A Retrospective Look at Some Strategy and Force Evaluation Games

T. A. Brown and E. W. Paxson

A Report prepared for

UNITED STATES AIR FORCE PROJECT RAND
The research described in this Report was sponsored by the United States Air Force under Contract No. F44620-73-C-0011 — Monitored by the Directorate of Operational Requirements and Development Plans, Deputy Chief of Staff, Research and Development, Hq USAF. Reports of The Rand Corporation do not necessarily reflect the opinions or policies of the sponsors of Rand research.
A Retrospective Look at Some Strategy and Force Evaluation Games

T. A. Brown and E. W. Paxson

A Report prepared for

UNITED STATES AIR FORCE PROJECT RAND

R-1619-PR
September 1975

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED
PREFACE

In 1962 one of the major research efforts under Project RAND was the Alternative Central War Strategy project. An important tool used by this project was the Strategy and Force Evaluation (SAFE) game, which gave participants an opportunity to project Red and Blue strategic forces forward over a ten-year period. The six plays of this game were unusually well-documented, and now that ten years have passed it is possible to compare the postures generated in the games with the postures generated in the real world. By making this comparison, we are afforded considerable insight into what was right and what was wrong with the design of the SAFE game itself.

This report summarizes the results of such a comparison and draws conclusions about what should be done in future exercises to avoid the pitfalls and enhance the strengths of posture-planning games. It should be useful to Air Force and other DOD agencies involved in studying strategic posture development, or in educating individuals concerning strategic issues.

This research was performed as part of the Project RAND project entitled "Information Sciences Research."
SUMMARY

SAFE was a series of six manual force posture planning games conducted at Rand during 1962. The time horizon of the games was ten years. Red and Blue teams, working under budget constraints, generated strategic postures to implement various patterns of national objectives. This report compares what happened in the six SAFE worlds with what actually occurred in the real world between 1962-1972. The reasons for likenesses and differences are analyzed. The question of whether the SAFE methodology could be a useful adjunct to both posture planning and threat assessment as currently practiced in the defense community is addressed.

As might be expected, SAFE postures are related to the real ones but are distorted in various ways. The major reasons for the distortions have been determined. They are (1) policy changes during 1962-1972 in the real world, contrasted with SAFE’s adherence to an initial policy statement (SAFE gave great emphasis to civil defense in the U.S.); (2) an accelerated introduction of new systems and retirement of old ones in the SAFE world; (3) a weapon system menu which did not allow for some technological developments (certain space systems), and which offered paper study systems (large cargo-type aircraft with offensive and defensive missions, barge-mobile ICBMs) that never passed that stage in reality. Ameliorating changes in the methodology have been established. On balance, we believe the SAFE approach is a valuable complement to standard procedures in posture planning and threat assessment.
Rand should examine the design of such exercises for possible intercollege play by the senior War Colleges, since these institutions command unusual personnel resources and have a unique organizational vantage, and since such exercises have well-proven educational value.
CONTENTS

PREFACE ................................................................. iii
SUMMARY ............................................................... v
FIGURES ................................................................. ix

Section
I. INTRODUCTION ................................................... 1
   What Were the SAFE Exercises? .............................. 1
   The Purpose of this Report ................................. 5

II. SURVEY OF SAFE POSTURES ................................. 10

III. STRATEGIC POLICY IN SAFE ................................. 28
   SAFE Formulation of Soviet Policy ......................... 28
   Soviet Strategic Policy in the Real World ............... 31
   Blue Policy Statements in the SAFE Games ............. 33
   Real-World U.S. Strategic Policies ....................... 35

IV. IMPORTANT DISSIMILARITIES BETWEEN SAFE PLAYS
    AND THE REAL WORLD ........................................ 40
    Civil Defense ............................................... 40
    The Blue ICBM/SLBM Spending Ratio ..................... 43
    Long-Endurance Aircraft .................................. 44
    Mobile Missiles ............................................ 45
    Summary ...................................................... 45

V. UTILITIES AND DISUTILITIES OF POSTURE GAMING:
    CONCLUSIONS ................................................ 47
    Modularizing ............................................... 49
    Purposes ..................................................... 51

SAFE BIBLIOGRAPHY ................................................. 54
NOTES ................................................................. 55
FIGURES

Fig. 1--U.S. Budget Allocation 1964-1972 ............... 13
Fig. 2--SU Budget Allocation 1964-1972 ............... 14
Fig. 3--Actual vs. SAFE U.S. Strategic Force ......... 16
Fig. 4--Actual vs. SAFE SU Strategic Force
   Expenditures (Red) .................................... 17
Fig. 5--Blue Bomber Force ................................ 19
Fig. 6--Red Bomber Force ................................. 20
Fig. 7--Blue Minuteman Force ............................ 21
Fig. 8--Red Missile Force ................................. 23
Fig. 9--Blue SSBN Force .................................. 24
Fig. 10--Red Yankee SSBN FORCE ........................ 25
I. INTRODUCTION

WHAT WERE THE SAFE EXERCISES?

SAFE is an acronym for Strategy and Force Evaluation; it is the name of a manual posture planning game, designed at Rand during the winter of 1961-62, which was played six times in support of the Alternative Central War Strategy (ACWS) project at Rand during 1962. For complete documentation of SAFE, see the SAFE bibliography at the end of this report.

A single play of SAFE took two weeks, and involved nine or ten people. Three of these people composed the "Blue" team, three of them the "Red" team, and the balance made up the control team.

[1]* At the beginning of the game, Blue and Red were each given: a budget; a "policy statement" which they were to implement; a menu of strategic forces which they could develop and buy over the period 1962-72; and an initial force posture which was based on the actual strategic arsenal of the United States and the Soviet Union as it existed in 1962 (modified somewhat by expected real procurement and deactivation for the period 1962-64). The game had five two-year moves or "periods," in each of which teams allocated their budgets to R&D (an obvious prerequisite to acquiring the more advanced weapon systems), to procurement costs, and to operating costs. Intelligence on what the other side was doing was given to each team at the beginning of each period. A

*Numbers in square brackets identify notes at the end of this Report, beginning on page 55.
severely limited amount of negotiation between the two sides was possible by means of written messages passed through the control team. The two teams would, from time to time, prepare "war plans" which would be run against one another by the control team. This was done to get some understanding of the general capabilities of the postures designed by the two sides, and not to test the teams' ingenuity. Each team spent at least ten hours on posture planning for every hour they spent writing war plans.

The purpose of the SAFE exercises, within the context of the ACWS project, was to explore the extent to which alternative sets of strategic objectives would lead to distinguishable general war force postures. Each one of the six plays of SAFE was an instance of the implementation of a set of U.S. objectives in interaction with a particular set of SU objectives for given budget profiles. The Blue team represented the level of the Joint Chiefs of Staff and the Office of the Secretary of Defense. They received policy directives, budget limitations and some (mild) political restraints from the ACWS project leadership, the SAFE equivalent of the National Security Council. But there was no role-playing, nor any attempt to simulate bureaucratic games or lag times. The Red team represented a presumed analogous group in the Soviet Union. Thus, there was nothing in a SAFE play which permitted the teams to fix the budget or the general policy to be pursued, which was all decided from above. The play was an attempt to work out the rational [2] consequences in terms of a strategic posture which could arise given a policy and budget.
The six plays were named with the first six letters of the alphabet. The policy statements and budgets in each play are summarized in Table 1.

Briefly, game A pitted a Blue with a generous budget and maximum intentions (peacetime and wartime deterrence, plus disarming capability) against a Red with a similarly generous budget and a policy emphasizing defense, given easy deterrence of Blue. B pitted the same Blue against Red seeking to achieve a reliable deterrent plus disarming capability on the same budget. In game C, Blue sought on a low budget to achieve peacetime and wartime deterrence, while Red sought to achieve superiority at three times the budget. D pitted the same Blue against a Red seeking to build a reliable deterrent and achieve force parity on a low budget. In E and F, Red had the same policy and budget as in A, whereas in E Blue had twice the budget to achieve peacetime deterrence plus disarming capability. In F, Blue had only two-thirds the budget for the full peacetime and wartime deterrence and disarming capability. (The policy statements are given in full below.)

The members of the ACWS project were not so naive as to suppose that strategic postures would be uniquely determined by policies and budgets, or that three Rand analysts would necessarily discover this uniquely determined posture even if it existed. The plays of SAFE, being a Rand research project, were viewed as educational, as ways of generating some common experience for members of the project, and as providing some
Table 1

COMBINATION OF STRATEGIC OBJECTIVES AND BUDGETS
USED IN THE SIX PLAYS OF SAFE

<table>
<thead>
<tr>
<th>Blue Policy</th>
<th>Red Policy and Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emphasize Defense,</td>
</tr>
<tr>
<td></td>
<td>Given Easy</td>
</tr>
<tr>
<td></td>
<td>Deterrence of Blue</td>
</tr>
<tr>
<td></td>
<td>Budget = 1.5</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Peacetime Deterrence Plus Wartime Deterrence
  - BLUE Budget = LOW
  - RED Budget = D
  - Result: C

- Peacetime Deterrence Plus Disarming Capability
  - BLUE Budget = 3.0
  - RED Budget = E
  - Result: A

- Peacetime Deterrence Plus Wartime Deterrence Plus Disarming Capability
  - BLUE Budget = 1.5
  - RED Budget = F
  - Result: B

NOTE: Ten-year budgets are expressed as multiples of ten times the estimated annual strategic budget (FY 1961-62) for the Soviet Union (for Red) or ten times the corresponding DOD budget (FY 1963) for the United States (for Blue).

"Low" budget means one determined by the control team during the actual course of the play.
mental furniture to give focus to subsequent seminars examining the relationships between policy and force posture. SAFE was very successful in all these roles. Before the SAFE games, the ACWS project was floundering and lacked focus or integration. After the SAFE plays, the project participants, having all played SAFE at least once and being familiar with the general course of all the plays, had a common vocabulary and body of artificial experience which enabled them to communicate with one another with a degree of clarity and precision which had been impossible before. The result was a series of reports (listed in the Bibliography) which led rather directly to the appointment of the project leader to a high post in OSD dealing with actual strategic forces. [3]

In this sense, the SAFE exercises were successful, and known to be successful, ten years ago. Why, then, do we wish to undertake a retrospective analysis of them at this time?

THE PURPOSE OF THIS REPORT

As noted, the aim of the SAFE exercises was not to forecast what was most likely to occur. Could such exercises, however, be used as an aid in forecasting real-world force postures? By carefully examining the differences and similarities between the generated SAFE postures and those which actually were fielded, we should be able to make a more informed estimate of the utility of exercises like SAFE as an aid in posture planning and forecasting. [4]

We shall see that there are at least five explanatory categories for the discrepancies between play results and
reality. These five types of explanation are the following: discrepancies in external conditions, accelerated time, menu errors, unforeseen technological developments, and unforeseen political constraints.

Discrepancies between the policy statements and budgets imposed upon the teams by the project leader and those realized in the actual world are the foremost cause for differences between SAFE postures and those observed in the real world. Budget differences appear to be more important than policy differences. The budget given to the Blue player was generally greater than the U.S. strategic budget over the ten-year period actually turned out to be, after deflating to constant 1962 dollars. [5] The budget given to the Red player was in terms of "allocation units" equal in purchasing power to a dollar in the United States. It is not possible to convert these units directly into rubles, but the forces which the SU procured and operated in the real world generally exceeded in quantity the forces they were able to buy in SAFE. Thus Red SAFE postures tend to be smaller than in reality, while Blue SAFE postures tend to be larger. Although budget levels had a direct effect upon the size and an indirect effect upon the shape of the postures deployed, it is not so clear what effect differences in policy statements really had on player procurement decisions. It is also not completely clear what policy the U.S. and the Soviet Union have "really" been pursuing in their real-world posture decisions.

Accelerated time is a common characteristic of war games and similar exercises, unless a disciplined and conscious attempt is
made to mirror the pace of real-world events. Things got done in SAFE far more rapidly than they would in reality. The players would decide upon their posture goals and then pursue them with a singlemindedness like that of science fiction neotronics. [6] In the real world there are hundreds of opportunities, barriers, mishaps, and mistaken hopes which simply cannot be reflected in the menus, rules, and procedures of a finite exercise. In the narrow world of the exercise, players move with a ruthless dispatch which will never be achieved in the real world. This is seen in the SAFE exercises in exceptionally rapid deactivations and accelerated development and deployment of new weapon systems.

Although the menu of possible systems was very carefully prepared for SAFE, it was perhaps inevitable that certain significant opportunities would be overlooked or poorly represented. When such a shortcoming could reasonably have been avoided by well-informed systems analysts in 1961-62 we call it a "menu error." [7] We shall see below that one of the most important menu errors was the failure to provide sufficient growth potential for Blue SLBMs. While opportunities were available to equip ICBMs with MIRVs and much greater accuracy, analogous opportunities were not provided for SLBMs. This tended to induce underspending on SLBMs and overspending on ICBMs. We know this error was foreseeable in 1962 because several participants commented on it during the course of the plays.

In addition to avoidable menu shortcomings, it is conceivable that there were shortcomings which no one could reasonably be
expected to detect in 1962. Rather than call these deficiencies "errors," we feel it is more correct to call them "unforeseen technological developments." [8] Such deficiencies, of course, become a greater and greater problem as the time-horizon of a planning exercise is extended. In the particular case of the SAFE exercises, with its ten-year time horizon (1962-1972), such deficiencies did not appear to be a major problem. We hesitate to generalize in respect to future exercises of this genre.

Einstein once remarked that politics is harder than physics. It certainly appears to be more volatile and unpredictable, although the fundamental particle people of the present might argue the point. The general philosophy of the SAFE exercises was to avoid putting rigorous political constraints on the players beyond the general guidelines contained in the policy statements. One exception to this philosophy was made in the case of Blue air-launched ballistic missiles (Skybolt). The project leadership felt that since Britain had agreed to purchase some Skybolt missiles, and was depending on the weapon to be the backbone of her strategic deterrent, it would be politically impossible for the U.S. to cancel the weapon system. Therefore, Blue was required in every play to purchase some minimum number of ALBMs. [9]

In real life, of course, Secretary of Defense McNamara cancelled the Skybolt in December of 1962, and the action did indeed cause political problems with Great Britain. So the one overt political constraint in SAFE turned out to be a poor representation of reality. The absence of political constraints
in some other areas also turned out badly. The outstanding example of this is that most SAFE players on the Blue side spent a substantial amount on civil defense, while in reality U.S. civil defense spending was small and diminished over the period 1962-72. We shall argue below that this discrepancy is due to unforeseen political considerations.

But before discussing the relative importance of these five sources of discrepancies, let us take a closer look at what budget allocations the players made and what postures they built during the six plays of SAFE, and how these allocations and postures compare with what actually occurred.
II. SURVEY OF SAFE POSTURES

This section compares what actually happened during the period 1964-1972 in respect to U.S. and SU military budgets and strategic force structures with those developed by the six SAFE exercises. All money values have been converted to constant 1962 dollars, using standard deflators. The cursory reader should also keep in mind that two-year aggregations are used. Official sources such as the annual budgets of the United States and the annual statements of the Secretary of Defense were consulted to get most of the real-world data.

Estimating the Soviet military budget is admittedly difficult, but procedures have become more and more refined since the SAFE era. A first unclassified cut can be made by taking from the Soviet State Budgets the ruble amounts for military expenditures and for science, which undoubtedly includes military RDT&E as a major component. An additional allowance of perhaps 25 percent covers the presumed hidden funds—subsidies, expenditures in civilian ministries, preferential pricing in procurement. Ruble/dollar ratios can be assessed by expenditure category. That is, one ruble, under the Soviet financial system, buys an amount of military hardware which would cost the U.S. $3 if designed and built Russian style. For military pay and allowances, currently one-half or more of the U.S. budget, the ratio may be upwards of $6 to one ruble. RDT&E may be factored out as a residual, since we know the size of the annual pool of engineers and scientists and can estimate through open sources the civilian component. The
strategic share of the budget can be approximated via the known military posture over the last decade, by then employing U.S. posture component ratios. Of course, classified analysis can use more sophisticated direct methods and data bases, which we cannot exploit in this study.

Table 2 summarizes the budget picture for the United States and the Soviet Union for the period 1964 to 1972. Pertinent comments by line item number are:

- **LINE 1.** The impact of the war in Southeast Asia is evident.
- **LINE 2.** Even without comparable additional major expenditures, the SU budget, in real terms, rose steadily.
- **LINE 3.** Expenditures on U.S. strategic forces decline. There is no budgetary reaction to the Soviet strategic buildup of the mid-sixties (Line 7), perhaps because U.S. energies were focused on the war in SEA.
- **LINE 7.** The SU civil defense budget was large relative to that of the U.S., but a numerical estimate is not available. It is not part of the Soviet Strategic Force budget shown. Such expenditures are most likely buried in the Soviet Republic budgets.
- **LINES 10, 12.** U.S. AEC funding is not charged to the strategic budget. SU AEC money is so charged since we cannot break it out.

Figures 1 and 2 contrast the budget allocations in five of the six SAFE exercises with the actual allocations for the period 1964-1972. Game D is omitted because, as explained below, after 1968 the players concentrated on arms deactivation, not deployment.

Except for SAFE C, U.S. budgets were appreciably higher in SAFE. They would evidently be much closer to reality had SAFE
### Table 2

**ACTUAL U.S./SU MILITARY BUDGETS (BILLIONS 1962 DOLLARS)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. TOTAL DOD BUDGET</strong></td>
<td>118.3</td>
<td>129.1</td>
<td>127.4</td>
<td>113.1</td>
</tr>
<tr>
<td><strong>2. TOTAL SU BUDGET</strong></td>
<td>68.3</td>
<td>74.1</td>
<td>80.1</td>
<td>83.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. U.S. STRATEGIC FORCES</strong></td>
<td>12.96</td>
<td>13.02</td>
<td>12.83</td>
<td>11.21</td>
</tr>
<tr>
<td><strong>4. AS % OF TOTAL BUDGET</strong></td>
<td>11.0%</td>
<td>10.0%</td>
<td>10.1%</td>
<td>9.9%</td>
</tr>
<tr>
<td><strong>5. CIVIL DEFENSE</strong></td>
<td>0.19</td>
<td>0.165</td>
<td>0.10</td>
<td>0.075</td>
</tr>
<tr>
<td><strong>6. TOTAL</strong></td>
<td>13.15</td>
<td>13.185</td>
<td>12.93</td>
<td>11.285</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7. SU STRATEGIC FORCES</strong></td>
<td>14.92</td>
<td>17.57</td>
<td>18.95</td>
<td>17.71</td>
</tr>
<tr>
<td><strong>8. AS % OF TOTAL BUDGET</strong></td>
<td>21.8%</td>
<td>23.7%</td>
<td>23.7%</td>
<td>21.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9. U.S. RDT&amp;E (STRATEGIC FORCES)</strong></td>
<td>5.90</td>
<td>5.27</td>
<td>4.89</td>
<td>5.44</td>
</tr>
<tr>
<td><strong>10. U.S. AEC</strong></td>
<td>4.04</td>
<td>3.61</td>
<td>3.29</td>
<td>2.87</td>
</tr>
<tr>
<td><strong>11. TOTAL</strong></td>
<td>9.94</td>
<td>8.88</td>
<td>8.18</td>
<td>8.31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>12. SU RDT&amp;E (STRATEGIC FORCES/INCLUDES AEC)</strong></td>
<td>5.00</td>
<td>5.55</td>
<td>7.48</td>
<td>9.68</td>
</tr>
</tbody>
</table>
P & O = Procurement and Operations
RDT&E = Research, Development, Test, Evaluation
CD = Civil Defense

Note: Game D is omitted because the players concentrated on arms deactivation rather than force posture.

Fig. 1 — U.S. Budget Allocation 1964–1972
(Billions of 1962 dollars)
Fig. 2 — SU Budget Allocation 1964-1972

(See note to Fig. 1)
civil defense expenditures been reduced to those actually made. On the other hand, it is a Rand rule of thumb that only about one-half of an RDT&E budget is applied directly to the development of named weapon systems. Supporting research, management support, and engineering modifications account for the other half. Presumably, all of the SAFE money was applied to named menu systems. Hence, except for SAFE F, one could even make a compensatory lumping of the RDT&E and CD sections of the pie charts, as if CD were the other half of RDT&E, and the greater overall size of the SAFE budgets would still be evident.

Since we have no good source for total Soviet expenditures on civil defense (although their program is clearly extensive), we compare only their actual production and operating expenditures and their RDT&E expenditures to the spending in those categories in the SAFE game, eliminating civil defense.

Figures 3 and 4 break out the budgets for the two-year periods by Procurement and Operations (P&O), Research and Development (RDT&E), and civil defense (CD). The solid black portions of the RDT&E segments are "bow wave" monies reserved for development of systems for the following decade, and so not operational during SAFE's decade, but which are charges to be added to appraise a total budget.

The project leader, who assigned budget ceilings, generally anticipated greater strategic expenditures by Blue than actually occurred during the decade. It is difficult to compare Red budgets in SAFE with the Red budget in actuality, because of
SAFE's method of ascribing dollar costs (or "allocation unit" costs) to Red weapon systems. But as we shall see below, the strategic posture actually procured by the Soviet Union was more powerful than the one Red usually procured in SAFE exercises. Thus the project leader anticipated less strategic effort by Red than actually occurred.

We turn now to the force postures, restricting our attention largely to components of the strategic offensive forces.

Figures 5 and 6 show the Blue and Red bombers as they became operational. We do not show the Blue bomber forces prior to 1968; they are of little research interest because there were no sensible differences in real and game B-47, B-58, B-52 components, and the B-47s and B-58s were largely phased out by 1966. The most striking feature is the attractiveness to the SAFE teams of the Dromedary--large, long-endurance, aircraft with a payload of long-range high performance missiles, differentiable for offense and defense missions. The system has continued to the present its popularity with analysts, but not with the military, who never let it pass the concept formulation stage.

The FB-111 did not appear on the SAFE menu. Research and development on the F-111 was well along in 1962, but in the context of the SAFE exercises the comparatively short range of the aircraft so limited its possible use as a strategic bomber that it did not appear worthwhile to place it on the menu.

The reader will note that aging systems were phased out in SAFE more rapidly than they were in real life. This effect is probably owing to two factors: SAFE teams were not subject to the
Fig. 5 — Blue Bomber Force

*Game D discontinued after 1968
institutional inertias [10] which affect their real-life counterparts, and SAFE did not reflect the myriad secondary missions (such as use of older B-52s to deliver conventional munitions) which often extend the useful life of aging strategic systems.

As shown in Fig. 7, which of necessity has a logarithmic ordinate, Blue teams A, E, and F purchased very large numbers of ICBMs. (Blue teams A and C used mobile barge-basing for about 200 units of the Minuteman force.) Figure 8 shows that Red teams A, E, and F did not react to this increase in Blue missile strength. In reality, the situation was exactly reversed. The explosive growth of the Soviet ICBM force during the sixties did not lead to a U.S. matching reaction. SAFE Red teams evidently did not deem such growth a desirable implementation of Red objectives. The point is well worth reflection, and will be discussed at greater length in the next section.

The U.S. Titan I/Atlas force was phased out in SAFE exercises approximately as actually happened, and the Titan II force was held at about 60 missiles in most SAFE exercises, as was the case in the real world.

The remaining component of the two strategic Triads, the SSBNs, are depicted in Figs. 9 and 10. Except for SAFE B, Blue teams invested less in SLBMs than did their real-life counterparts. The reason will also be discussed in the next section.
*Missiles not under conversion to Minuteman III. Those under conversion not carried in active inventory.

Fig. 7 — Blue Minuteman Force
Fig. 9 — Blue SSBN Force

Fig. 10 — Red Yankee SSBN Force
SAFE Red teams bought large numbers of advanced nuclear submarines, which carried, however, only six missiles apiece, as opposed to the 16 which the Yankee class turned out to load. For 1970 and 1972 the total number of missiles is not too different, in most cases, from what actually occurred, although the number of boats is substantially greater. Observe, however, that SAFE introduced the advanced boat in the fleet in significant numbers about four years before this actually occurred. (Timing is perhaps the most crucial problem in posture planning methodology and threat assessment.) Coincidentally, SAFE charged $320 million for three boats (18 missiles), and we currently assess the Yankee (16 missiles) to cost about the same. Hence, in Fig. 10 we get a fairer comparison by dividing the SAFE force of smaller boats by three. That is, 20 "equivalent" boats in the figure corresponds to 60 in the SAFE exercises.

Moreover, a distinction must be made between launch tubes and reentry vehicles. Each Poseidon launch vehicle carries ten RVs. The U.S. Navy progression concept (Polaris, Poseidon, Trident) puts successively more RVs in each boat.

The H-class SSBN was carried throughout in most SAFE navies at 12 to 15, versus about nine in the Soviet Navy. That navy also had in 1972 42 cruise missile SSGNs with 336 SLCMs. The class did not appear in the SAFE menu, probably because of its short range. It may be noted, however, that an SLCM is currently under development by the U.S. Navy, presumably with a strategically significant range. HUKs (Hunter/Killer submarines) also did not
appear in SAFE play, indicating that little attention was given to antisubmarine warfare.

We shall not tabulate strategic defense forces, but shall make a few comments about them for the interested reader. SAFE Red teams phased out the older fighters to save annual operation and maintenance money. Actually, in the early seventies the PVO Strany still carried in the active inventory more than 2000 aircraft ten years old and more. This is another example of the "failure" of planning exercises to reflect institutional constraints and inertia and secondary missions.

In a similar but opposite vein, SAFE did not follow the Russian practice of bringing in new aircraft (and missile mods) to an almost rhythmic timetable. During the SAFE decade, PVO Strany introduced the Firebar (Yak-28), the Fiddler (Tu-28), the Flagon A, and the Foxbat. In fact, the aerospace defense budget probably amounted to about 40 percent of all strategic expenditures, of which, in turn, fighters took an appreciable share. SAFE defense allocations were appreciably lower, down to 21 percent in one exercise. Red players tended to replace their interceptors with an area defense system built around large, long-endurance aircraft armed with long-range radar and air-to-air missiles--the Dromedary class.

Two Blue teams, A and E, fielded ABM units, 55 and 78 launchers, respectively. Blue team F introduced a "Bambi" fleet of satellites (three million pounds in orbit) for boost phase intercept of ICBMs. Three Red teams, A, C, F, introduced ABM launchers in numbers (46, 125, 35) bracketing the actual 1972 number of 64.
III. STRATEGIC POLICY IN SAFE

As we have mentioned, strategic policy was not an output of the SAFE exercises, but rather an input to them. Each team, in each exercise, was given a "policy statement," prepared by Fred Hoffman, the project leader. The teams were to implement these policy statements through the strategic postures they generated. The amount of attention actually paid to these policy statements varied from team to team, but there seemed to be general agreement that the budget exercised greater leverage on the postures generated than did the policy statements, which strikes one as a pragmatic observation. In this section, however, we will briefly review these policy statements and compare them with current appraisals of the evolution of strategic policy in the real world during the period 1962-1972.

SAFE FORMULATION OF SOVIET POLICY

In the Introduction, we gave an overview of the situation in each game. Here we begin by discussing the 1962 SAFE formulations of SU objectives in more detail.

SAFE A, E, F. The primary goal is to defend the Soviet Union. Deterrence is to be achieved without engaging in an arms race with the U.S. The Soviet posture must not give the impression that a policy of controlled response has been adopted. Should deterrence fail, the SU should be able to limit the damage suffered to the extent that national cohesion is assured and
recovery is possible. Hence, strong defense forces must be maintained.

This policy statement was used for Red in three of the six plays of SAFE. The explicit emphasis on defense reflected the feeling of Rand analysts at the time that the Soviet Union seemed to spend more on defense than could be "rationally" accounted for in terms of cost effectiveness. The provision about not "engaging in an arms race" had no visible effect on the players in the games, while in reality the Soviets appeared to run a one-man race against the clock.

SAFE play B was actually the first of the serious SAFE exercises. The policy statement prepared for it was, to some extent, a "primitive" version of the "standard" Red policy statement which was used in play A (actually the fourth serious exercise run) [11], E, and F. The SAFE B policy statement was:

SAFE B. Forces are to be developed that are well enough protected to minimize the advantages an aggressor would realize from a surprise attack with or without strategic warning. Capabilities against the U.S. are to be increased by the late sixties. Recognition of the U.S. doctrine of controlled response might currently weaken SU deterrence of a U.S. attack.

The primary goal of the SU armed forces is to protect the nation and party apparatus. In the event of nuclear war, this implies some mixture of active and passive defense and counterforce operations. A feasible goal is to achieve deterrence as well as the ability to eliminate any specially
vulnerable U.S. elements such as soft bomber bases, "though not necessarily to eliminate large portions of the protected U.S. missile force"!

SAFE C. It is necessary that the SU provide means to reduce the ability of the U.S. to inflict damage on the Soviet Bloc. This can only be achieved by a combination of active military means (counterforce and active defense), civil defense, and wartime deterrence (a secure holdback force). The buildup of strategic forces should be such as to postpone the realization by the U.S. that the SU has not in fact entered a tacit agreement to forego general war superiority.

SAFE C was one of a pair of plays (C and D) in which Blue was given a highly conciliatory policy statement (see below) which urged Blue to seek deterrence and parity while placing a high priority on avoidance of an arms race. In play C Red was given the above rather aggressive and deceptive policy statement in order to test the extent to which advantage could be taken of a conciliatory Blue stance. This is strikingly in contrast with the policy statement given to Red in play D.

SAFE D. The primary long-run goal of the SU is to achieve a stable balance of strategic forces with the U.S. as a prerequisite to an effective disarmament agreement. A secure retaliatory capability is to be achieved as soon as possible by that mix of offensive and defensive weapons which will yield the most efficient second-strike force. When parity is achieved, it will be desirable to reduce offensive forces to as low a level as will provide a safe deterrent. Since the U.S. may try to
preserve its strategic advantage, it will be necessary to hedge against technological surprise by maintaining an R&D program in areas where developments might upset the strategic balance. Given stable strategic parity, damage limiting may be restricted to the protection of population from the collateral damage that may result from unlikely attacks against SU retaliatory weapons.

This policy statement is analogous to that given to Blue in plays C and D. The control team wondered, after Red had taken considerable advantage of Blue's conciliatory attitude in play C, whether the degree of distrust between the two sides would be great enough to prevent any significant arms control agreements being reached. In the play, however, both sides were willing to make far-reaching agreements, and in fact, play was suspended in game-year 1968 (after three periods rather than the usual five) since the teams had reached a point where they were spending all their time negotiating deactivations rather than building postures.

Further SALT agreements in the present decade may actually lead to mutual offensive force reduction. However, the continued vigor and growth of the SU RDT&E establishment may mean they are now buying time and have opted for the aggressive, deceptive policy of the Red play C policy statement, with quality replacing quantity.

SOVIET STRATEGIC POLICY IN THE REAL WORLD

A major difference between the SAFE world and the real world is that in SAFE, policy is fixed for the whole play. In the real
world, strategic policy is of course dynamic, changing as the personalities, bureaucratic structures, and politics of governments change. A recent interpretation [12] of Soviet strategic concepts made the following points:

1. Until Khrushchev's ouster in October 1964, owing to the quantitatively inferior Soviet force there was a (reluctant) acceptance of deterrance embodied in a Soviet approximation of the Assured Destruction concept.

2. The rapid deployment rates of new strategic systems clearly indicate a major doctrinal branching. Of course, the new systems were well along in development in 1964, but it cannot be known whether Khrushchev would have built up forces to the imposing size they attained, had he remained in power.

3. The idea now was to reach, at the very least, strategic parity with the United States. However, there was probably no belief that an Assured Disarming first strike capability could be achieved by the early seventies.

4. The Soviets were pressing for a war-fighting capability and never accepted the American assumption of a Mutual Assured Destruction deterrent, which is alien to the Soviet organizational set. The leadership wanted to be able to wage nuclear war, if necessary, both against an enemy's war-fighting and war-supporting structures. The forces built up were to be able to maximize the chance of national survival, and secure postwar advantages; in sum, win a nuclear war.

5. Hence defensive forces must be emphasized equally with offensive forces. World War II experience taught that defense of the homeland was paramount. The PVO has always been both healthy and stable in its share of the military budget. Air defenses, antisubmarine warfare, and ABM development continued to be pushed. It is conceivable that after 1966, if the Strategic Rocket Forces were seeking a larger budget share, Soviet proponents of the ABM had to contend with arguments borrowed from U.S. lobbyists for ABM limitations. Offensive and defensive naval forces continued to grow, largely at the expense of the Strategic Air Force component, as the Soviets started a global projection of sea power.
6. Since the mid-sixties, it has been consistent U.S. policy to favor programs giving confidence in the viability of the Assured Destruction Deterrent. But the SU has chosen a course that leaves open various forms of superiority and has shown no unilateral willingness to halt at a specified "end point."

7. However, because of SALT I, it appears that SU strategic doctrine is now at another crossroads. They must choose between continued pursuit of superiority or willingness to settle for parity formalized in a structure of bilateral agreements. (Or could they still be seeking the former sheltered by the latter?)

It would appear from this analysis that the Soviet Union began the decade 1962-1972 with something like the "A-E-F" policy statement, but evolved into something approximating the "C" policy statement, and may now be willing to settle for a somewhat stronger approximation to a D-type statement. Although the dynamics of policy are totally different in the world of SAFE, this analysis at least demonstrates that the policy statements used constituted live options for the Soviet Union. We are struck again, however, by history’s reluctance to march to the analyst’s beat.

BLUE POLICY STATEMENTS IN THE SAFE GAMES

Blue policy statements employed a spectrum for the six plays similar to that of the Red policy statements.

Blue Play A, B, and F. This "standard" Blue policy statement stresses a secure retaliatory capability and the denial to Red of any significant military superiority in any contingency. During wartime it envisions the U.S. population and economy being protected by a combination of restrictions on Red’s capability and
will to inflict damage. Red's capability is to be restricted by a combination of Blue counterforce strikes and active and passive defense. Red is deterred from attacking cities, since Blue would not initiate such warfare except in retaliation. This posture statement put much emphasis on the enduring survival of Blue forces.

**Blue Plays C and D.** The policy statement for this pair of plays was much softer in tone than the standard policy formulation. Protecting the U.S. civil fabric from deliberate enemy attempts to rend it is a hopeless task. The central objective of the U.S. is the preservation of a substantial and controllable retaliatory force. This capability should be achieved at the minimum possible cost. There is a strong implication that costs could be substantially reduced by means of appropriate bilateral arms limitation agreements with the SU.

**Blue Play E.** This ambitious policy states that the U.S. must be able to deter SU aggression by threats to destroy SU strategic forces. This demands offensive and defensive forces adequate to protect the U.S. against punitive attacks by the SU. Intrawar deterrence (a withheld countervalue threat) cannot be relied upon to prevent Soviet retaliation, but since it is possible that the Soviets could be deterred by such a withheld threat, cities should not be hit (in the absence of an overwhelming military requirement) save in retaliation. This policy of maintaining superiority was to be carried out in "as nonprovocative a manner as possible."
REAL-WORLD U.S. STRATEGIC POLICIES

Just as Soviet policy went through a period of evolution during the 1962-1972 decade, so too did U.S. policy change from year to year.

In 1961-62, the U.S. had clear strategic superiority by a wide margin, although the threat of a large Soviet ICBM force was portrayed by the DOD as only a year or two on the horizon, an underestimate of about five years. Launching ICBMs on warning was considered infeasible and potentially catastrophic, because the technology of the time could not provide unambiguous warning. Counterforce capability in a flexible combination of manned and unmanned systems was the requirement. [13] Civil defense had very high visibility, although quoting 1961 testimony, "expenditures must be directed toward obtaining maximum protection for lowest possible cost [sic]."

The major mission of the strategic retaliatory forces was to deter war by a capability to destroy the enemy's war-making capability. It was asserted that requirements could be calculated with reasonable precision, defining cost/effectiveness as the combat effectiveness of each system per dollar of outlay.

It is most important to observe that Assured Destruction was not the capstone of strategic thinking in 1962 and that vigorous active and passive defense still had an important place. This atmosphere undoubtedly influenced SAFE designers.

Actual U.S. policy at the beginning of the decade 1962-72 was thus quite similar to the "standard" policy statement used in
three of the six SAFE exercises. As time wore on, however, the U.S. tended to shift in the direction of the policy statement used in plays C and D. This shift can be tracked by bald paraphrases of congressional testimony given by the successive Secretaries of Defense as follows:

1963 (Robert MacNamara). The Assured Destruction concept gains strength. Deterrence is secured by the capability to destroy not only enemy nuclear strike forces and military installations, but also his urban society if necessary. A second strike force is provided for the first mission, and a protected force employed or held in reserve for the second.

1964. The language of 1963 is now inverted. The retaliatory forces must maximize deterrence by being visibly capable of fully destroying the Soviet society under all conditions of retaliation. In addition, given war, these forces should have the power to limit the destruction of our own cities. A full, first-strike counterforce capability is simply unattainable by 1967-69.

1965. Assured Destruction (AD) and Damage Limiting (DL) are still the paired operative concepts. The mirror view of symmetric deterrence is adopted. Assured Destruction is defined quantitatively for the first time—one-fourth to one-third of the Soviet population killed, and two-thirds of the industrial capacity destroyed. Once high confidence in AD is assured, any further increase in forces is to be based on a contribution to DL. A marginal equilibrium analysis is the way to "balance" the forces. Civil defense sums of $5 billion to $25
billion are discussed. (CD funding for 1966-1968 was actually $170 million.) Active defense forces costing $20 billion are at least contemplated.

1966. The concept of AD plus DL is still in the saddle. But AD can now stop at the point of diminishing marginal returns, since smaller and smaller cities would be attacked. Because of uncertainties about Soviet responses to DL measures, it is not clear what should be the extent and nature of DL efforts.

1967. AD is now redefined to mean one-fifth to one-fourth of population killed and one-half to two-thirds of industrial capacity destroyed. The view of mutual deterrence persists. U.S. attempts at DL would put pressure on the SU to increase attack forces, and conversely. Therefore, there is a mutuality of interest in limiting ABM deployment. In the early seventies, the U.S. is expected to still have a significant lead in the number of strategic weapons and a substantial superiority in overall combat effectiveness.

1968. Forces must be sufficiently large for the AD deterrent, still defined as in 1967. But for DL to contribute to deterrence it would have to be extremely effective. We now have no way to accomplish this. However, if the SU persists in ABM deployment, the U.S. will be forced to take additional steps. (Thus, at the close of the MacNamara era, the change from the "standard" SAFE policy to the more modest policy similar to that pursued in plays C and D is almost complete.)

1969 (Clark Clifford). The U.S. will continue to have, as far into the future as we can discern (1973), a substantial
qualitative lead and a distinct superiority in the number of deliverable weapons and in overall combat effectiveness. It is now generally agreed that the primary deterrent is AD and not DL.

1970 (Melvin Laird). The retaliatory forces are still the deterrent in the second-strike Assured Destruction mode. There is now heavy emphasis on the defense of AD forces. Without ABM defense of bomber bases, the Soviet SLBM force would constitute by 1972 a severe threat to pre-launch survival. The deterrent value of offensive forces could be supplemented by an ABM deployment to protect cities against the Chinese ICBM threat. Deployment of SAFEGUARD is to be continued, since it is a core for growth options in defense of MINUTEMAN. This would postpone a commitment to mobile MINUTEMAN (on land or afloat) or to further hardening of silos.

1971. Sufficiency criteria, more comprehensive than AD, are now to be followed. Sufficiency means maintenance of forces adequate to prevent the U.S. and its allies from being coerced. It is inconsistent with sufficiency to base force planning solely on some finite—and theoretical—capacity to inflict casualties presumed to be unacceptable to the other side. (The deduction of requirements based on the sufficiency concept is hardly persuasive.)

1972. Quotes from President Nixon's Foreign Policy Report to Congress: "A simple 'Assured Destruction' doctrine does not meet our present requirements for a flexible range of strategic options. No President should be left with only one strategic course of action, particularly that of ordering the mass
destruction of enemy civilians and facilities."

The U.S. strategic policymakers in the real world apparently began with something like the standard SAFE policy, but moved toward the softer C and D policy as the SU became stronger. Now (1974) there is apparently a tendency to stiffen U.S. policy, and return to broader strategic criteria (like those of the standard policy statement) in combination with an imperative to limit strategic arms through bilateral agreements.

The policy of play E, to maintain a large measure of superiority over the Soviet Union, has never been espoused by the later leaders of the U.S. government. Such a policy would be extraordinarily expensive and, against a reactive Soviet, probably unsuccessful.
IV. IMPORTANT DISSIMILARITIES BETWEEN SAFE PLAYS AND THE REAL WORLD

As discussed in the preceding chapters, the various plays of SAFE were all different from one another, and each of them generated postures naturally different in many details from the force postures evolved in the real world during the period 1962-1972. In this chapter we shall focus upon four major dissimilarities between SAFE postures and the real world which arose in several plays, and try to analyze the causes. These four dissimilarities are:

1. In most SAFE plays Blue spent a moderate to large amount on civil defense, while in the real world the United States spent very little indeed in this area.

2. The ratio of Blue spending on ICBMs to spending on SLBMs tended to be much greater in the SAFE plays than in reality.

3. Long-endurance aircraft (called Dromedaries) were a favorite of both Red and Blue in many SAFE plays. In reality, no such aircraft were procured for combat missions.

4. Both sides were attracted to mobile ICBMs in SAFE, but in real life no such systems have as yet been deployed.

We will discuss each of these dissimilarities in turn.

CIVIL DEFENSE

The expenditures on civil defense by Blue players varied between 8 percent (play E) and 16 percent (play A) of the respective total strategic budgets. In reality, only 1 percent of
the U.S. strategic budget was spent on civil defense over the decade in question. What can explain such a spectacular difference?

- The SAFE games were played at a time when U.S. interest in civil defense peaked. The Kennedy administration was recommending the construction of "backyard" fallout shelters on an individual basis, and in some areas neighbors discussed forming assessment districts to build neighborhood shelters. Later, however, opinion leaders in this country cooled to the notion of civil defense, feeling that an aggressive program tended to create an unhealthy war consciousness on the part of the general public.

- SAFE players viewed counterforce war, rather than an attack on cities, as the serious possibility. The opposite view was probably held in Washington and in public thinking. Fallout shelters can be very effective in reducing casualties if ICBM wings, air bases, and other military targets are attacked. But shelters do not provide much protection if central cities are deliberately flattened. (We will discuss immediately below, however, the Soviet approach to protection of urban populations.)

- As time moved on in the real world, many officials equated our Assured Destruction capability to an Assured Deterrent, so that nuclear war was not a real possibility. Furthermore, they felt that civil defense could be a destabilizing signal that the U.S. was not content with a merely deterrent posture.

So in this country, CD lost all visibility, degenerating into placarding office buildings as shelters, sounding sirens, and providing part-time jobs for mayors' brothers-in-law. The situation was markedly different in the Soviet Union.

The Soviet CD program, [14] headed by a Marshal—a Deputy Minister of Defense—provides measures for the defense of the
population, and plans for large-scale postattack recovery. In the late sixties, much reliance was placed on several days' strategic warning to evacuate the urban population. Brezhnev repeated an endorsement of CD in 1967.

The deep subways of Moscow, Leningrad, Tbilisi, Kiev, and Baku have been designed not only to move but also to shelter large numbers of people. Special shelters, mines, and basements are available to accommodate thousands. Manuals provide information on quick construction of fallout shelters in rural areas. Shelters are designed to serve peacetime public or economic uses, as in Sweden.

Although Russian resources committed to CD have not been explicitly estimated, since costs are hidden in the budgets of republican and local administrations and economic and other institutions, if these costs were collected they would probably reach a healthy percentage of the sums spent by SAFE Red teams.

The real summary of what occurred is probably that for domestic political reasons the U.S. did not emphasize CD, whereas, also for political reasons, the SU did. So much for mirror-image approaches to U.S./SU behavior.

Should we expect posture planning exercises to allow for such degeneration of major programs? The answer is part of the larger issue of whether or not a control group should try to inject a higher level of political dynamics into posture planning exercises.
THE BLUE ICBM/SLBM SPENDING RATIO

In four out of five plays which were carried to completion, Blue deployed more Minutemen than the United States did in the real world (plays A, B, E, and F). On the other hand, in four out of five plays Blue deployed fewer SLBMs than in the real world (plays A, C, E, and F). In play B Blue bought more of both, and in play C bought less of both. Plays B and C require no special explanation—the budgets given the Blue players in these two cases were simply respectively greater and less than in reality. But what explains cases A, E, and F? Why did the Blue players find land-based ICBMs relatively more attractive and SLBMs relatively less attractive than did their real-world counterparts?

The answer, we believe, rests in an imbalance in the Blue menu. [15] The Blue menu provided plenty of growth potential for Minuteman, including both harder silos and MIRVs. The growth potential for SLBMs, on the other hand, stopped at the Polaris A-3 missile. MIRVing SLBMs was not part of the SAFE menu. This was, perhaps, a natural distortion for a menu created at Rand, which has always been oriented more toward Air Force rather than Navy systems. Nevertheless, several players remarked in the course of the plays that it seemed unfair to have so much growth potential for ICBMs and so little for SLBMs. Perhaps exercise directors should pay more attention to the initiatives of their neoterics.
LONG-ENDURANCE AIRCRAFT

The postulated Dromedary weapon system employed a large, slow cargo-type aircraft which with tanker support had an airborne endurance of three days. In its air defense mission it carried 60 Eagle missiles with an air-to-air range of about 100 miles and associated radar equipment. [16] It could also be configured for an attack role using long-range stand-off air-to-surface missiles. An ASW configuration was also available on the menu.

Dromedary was fielded by four Blue teams (plays A, B, E, and F) and two Red teams (in plays A and B). It is somewhat surprising that this did not actually occur in the Soviet Union at the least. The Soviet Navy has developed ship-to-ship and ship-to-shore cruise missiles, the Soviets have always been large-aircraft-oriented, and defense is emphasized. It is possible that Soviet backwardness in solid-propellant technology was an inhibiting factor. The rise of the Strategic Rocket and naval forces could also indicate preemption. These are, of course, only surmises.

Bomber generals want faster and more sophisticated bombers. The Air Force argument is that the human eyeball must be in the battle area to exploit the flexibility of the bomber. Any very large, slow aircraft would, they argue, be of very limited utility because of its problems in penetrating enemy airspace. [17] Rand missionaries propagating this faith continue to be rebuffed, despite sunk development costs in large airframes (747, C-5), multifaced radars, and high performance missiles (SPRINT/HIBEX).
MOBILE MISSILES

Barge-based ICBMs appeared in the Blue force posture in two plays (A and C) and in the Red force posture in four plays (A, B, D, and F). No mobile ICBM has been deployed in the real world, although the notion has been very widely discussed. What made such a weapon more attractive in SAFE than in the real world?

One factor was again the lack of growth for sub-launched missiles on the SAFE menu. Due to this shortcoming, you could get a MIRVed missile on a barge, but not on a submarine. Thus any player who wanted a MIRVed missile not subject to the pinpoint attack which a silo must face had to turn to the barge.

A second factor is that an operational mode such as barge-basing is alien to the Air Force's organizational set. Such a consideration carries great weight in the real world, but meant nothing in SAFE. A third factor is that mobile missiles raise, in some people's minds, a risk of nuclear accident which is, for some reason, more frightening than the risk from, say, a bomber accident or a detonation in a silo.

Finally there is the notion that verifying the number of mobile missiles would be difficult and thus would make arms control agreements much more difficult. [18]

SUMMARY

The major discrepancies between the SAFE postures and the postures in the real world seem to be attributable to the menu's limitations on the growth potential of SLBMs (which contributes both to larger-than-life ICBM postures and to the
deployment of barge-based ICBMs), and unforeseen political constraints (which depressed U.S. civil defense programs, and may also have contributed to the lack of interest in very large combat aircraft and mobile missiles).

The effect of "accelerated time" was simply to speed up the transition from 1962 postures to the postures which the players thought were the best achievable within the menu.

Unforeseen technological developments did not turn out to be significant in those areas which were modelled in detail in SAPE. However, one notes that space systems were badly under-represented in the menu and in the play of the game itself. The menu offered satellite interceptors, the "Bambi" space-based ICBM intercept system, satellites to warn of missile launch during boost, and fractional orbit ICBMs. Not offered were space systems for communications, reconnaissance, empty-hole information, bomb damage assessment, and midcourse tracking of RVs. If a greater emphasis had been put on space, a certain amount of money would most likely have been siphoned from the ICBM force into space fleets.
V. UTILITIES AND DISUTILITIES OF POSTURE

GAMING: CONCLUSIONS

In any posture planning exercise, one of the major problems is how to represent the force posture likely to be attained by the major antagonist (or antagonists). There are two extreme solutions to this problem. The first extreme is to take a given enemy force posture, developing over time, and design an own posture to meet it. That is, a threat is postulated which is independent of own posture. The opposite extreme is to postulate a "perfectly reactive" antagonist, who always chooses to deploy just those weapons which are most effective in countering own choices. Although a fixed threat may be an adequate representation of reality over the short term, and a perfectly reactive opponent may be a fair representation over the very long term, the truth obviously lies somewhere between these two extremes. The approach used in the SAFE exercises offers a way to carry out posture planning over a longer period in a more realistic way, with each side's decisions, year by year, being partially shaped by what they perceive their potential antagonists to be doing and partially shaped by their perceptions of their own needs.

Even so, it was recognized at the time SAFE was created that it would be less than perfect as a predictive tool, for it does not contain any reasonable model of institutional inertia or the political factors which often have a substantial effect on military programs. Should posture planning games include mechanisms to model these "extrarational" factors?
One could argue that the game controllers should provide institutional and other domestic constraints on objectives, budgets, and major allocations, thereby reflecting the role of Congress, the media, the public, and the administration. This would perhaps lead to the generation of postures in the exercise which would be closer to the postures of real life. On the other hand, at least three cogent objections can be raised.

First, the political factors are themselves highly unpredictable. In 1962, when the SAFE games were played, national political leadership seemed to be endorsing a strong civil defense program. An attempt to introduce "political factors" into civil defense decisions in SAFE at that time would probably have been in the direction of increasing them, rather than (as turned out to be the case in the real world) decreasing them. We simply are not able to make as good predictions about the political possibilities for strategic force postures as we are able to make about the technological possibilities.

This brings us to the second objection to having the control team impose greater constraints on the players. It tends to make the results more difficult to interpret. If the teams are free to choose the postures they prefer, then the postures generated explore the opportunities inherent in the technological forecasts embodied in the menu. But if they are bound by political constraints imposed by the control team, how are we to interpret the postures they generate? At the extreme they may represent nothing more than a forecast by the control team of the postures each side will deploy, imposed on the players disguised as
"political constraints." This is especially apt to be the case if the control team imposes additional constraints as the play of the game goes on. The way to avoid turning the exercise into a mere puppet show is for control to decide on any political constraints in advance of the exercise and to make them simple enough that they can be reported in full along with the exercise results.

Finally, there are some who will argue that the exercise results are really more useful if they transcend political constraints. Political constraints, after all, can be overcome if there is the will to do so; one function of posture-planning games might be to point out how postures would work out if there were no political constraints at all, and this might have some effect on how such constraints took shape in real life.

The decision as to how such political or institutional constraints should be imposed on the teams is one which cannot be made in the abstract. It depends strongly on the purpose for which the game is being used. Possible uses for posture games will be discussed later in this section.

MODULARIZING

At the time the SAFE games were played, the kind of on-line computer systems which are common everywhere today were not available. The SAFE game was entirely manual. Even today, it would probably be more efficient to make such a game "semi-automatic" rather than to try to computerize the entire exercise. But individual parts of the control team's job, such as calculating the total budget expenditures, performing the
randomizations required to determine success in research and development, determining what intelligence is passed, and carrying out some of the calculations involved in evaluating trial war plans, should certainly be computerized. This should be done in modular form, so one part of the game can be changed without changing every part. The use of such modules would make the control team's job easier and more error-free. It would also make it possible to use more realistic representation of some processes, such as costing, than is possible with strictly manual models.

A further virtue of designing a collection of modular on-line computer programs to support such a game is that the modules themselves may turn out to be of independent value. A good example of this occurred in connection with the XRAY2 series of political-military exercises, similar in some respects to SAFE, but developed at Rand five to eight years later. A JOSS* program was designed to carry out costing in this exercise. This module was adapted by the Air War College to support their seminars in force-structure planning. As of April 1974, all 26 of their seminars were using the program, in both an interactive and a batch mode. The AWC faculty believes that the approach should have practical application to the problem of structuring military forces at service headquarters and in the JCS. No part of SAFE

*JOSS is the trademark and service mark of The Rand Corporation for its computer program and services using that program.
ever achieved this kind of external acceptance and use.

A third improvement which should be considered in any future SAFE-type exercises is the addition of teams to play Europe, to play China, and possibly to play other nations. There is no inherent reason why SAFE should be limited to two sides, except for the limited capacity of the control team to process data. Suitably automated procedures should relax this constraint, and permit as many sides to be played as are necessary for the particular end the exercise is intended to illuminate.

PURPOSES

Which brings us to the ultimate question of this chapter: what are posture planning exercises really good for? What purpose do they serve to justify the expense of preparing and carrying them out? There are four purposes which such exercises can serve: a training device; an integrative technique for a strategic studies program; a device for suggesting improved methods of posture planning; and finally a technique for forecasting strategic postures.

A game similar to the SAFE exercise was used for many years at the Air Force Academy. Such a game is undoubtedly useful in motivating students to learn the characteristics of current and potential weapons systems, teaching them some of the rudimentary techniques of systems analysis, and in giving them a better appreciation of the place of different kinds of weapons in the overall strategic force posture. It is hard to use such a game in a large class because individual teams should be small, and if
an attempt is made to play too many games simultaneously the
control team is swamped. Increased automation can help overcome
this problem.

The SAFE game itself was designed to be an integrative device
in a program of strategic studies. By playing the game six times
(with most individuals in the program participating in two or
three different plays) it was possible to build up a common "data
base," a common vocabulary, and a background of shared (even
though artificial) experience. This made round-table discussions
much more cogent than they otherwise would have been, and helped
make almost every part of the program that much easier to carry
out. Unfortunately, when the Alternative Central War Strategy
project was concluded, there was no other strategic project at
Rand with sufficient breadth to pick up the SAFE game, update it,
and continue to apply it. This meant that the intellectual
capital generated was essentially lost after only a year and a
half of use. If such an exercise is designed in the future, care
should be taken to extend its life as much as possible.

Posture planning in the real world, with billions of dollars
at stake, employs a mechanism which is extremely elaborate and
cumbersome. Exercises such as SAFE provide an opportunity to
look at the whole posture, unencumbered by service or political
constraints. Out of this "free" look may come fresh insights
into important posture characteristics which may get lost in the
normal machinery. These insights in turn may lead to
improvements in the machinery itself. This, of course, is one
reason to avoid putting too many "realistic political
constraints" on the behavior of the players: We don't want to reproduce the existing system, but to try to improve it.

Finally, there is the use of a posture planning game as a forecasting device. SAFE was not designed to make forecasts: the forecasts we have examined in this report were strictly a by-product. Nevertheless, we have seen that the postures generated were usually fairly realistic. Security restrictions have prevented us from making explicit comparisons between the SAFE forecasts and projections made by the intelligence community at the same period; but the SAFE forecasts were probably about as good and in some cases much better. On the basis of this evidence, posture-planning games can be a significant aid in understanding the future of strategic forces.

In conclusion, both authors of this report feel that the construction of a modern posture planning game, similar to SAFE but making use of up-to-date information processing techniques, would be a worthwhile addition to any comprehensive program of strategic studies.
SAFE BIBLIOGRAPHY


Kao, K., Relating the U.S. and SU General War Forces to Their Strategic Objectives and Budgets: Case A, The Rand Corporation, RM-3542-PR, April 1963 (Secret).

Lavin, M., Relating the U.S. and SU General War Forces to Their Strategic Objectives and Budgets: Case B, The Rand Corporation, RM-3315-PR, April 1963 (Secret).

Lavin, M., and J. Thurneysen, Relating the U.S. and SU General War Forces to Their Strategic Objectives and Budgets: Case C, The Rand Corporation, RM-3461-PR, April 1963 (Secret).

Lavin, M., Relating the U.S. and SU General War Forces to Their Strategic Objectives and Budgets: Case E, The Rand Corporation, RM-3470-PR, April 1963 (Secret).

Lavin, M., Relating the U.S. and SU General War Forces to Their Strategic Objectives and Budgets: Case F, The Rand Corporation, RM-3471-PR, April 1963 (Secret).

Wildhorn, S., Relating the U.S. and SU General War Forces to Their Strategic Objectives and Budgets: Case D, The Rand Corporation, RM-3394-PR, April 1963 (Secret).
1. Of the 26 members of the 12 Blue and Red teams, 10 played in two exercises each, usually changing color. A different research strategy for a series of exercises is to use "naive" teams on successive plays. That is, they are not only new players but are not given access to the records of previous plays. This presumably circumvents "learning" and "perpetuation." We do not debate the relative merits of the two strategies, except to remark that the "naive" approach also keeps the ground rules, such as budget level, constant over the series. The two strategies implement different research objectives.

2. The research design did not contemplate an analysis of the deeper reasons for what many outside observers term "irrational" consequences of a presumed policy in the real world of defense planning.

3. In 1965 Fred Hoffman became Deputy Comptroller of the Department of Defense, and later Deputy Assistant Secretary for Systems Analysis.

4. We must remark here that a sharp distinction must be made between research whose results are to be "normative" and research intended to be "descriptive" of behavior—what should be done as opposed to what will be done. Should the analyst be descriptive in respect to the Soviet Union, but take a course between the normative and the descriptive for the United States? That is, should he show the expected consequences of the "should be" and "will be" approaches, and then temper the former with bureaucratic and political realities in the hope that his work will have a hearing in and an impact on the real world?

5. In this respect, one must also keep in mind the "costing" problem which plagues all planning exercises whose horizons are many years in the future. How well can future R&D charges, procurement costs, and operating expenses be assessed? Should a range be used? This leads to technical difficulties. Can such events as budgets more than half of which are in pay and allowances be anticipated?

6. The "neoterics" are a species of small, intelligent animal created by the scientist Kidder in Theodore Sturgeon's "Microcosmic God" (Astounding Science Fiction, April 1941). These little animals were able to accomplish any research task Kidder assigned to them much faster than human scientists could because (1) they had vastly stepped-up
metabolic rates and (2) they regarded Kidder as God and devoted their whole souls to trying to fulfill his requests. Kidder kept his neoterics in four sealed rooms in the basement of his laboratory and sent them instructions on a teletype. The director of the ACWS project kept the SAFE teams in three rooms in the basement of The Rand Corporation, and used a Xerox machine for his instructions.

7. In defense of the SAFE menu, we point out that it offered for development and procurement many advanced weapon systems which never passed the paper study phase in the defense community. In both the U.S. and the SU, that community tends to fund improved versions of existing systems.

8. Some developments in satellite capabilities, for example.

9. Currently, paper studies of air-launched ballistic missiles are again underway, largely because of the advent of jumbo aircraft and the improving accuracy of ICBMs against silos.

10. Maintaining budget share and manpower are among the military imperatives driving any service. This is clearly evident in the Soviet Union. This leads to keeping obsolescing systems in the inventory.

11. The first play A was a shakedown run, and was later replayed. Only this replay is discussed in this report.


13. See the report of the Secretary of Defense to the Congress, 1974, as an example of historical policy cycling.


15. The subliminal effect on players of a menu distorted—if only slightly—by relative emphasis on offered weapon systems should be explicitly flagged as a caveat in designing exercises.

16. The Eagle missile was an active U.S. Navy project during 1959-1960. But the Navy wanted to design and procure a specialized aircraft with cubage adequate for the large diameter radar dish needed to match the missile’s range capability. The project founded because of the estimated cost vis-à-vis other demands on the budget. Note that the Dromedary carrier was not specialized but had optional mission configurations. This lesson of system flexibility in posture planning should be evident.
17. This view can be turned on itself and an argument for complementarity can be made. Aircraft of this type may be needed to assure bomber penetration, just as fighter cover was needed in World War II despite the formidable panoply of gun turrets protecting the bomber box. Synergism should also be a posture planning principle.

18. Compare the U.S. position in SALT I.