we should ask, are there circumstances where the employment of an RLS is the obvious (or only) choice?

---

*This has been described in detail: See Figure 5 (page 40).

- The current situation is one of transition from essentially invulnerable forces to vulnerable forces--with the projection of a return to survivable land-based force posture. Any analysis of government RLS policy statements must include consideration of tense (stated or implied) (i.e., does the statement refer to current policy or future options).

- The difference between a "veiled threat" and a strategy that is dependent on reflexive response is significant. The major objective of reflexive launch options--like the weapons themselves--is to deter attack. As Richard Garwin states:

> Our preference by far is to avoid war with the Soviet Union, including war initiated by the Soviet Union with the expectation of achieving benefits worth the threats of substantial loss to the Soviet Union. Although it would be desirable to have forces which are capable of surviving nuclear war and carrying out orders of the U.S. Government during the course of such a war, it is more important to deter nuclear war. Therefore, there is a role for doctrine for the use of a capability for launch under attack/launch on impact, as well as for declaratory policy which informs others (more or less accurately) of our capability and intent.

> Doctrine and the declaratory policy cannot diverge very much for the United States, given our relatively open system of government and press. This makes more difficult the problem of establishing the doctrine and declaratory policy, but eases the task of writing about them.[67]

Colin Gray also noted the deterrent value of declarations of the possibility of employing reflexive responses:

> ...but handled properly, LOW has some deterrent merit. As an operational firing tactic, it would be monumental folly, but as a veiled suggestion of the 'we refuse to rule it out' variety it should not be despised. Responsible decision-makers must retain a small suspicion that the adversary might just launch some missiles before the incoming warheads arrived: one should not attempt totally to allay this suspicion.[68]

61

Current public policy statements such as the following one by the Department of State support this concept of "veiled suggestion:"

> ...and would the United States launch its own ICBMs once, it was determined that a massive Soviet ICBM attack was underway, thus leaving only empty holes for the Soviet missiles to hit.[69]

> Similarly, Secretary of State Vance in a quote from a recent television interview said, "No one should assume those missiles wouldn't be launched before they were struck by incoming missiles."[70]

> Harold Brown reinforced this concept of deterring uncertainty in stating, "And they would face a considerable risk that we could* launch all or part of our ICBMs before they could be destroyed--thus frustrating whatever objective the Soviet attack might have had."[71]

The most current and definitive statement of United States RLS policy is contained in the 1981 DOD Annual Report:

> Why should we not settle for the new status quo and plan to launch our ICBMs on warning, or replace MINUTEMAN--if we must replace it at all-- with what some would call a less threatening (meaning less versatile and effective) system than MX?

> These questions have several answers. The first is that it is one thing (and by no means an easy one*) to have an operational capability to launch nuclear weapons, with warning or under attack. It is quite another matter to be obliged to launch them simply to avoid losing them to the attacker. The latter posture, with its vulnerability to accidents and false alarms, and still more with its premium on hasty action rather than delibera- tion and control, is unacceptable to the United

---

*Emphasis added.

62

States. In a given situation, the President may decide to order a launch, with or without warning. The duty of the Department of Defense is to plan and procure systems so that the force can ride out an attack if that is what the situation calls for, and what the President directs. It is not our duty to force his hand.[72]

Thus it can be seen that it is not that the current U.S. policy is ambiguous, but rather that this question is a complex admixture of varying political, technical and timing elements. It is clear from the above statement as well as procurement initiatives that the current U.S. policy is to restore land-based missile system survivability as well as to enhance the capability for reflexive response. This RLS potential is designed to act as an element of general deterrence and to provide an operational capability for rapid response under appropriate situational conditions.

A. THE PARADOX OF "INTERIM SOLUTIONS"

As stated above, analysis of the utility of RLS options must be tied to both timeframe* and the political/military scenario. Comprehension of this timeframe concept aids in alleviating apparent ambiguity in both strategic literature and government statements. For example, many of those who (like Secretary of Defense Brown) believe that a survivable land-based ICBM is the only appropriate permanent solution to existing force vulnerability, see at least a threat of RLS

_____

*Timeframe refers to the state of the strategic balance (e.g., today's balance vs. 1983 relative force levels and capabilities).

63

employment as an acceptable interim element of general
deterrence.

Viewpoints regarding reflexive options generally fall
into three main categories.

- Those who abhor any use of RLS threats or operational
  doctrine.

- Those who support RLS as a permanent solution to land-
  based ICBM vulnerability.

- Those who see some utility in RLS as a part of general
  deterrence and/or a "valuable backstop if either
  super power found itself temporarily embarrassed by
  technical surprise or a tardy response to the develop-
  ment of an advisary counter-force capability.[73]

A large proportion of strategic thinkers fall into this
third group. They view relfexive options as a strategic
"spare tire:" their availability provides added confidence
when the strategic system is strong and in times of strategic
setback they provide an interim solution. This analogy of
RLS as a sort of "spare tire" aids in resolving the paradox
of "interim solutions:" that is, if RLS is acceptable as
an interim solution, why is any further action required?
As Patrick Parker has said, "This is the problem of all
'interim solutions'--they tend to be viewed as permanent
cures."[74] The other principal argument opposing reflexive
options--as even an interim solution--is that the extensive
cost and effort required to construct a credible RLS system
could better be applied to accelerating a more robust and
lasting solution. Although an excellent case exists for
accelerating critically required force modernization, the

64

hardware and analysis required to develop an enhanced RLS

capability is needed for other vital purposes* and thus

RLS may be viewed as a king of "free" option.

----

*This subject is discussed in depth later in this paper.

VI. ISSUES AND PROBLEMS

A. TARGETING FOR RLS

> However, an important issue surrounding the launch-
> under-attack option is "launch what against what
> Soviet targets--upon what degree of evidence that
> an attack of what size is underway against what U.S.
> targets?[75]
>
>   Paul H. Nitze
>   February 1979

One of the principal objections to reflexive response is
the targeting issue. This argument has it's roots in what
M. R. Gustavson calls the concept of "launch-to-destruction-
on-warning."[76] This concept-espoused primarily by those who
attempt to totally dismiss reflexive options--conveys an
image of an RLS as automatic escalation to an all-out counter-
value retaliation. Upon close examination, it becomes clear
that the false premise on which this argument is based is
that there are essentially only two types of targets--
missile silos or populations.

The argument against countervalue/population targeting
for reflexive retaliation is the obvious one of unthinking,
and possibly unwarranted, escalation. As Donald R. Westervelt
has written,

> The concept of launch-on-warning has been deplored
> in the context of a spasm-response countervalue-
> oriented strategic emphasis. It is quite a different
> situation when counterforce objectives are primary,
> when an opposing force is known to have the character-
> istics imputed to future Soviet forces, and when the
> warning is based on observation of an attack as massive
> as would be necessary in any attempt to disarm us.[77]

The case against a countersilo RLS is that we probably would not know which silos were empty and would thus expend hundreds of warheads to no avail. Further, it has been suggested that even if we did have knowledge* of the distribution of Soviet reserve ICBMs; a U.S. countersilo RLS would force escalation by driving the Soviets to exercise a launch-on-warning of their residual (countervalue) forces. A final (game theory) argument against counterforce RLS is that, given a number of assumptions, we would not improve the numbers balance in such an exchange. As T. K. Jones has stated, We have done some analysis of launch-on-warning. Assuming the Russians would launch if we did, we have found that we are worse off if both sides do it."[78] The question of relative advantage resulting from reflexive counterforce response to a Soviet first strike--like all simulations-- is most significantly influenced by the assumptions (i.e., accuracy, reliability, etc.); however, ICBM throwweight advantage results in a Soviet numerical superiority as the "bottom line" of most of these calculations.

The fact that populations and silos are not appropriate targets for reflexive responses should not be equated with a paucity of targets. As Marshal Grechko has written:

---

*This knowledge could be based on real-time reconnaissance and/or best estimate analysis (e.g., SS-18s would not be one of the targets).

The Strategic Missile Forces, which form the basis
of the combat might of our Armed Forces, are in-
tended for the destruction of the <u>enemy's means of</u>
<u>nuclear attack, his large troop formations and</u>
<u>military bases, the destruction of the aggressor's</u>
<u>defense industry, the disorganization of (his) state</u>
<u>and military command and control, and the operations</u>
<u>of his rear and transportation.</u>*[79]

Soviet writings are a useful source for compiling

"appropriate" RLS targets for it is, after all, the Soviets

whom we would attempt to deter through adoption of an RLS

posture.   Colonel M. Shirokov suggests some other possi-

bilities:

In determining these targets, application should
be made of the industrial branch principle and
the selected critical links in the economy....[80]

Shirokov suggests large power stations, oil storage/

production, large blast furnaces, steel plants, chemical

facilities, rail yards and other transportation centers.[81]

Richard L. Garwin recommends a similar target mix for re-

flexive forces:

Since it is inefficient to attempt to produce such
damage to the Soviet ICBM force, the targets should
be the highest-value targets in the conventional
military forces (divisional headquarters, marshal-
ling yards, troop concentrations, and the like),
and the United States should attack directly massive
industrial and infrastructure investments up to a
number which would result in a similar level of
casualties on the Soviet side. This would mean
primarily military-related industry, nuclear-energy
facilities, dams, aircraft concentrations, and the
like, including installations for defense against
attack by neighbors of the Soviet Union.[82]

---

*Emphasis added.

Roger Speed presents a different "problem" associated

with RLS target selection:

> The primary reason for maintaining a triad of
> strategic forces is to guarantee that, at a
> minimum, the United States can maintain an
> assured-destruction capability to deter an
> all-out attack on American cities. If a Soviet
> attack were directed only at U.S. strategic
> forces, the launch-on-warning policy would be
> faced with a dilemma. If the U.S. ICBMs were
> directed against Soviet cities, this would
> assure that U.S. cities would also be attacked,
> which is the opposite of what is desired. If,
> on the other hand, U.S. ICBMs were directed
> against Soviet military targets instead of
> cities, <u>they would no longer be available to
> deter attacks on U.S. cities. In either case,
> a LOW policy fails to serve its main purpose--
> to maintain a U.S. assured-destruction capability.</u> *83

The above analysis contains three major flaws:

- It does not consider targets other than "cities"
  (population) or "military targets." Examples
  include isolated manufacturing and energy facili-
  ties as well as dams, transportation centers and
  other key targets.

- It implies that the principal value of the U.S.
  ICBM force is <u>countervalue</u> deterrence. While
  Minuteman could be used in a countervalue/countervalue
  deterrence role, it's primary advantage lies in its
  accurate hard target kill potential.

As the FY1980 JCS Military Posture states:

> The Minuteman II's long range accuracy and single
> warhead provides a weapon for use against some
> hardened targets.

> ...Modernization programs include an improvement
> in accuracy on all missiles and the replacement
> of the MK-12 reentry vehicle (RV) with the MK-12A
> warhead on 300 Minuteman III ICBMs in FY1980-1982.
> These improvements will help the United States
> maintain current capability against an increasingly
> hardened Soviet target base. 84

69

In 1974, Secretary Schlesinger made a similar analysis:

> My own judgment is that the ICBM force always had a
> role to play except in the assured destruction
> notions which were regarded by some as a deux ex
> machina as a substitute for thinking about the
> program. 85

Harold Brown uses the following assumptions in an analysis
of U.S. response to a Soviet counterforce attack.

> We assume that the initial Soviet attack uses ICBM
> warheads against U.S. silos, forward-deployed SLBM
> warheads against time urgent C^3 and bomber ports
> and other supporting installations. The U.S. re-
> taliatory counterforce attack uses surviving ICBM
> and SLBM warheads against Soviet bomber bases, SSBN
> ports and hardened C^3 targets, and surviving ICBM
> and bomber warheads against Soviet silos.86

Speed fails to account for the deterrent value that would
remain in SLBMs and the bomber/ALCM force regardless of the
disposition* of the ICBMs.

- The motivation for a launch-on-warning policy is not
  "to maintain a U.S. assured-destruction capability;"
  the purpose is to deter a pre-emptive, counterforce
  attack and, failing that, to exercise time-urgent
  hard/semi-hard target kill capability.

Although the concept of reflexive response is hindered
by many complex--and perhaps insurmountable--problems, a
shortage of appropriate targets (short of a full scale
countervalue response) is not among them. As Soviet Major
General Anureyev has written:

> For undermining the enemy's strategic potential
> there is no need for its complete destruction.
> For this it can be sufficient to put out of action
> one of its most important elements. In this

---

*Launched-under-attack or destroyed in their silos.

connection an enormous role is acquired by the working out of the scientific criteria and principles of selection of targets, and also the means of influencing them. The qualified solution to the given problem requires the participation along with military specialists, of economists, sociologists, engineers, and physicians.[87]

B. RLS FORCE COMPOSITION

Closely associated to the targeting issue is the question of RLS force composition (i.e., How many do we launch?). The prevalent assumption is that launch-on-warning/under-attack implies launching the entire force to prevent its destruction. As Paul Wolfowitz testified, "If our response were in fact to be as swift and certain as it is supposed to be, any attack no matter how small or controlled, would result in total war."[88]

A full scale launch of several thousand Minuteman warheads-- even if aimed at military targets--would result in significant numbers of Soviet casualties, as well as loss of residual U.S. prompt hard-target kill capability. Alternatively, retention of large portions of the force, in the face of an effective all out counterforce attack, would result in its loss. Additionally, a gray area exists involving the question of how to respond to a small scale or accidental attack. Richard Garwin supports a tactic of launching a portion of the force equipped with a modification to allow a delayed arm commitment:

Only a limited number (say, 50) of Minutemen need or
should be launched--unarmed, subject to command-arm
in flight. One hopes that launch-under-attack will
never occur inappropriately, in response to false
indication of sensors, or other cause. Should such
an unwarranted launch occur, however, we would prefer
not to have armed the missiles, nor would we want to
disarm ourselves by having launched the entire ICBM
force, which would thus be lost to our future capa-
bility...It seems reasonable that no more than 50
percent of the Minutemen need be considered for launch
under attack even in the event of what appears to be
an attack against the entire force. This conclusion
stems from the observation that a pre-launch surviva-
bility of Minuteman of 0.5 would seem to preclude
great enthusiasm for rebasing of the Minuteman force
or for replacing it with an invulnerable force; hence,
achieving the equivalent survivability by a commitment
to launch as much as 50 percent of the ICBM force on
attack should be adequate.[89]

The essence of Garwin's argument is not the <u>defensive</u>

value of the proposal, but its effectiveness as a <u>deterrent</u>.

A <u>critical weakness</u> in this plan, and in fact all reflexive

remedies, is the problem of pin-down-and-destroy tactics.

As Garwin himself acknowledges:

Depending on the actual number of megatons per
minute required for pin-down, the SLBM fleet
may or may not be able to prevent the launch of
the Minuteman force. If it can, then the ICBM
force could prolong this pin for several hours.
Should the SLBM <u>not</u> be adequate to provide pin-
down, it may be <u>that</u> an ICBM raid small enough
not to trigger a launch-under-attack system
could provide a continuing pin-down while a
massive attack on Minuteman got underway. Thus,
a pin-down attack might be a way of beating a
launch-under-attack system, but only if the
threshold for pin-down were low enough.*[90]

---

*Emphasis added.

C. PIN-DOWN

The Achilles' heel of reflexive concepts is the potential disabling effect of pin-down tactics. A pin-down attack concists of a vanguard of warheads detonated above the missile fields to create a mixture of nuclear effects* that effectively prevents Minuteman launch pending arrival of the main Soviet counterforce attack.

There are two basic means of executing this tactic:

- Utilizing a small number of ICBMs to create uncertainty and inhibition of a luanch-on-warning response. This approach relies on deception to pin-down the force prior to full scale attack.

- Employment of SLBMs for pin-down prior to attack. This tactic is the most probable and relies on the short time of flight (and warning) of an SLBM attack.

It is the possibility of an SLBM pin-down tactic that is the most devastating technical argument against reflexive strategies. The essence of the problem is that even with perfect warning, the reaction time from first indication to Minuteman launch must be less than fifteen minutes.** If the thirty minute flight time of an ICBM stresses the capability of a reflexive system, then the less than fifteen minute decision window of a pin-down scenario virtually destroys the credibility of the entire concept. However, as has been stated earlier, to determine the credibility of a reflexive

---

*Electromagnetic pulse (EMP) to disturb electronics, radiation to damage warheads and dust and blast to damage missile structures.

**Use of depressed trajectory SLBM would provide less than 10 minutes' warning; see Francis P. Hoeber, Slow to Take Offense, p. 21.

response, the entire spectrum of political-military situational factors must be considered. For example, if the PAVE PAWS SLBM warning radar reports a massive launch that is the culmination of a deteriorating political crisis accompanied by extensive Soviet mobilization including significant numbers of forward deployed SSBNs, then a reflexive response capability <u>might</u> be a credible deterrant.

Although considerable uncertainty exists concerning the real-world effects of any pin-down attempt, it still remains the most significant problem affecting reflexive options. As Paul Wolfowitz states:

> The vulnerability of ICBMs during the first stage of flight means that even a few overhead detonations would prevent us from launching Minuteman. Thus we could never be certain that an attack was really a "limited" one, and not one designed to keep our missiles in their silos until a full-scale attack arrived.

> We would thus have to respond before the arrival of even a limited number of submarine-launched missiles. Such missiles can be fired from much closer to the United States along trajectories which would bring them to their targets in ten minutes or less. They could penetrate our present* radar network with virtually no warning at all. Even with improvements in our warning system, there will be at most ten minutes for our entire response, from radar sighting through the actual firing of our missiles.[91]

---

*1970

D.   "FAIL-SAFE" CONSIDERATIONS

> But almost all who have looked at this problem
> agree that once we make it an accepted or
> standard procedure to fire ICBMs on warning,
> it begins to get very easy to write scenarios
> for accidental war. Indeed, one of the main
> reasons the current system can be considered
> relatively stable and in any way "acceptable,"
> is that we assume the doctrine of both sides
> is not to fire on warning. [92]
>
> > Herman Kahn
> > 1969

One of the major hurdles facing construction of an RLS

system and adopting a reflexive posture is the conflicting

requirements of dependence on certain, rapid--virtually

automatic--response and the need for a system that precludes

inadvertent launch. Although these are not--theoretically--

mutually exclusive design goals, those systems and procedures

that optimize one of the above two goals tend to degrade the

other.

As early as 1960, Herman Kahn commented on the problems

of designing a "fail-safe" RLS system:

> A complete positive control" reaction is not possible
> for the ICBM. It cannot "fail safe." Even if one
> had a destruct-mechanism, whereby ICBMs that were shot
> off by mistake could be destroyed in the air, it would
> not be satisfactory to react to a false alarm. First,
> it would be too expensive. Second, and even more im-
> portant, we could not be sure that the destruct-
> mechanism would be 100 percent reliable. Therefore,
> it is quite unlikely that any order could or should
> be given to fire ICBMs on any but the most certain
> type of evidence. [93]

A decade later, Paul Wolfowitz drew essentially the same

conclusion:

An obvious danger arises from the fact that <u>any</u> <u>decision to "launch on warning" would have to be</u> <u>made in a short time and on the basis of early</u> <u>radar signals</u>. The crucial judgment as to the reliability and significance of the signals would necessarily be made by technicians and military officers at the observation centers. The President would have neither the time nor the technical competence to question their evaluations. If the radar operators informed him that the signals could not yet be clearly identified as coming from Russian missiles, or if his scientific adviser (if he could be reached) suggested that the signals could possibly be the result of some natural phenomenon, or if reports were coming from some radar stations but not others, the President would want an explanation, but there would be little time to obtain one. <u>Under</u> <u>such circumstances the danger of starting World War</u> <u>III by mistake would become frighteningly real</u>.[94]

The technical advances of the two decades since Herman Kahn's succinct analysis of the systemic problem of designing a fail-safe RLS system have failed to change the <u>basic</u> weaknesses of the concept. As Fred Iklé recently remarked:

The more you lean on any such system, the more you are driven to make it taut and rapidly responding, which means that you're increasing the risk of some kind of short circuit. Making the system taut could also mean putting incredible responsibility on some tech sergeant in the innards of the system. The more quick and automatic it is, the more you're turning over decisions--the most fateful decisions in the nation's history--to people far removed from the President and the Joint Chiefs. [95]

Three events within seven months during 1980 substantiated Mr. Iklé's contentions. The first incident involved a NORAD computer mechanical malfunction that allowed an alert signal on a simulation tape to be broadcast to some of the strategic forces. Then, during one week in June,

two additional computer malfunctions "set off a false warning of a Soviet multiple missile attack."[96] In all of the above incidents the miscalculation was quickly discovered and the strategic force alert cancelled. It is precisely because the current strategic suite is not totally dependent on reflex for survival that disaster was averted in these three incidents. Additionally, reaction to these incidents was moderate (precautionary alert) because they occurred without other political or military signals.

Some analysts like William R. Graham believe it is beyond the state-of-the-art to design an accident proof "launch-on-warning" system:

> Therefore, to be consistent with nuclear weapon safety requirements, the mandatory "Launch-on-Warning" system would have to be much less susceptible to unwarranted triggering than are individual nuclear weapons. For something so complex as the "Launch-on-Warning" system, satisfying such a safety requirement goes beyond the range of existing technical experience, and becomes at best a highly speculative endeavor.[97]

This concern is compounded by the requirement of insuring that weapons are launched in an actual attack. A reflexive system consists of two major elements, a communication system and a sensor network; Graham views both of these element as intrinsically fragile and thus susceptible to failure and/or attack:

> ...sensors tend to be fragile. As they must necessarily be rather sensitive devices, the possibility exists that they could be "jammed,"

or fed a high level of interference. They would also be subject to destruction by either nuclear or non-nuclear direct attack. The system would then degenerate to one of "Launch-on-Blindness" or "Launch-on-Loss of Sensor," rather than "Launch-on-Warning."

Communication systems contain long, tenuous paths separated by isolated nodes. Jamming has the potential to be effective against the paths, while the nodes may be subject to direct physical attack. Providing rigorous protection for either long communication paths or isolated and often unattended nodes has not in the past proven to even approach being practical.*[98]

Finally, the final link in an RLS system is the President who must react quickly and determine if a launch is indicated. Given the automation and complexity of an effective RLS system, there is reasonable doubt as to whether a President would hesitate to take so grave a step based solely on sensors, signals, and readouts.** As Deborah Shapley states:

Politically, a launch-on-warning policy would raise a storm of domestic controversy, not only from arms controllers, who would worry about the dangers of such hair-trigger launches, but from conservatives who would complain that a President confronted with blinking machines and a horrendous choice might hesitate, do nothing for 25 minutes, and lose his land-based ICBM's without striking back in return.[99]

E. THE POLITICAL PROBLEMS OF A "HAIR TRIGGER" DETERRENT

  1. Reaction Time and the Decision Process

     If one word can be used to describe the fundamental

---

*Emphasis added.

  **It is one thing to react to a phone call that states "Mr. President, Minot is under attack"--it is quite another to respond to "...the PAVE PAWS system indicates an SLBM launch"--(Eight minutes and counting).

<u>flaw</u> in any reflexive remedy to ICBM vulnerability it is
<u>time</u>. Though existing technology has provided the maximum
possible warning time, human limitation becomes the ultimate
constraint.

Paul Wolfowitz in his definitive Senate testimony
emphasized that time constraints are <u>inherent</u> in the human
decision process (for so grave a decision) and are not
simply due to "technical" (i.e., resolvable) deficiencies:

> It is suggested that we would have twenty
> minutes of warning before an attack arrived.
> This is very little time just for making such
> a decision--to say nothing of first transmit-
> ting the warning to the President (whatever
> the time of day or night and wherever he might
> be), and afterwards transmitting the orders to
> launch. In addition time would be needed just
> to distinguish radar indications of an impending
> attack from the background of innocuous and
> spurious signals. There would be no time to
> clarify ambiguities in the radar signals, to
> investigate the source or the extent of the
> attack, or to adjust our plan of retaliation.
> The example of Pearl Harbor, and more recently,
> the <u>Pueblo</u> seizure, show that messages and
> warnings may travel slowly and arrive too late.
>
> Steps would certainly be taken to speed the flow
> of information if our deterrent depended solely
> on timely warning. But a dilemma exists which
> no amount of care or expense can eliminate com-
> pletely. By reducing the amount of checking
> and consultation and increasing the speed of our
> reaction, we would increase the risk that inade-
> quate information or unauthorized commands could
> result in accidental war. A warning system which
> alerted the President at the first unidentified
> radar blips would, at a minimum, increase
> tensions--unless, like the "man who cried wolf,"
> the warnings began to be ignored. At worst, such
> a warning system could start World War II by
> mistake.[100]

As Herman Kahn described the problem:

> In analyzing the usefulness of any warning and
> reaction proposal, we should differentiate
> between the physical reaction time--that is,
> the time it takes the system to implement the
> order to institute any particular reactions--
> and the _effective_ reaction time which includes
> the time for receiving information, evaluating
> it, and making the decisions to react in an
> appropriate way. The more innocuous the reac-
> tion and the better the information gathering
> and evaluation, the more automatic and fast we
> can afford to make the reaction.[101]

Although time is the crucial factor in the reflexive

scenarios, many analysts have focused on the wrong aspect of

this time constraint. Amoretta and Francis Hoeber, for

example, have included target selection as a requirement

of the decision process: "With almost zero decision-making

time available, the policy question would arise, launch-on-

warning against what?"[102] While it is true that, in many

scenarios, the time required for the decision process may

exceed the time available (and that target _systems_ must be

selected), the target issue has been overemphasized. A

spurious element in the discussion of time constraints

and the decision process is a dual part _assumption_:

- -that the specific response (i.e., force
  level and target(s) for a reflexive option
  must be developed "on the spot." Some ob-
  servers attempt to paint a picture of a
  blear-eyed President in his pajamas toiling
  over a target map with six minutes to go
  before impact. In fact, detailed options
  can and must be preselected for a reflexive
  system. In such a system a selection would
  be made from a menu of appropriate responses.

- the second interacting and false part of this
  assumption is that if RLS is completely dis-
  carded and survivable forces constructed,
  decisions could be carefully developed in any
  post-attack* environment. The point is that
  the same--previously discussed--vulnerabilities
  of reconnaissance and C^3 assets that might obvi-
  ate RLS also severely limit the capabilities for
  post-attack analysis. It is simply not true
  that a "better" decision can be made through
  post-attack analysis: If the White House, the
  Pentagon, the CIA/DIA, the defense satellites,
  and communication links with forces/allies have
  been destroyed, can a "better"** decision be
  made? Who would make such a decision and what
  would be its objective?

The question of decision-maker and the devolution of

authority are also a problem for the reflexive system

decision process. Richard Garwin suggests one solution:

> Naturally, the NCA is not the person of the
> President but his duly constituted power, as
> provided by law. The preservation of NCA for
> the period of decision to launch under attack
> is a lessor problem than its preservation
> throughout a prolonged nuclear war. In particu-
> lar, there should be a clearly designated line
> of devolution of the NCA authority in certifying
> the assessment of a massive Soviet raid on the
> ICBM silos so that the previously-taken decision
> to launch under attack will proceed; however,
> the President himself, having the authority to
> retrieve all powers of the President when he is
> in communication, would be able to veto the
> decision to launch, if his communications provide
> him with data on which he feels able to judge.
> A cryptographic authentication method will ensure
> that the veto comes from the President.[103]

Such a plan, however, has several serious drawbacks;

as William Graham states:

---

*There is no doubt that survivable forces (e.g., MX) are
required to markedly enhance deterrence and reduce incentive
for attack.

**i.e., "better" than during the trans-attack period.

Finally, the key person at the end of the chains, presumably the President, has historically proven to be vulnerable to small but determined attacks. Since there is no way to assure the survival of the President at all times, a predelegation of ICBM launch authority would have to be made if the "Launch-on-Warning" policy was to continue to be credible immediately following the removal of the President, a possibility that frequently could be under the control of the Soviets. Furthermore, the devolution of authority to a predelegated chain of successors to the President would have to be carried out so smoothly that not even minutes would be lost in establishing who was to make the decision to launch the ICBMs, locating him, and providing him with the necessary facilities and information. In addition to presenting another impediment to the timely operation of a launch-on-warning system, by increasing the number of persons who must be able to launch the ICBMs, the issue of pre-delegation and continuity of authority creates additional problems in the area of nuclear safety.[104]

In the final analysis, the answer to the question, "Is there sufficient time to exercise LOW/LUA?" is again dependent on the military/political scenario. Two basic possibilities exist:

- Escalation within the context of a political/ military crisis.

- Surprise attack

In the first case, a "rational" excursion up the escalation ladder, a threat of reflexive response would be credible. International stakes, positions, and consequences would all have been calculated. Most significantly, as the situation deteriorated the requisite (attack/retaliate)

mind-set would exist to enable swift response. A crisis situation in which a significant portion of one side's forces are temptingly vulnerable is obviously an _unstable_ one; but it is also this imbalance that makes the possibility of reflexive response a credible deterrent. The resulting crisis instability is the principal problem of vulnerable forces shielded only by the option of "quick-draw" tactics.

The second case, _surprise attack_, is more demanding. It is one thing for a President to order a launch-under-attack in the wake of a major confrontation while flying in the E-4 (Airborne Command Post). It is quite another to imagine the President being awakened at 0400 and told: "Mr. President, we have satellite and PAVE PAWS indication of a massive Soviet assault on the central U.S.--there are also conflicting reports of Soviet conventional mobilization. We have rechecked all our sensors and estimate first impact (SLBM) in five minutes." Such a chilling scenario--if possible--would virtually rule out a credible reflexive response. Although reflexive response is least credible for a "bolt from the blue" attack, a "bolt from the blue attack" is itself the least credible possiblility.* Even the classic "surprise" attack at Pearl Harbor cannot be considered to be a "bolt from the blue;" it occurred within the context of an already grave world situation. The problems

_____

*However, the fact that a capability/possibility exists, demands development of defended or mobile ICBM forces.

83

associated with developing a disarming first strike that is
supportive of rational political goals are as insurmountable
as designing a foolproof launch-on-warning system. The key
element of this assertion is the concept of rational goals.
The enormous risks assumed by a Soviet initiated "surprise"
thermonuclear attack would have to be balanced by the pro-
bability of achieving significant goals. To achieve such
goals (e.g., occupation of western Europe) extensive prepa-
ration would be required. As Sidney Drell testified:

> In particular he (T. K. Jones) calculates that
> "A full three-day evacuation of the type called
> for in Soviet plans would reduce fatalities to
> no more than 10 million people."

> ...We can assume that the United States would
> have at least three full days of intelligence
> available of ominous and imminent Soviet in-
> tentions as they evacuate their cities. Under
> these circumstances I can neither accept nor
> understand the assumption in his calculations
> that no more than one-half of our strategic
> arsenal would survive a Soviet first strike
> and be available for retaliation. To the con-
> trary, an appropriate U.S. response in the face
> of this clearly provocative Soviet action could
> be to put our entire retaliatory arsenal on the
> highest status of alert and out on station. The
> President could announce furthermore that we are
> moving to a launch-on-warning policy for the
> duration of the provocation.*105

Of greatest import is not that surprise attacks are
improbable, but rather that they are possible. Throughout
history surprise attack could and did occur; and although
a surprise nuclear attack may not appear "rational,"

---

*Emphasis added.

84

rationality is a direct function of both circumstance (dynamics) and perception (values).

Technology has theoretically reduced the prospect of surprise, but the problem of <u>too little data</u> has been replaced by one of <u>too much data</u>. The sheer volume and attendant possibility of ambiguity could dictate hesitation and a failure to act promptly. Roger Speed offers some additional considerations:

> Although the United States may be confident of its capability to detect an impending attack, the historical record gives little justification for such confidence.
>
> ...The predominant viewpoint is that although there are generally clear indications of an approaching crisis, these signals are usually lost in the noise of competing and contradictory signals. Others have argued that deception is the key to surprise. That is, background noise is not always just irrelevant information but often a deliberate attempt to transmit disinformation to deceive the other party. This was the case not only in Hitler's surprise attack on Russia but also in the Arab attack on Israel in 1973.[106]

The problem is that even if warning signals are available, they may be ignored. This results from what Speed describes as, "a tendency to 'mirrow image' and to act under the assumption that the other side shares one's own conceptual framework...."[107] Comprehension of the limitations of "mirrow image" analysis <u>does not necessarily</u> equate to gloomy prospects for the United States. As Joseph I. Coffey states:

One need not postulate either wholly rational or completely benevolent Soviet leaders virtually to rule out such a "strike from the blue" against NATO Europe (or against the United States). Indeed, one anthropologist characterized the belief that the U.S.S.R. might launch a first strike as "...a projection of our own (American) image of what happens when two opponents face each," and not as a realistic assessment of Soviet behavior.[108]

Unfortunately, analysis of Soviet writings does not support

Coffey's contention. As Joseph D. Douglass, Jr., and

Amoretta M. Hoeber have written:

The preponderant base of evidence in the Soviet literature designed for internal use calls for their striking first against the West with maximum surprise when the situation calls for war and when the factors are in the Soviet favor.[109]

A statement in Voyennaya mysl supports this analysis:

...And confidence in the success of a nuclear attack can occur in conditions whereby there is a sufficiently high guarantee that nuclear strikes will be delivered to the objectives   . of destruction, that a mass launch of ballistic missiles and takeoff of aircraft will occur for a relatively long time undetected by the country against which the attack is being carried out, and that the armed forces, and above all the strategic nuclear means of the enemy, will suffer such destruction that they will be incapable of carrying out a powerful retaliatory nuclear strike.[110]

While an isolated quotation from a Soviet military journal

(circa 1968) does not equate to an inside look at the

Russian game plan for WWIII, it does shed some light on

the questions of "minor imaging" and Soviet strategic logic

pattern.

The problem with surprise attacks is not their high probability, but rather their devastating consequences. Although analysis based on averages, theory, and cost/benefit trade-off might support a case for maintaining a force "protected" only by firing doctrine, the consequences of miscalculation--no matter how "improbable"--are so grave that the risk is unacceptable. As Douglass and Hoeber conclude:

> Therefore, although an attack out of the blue is often regarded in the United States as a "worst-case" fantasy and not "worth spending much money on" and although it may be impossible--by definition--to conclusively support the idea that anyone, including the Soviets, would deliberately start a global nuclear war, the converse, i.e., that they would not strike first, is extremely difficult to consider valid in the absence of an enormous change in the foundation of their underlying military thought--laws, principles, tactics, strategy, and doctrine.[111]

2. Soviet Perceptions

Analysis of the threat of counterforce attack and the offsetting utility of reflexive options must include an assessment of Soviet perception. Important to this analysis is Soviet perception of U.S. response and predictability; as Jiri Valenta has written:

> Several times in the past, Soviet leaders had been unpleasantly surprised by U.S. responses, such as the U.S. intervention in Korea in 1950, Kennedy's blockade of Cuba in 1962, and the decision to bomb North Vietnam while Kosygin was visiting Hanoi in 1965. As Soviet Foreign Minister Gromyko once complained to U.S.

87

> Ambassador J. L. Beam: "You're so unpre-
> dictable. We can't count on American
> policy."*112

Soviet statements and literature demonstrate that they

are well aware of the technical and political aspects of

reflexive response. For example, in 1959, when the Soviets

found themselves vulnerable to attack, they espoused RLS

as a deterrent:

> A vivid exhibition of national impulsiveness
> at the highest level of government was
> described by Averell Harriman in his account
> of a meeting with Krushchev in 1959. "Your
> generals," said Khrushchev, "talk of main-
> taining your position in Berlin with force.
> This is bluff." With what Harriman describes
> as angry emphasis, Khrushchev went on, "If you
> send in tanks, they will burn and make no
> mistake about it. If you want war, you can
> have it, but remember it will be your war.
> Our rockets will fly automatically." At this
> point, according to Harriman, Khrushchev's
> colleagues around the table chorused the word
> "automatically."*113

In the above performance, Khrushchev emphasized not only the

force survival element of reflexive response, but also the

need for adversary caution resulting from the Soviet Leader's

"tenuous" control of force commitment. Although access to

authoritative Soviet technical publications is limited,

the following excerpt exemplifies Soviet consideration of

a U.S.S.R. (or U.S.) reflexive response to counterforce

attack:

---

*Emphasis added.

The combat readiness of strategic missile
complexes is defined as the time required
for preparing missiles for launch from
different conditions. There are four
classes of combat readiness, depending on
the condition of the complex: transport,
constant, high, and total combat readiness.
The highest level of combat readiness is
total combat readiness, characterized by
time t_v for preparation and launch of
missiles.

During designing of missile complexes,
efforts are made to reduce t_v to a minimum.
The reason for this is that as t_v is decreased
it is possible to launch a large number of
rockets before attacking warheads of the
enemy fall upon the combat positions. However,
a reduction in the time of preparation for
launch and the launching of missiles is usually
brought about by adding extra equipment. There-
fore, it is accompanied by a reduction in relia-
bility and an increase in the cost of the
complex.*[114]

In addition to espousing RLS advantages, the Soviets

have also articulated the technical <u>vulnerabilities</u> of re-

flexive tactics:

A considerable threat to the intercontinental
ballistic missiles are powerful nuclear explo-
sions set off at great altitudes, because the
impulses of electromagnetic energy created by
such explosions can put out of commission not
only the on-board missile equipment, but also
the ground electronic equipment of the launch
complexes.[115]

Joseph Douglass and Amoretta Hoeber postulate a Soviet strategy

including the exploitation of these effects (time urgent pin-

down and ICBM C^3 attacks):

_____

*Emphasis added.

A U.S. launch-on-warning capability is a major
concern of the Soviets may be the U.S. strategy
that they assume in their analyses. It is
quite possible that part of the motivation for
stationing missiles in Cuba might have been--
and may still be--associated with the desire
to strike extremely time-sensitive targets (e.g.,
command/control centers) before appropriate
actions to launch the Minuteman missiles could
be taken. In this regard, the Soviets recognize
explicitly that one of the advantages of
submarine-launched ballistic missiles is that
they can be launched near the United States and,
hence, have a shorter flight time. This enables
the Soviets to increase the probability of
destroying command/control and launch centers
prior to the launch of the missile force. The
submarine component of Soviet forces, therefore,
may well be designed at least partially to be
used early, rather than to be withheld, as has
been the U.S. approach.[116]

Soviet military writing is dominated by emphasis on

the element of surprise in conducting disarming attacks. For

example, Lieutenant General Shuryrin stated that:

...one must keep in mind that the aggressors
will not be able to make full use for their
purposes of their strategic means of attack.
A portion of these means of weapons delivery
will be destroyed or damaged before their
launching while they are still on their
launch sites, bases and airfields: another
portion will be destroyed or damaged by the
weapons of the Air Defense in flight at the
approaches to the territory of the socialist
camp; still another portion of the missiles
and aircraft will fail to reach their targets
for technical reasons (i.e., malfunction).[117]

Recognizing the decisive significance of a surprise

counterforce attack, the Soviets are prepared to employ

reflex to counter it. This option will become even more

important if the United States continues to improve its

hard target kill capability* and the Soviet Union continues
to maintain 75 percent of their warheads in fixed land-based
ICBMs. L. Glagolev and V. Larionov in an article in Inter-
national Affairs (Moscow) prescribe a solution to force
vulnerability:

> The first missiles and bombers of the side on
> the defensive (i.e., the Soviet side) would
> take off even before the aggressor's first
> missiles to say nothing of his bombers arrive.[118]
>
> ...Foreign military analysts' were said to be
> 'talking through their hats' when they claimed
> that 'Soviet nuclear rockets are highly vulnera-
> ble and (therefore) designed for a first and not
> a counter-strike;' 'An aggressor would be unable
> to destroy all the counter-strike means with his
> first salvo, for these means...are dispersed.
> A considerable part of them is constantly on the
> move. Another, even greater part, is in a state
> of almost instant readiness to take off. It is
> physically impossible--to knock out all the
> counter-strike means simultaneously.'[119]

Despite the extensive and sustained drive for ever
increasing and throw-weight, as exemplified by the SS-18,
the Soviets continue to contend that they are not building
a first-strike counterforce capability. Trofimenko in 1977
stated:

> The Soviet Union does not subscribe to the
> "first-strike doctrine." This fact is well
> known and has been reaffirmed recently by
> General Secretary of the CPSU Central
> Committee L. I. Brezhnev in his important
> foreign policy speech in Tula on January 18,
> 1977. Brezhnev described as "absurd and
> totally unfounded" the allegation that the
> Soviet Union "strives for superiority in
> armaments with the aim of delivering a
> 'first strike'...The Soviet Union has always
> and remains a convinced opponent of such
> concepts."[120]

---

*Minuteman/MK12A; the Advanced Ballistic Reentry System
(ABRES); MX/AIRS; TRIDENT; and the Navy's MK500 MARV.

This disparity between observed Soviet capabilities and statement such as the one above can best be explained by the statement in Colonel N. F. Miroshnichenko's <u>Military Herald</u> article:

> An indispensible condition for achieving surprise is secrecy. However, achieving it is not easy. For this, along with arrangements for countermeasures of the enemy's reconnaissance, it is necessary to perfect constantly the means and methods of camouflage and of disinformation, to raise the tactical training of officers, their knowledge of the enemy, his tactics, and his strong and weak sides.*121

It is clear from the logic of Soviet hardware, despite the ambiguous character of Soviet pronouncements, that they maintain a capability for launch-under-attack and expect that the U.S. may--under the proper conditions--exercise its own RLS potential.

3. <u>U.S. and Allied Perceptions</u>

> The launch-on-warning option is addressed re-luctantly by strategic analysts who see it at best as an option of desperation.122
>
> > Walter F. Hahn
> > 1978

> ...we are set on the road to launch-on-warning, a reckless and uncertain course of action that no nation with our resources should ever need resort to in desperation.123
>
> > William R. Van Cleave
> > 1980

---

*Emphasis added.

92

To have a credible deterrent it must first appear
credible to ourselves and our allies. This is one of the
principal reasons RLS cannot be a substitute for survivable
forces; the United States public and our allies would never
be secure with such a tenuous and vulnerable posture. It
is not RLS as part of an entire range of strategic options*
that would cause uneasiness, but rather a dependence on
reflex for force survival.

As Johan J. Holst stated:

> Nor would a doctrine which made deterrence
> dependent on a launch-on-warning (LOW)
> posture seem particularly attractive to an
> allied observer who is not only interested
> in the credibility of the American commit-
> ment to the defense of Eruope, but also
> concerned about the possibility of becoming
> enbroiled in a devastating conflict because
> of American miscalculations.[124]

Amoretta and Francis Hoeber see a more subtle per-
ceptual problem surrounding the launch-on-warning issue:

> ● Launch on categorical warning might leave
> forever obscure in the eyes of the world
> the question of who really made the first
> nuclear strike. This is a nontrivial
> question, unless one assumes the world
> truly is wiped out in such an Armageddon--
> in which case launch-on-warning is certainly
> madness.[125]

_____

*For example, survivable forces could be upgraded to
LAA as a deterrent during a crisis.

93

4. Crisis Stability

> The outcome of the crisis depends simply on
> who first finds the suspense unbearable.
> If the leaders on either side think the
> leaders on the other are about to find it
> unbearable, their motive to throw the switch
> is intensified.[126]

>   Thomas C. Schelling
>   1966

If pin-down is the most critical <u>technical problem</u>

of a launch-on-warning doctrine,* then crisis stability must

be considered its most serious political weakness. As

Herman Kahn viewed the problem:

> ...Under some circumstances our vulnerability
> to a Russian first strike would both tempt the
> Russians to initiate a war and at the same
> compel them, because they might feel that we
> would be tempted to preempt for our own
> protection....[127]

Kahn's message is that vulnerable "deterrent" forces heighten

paranoia and reduce crisis stability. The problem is further

aggravated in a situation, like the current one, in which

the Soviet Union possesses significant counterforce capa-

bility while we have much less. As Arthur Waskow summarized

the dilemma of the deadly combination of counterforce with

LOW as the "solution:"

> With the pressure so enormous and the stakes
> so high, there can be little doubt that each
> side would be forced to try to fire first, pre-
> empting the other's attack. Every major inter-
> national crisis would press both sides quickly
> to the brink of war, and if counter-force
> strategy had been highly developed, beyond the
> brink. Hair-trigger responses are built into
> counter-force strategy even if they are dis-
> claimed by counter-force strategists.[128]

---

*See page 73.

94

VII. THE FUTURE OF RLS

Because reflexive launch strategies are not sufficiently robust to be the primary shield for ICBMs, many observers would draw the erroneous conclusion that survivable forces (i.e., defended and/or mobile) could and should completely--and finally--eliminate the requirement for "hair trigger" response capability. This analogy ("hair trigger") is an appropriate one; although it would be unacceptably dangerous to have an _individual's_ survival reliant on carrying a perpetually cocked pistol, we would by no means suggest that there are no cases in which the option to cock the gun--for deterrence or defense--would be valuable or even vital. Construction of vitally needed survivable forces will allow us to "uncock the gun," but it will not guarantee that reflexive capability won't be required in the future. Even with "survivable" forces, RLS may be required in two cases; unforeseen vulnerability and general deterrence:

- Unforeseen vulnerability of ICBMs or defenses:

  Essentially, there is no "ultimate" weapon. For example, some defense snalysts have argued that MX can be checked simply by increased Soviet fractionation:

  > If the U.S.S.R. were to respond to MX deployment by increasing the number of its warheads, it could defeat the proposed multiple-shelter scheme for each of 200 MX missiles simply by attacking all the shelters simultaneously.

> To make the shelters as protective as those
> for our current Minuteman ICBMs would be
> prohibitively costly; it also would invite
> the U.S.S.R. to set up a similar system,
> presenting serious new problems of verifi-
> cation for U.S. reconnaissance systems.*[129]

The question does not revolve only around MX, but rather all

strategic systems. The classic principle of Jomini still

applies: Offense can saturate defense at its weak point.

ABMs can be overwhelmed and even the "ultimate" strategic

defensive weapons, space based lasers and particle beam

weapons, require c^3 and tracking systems that are vulnerable

to jamming and/or deception.

- The second case is general deterrence. The theory is
  that survivable forces simply shift vulnerability from
  weapons to the centers of political, military and
  economic power.

Preemption can work in two ways. First and more conventionally

preemption can destroy weapon (i.e., land based ICBMs); a

second more subtle effect is the ability to obviate the will

and/or the capacity to launch these weapons. Now there is

no doubt that despite the myriad of uncertainties involves in

assuring the ability to destroy weapons, this task is far

more predictable than the ability to destroy the will to act.

However, the question remains that if we completely reject

RLS (in this case launch-after-attack) even as a deterrent

assertion, would we not be theoretically vulnerable to a

---

*The author does not support the contentions of this quote,
but instead presents it to illustrate that theoretical vulnera-
bilities frequently emerge even before new weapon systems are
"off the drawing boards."

counterforce (bomber/ALCM, C^3, SLBMs in port, etc.)/counter-state attack? If, for example, Soviet SS-18s were retrained on Washington and the New York, Chicago and Los Angeles financial districts, could a preemptive strike cripple U.S. ability and/or will to retaliate? Simply stated a properly placed bullet in the head or heart can have the same "disarming" effect as one that destroys the gun itself. In 1962 Arthur Waskow discussed the same problem as it related to an earlier "survivable" strategic system:

> Rational control must rest on extremely
> effective communications, and communications
> would surely be one of the first casualties
> of a thermonuclear war. It will be extremely
> difficult even to assess the damage to American
> forces caused by the first strike against us.
> Missilemen in one country will probably have no
> way of discovering whether the missile bases in
> the next county are still capable of firing.
> To get any clear picture of what damage we have
> done the enemy will be enormously more difficult.
> Assuming that an American government is still
> functioning after the attack, it will have to
> try to give orders without knowing its own sur-
> viving defenses, the power left to its own
> striking arm, or the targets still requiring
> destruction in the enemy's territory. [130]

If survivable forces are complemented by the <u>ability</u> and <u>stated determination</u> to respond swiftly (LUA or LAA), the incentive-however remote--to attempt to destroy the nerve center of the strategic systems is reduced.

Finally, the future may well provide significant advances in the key elements of a reflexive system. Improvements in sensors and C^3 could change many of the assumptions pertaining

to RLS. Of particular significance, would be development of a real-time, man-in-the-loop (i.e., space or ground-based) all-weather imaging ballistic missile warning sensor.* As previously stated, it is unacceptable to expect a President to act based _only_ on "flashing lights and radar blips," but if he could sit in his office and actually watch the 300 "SS-Xs" lift-off on his wall screen, then the decision process takes on a completely different character.

---

*This system _like any system_ would also have its vulner-
abilities.

98

VIII. CONCLUSION

The emotion found "between the lines" of most references*
to reflexive options, results from over-simplication of what
is actually a complex issue. Inconsistent nomenclature and
incomplete definitions compound the problem: analysts
frequently lump the entire RLS concept under the misleading
(and emotionally charged) term "launch-on-warning." The
third aspect of the problem of understanding the role of re-
flexive responses is the tendency to discuss RLS outside the
context of a complete political-military scenario. Herman
Kahn, in a 1969 article about the ABM systems, stated:

> The worst (and it is typical of how extreme some
> people have gone in their opposition to this
> system) is that we fire our Minuteman missiles
> on fifteen minutes warning of an attack rather
> than follow the current procedure which is to
> have a capability for such firing but basically
> to expect to ride out any attack on our strate-
> gic forces before making any decision to fire.
> It is still worthwhile to have the capability
> to fire in a minute or so for a number of reasons.
> For one thing, it makes the opponent cautious.
> He can't be sure that you won't fire. For
> another, you may, in various circumstances,
> have to change doctrine at the last moment.**131

Finally, RLS hardware is required, whether or not the
doctrine is adopted. The critical RLS warning and C^3I
systems are also required for the bomber/ALCM carriers,

---

*E.g., Walter F. Hahn titled his editorial on the subject,
"Launch in Desperation?"--Strategic Review, 6 (Summer 1978).
(Emphasis added.)

**Emphasis added.

99

submarines in port, civil defense, exposed mobile ICBMs and any possible future ABM system. As William Graham has testified, "Since the strategic bomber force does depend upon launch-on-warning for its survival, the U.S. must in any case maintain an elaborate attack warning system."[132]

Although reflexive options will continue to play a role both as an element of general deterrence and an interim backstop for current strategic force deficiencies, they do not provide sufficient depth or flexibility to be utilized as a permanent doctrinal shield for inherently vulnerable land-based ICBMs.

FOOTNOTES

1. Herman Kahn, On Thermonuclear War (Princeton: Princeton University Press, 1960), p. 259.

2. Richard L. Garwin, "Launch Under Attack to Redress Minuteman Vulnerability?" International Security 4 (Winter 1979/80), p. 124.

3. F. P. Hoeber in Strategic Options for the Early Eighties, Ed., Wm. Van Cleave and W. Scott Thompson (New York: National Strategic Information Center, Inc., 1979), p. 144.

4. Marshal P. A. Rotmistrov quoted in Robert Roman, The Rockets Red Glare (San Jose: Academy Press, 1970), p. 71.

5. John S. Foster (DDR&E) in Hearing Before the Committee on Armed Forces United States Senate Military Implications of Anti-Ballistic Missile Systems and the Interim Agreement on Limitation of Strategic Offensive Arms, 92nd Congress, 2nd Session, (Washington, DC: U.S. G.P.O., 1972), p. 271.

6. Col. V. V. Larionov, "New Weapons and the Duration of War," Red Star, March 1965, reprinted in William R. Kintner and Harriet Fast Scott, The Nuclear Revolution in Soviet Military Affairs (Norman: University of Oklahoma Press, 1968), p. 61.

7. See DoD Annual Report, FY 1981, p. 85.

8. James Schlesinger, DoD Annual Report, FY 1976 and FY 197t (Washington: U.S. G.P.O., 1975), p. II-4.

9. Herman Kahn, On Escalation, (New York: Hudson Institute, 1965), p. 174.

10. Hearing before the Subcommittee on Arms Control, International Law and Organization of the Committee on Foreign Relations United States Senate Ninety-Third Congress Second Session (U.S. Soviet Strategic Doctrine and Military Policies, 4 March 1974 (Washington: U.S. G.P.O., 1974), p. 15.

11. For an excellent discussion on the MIRV threat to Land Based ICBMs, see: Lynn Ethridge Davis and Warner Schilling, "All You Ever Wanted to Know About MIRV and ICBM Calculations But Were Not Cleared to Ask," Journal of Conflict Resolution 17:2 (June 1973), pp. 202-241.

12. Lieutenant Colonel V. M. Bondarenko, "Military-Technical Superiority: The Most Important Factor of the Reliable Defense of the Country," Communist of the Armed Forces reprinted in William R. Kintner and Harriet Fast Scott, The Nuclear Revolution in Soviet Military Affairs, p. 365.

13. Barry Carter, "Nuclear Strategy and Nuclear Weapons," in Nuclear Strategy and National Security Points of View, ed., Robert J. Pranger and Roger P. Labrie (Washington: American Enterprises Institute for Public Policy Research, 1977), p. 239.

14. Herman Kahn, "The Case for a Thin System," in Why ABM, ed. Johan J. Holst and William Schneider, Jr., (New York: Pergamon Press, 1969), p. 75.

15. Sidney D. Drell and Frank von Hippel, "Limited Nuclear War," Scientific American, 235:5 (November 1976), pp. 27-28.

16. John D. Steinbruner and Thomas M. Garwin, "Strategic Vulnerability, The Balance Between Prudence and Paranoia," reprinted in Robert J. Pranger and Roger P. Labrie, op cit, p. 250.

17. Colin S. Gray, The Future of Land-Based Missile Forces (Adelphi Paper #140) (London: The International Institute for Strategic Studies, 1977), p. iii.

18. Clarence A. Robinson, Jr., "Space-Based Systems Stressed," Aviation Week and Space Technology, 3 March 1979, p. 33.

19. Albert C. Hall, "The Case of an Improved ICBM," Astronautics and Aeronautics, February 1977, p. 31.

20. Gen. Ellis cited in Edgar Ulsamer, "In Focus," Air Force Magazine, December 1979, p. 20.

21. Wm. Schneider, Jr., "Survivable ICBMs," Strategic Review IV:4 (Fall 1978), p. 17.

22. There is considerable uncertainty regarding these effects.

23. Albert C. Hall, "The Case for an Improved ICBM," P. 30.

24. The U.S. DoD is developing a system known as Integrated Operational Nuclear Detection System (IONDS) to "...detect, quickly locate and report nuclear detonations on a global basis. The system will provide nuclear trans- and post-attack damage assessment information to the NCA. To increase the survivability of our nuclear damage assessment system we plan to install detection sensors on the satellites of the

NAVSTAR Global Positioning System (GPS) in addition to early warning satellites which host our current nuclear detection sensors." Harold Brown, Annual Report Fiscal Year 1981 (Washington, DC: U.S. Government Printing Office, 29 Jan 1980).

25. Garwin, "Launch Under Attack to Redress Minuteman Vulnerability, p. 126.

26. This subject area is also covered in the "technical advances" section of this paper. See also: Clarence A. Robinson, Jr., "ICBM Survivability Aid Studied," Aviation Week and Space Technology, 25 February 1980, p. 16.

27. Ibid.

28. Ibid.

29. Harold Brown, Annual Report Fiscal Year 1981 (Washington: U.S. G.P.O. 1979), p. 136.

30. Richard Garwin, "Launch Under Attack to Redress Minuteman Vulnerability," p. 118.

31. Wm. Graham and Paul H. Nitze, "Viable U.S. Strategic Forces for the Early 1980's," Strategic Optiosn for the Early Eighties, ed. Wm. R. Van Cleave and W. Scott Thompson, p. 132.

32. Colin Gray, The Future of Land-Based Missiles, p. 14.

33. Seymour Zeiberg, "Strategic Systems Outlook," National Defense July/August 1979, p. 27.

34. Colin Gray, op cit, p. 14.

35. Harold Brown, Annual Report Fiscal Year 1981, p. 142.

36. Edgar Ulsamer, "In Focus," p. 20.

37. Harold Brown, Annual Report Fiscal Year 1981, p. 140.

38. Ibid.

39. Wm. Schneider, Jr., "Survivable ICBMs," Strategic Review IV:4, (Fall 1978), p. 16.

40. Albert Hall, "The Case for an Improved ICBM," p. 30.

41. Clarence A. Robinson, Jr., "Survivability, Accuracy, Yield Pressed for Minuteman," Aviation Week and Space Technology, 22 Oct 1979, p. 40.

42. Paul W. Wolfowitz, "The Proposal to Launch on Warning" in U.S. Congress, Senate, Committee on Armed Services, <u>Authorization for Military Procurement, Research and Development, Fiscal Year 1961, and Reserve Strength, S3367 and HR 17123</u>, 91 Cong., 2nd Sess., 1970 (Part 3).

43. Richard Garvin, "Launch Under Attack to Redress Minuteman Vulnerability?" p. 119.

44. Clarence Robinson, "ICBM Survivability Studied," p. 18.

45. "Launch Concludes Minuteman Research," Aviation Week and <u>Space Technology</u>, 7 April 1980, p. 15; Edward Luttwak, <u>Strategic Power: Military Capabilities, and Political Utility</u> (The Washington Papers No. 38) (Beverly Hills: Sage Publications Inc., 1976), p. 25.

46. Colin Gray, op cit, pp. 9-10.

47. Harold Brown, DOD Annual Report FY1980, p. 120.

48. William J. Perry, op cit, p. VI-12; Ses alsl: Congressional Budget Office <u>Planning U.S. Strategic Nuclear Forces for the 1980s</u>, (Washington, DC: U.S. G.P.O.), p. 47.

49. "Filter Center" <u>Aviation Week and Space Technology</u>, 26 May 1980, p. 91.

50. See Harold Brown, <u>DOD Annual Report FY80</u>, p. 133, for a description of the ELF system; of note is the fact that the <u>FY81 Report</u> makes no reference to the system and does not include it in the Strategic Surveillance and Warning Budget, p. 143.

51. Sidney Drell, "SUM" <u>Arms Control Today</u>, September 1979, p. 4.

52. "Filter Center, <u>Aviation Week and Space Technology</u>, 26 May p. 91.

53. Lt. Gen. Kelly H. Burke, Air Force Policy Letter for Commanders, Office of the Secretary of the Air Force, 15 March 1980.

54. Interview with Lt. Gen. Kelly H. Burke, "MX Technical, Environmental, and Defense Issues," <u>Air Force Magazine</u>, April 1980, p. 35.

55. "Should U.S. Kill the MX Missile," <u>U.S. News and World Report Inc.</u>, 28 April 1980, p. 60.

56. Bernard T. Feld and Kosta Tsipis, "Land-Based Inter-
    continental Ballistic Missiles," Scientific American, 241:5,
    November 1979, p. 60.

57. Clarence Robinson, Jr., "Missile Defense Gains Support,"
    Aviation Week and Space Technology, 22 October 1979, p. 14.

58. William J. Perry, The FY 1981 Department of Defense Program
    for Research, Development and Acquisition, p. VI-17; See
    also, "Army prepares for testing 2 new ABM systems,"
    Washington Star, 2 April 1980, p. 6.

59. Thomas W. Wolfe, The Salt Experience, (Cambridge: Ballinger
    Publishing Co., 1979), p. 194.

60. Harold Brown, DOD Annual Report, FY1981, p. 86.

61. Colin S. Gray, "The Strategic Forces Triad," Foreign Affairs,
    July 1978, p. 780.

62. Harold Brown, DOD Annual Report FY 1980, p. 17.

63. Ibid., p. 117.

64. Ibid, p. 50.

65. William J. Perry, "MX Mobile Basing," Command Policy 2:11
    (November 1979), p. 9.

66. "Should U.S. Kill the MX Missile," U.S. News and World Report,
    28 April 1980, p. 59.

67. Richard L. Garwin, "Launch Under Attack to Reduce Minuteman
    Vulnerability?" International Security 4 Winter 1979/80,
    p. 126.

68. Colin Gray, The Future of Land-Based Missile Forces, (Adelphi
    Papers #140), p. 14.

69. United States Department of State SALT and American Security,
    (Washington: U.S. G.P.O., November 1978), p. 8.

70. Daniel Seligman, "Our ICBMs are in Danger," Fortune, 2 July
    1979, p. 53.

71. Harold Brown, "Remarks at the U.S. Naval Academy," Selected
    Statement (Washington: Department of the Air Force 1 July
    1979), p. 51.

72. Harold Brown, DOD Annual Report FY 1981, p. 88.

73. Colin Gray, The Future of Land-Based Missile Forces, (Adelphi Paper #140), p. 14.

74. Patrick J. Parker, Chairman, Department of National Security Affairs, Naval Postgraduate School, Interview, Monterey, CA, February 1980.

75. Paul H. Nitze, Statement Before the Committee on Armed Services of the House of Representatives on February 6, 1979.

76. Mr. Gustavson in William R. Van Cleave and W. Scott Thompson ed., Strategic Options for the Early Eighties, p. 144.

77. Donald R. Westervelt, "The Essence of Armed Futility," ORBIS, Fall 1974, p. 701.

78. William R. Van Cleave and W. Scott Thompson, Strategic Options for the Early Eighties, p. 144; see also: Gough C. Reinhardt "A Framework for Quantifying Strategic Stability," Energy and Technology (UCRL-52000-76-3) Lawrence Livermore Laboratory March 1967; Gough Reinhardt Counter Force Strategies (UCRL-51632) Lawrence Livermore Laboratory 31 July 1974.

79. Grechko, Na Strazhe Mira T Stroitel' stava Kommunizma, p. 41, quoted in Leon Gouré et al The Role of Nuclear Forces in Current Soviet Strategy, p. 107.

80. Colonel M. Shirokov quoted in Leon Gouré and Michael J. Deane, "The Soviet Strategic View," Strategic Review, VIII:1, Winter 1980, p. 81; see also: William T. Lee, "Soviet Targeting Strategy and Salt," Air Force Magazine, September 1978, p. 122.

81. Ibid.

82. Richard L. Garwin, op cit, p. 130.

83. Roger D. Speed, Strategic Deterrence in the 1980's, (Stanford: Hoover Institution Press, 1979), p. 72.

84. The Organization of the Joint Chiefs of Staff, United States Military Posture for FY1980 (Washington: GPO), p. 67.

85. James R. Schlesinger in Hearings before the Subcommittee on Arms Control, International Law and Organization of the Committee on Foreign Relations United States Senate, 93rd Congress, 2nd Session (U.S.-U.S.S.R. Strategic Policies), 4 March 1974 (Washington: U.S. GPO), p. 55.

86. Harold Brown, <u>DOD Annual Report, FY 1981</u>, P. 124.

87. Maj. Gen. It Anureyev, "Determining the Correlation of Forces,"
     <u>Voyeonaya Mysl</u> quoted in Joseph D. Douglass, Jr., and
     Amoretta M. Hoeber, <u>Soviet Strategy for Nuclear War</u> (Stanford:
     Hoover Institution Press, 1979), p. 84.

88. Paul Wolfowitz, op cit, p. 2279.

89. Richard Garwin, op cit, p. 125.

90. Richard Garwin, op cit, p. 138.

91. Paul Wolfowitz, op cit, p. 2279.

92. Herman Kahn, "The Case for a Thin System," in <u>Why ABM?</u>,
     ed Johan J. Holst and William Schneider, Jr. (New York:
     Pergamon Press, 1969), p. 89.

93. Herman Kahn, <u>On Thermonuclear War</u> (Princeton: Princeton
     University Press, 1960), p. 259.

94. Paul Wolfowitz, op cit, p. 2280.

95. Daniel Seligman, op cit, p. 53.

96. "U.S. Forces on Alert," <u>Los Angeles Times</u>, 5 June 1980,
     p. 1; "New Computer Failure Triggers Missile Alert,"
     <u>San Francisco Chronicle</u>, 6 June 1980, p. 1, and 8 June 1980,
     p. 1.

97. William R. Graham, Statement for Presentation to the Committee
     on Armed Services of the House of Representatives, 23 February
     1979, p. 4.

98. Ibid, pp. 5-6.

99. Deborah Shapley, "Technology Creep and the Arms Race: A
     World of Absolute Accuracy," <u>Science 201</u> (29 September 1978),
     p. 1195.

100. Paul Wolfowitz, op cit, p. 2279.

101. Herman Kahn, <u>On Thermonuclear War</u>, p. 262.

102. Amoretta M. Hoeber and Francis P. Hoeber, "The Case Against
      the Case Against Counterforce," Strategic Reivew III:4
      (Fall 1975), p. 56.

103. Richard Garwin, "Launch Under Attack to Redress Minuteman Vulnerability?" p. 136.

104. William R. Graham, op cit, p. 6.

105. Sidney D. Drell in Hearings before the Committee on Foreign Relations, United States Senate, Ninety-Fifth Congress, First Session on The National Security and Arms Control Implications of Current United States Strategic Options; Soviet Capabilities and Intentions, 17, 19 January and 16 March 1977 (Washington: U.S. G.P.O., 1977), p. 73.

106. Roger Speed, op cit, p. 21--Speed presents a balanced and concise analysis of the question of surprise attack (pp. 20-22).

107. Ibid, p. 22.

108. Joseph I. Coffey, Deterrence in the 1970's (Vol. 8, Monograph 3 1970-71) (Denver: University of Denver, 1971), p. 24.

109. Joseph D. Douglass and Amoretta M. Hoeber, Soviet Strategy for Nuclear War, p. 106.

110. Ibid.

111. Ibid, p. 107.

112. Jiri Valenta, Soviet Intervention in Czechoslovakia, 1968- Anatomy of a Decision (Baltimore: The John Hopkins University Press, 1979), p. 129.

113. Thomas C. Schelling, Arms and Influence (New Haven: Yale University Press, 1966), p. 39.

114. V. I. Varfolomeyev and M. I. Kopytov, Design and Testing of Ballistic Missiles--USSR, Trans. Joint Publications Research Service, JPRS-51810 (Washington: JPRS, 19 November 1970), p. 305.

115. "Trends in the Development of U.S. Strategic Missiles," Voyennaya mysl's 1968 quoted in Joseph D. Douglass, Jr., and Amoretta M. Hoeber, op cit, p. 79.

116. Joseph D. Douglass, Jr., and Amoretta M. Hoeber, op cit, p. 77.

117. Gen. D. I. Shuryrin, "A Reliable and Effective System," Voennyye Znaniia 10 (Oct 1968), p. 17, quoted in Leon Goure, Foy D. Kohler, and Mose L. Harvey, The Role of Nuclear Forces in Current Soviet Strategy (Miami: University of Miami Center for Advanced International Studies, 1974), p. 109.
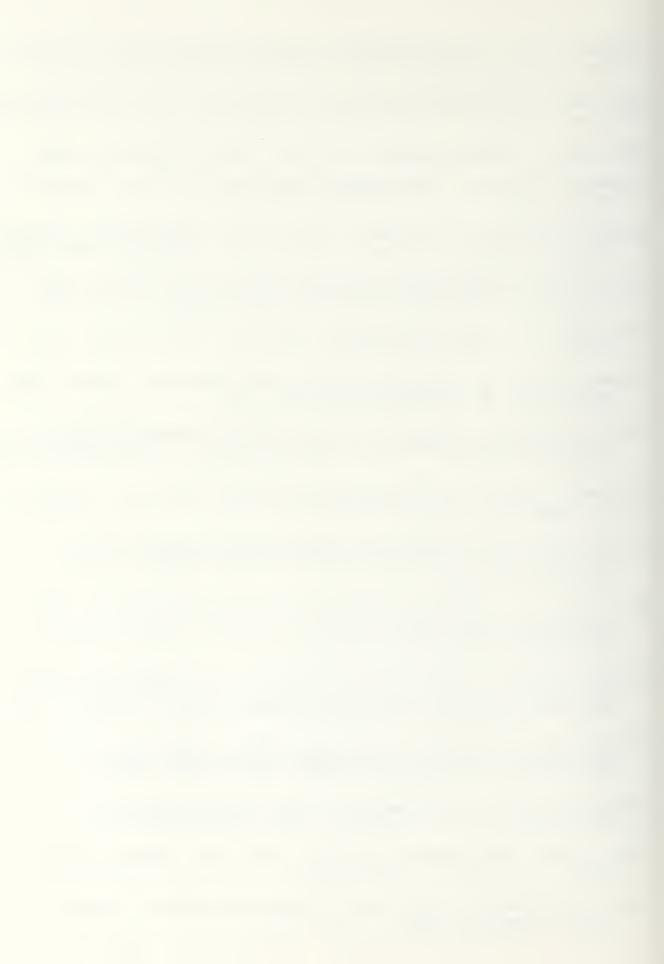
118. L. Glagolev and V. Larinov, "Soviet Defense Might and Peaceful Coexistence" International Affairs (Moscow), 11 (November 1963), p. 32, quoted in Goure et al op cit, p. 108.

119. Idem, "Soviet Defense Might and Peaceful Coexistence," quoted in C. G. Jocobsen, Soviet Strategy-Soviet Foreign Policy (Glasgow: The Universtiy Press, 1972), p. 59.

120. Henry Trofinenko, "The 'Theology' of Strategy" Orbis 21:3 (Fall 1977), p. 510.

121. Colonel W. F. Miroshnichenko, "Changes in the Content and Nature of Modern Combat," Military Herald, October 1966, reprinted in William R. Kintner and Harriet Fast Scott, The Nuclear Revolution in Soviet Military Affairs (Norman: University of Oklahoma Press, 1968), p. 373.

122. Walter F. Hahn, "Launch in Desperation?" Strategic Review 6 (Summer 1978), p. 9.

123. William R. Van Cleave, Statement on U.S. Strategic Force Programs and Options Before the House Armed Services Committee, 14 March 1980, p. 8.

124. Johan J. Holst, "Missile Defense: Implications for Europe" in Why ABM?, p. 192.

125. Amoretta M. Hoeber and Francis P. Hoeber, "The Case Against the Case Against Counterforce," p. 56.

126. Thomas C. Schelling, Arms and Influence, (New Haven: Yale University Press, 1966), p. 225.

127. Herman Kahn, On Thermonuclear War, p. 259.

128. Arthur I. Waskow, The Limits of Defense, (New York: Doubleday Co., Inc., 1962), p. 28.

129. Bernard T. Feld and Korta Tsipis, "Why the MX Missile is not the Answer," Baltimore Sun, 7 November 1979, p. 23.

130. Arthur I. Waskow, The Limits of Defense (New York: Doubleday and Co., Inc., 1962), p. 26.

131. Herman Kahn, "The Case for a Thin System," pp. 88-89.

132. William R. Graham, Statement to the House Armed Services Committee, p. 3.

SELECTED BIBLIOGRAPHY

BOOKS

Allison, Graham T., _Essence of Decision_, Boston: Little, Brown and Company, 1971.

Andomeit, Hannes, _Soviet Risktaking and Crisis Behavior_, Adelphi Papers #101), London: International Institute for Strategic Studies, 1973.

Brodie, Bernard, _Strategy in the Missile Age_, Princeton: Princeton University Press, 1971.

Chayes, Abram, and Weisner, Jerome B., ed., _ABM - An Evaluation of the Decision of Deploy an Antiballistic Missile System_, New York: Harper & Row, 1969.

Coffey, Joseph I., _Deterrence in the 1970's_, Denver: University of Denver, 1971.

Douglass, Joseph D., Jr., and Hoeber, Amoretta, _Soviet Strategy for Nuclear War_, Stanford: Hoover Institution Press, 1979.

Eearle, Edward Mead, ed., _Makers of Modern Strategy_, Princeton: Princeton University Press, 1973.

Goure, Leon; Kohler, Foy D., and Harvey, Mose L., _The Role of Nuclear Forces in Current Soviet Strategy_, Miami: Centered Advanced International Studies.

Gray, Colin S., _The Future of Land Based Missile Forces_, (Adelphi Papers, 140) London: The International Institute for Strategic Studies.

Haslkorn, Avigdor, _The Evolution of Soviet Security Strategy 1965-1975_, New York: Crane Russak and Co., Inc., 1978.

Hoeber, Frances, _Slow to Take Offense_, Washington, DC: Center for Strategic and International Studies, 1977.

Holst, Johan J., and Schneider, William, Jr., ed., _Why ABM?_, New York: Pergamon Press, 1969.

Horelick, Arnold L., and Rush, Myron, _Strategic Power and Soviet Foreign Policy_, Chicago: The University of Chicago Press, 1966.

Jacobsen, C. G., Soviet Strategy, Soviet Foreign Policy, Glasgow: The University Press, 1972.

Kahn, Herman, On Thermonuclear War, Princeton: Princeton University Press, 1960.

Kahn, Herman, On Escalation, New York: Hudson Institute, 1965.

Kaufmann, William W., The McNamara Strategy, New York: Harper & Row, 1964.

Kintner, William R., and Scott, Harriet Fast, The Nuclear Revolution in Soviet Affairs, Norman: University of Oklahoma Press, 1968.

Knorr, Klaus, On the Uses of Military Power in the Nuclear Age, Princeton: Princeton University Press, 1966.

Lapp, Ralph E., Kill and Overkill, New York: Basic Books, Inc., 1962.

Luttwak, Edward N., Strategic Power, (The Washington Papers) #38, Washington, DC: Sage Publications, 1976.

Luttwak, Edward N., The U.S.-U.S.S.R. Nuclear Weapons Balance, (The Washington Papers) #13, Washington, DC: Sage Publications, 1975.

McNarama, Robert S., The Essence of Security, New York: Harper & Row Publishers, 1968.

Morgan, Patrick M., Deterrence, A Conceptual Analysis, Sage Library of Social Research, Beverly Hills-London: Sage Publications, 1977.

Nitze, Paul H., Dougherty, James E., and Lane, Francis X., The Fateful Ends and Shades of Salt, New York: Crane, Russak and Company, Inc., 1979.

Pranger, Robert J., and Labrie, Robert P., ed., Nuclear Strategy and National Security Pionts of View, Washington, DC: American Enterprise Institute for Public Policy Research, 1977.

Proceedings of the National Security Affairs Conference, 1978, Equivalence, Sufficiency and the International Balance, Washington, DC: National Defense University, 1978.

Quanbeck, Alton H., and Blechman, Barry, Strategic Forces, Washington, DC: The Brookings Institution, 1973.

Roman, Robert, The Rockets Red Glare, San Jose: Academy Press, 1970.

Schelling, Thomas C., Arms and Influence, New Haven, London: Yale University Press.

Scott, Harriet Fast, and Scott, William F., The Armed Forces
    of the U.S.S.R., Boulder: Westview Press.

Sokolovsky, Marshall V., ed., Military Strategy, Soviet Doctrine
    and Concepts, New York/London: Fredirick A. Praeger, Inc.,
    1963.

Speed, Roger D., Strategic Deterrence in the 1980's, Palo Alto:
    Hoover Institution Press, 1979.

Spielmann, Karl F., Analyzing Soviet Strategic Arms Decision,
    Boulder: Westview Press, 1978.

Stone, Jeremy J., The Case Against Missile Defenses, (Adelphi
    Papers #47), 1968, London: Institute for Strategic Studies.

Teller, Edward, and Brown, Allen, The Legacy of Hiroshima,
    New York: Doubleday & Company, 1962.

Valenta, Jiri, Soviet Intervention in Czechoslovakia, 1968--Anatomy
    of a Decision, Baltimore: Tne John Hopkins University Press,
    1979.

Van Cleve, William R., and Thompson, W. Scott, ed., Strategic
    Options for the Early Eighties, New York: National Strategy
    Information Center, 1979.

Waskow, Arthur I., The Limits of Defense, New York: Doubleday
    and Company, 1962.

Waskow, Arthur, ed., The Debate over Thermonuclear Strategy,
    Boston: D. C. Heath & Company, 1965.

Wolfe, Thomas W., The Salt Experience, Cambridge: Ballinger
    Publishing Company, 1979.

GOVERNMENT DOCUMENTS

Collins, John M., Counterforce and Countervale Options Compared,
    (U.C. 650A, 72-240F), Congressional Research Service,
    December 7, 1972.

The Organization of the Joint Chiefs of Staff, United States
    Military Posture for Fiscal Year 1980, Washington, DC: U.S. GPO.

U.S. Department of Defense, Defense Program and Budget, Fiscal
    Year 1971, Washington, DC: U.S. GPO.

U.S. Department of Defense, Annual Report Fiscal Year 1977,
    Washington, DC: U.S. GPO.

U.S. Department of Defense, Annual Report Fiscal Year 1978,
     Washington, DC: U.S. GPO.

U.S. Department of Defense, Annual Report Fiscal Year 1979,
     Washington, DC: U.S. GPO.

U.S. Department of Defense, Annual Report Fiscal Year 1980,
     Washington, DC: U.S. GPO.

U.S. Department of Defense, Annual Report, Fiscal Year 1981,
     Washington, DC: U.S. GPO.

U.S. Department of Defense, The FY 1981 Department of Defense
     Program for Research, Development, and Acquisition.

U.S. Department of Defense, Statement of Secretary of Defense
     Robert S. McNamara Before the Senate Armed Services
     Committee, on the Fiscal Year 1969-73 Defense Program and
     1969 Defense Budget, Washington, DC: U.S. GPO, 22 January
     1968.

Wolfowitz, Paul W., "The Proposal to Launch on Warning," in
     Hearings before the Committee on Armed Services, United
     States Senate, Ninety-First Congress, 2nd Session--
     Authorization for Military Procurement, Research and Develop-
     ment, Fiscal Year 1971, and Reserve Strength (Part 3), 2, 6,
     9, 13 March; 7, 12, 19, 27 May; 11 June 1970, pp. 2278-2283.

U.S. Department of Defense, Supplemental Statement to Report of
     Blue Ribbon Defense Panel, The Shifting Balance of Military
     Power, Washington, DC: U.S. GPO, September 30, 1970.

U.S. Congress, Congressional Budget Office, Salt and The U.S.
     Strategic Forces Budget, Washington, DC: U.S. GPO, June 23,
     1976.

U.S. Congress, Congressional Budget Office, U.S. Strategic
     Nuclear Forces: Deterrence Policies and Procurement Issues,
     Washington, DC: U.S. GPO, April 1977.

U.S. Congress, Congressional Budget Office, Counterforce Issues
     for the U.S. Strategic Nuclear Forces, Washington, DC:
     U.S. GPO, January 1978.

U.S. Congress, Congressional Budet Office, Planning U.S. Strategic
     Nuclear Forces for the 1980's, Washington, DC: U.S. GPO,
     June 1978.

U.S. Congress, Congressional Budget Office, Retaliatory Issues
     for the U.S. Strategic Nuclear Forces, Washington, DC:
     U.S. GPO, June 1978.

U.S. Congress, House Armed Services Committee, <u>Land-Based ICBM</u>
<u>Vulnerability</u> (H.A.S.C. No. 95-69), Washington, DC: U.S.
GPO, 5 October 1978.

U.S. Senate Committee on Aeronautical and Space Sciences,
<u>Hearings before the Preparedness Investigating Subcommittee</u>
<u>of the Committee on Armed Services</u>, 86th Congress, 2nd Session,
February 2, 3, 4, 8, 9, and March 16, 1960.

U.S. Senate Committee on Foreign Relations, <u>Hearing Before the</u>
<u>Subcommittee on Arms Control International Law and Organization</u>,
93rd Congress, 2nd Session, March 4, 1974.

U.S. Senate Committee on Foreign Relations, <u>Hearings Before the</u>
<u>Committee on Foreign Relations and the Subcommittee on Arms</u>
<u>Control, Oceans and International Environment</u>, 95th Congress,
1st Session, January 14, 19, and March 16, 1977.

Stanford Research Institute, <u>Study of Controlled Conflict</u>, General
Services Administration, June 1975.

PERIODICALS

Aspin, Les, "What Are the Russians Up To?" <u>International Security</u>
(Summer 1978), pp. 30-46.

Beard, Robin, "National Security Policy Under the Carter
Administration - An Alternative View," <u>Journal of International</u>
<u>Relations</u>, 2 (Summer 1977), pp. 141-151.

Biddle, Wayne, "Misguided Missiles; The MX Project," <u>Harpers</u>,
(December 1979).

Feld, Bernard T., and Tsipis, Kosta, "Land-Based International
Ballistic Missiles," <u>Scientific American</u>, 241 (November 1979),
pp. 51-61.

Garthoff, Raymond L., "Mutual Deterrence and Strategic Arms
Limitation in Soviet Policy," <u>International Security</u> 3 (Summer
1978), pp. 112-147.

Garwin, Richard L., "Launch Under Attack to Redress Minuteman
Vulnerability?" <u>International Security</u> (Winter 1979/80),
pp. 117-129.

Gray, Colin S., "Nuclear Strategy: The Case for a Theory of
Victory," <u>International Security</u> (Summer 1979), pp. 54-72.

Gray, Colin S., "The Strategic Forces Triad," Foreign Affairs, (July 1978), pp. 771-789.

Gray, Colin S., Force Postures, Arms Races, and the Future of Salt, Hudson Institute (December 1978), pp. 1-23.

Gustavson, Marvin R., "A Dynamic View of Deterrence," Comparative Strategy 1 (1979), pp. 169-177.

Hall, Albert C., "The Case for an Improved ICBM," Astronautics and Aeronautics, (February 1977), pp. 1-31.

Hanning, LT COL (Ret'd), "Essential Equivalence, The End of the Nuclear Deterrent Myth," International Defense Review 12 (4 April 1969), pp. 179-185.

Hoeber, Francis P., "The Salt II Treaty and the Security of the United States," International Security Review 4 (Summer 1979) pp. 105-129.

Hoeber, Francis P., "Civil Emergency Preparedness if Deterrence Fails," Comparative Strategy 1 (1979), pp. 183-192.

Hoeber, Amoretta M. and Hoeber, Francis P., The Case Against the Case Against Counterforce," Strategic Review Policy, (1979), pp. 54-63.

Jones, David C. (GEN, USAF), "Military Posture and National Power," Command Policy 2 (June 1979), pp. 1-7.

King, Peter, "Two Eyes for a Tooth: The State of Soviet Strategic Doctrine," Survey, 27 (Winter 1979), pp. 45-54.

Lambreth, Benjamin S., "The Political Potential of Soviet Equivalence," International Security 4 (Fall 1979), pp. 22-39.

Marshall, A. W., "Bureaucratic Behavior and the Strategic ARMS Competition," pp. 1-15.

Nitze, Paul H., "Assuring Strategic Stability in an Era of Detente," Foreign Affairs, 4 (January 1976), pp. 207-232.

Perry, William J. (Dr.), "MX Mobile Basing," Command Policy, 2 (November 1979), pp. 9-12.

Pincus, Walter, "Aging Titan Missile Hangs on by Virtue of Size and Politics," Washington Post, 20 November 1979, p. 5.

Pipes, Richard, "Why Ignore What the Soviets Say," Washington Star, 24 July 1977, p. D-4.

Schneider, Stanley, "Observations on the Impact of Uncertainty in Strategic Analysis," World Politics, 32 (October 1979), pp. 90-101.

Seligman, Daniel, "Our ICBM's are In Danger, Fortune, (2 July 1979), pp. 50-56.

Shapley, Deborah, "Technology Creep and the Arms Race: A World of Absolute Accuracy" (Part 2 of 3 parts), Science 201 (29 September 1978), pp. 1192-1196.

Sienkiewicz, Stanley, "Observations on the Impact of Uncertainty in Strategic Analysi," World Politics, 32 (October 1979), pp. 90-101.

Ulsamer, Edgar, "In Focus," Air Force Magazine, (December 1979), pp. 20-24.   .

Van Cleve, William R., "The Nuclear Weapons Debate," U.S. Naval Institute Proceedings, (May 1966), pp. 28-37.

Westervelt, Donald R., "The Essence of Armed Futility," ORBIS, (Fall 1974) pp. 689-705.

Wohlstetter, Albert, "The Delicate Balance of Terror," Foreign Affairs.

Zeiberg, Seymour L., (Dr.), "Strategic Systems Outlook," National Defense, (July/August 1979), pp. 26-32.

INITIAL DISTRIBUTION LIST

<div align="right">No. Copies</div>

1. Defense Technical Information Center   2
   Cameron Station
   Alexandria, Virginia 22314

2. Library, Code 0142   2
   Naval Postgraduate School
   Monterey, California 93940

3. Department Chairman, Code 56   1
   Department of National Security Affairs
   Naval Postgraduate School
   Monterey, California 93940

4. Professor Patrick J. Parker, Code 56   1
   Department of National Security Affairs
   Naval Postgraduate School
   Monterey, California 93940

5. Adjunct Assistant Professor David S. Yost, Code 56Yo   1
   Department of National Security Affairs
   Naval Postgraduate School
   Monterey, California 93940

6. Assistant Professor Jiri Valenta, Code 56Va   1
   Department of National Security Affairs
   Naval Postgraduate School
   Monterey, California 93940

7. Professor William Reese, Code 61Rc   1
   Department of National Security Affairs
   Naval Postgraduate School
   Monterey, California 93940

8. Associate Professor Edward J. Laurance, Code 56Lk   1
   Department of National Security Affairs
   Naval Postgraduate School
   Monterey, California 93940

9. Lieutenant Colonel David P. Burke, USAF, Code 56Bq   1
   Department of National Security Affairs
   Naval Postgraduate School
   Monterey, California 93940

10. Major General Kelly H. Burke, USAF   1
    Directorate of Operational Requirements (AF/RDQ)
    Department of the Air Force
    The Pentagon
    Washington, D.C. 20330

11. Brigadier General Guy Hecker, USAF   1
    Directorate of the Air Force
    The Pentagon
    Washington, D.C. 20330

12. Dr. Scott Tompson   1
    Fletcher School of Law and Diplomacy
    Tufts University
    Medford, Massachusetts 02155

13. Mr. D. Westervelt   1
    Los Alamos Laboratory
    Los Alamos, New Mexico 87544

14. Mr. Alvin Cotrell   1
    Georgetown Institute of Strategic Studies
    Washington, D.C. 20007

15. Mr. Dimitri K. Simes   1
    John's Hopkins School of Advanced
        International Studies
    1740 Massachusetts Avenue, N.W.
    Washington, D.C. 20036

16. The Honorable Harold H. Brown   1
    Office of Secretary of Defense
    Washington, D.C. 20301

17. Mr. William R. Van Cleave   1
    Suite 301
    University of Southern California
    Los Angelos, California 90007

18. Mr. G. C. Reinhardt (L-11)   2
    Lawrence Livermore Laboratory
    P.O. Box 808
    Livermore, California 94550

19. The Honorable Antonia H. Chayes   1
    Assistant Secretary of the Air Force
    (Manpower, Reserve Affairs, Installations)
    Department of the Air Force
    The Pentagon
    Washongton, D.C. 20330

20. Mr. W. Gregory   1
    Aviation Week and Space Technology
    McGraw-Hill Building
    1221 Avenue of the Americas
    New York, New York 10020

21. Mr. Clarence Robinson   1
     Aviation Week and Space Technology
     McGraw-Hill Building
     1221 Avenue of the Americas
     New York, New York 10020

22. Mr. Barry Blechman   1
     Carnegie Endowment for International Peace
     11 Dupont Circle N.W.
     Washington, D.C. 20036

23. Commander Kurt A. Strauss   5
     Plans and Policy Division
     Supreme Headquarters Allied Powers
        Europe (SHAPE)
     APO New York 09055