

GAMA CORPORATION
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PLANNING UNDER UNCERTAINTY:

**SDIO AND THE EMERGING
U.S.-SOVIET INTERACTION**

15 December 1989

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The GAMA Corporation provides services to corporations and state and federal government agencies in strategic planning and contingency preparedness. GAMA specializes in gaming and analyzing situations characterized by high uncertainty or adversarial positions; e.g.: Colombia's drug war; energy emergencies; natural disasters; R&D choices; and debt negotiations. Since 1985, the GAMA Corporation has conducted over 90 strategic planning and contingency gaming sessions. These projects have involved over 1500 participants.

Such scenario-based planning and gaming is the process of developing plans which test, rather than assume, the responses of opposing powers or interest groups. GAMA uses electronic polling and computer techniques to capture the essence of what experts believe, and why. This method of structured planning sessions is intended not to predict a single-point outcome, but to increase the understanding of an issue by analyzing it from several perspectives, to include those with opposing objectives.

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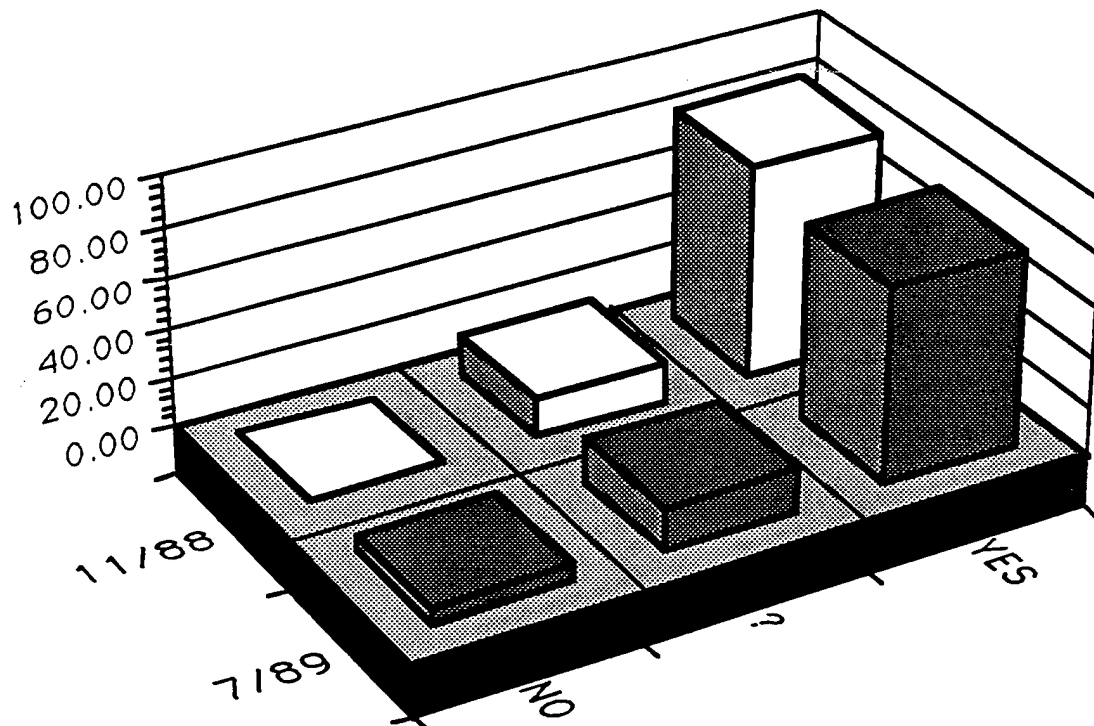
I. EXECUTIVE SUMMARY

The use of gaming as a tool for strategic planning can yield both insights and consensus about major issues. The last two planning sessions -- (at the Naval War College, Newport in October 1989 and in the SDIO conference room in December 1989) -- yielded a similarity and a pattern described as follows. The purpose of the two sessions was to "Think Red" and determine how to cooperate with the U.S. on SDI and then to "Think Blue" about the technology management implications of possible Red proposals/actions. (The figures refer to the quantitative judgments of the participants.)

1. If there were a U.S.-USSR war, conventional or nuclear, both sides would employ ASAT and there would be a battle for control of space. (Figure 1, p. 2)
2. The central Soviet concern about SDI is not that it could prevent the assured nuclear destruction of CONUS; it is that it would confer upon the U.S. the capability to control space (Figure 2, p. 3), which has much broader day-to-day applicability than just the intercept of 1000 to 2000 RVs in a low probability SIOP-level exchange.

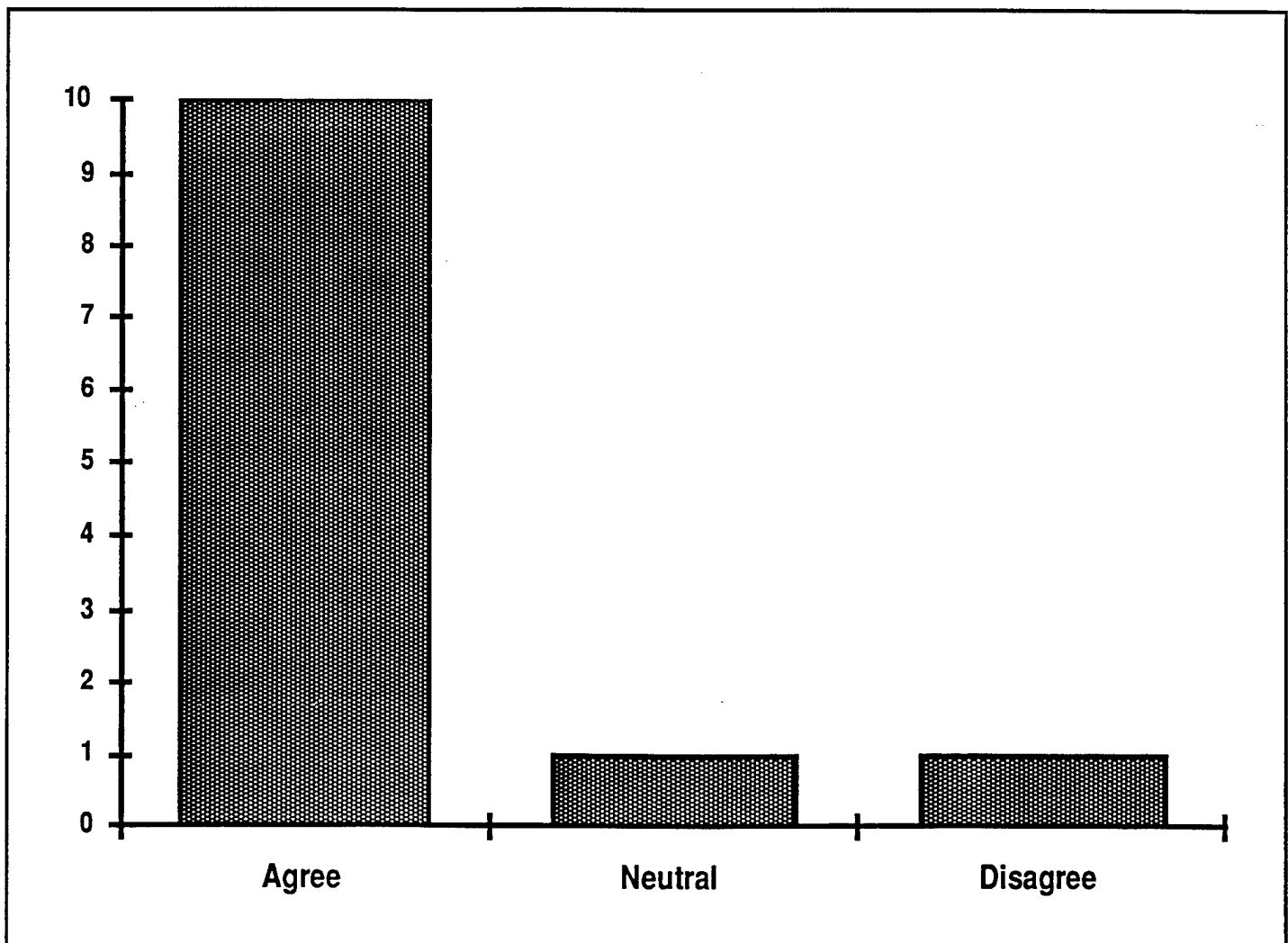
1. In a conventional war, there would be a campaign to control space, just as to control the sea.

1) No 2) Neutral 3) Yes



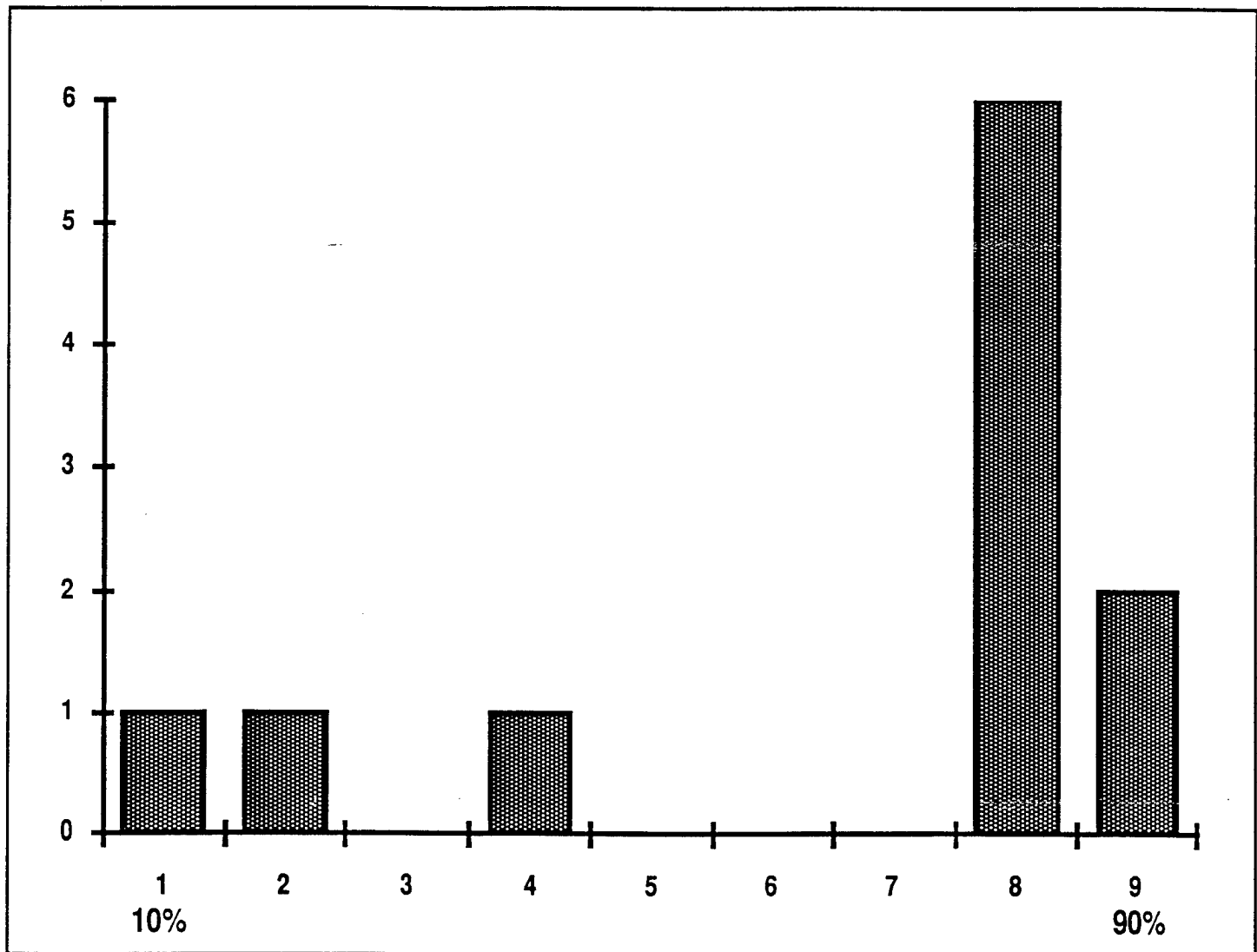
2. Just as quiet U.S. SSNs signify sea control, actual space-based U.S. SDI, taking into full account Soviet responses, would signify space control.

1) Agree 2) Neutral 3) Disagree

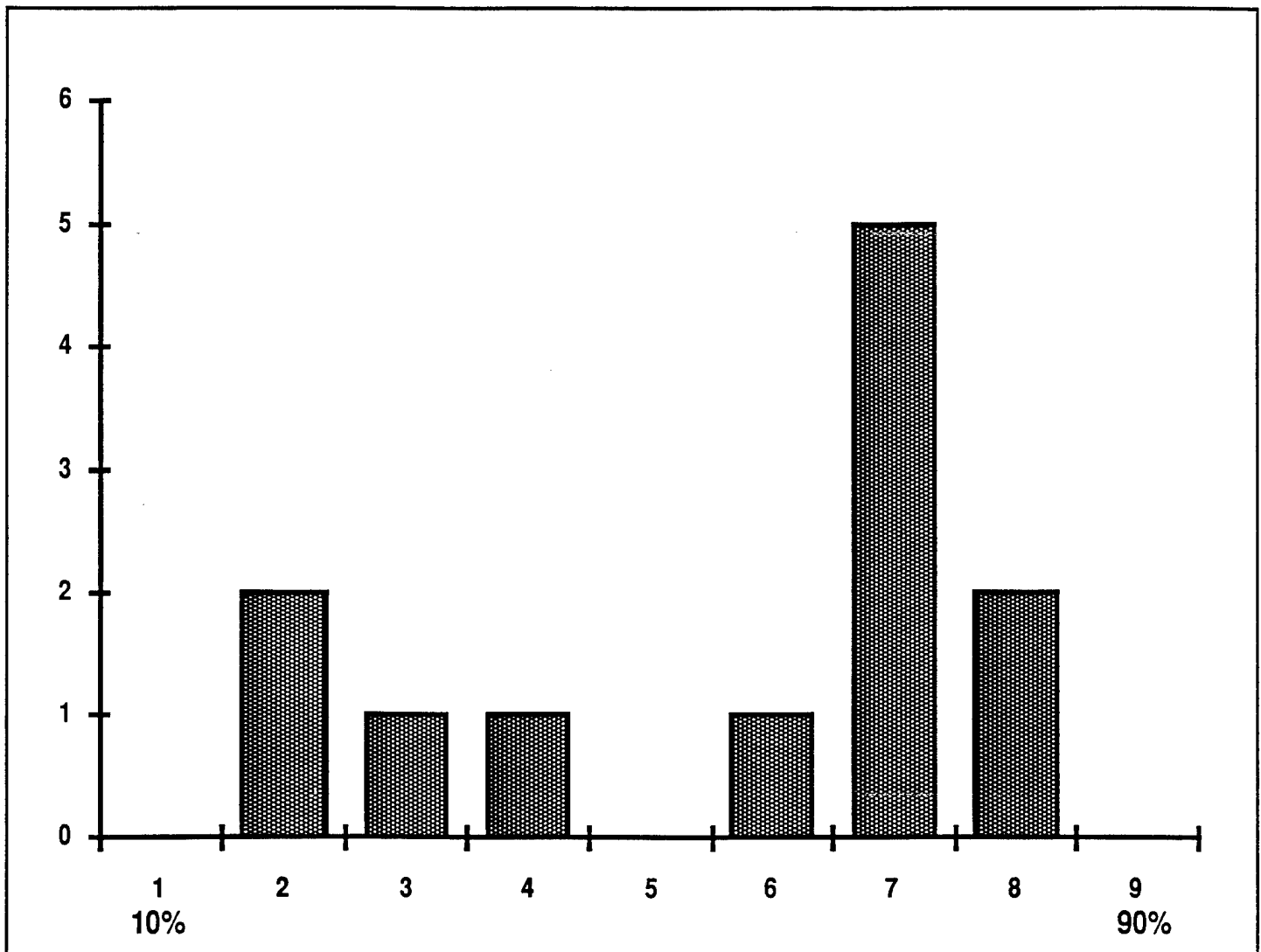


3. The Soviets know they cannot successfully compete against the U.S. SDI, with all that portends for space. There is a good chance the U.S. will continue SDI R&D through the 1990s at \$3-4 billion per year. (Figure 3, p. 5) If so, the U.S. will retain space-related R&D superiority over the Soviet Union. (Figure 4, p. 6) Given militarily-applicable trends, the USSR will not diminish the current technology gap. (Figure 5, p. 7) This R&D lead is significant for three reasons:
- The incentive to develop a mutually acceptable path into the future increases markedly when an adversary knows he will fail in a competitive race.
 - For little more than one percent of the Defense budget, the SDI R&D program has yielded a large deterrent dividend; without the expense of largescale procurements, it has created an incentive not to compete.
 - Because the Soviets do not want to enter a space-based arms competition they believe they will lose, they are willing to discuss arms control alternatives.
4. The Soviet reaction to an actual Phase One deployment would be vehement and real; it would not be posturing. (Figure 6, p. 8)

3. Probability through 2000 of R&D at \$3-4 billion (10 years in constant dollars).



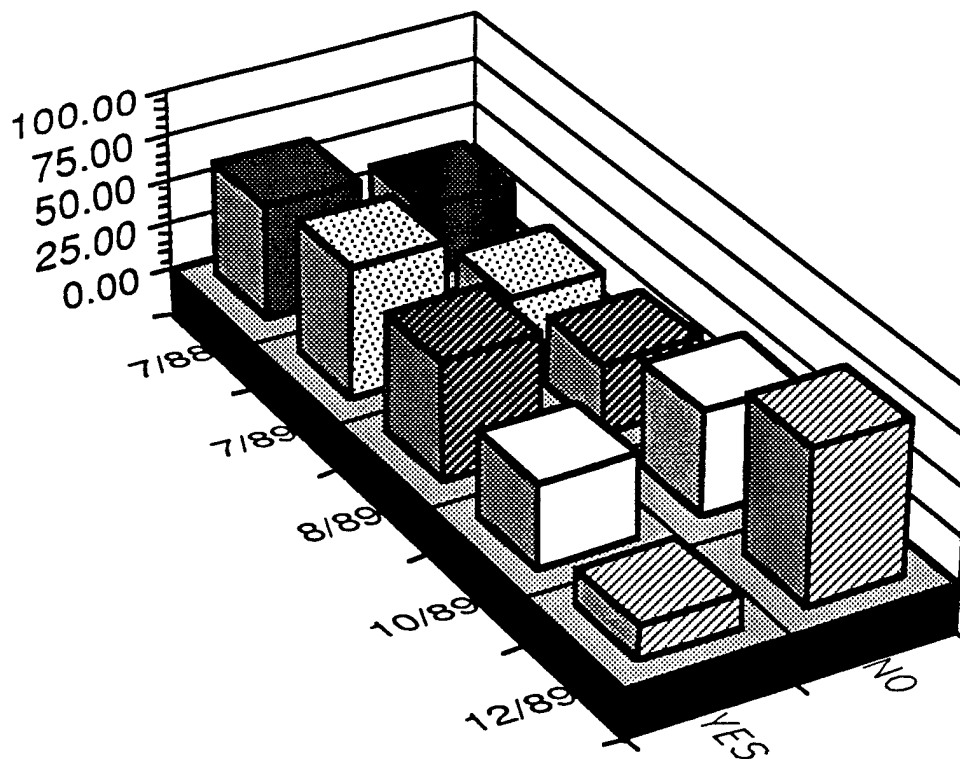
4. Probability U.S. will retain an R&D base with space based-focus superior to Soviets.



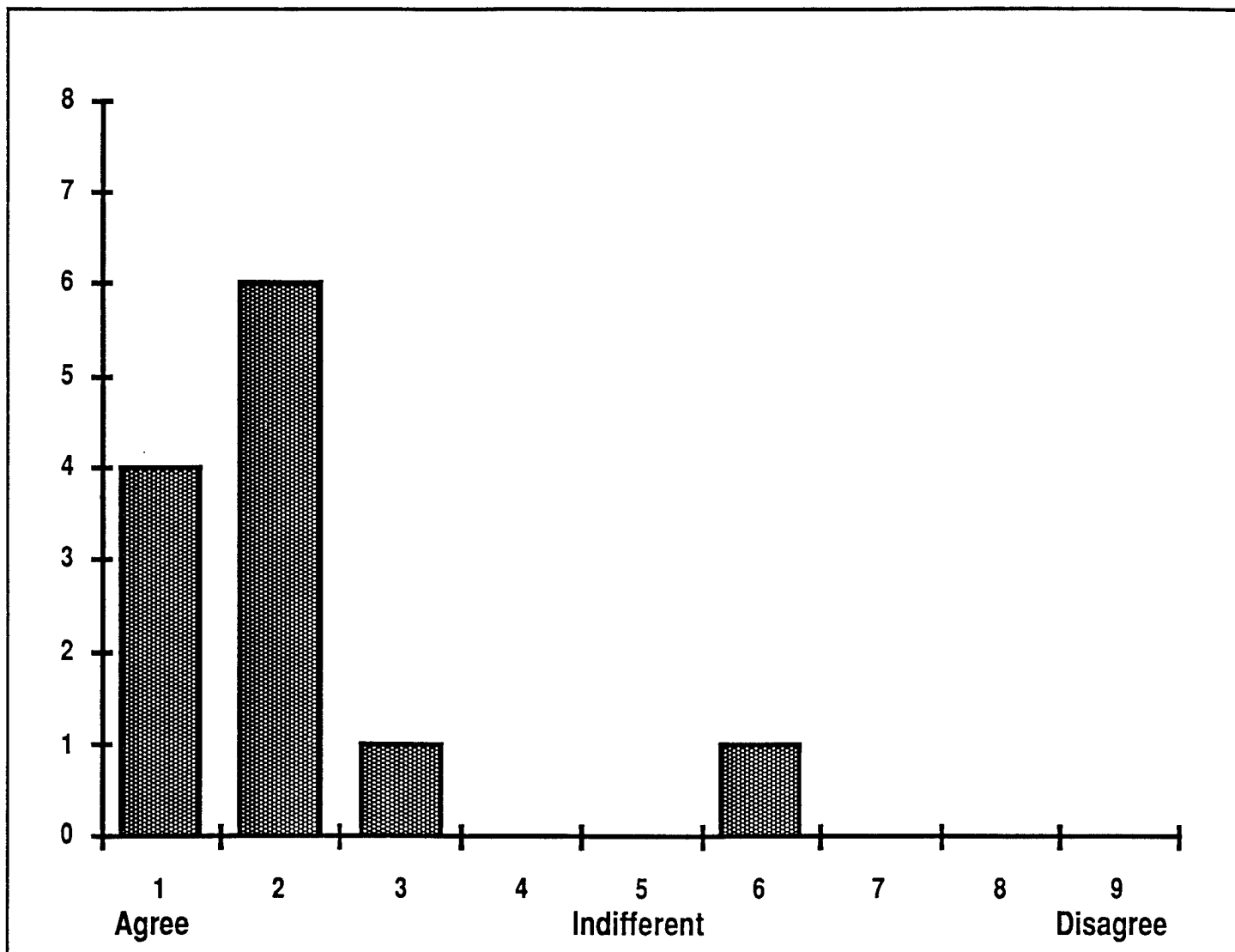
5. Between now and 2010, will the USSR diminish current militarily applicable technology gap:

1) Yes

2) No



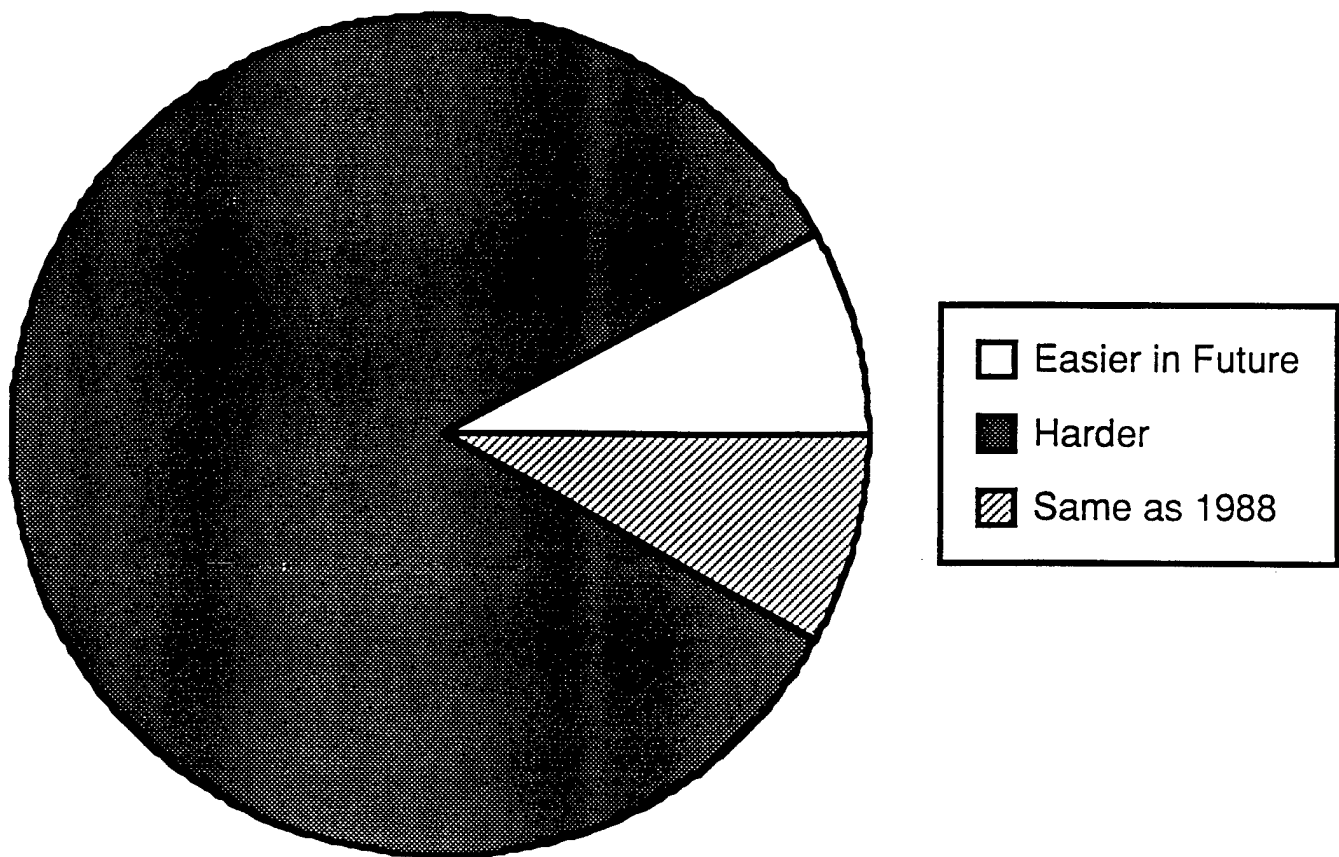
6. Assume START constrains each side to 6000 warheads. In that environment neither side will tolerate without a strong reaction a unilateral strategic defense addition by the other side capable of 1000 or more intercepts.



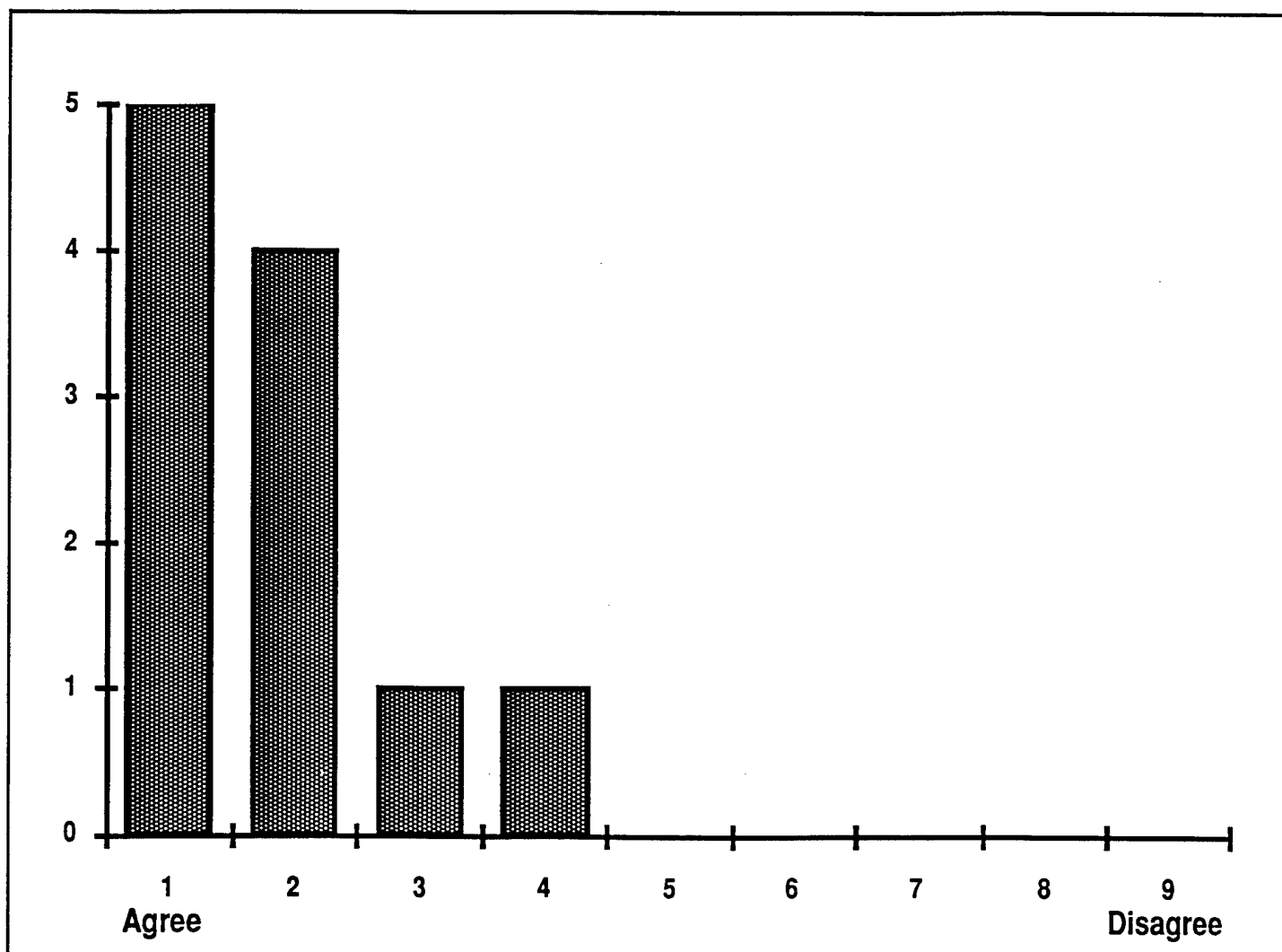
5. Knowing that, U.S. decisionmakers will not jeopardize what is a favorable climate for U.S. interests. (Figure 7, p. 10) Before deciding to deploy Phase One, they would attempt to persuade the Soviets to cooperate. (Figure 8, p. 11)
6. The Soviets would prefer a revised BMD agreement, if any, which restricted space-based defenses more than land-based defenses. (Figure 9, p. 12)
7. Unless there is a breakdown in the current international climate, any deployment must be cooperative. It is perhaps a 50-50 bet that there could be significant U.S.-Soviet cooperation in strategic defenses by 2000. (Figure 10, p. 13)
8. The areas where the Soviets might cooperate are space-based surveillance, lift and ground-based interceptors. Their goals are to prevent further U.S. steps toward a space-based weapon system and to gain technical benefits.
9. Conversely, for the U.S. there is no technical benefit. The goal is to retain domestic and international support for the SDI program, in order to: (1) retain leverage which influences the Soviets to remain cooperative (the deterrent dividend); (2)

7. Soviet conventional power and the Soviet threat in general are perceived as lessening. Given these and other international and domestic trends, a unilateral decision to clearly violate the ABM Treaty will be, using 1988 as the base year:

- 1) Easier in the Future
- 2) Harder
- 3) Same as 1988

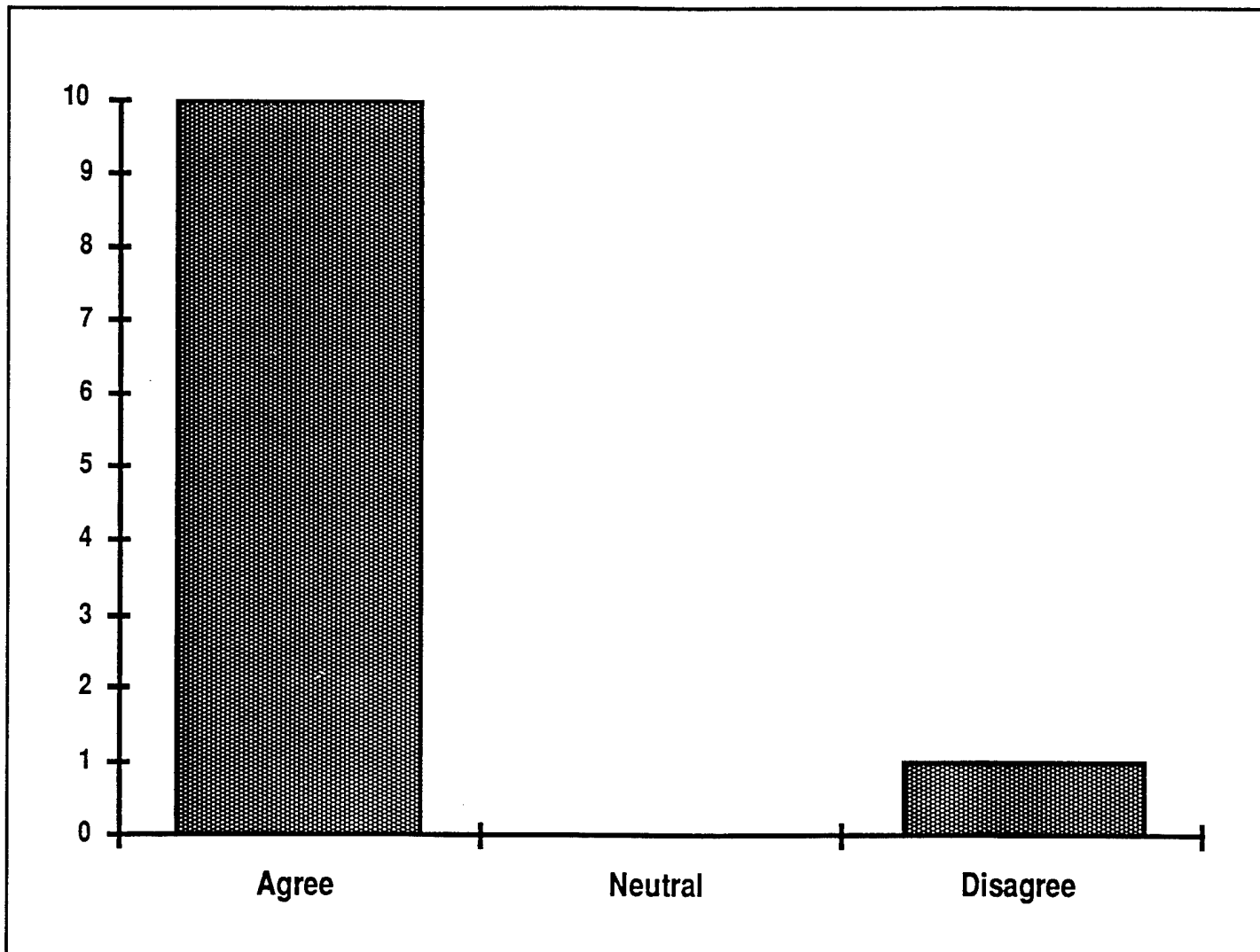


8. Before making a decision to deploy a significant SDS (e.g., 1000 intercepts or more), the U.S. will attempt to persuade the Soviet Union to cooperate by agreeing to defenses, not offenses.

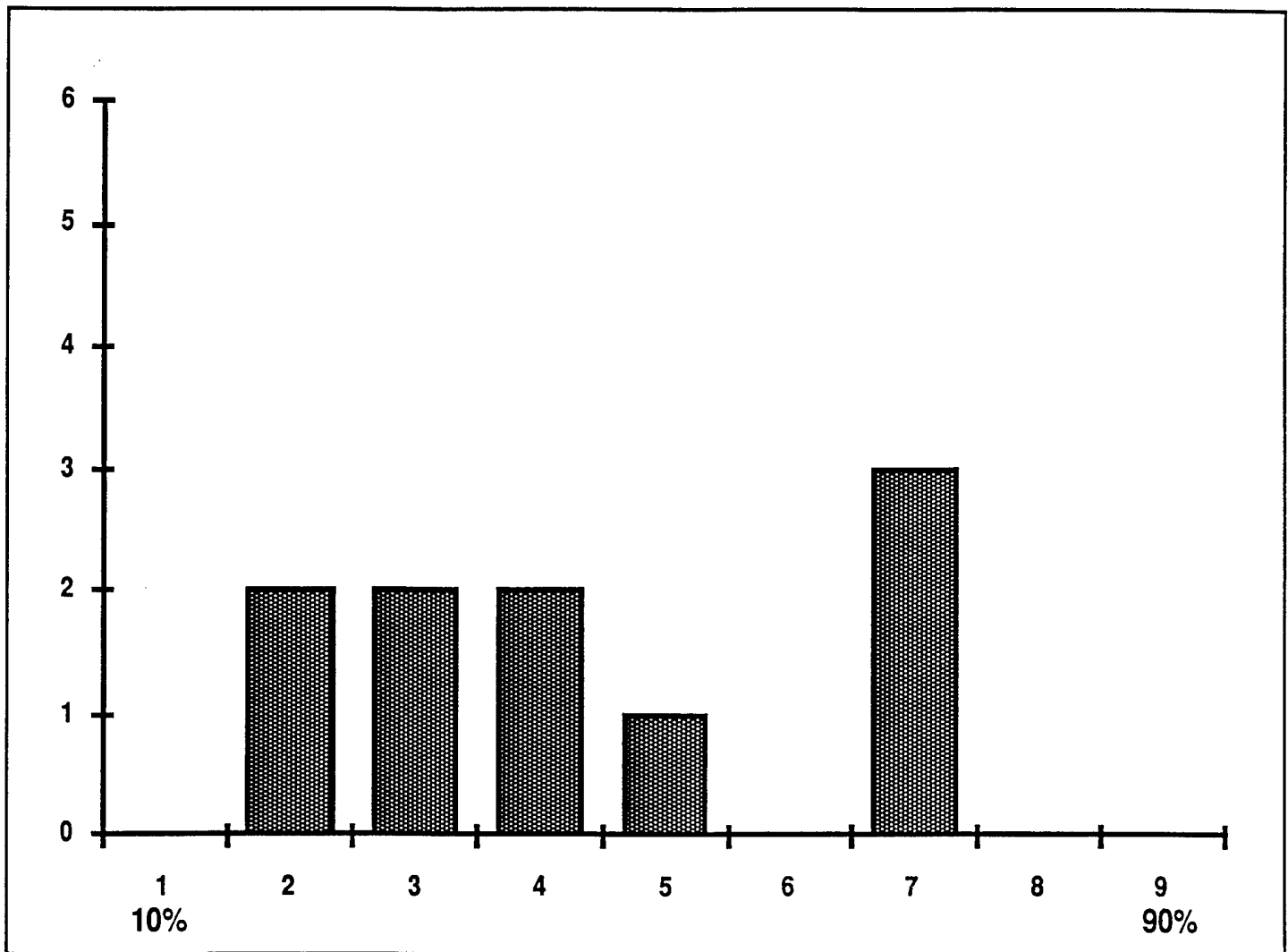


9. The harsh environment of space places special requirements upon high technology, engineering specificity, maintenance, etc. The Soviets would prefer a revised BMD agreement, if any, which restricted space-based defenses more than land-based defenses.

1) Agree 2) Neutral 3) Disagree



10. Relative to strategic defense by 2000 there will be significant cooperation.



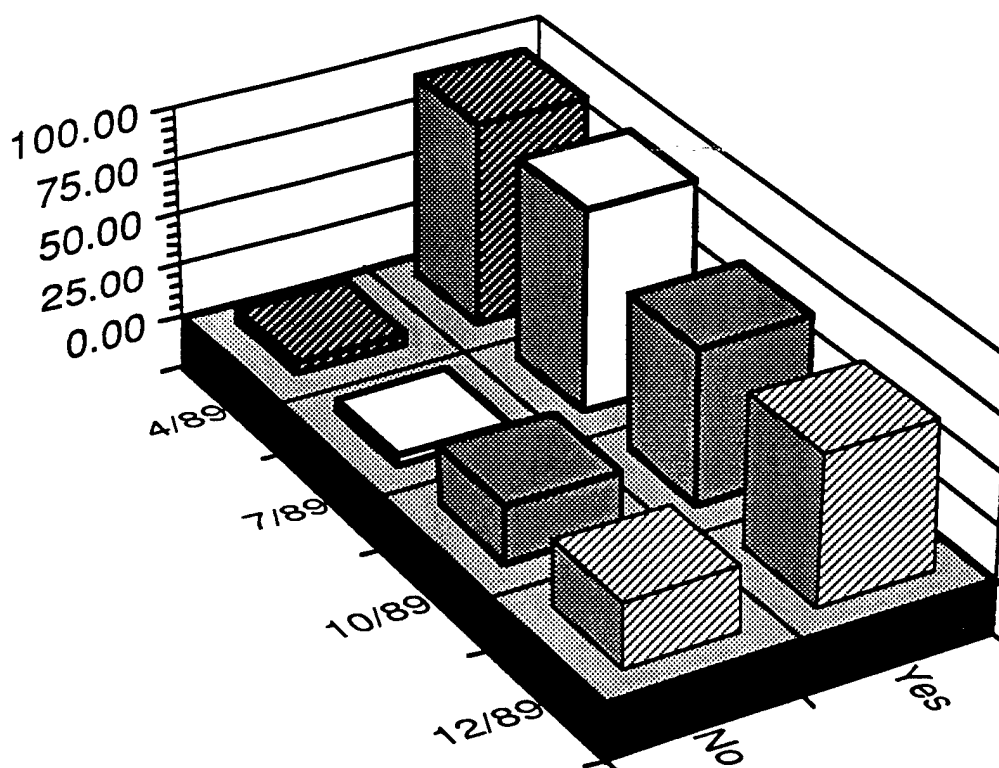
hedge against a sharp breakdown in U.S.-Soviet relations (an insurance policy); and (3) offset ballistic missiles as terror weapons used by Third Nations or through unauthorized or accidental launches.

10. The proliferation in Third Countries of ballistic missiles and improved chemical agents will necessitate defenses involving SDI-related R&D programs. U.S. CINCs will probably argue for some sort of defense (Figure 11, p. 15) and the proliferation of ballistic missiles will have an impact upon the ABM Treaty. (Figure 12, p. 16)
11. This view places SDI inside the context and spirit of the ABM Treaty and of other arms control efforts aimed at creating a stable international order. The bedrock of this approach is to secure a domestic and international consensus which will support a robust SDI R&D base. A Limited Protection System (LPS) is a possible branch in the strategy which could be helpful if something must be deployed to sustain support for the R&D base. There is perhaps a 50-50 chance both sides will deploy an LPS by 2000. (Figure 13, p. 17) Done cooperatively, it might occur in the mid-90s as British and French opposition to any defenses diffuses and as the world community becomes more concerned about ballistic missiles in Third Nations.

11. By 2000, non-Soviet ballistic missiles, without nuclear warheads, will be considered a threat against U.S. forces by U.S. CINCs, for which they will demand a defense.

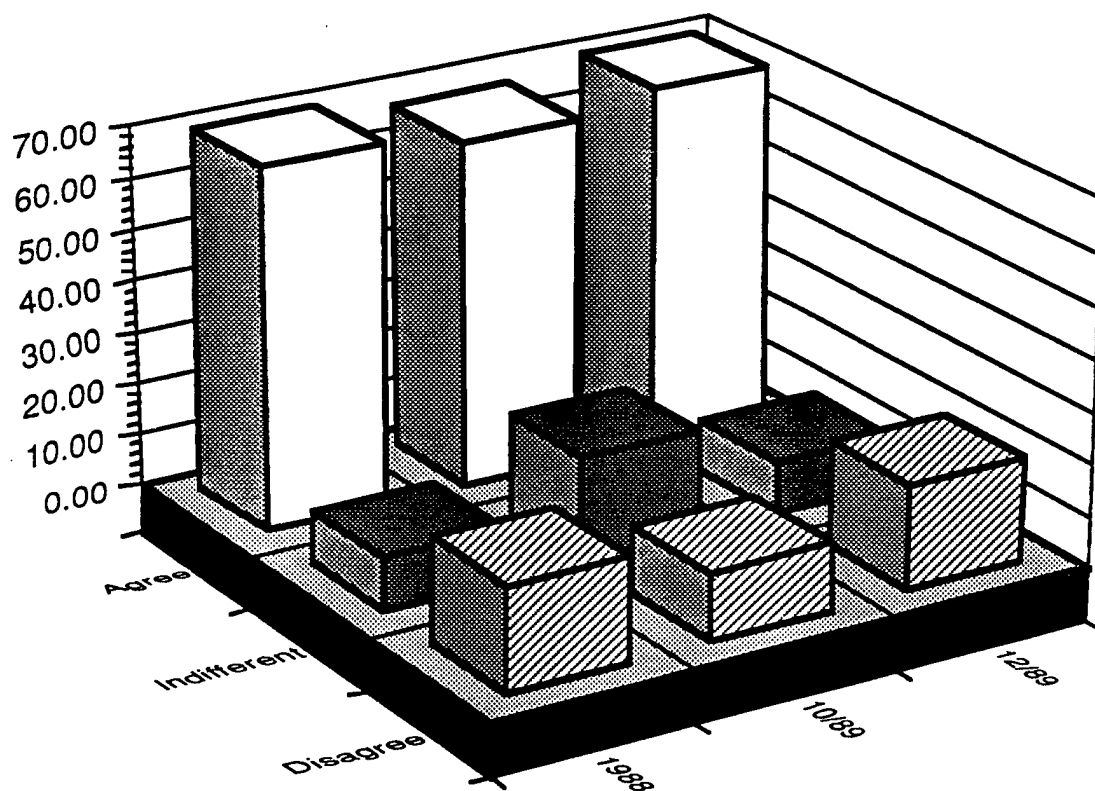
1) No

2) Yes

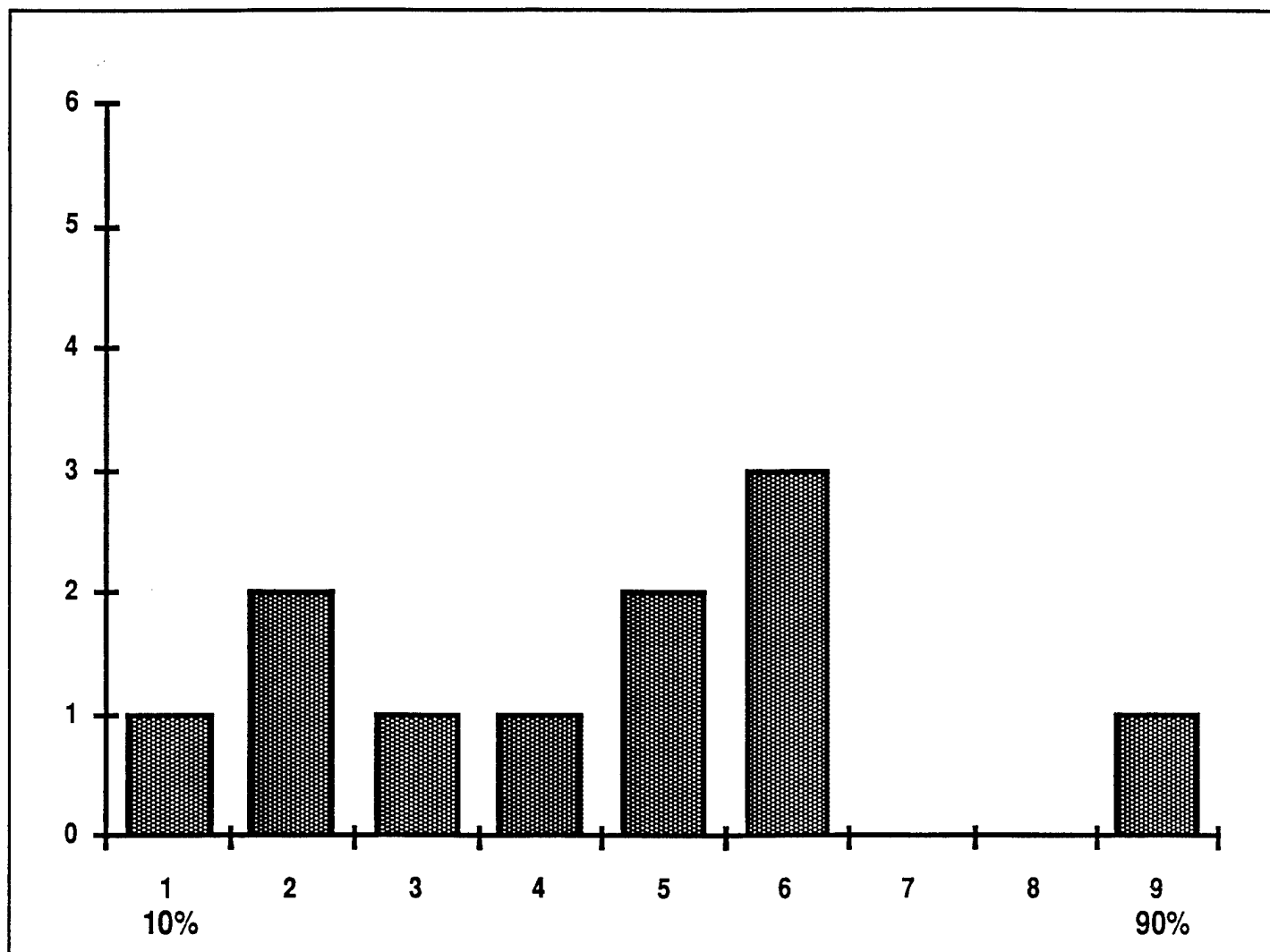


12. By 2000, the proliferation of non-Soviet ballistic missiles will have a significant impact relative to the ABM Treaty.

1) Agree 2) Indifferent 3) Disagree

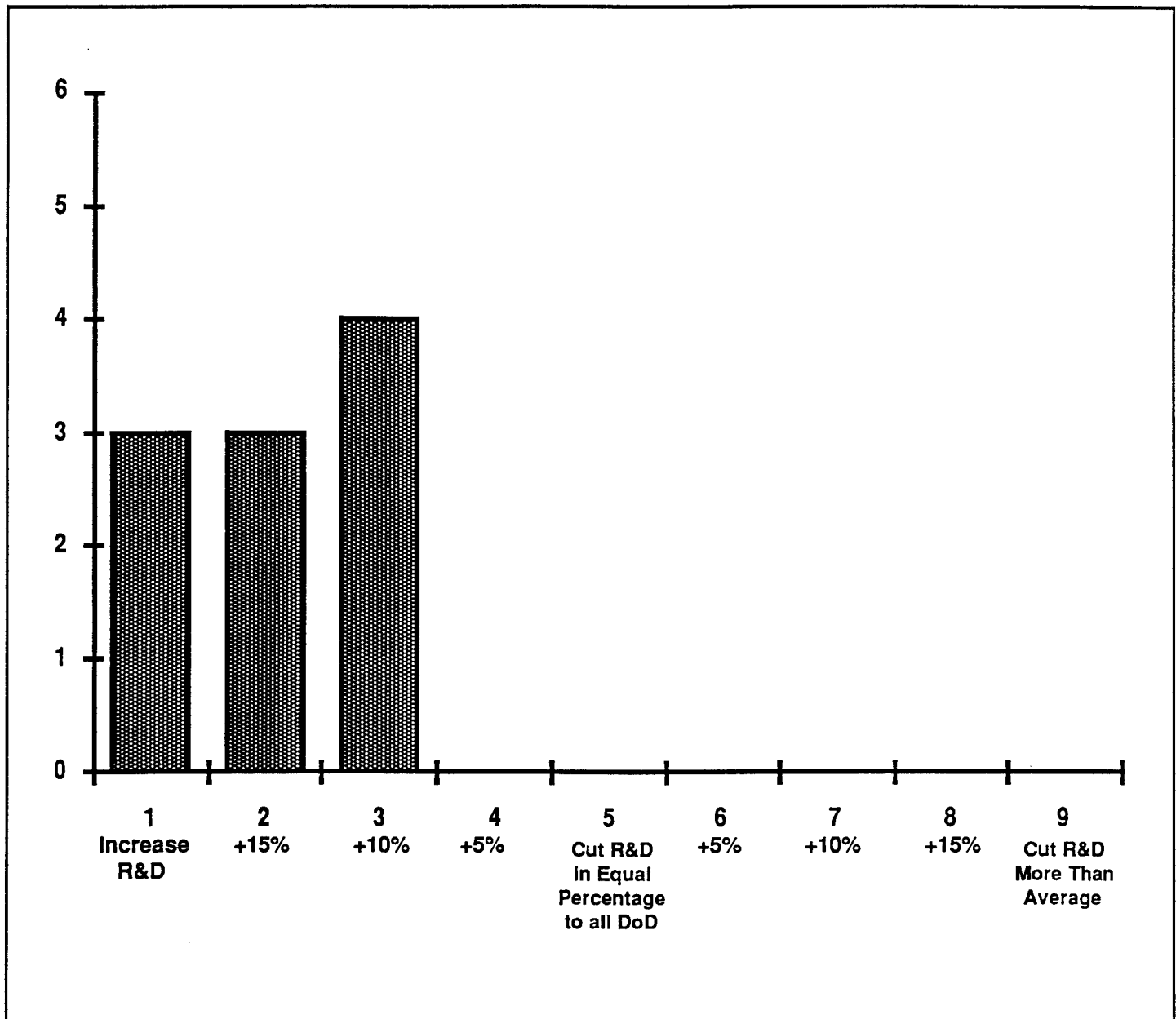


13. By 2000, both sides will deploy some sort of LPS.

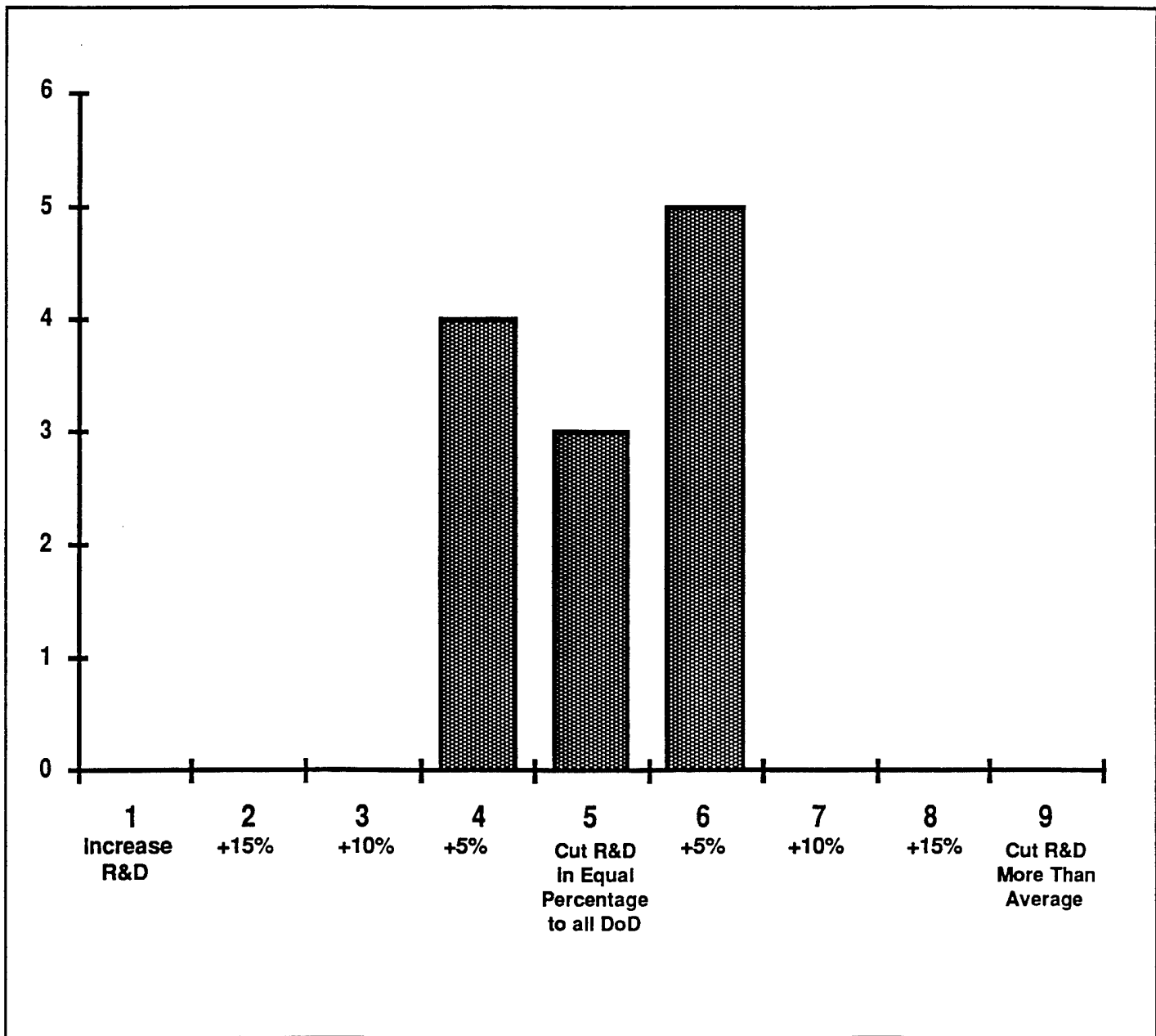


12. According to this view which emphasizes cooperation more than competition, there is merit in a two-sided LPS which, at least in its formative stages, could not pass the test of being "militarily effective" because it cannot intercept thousands of RVs. But this view holds that "militarily effective" is a flawed criterion, as evidenced by the effect SDI has already had upon Soviet behavior, without one piece of hardware being deployed. A program, like SDI, can be short of fulfilling traditional definitions of "military effectiveness", and still have a major impact upon national security, depending on its potential.
13. Entering a period of high promise and uncertainty, and faced with a less immediate threat, the prudent DoD plan would be to increase the DoD R&D base (Figure 14, p. 19) and decrease near-term readiness. But, given the politics of Defense, it is more likely that R&D will be cut equally with all Defense programs. (Figure 15, p. 20)
14. In either event, DoD must alter the incentives of industry if R&D is to remain robust in a period of decreased procurement. (Figure 16, p. 21)

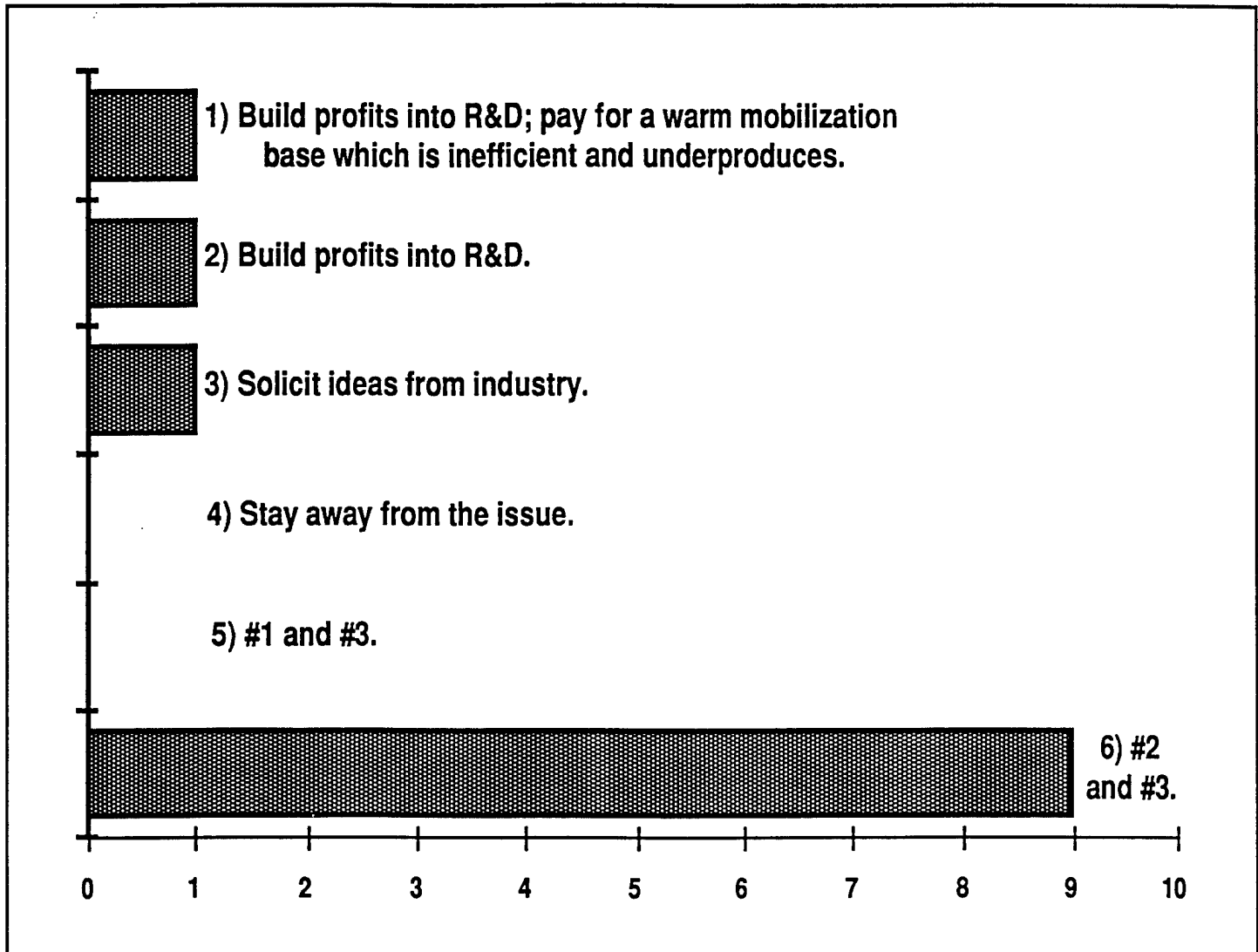
14. The most prudent Defense plan for the 1990s, given current geopolitical and fiscal trends, is:



15. The most likely plan is:



16. The most prudent set of incentives to proffer Defense industries in the 1990s is:



II. PURPOSE.

Two issues were addressed.

- 1) What are the major alternative approaches (decision paths) the Soviets could take to SDI over the next year?

How do these alternatives affect SDIO?

- 2) Given the FY90 appropriation, the events of the past several months and the Soviet alternatives, what are the implications for SDIO management of the emerging technologies?

III. METHOD & SCHEDULE

A. METHOD.

Gaming is a method of strategic planning under conditions of competition.

"Strategic thinking rarely occurs spontaneously. Formal planning provides the discipline to pause occasionally to think about strategic issues."

"Every company should have a strategic plan. A good plan should contain an analysis of the logic of each competitor's strategy, how it thinks, and its likely future moves."

Excerpts from The Economist, 23 May 1987

Any organization does plan based on some view of the future, whether or not that view is made explicit. Gaming assists in strategic planning by providing alternative scenarios, or alternative futures. Gaming does not predict a future or an outcome, but it can identify factors which a decisionmaker or a planner might otherwise overlook.

On 15 December, a modified-Delphi*, computer-aided gaming method was used to focus expert judgment upon alternative paths and outcomes which depend upon the interaction of adversaries. There were two teams. Each team met in caucus to address a series of questions, called a Charge. The teams then met in plenary session to exchange points of view and identify where they agree and disagree, and why.

B. FOCUS.

The SDIO is a management system for R&D activities and programs; it is not a policy analysis or field agency. Its concern is the management of some of the world's most advanced and complex technologies.

The players were asked to view the discussions in the game through the prism of the technical manager: how do the factors under discussion affect the management of the multi-billion dollar SDI program?

* Delphi-type techniques impose a formal structure for eliciting group planning in which each participant can: (1) observe the responses of the others and (2) modify his judgments when presented with new information, arguments or perspectives. See, for instance, Olaf Helmer, *Analysis of the Future: The Delphi Method* (The Rand Corporation, p. 358, March 1967); Normal C. Dalkey, *The Delphi Method: An Experimental Study of Group Operations* (The Rand Corporation, RM-5888-PR, June 1969.)

C. SCHEDULE.

0900 - 0915.....Introduction
0915 - 0945.....Caucus as Soviet Teams
0945 - 1015.....Plenary Discussion
1015 - 1045.....Caucus as Blue Teams
1045 - 1130.....Plenary Discussion
1130 - 1200.....Delphi - Session

D. GAME RULES.

- The first rule is that disagreements and contradictions are expected.
- The second game rule is that agency positions should not constrain the expertise of the individual players. Institutional perspectives should be explained but no one is expected to speak as if he were the institution.
- The third rule is that the content of the game and any conclusions any participant chooses to draw do not, obviously, reflect the position or the endorsement of any government agency.
- The fourth rule is non-attribution. After the game, remarks should not be attributed to any individual without his or her consent. The utility of sessions such as this is that all participants must feel free to express themselves.

IV. ASSUMPTIONS.

A. The wealth among nations will shift, as shown below.

	<u>GNP</u> (trillions)	
	<u>1990</u>	<u>2010</u>
U.S.	4.7	7.9
W. Europe	3.7	6.5
Soviet Union	2.0	2.9
Japan	2.1	3.7
China	1.5	3.0

The Soviet Union will lose ground, comparatively speaking. While its GNP per capita may rise from \$7000 in 1990 to \$8500 in 2010, the U.S. will increase from \$19,000 to \$27,000 and W. Europe from \$15,000 to \$23,000.

B. The U.S.-Soviet conventional force balances in Europe by 1995 will be 10% to 25% less than in 1989.

V. BACKGROUND ON MISSIONS FOR SDI.

According to former national security advisor Robert C. McFarlane, the concept of SDI originated informally in 1982 with the JCS. They were concerned that the deployment of accurate Soviet land-based missiles would not be countered by the actual deployment of an MX. The JCS suggested a limited, ground-based BMD system to deny the Soviets confidence in an initial counterforce barrage.

On 23 March 1983, President Reagan proposed research on strategic defense, with the long-term hope that this could shift the basic strategic construct from deterrence based on retaliation and assured damage to security based upon defending the nations' peoples.

In October of 1988, the Defense Acquisition Board directed the SDIO to pursue the development of a "system of systems" of technologies, such that an informed decision whether to deploy a "Phase One" could be made in the early 1990s.

This program, called the Phase I Architecture, anticipates a ground-and-space-based BMD system, with component IOCs before 2000, which can destroy a substantial number of Soviet RVs, primarily in the boost, post-boost, and midcourse phase of flight.

Views of Alternative SDI Missions

- | | |
|---|--|
| 1. JCS, February 1982
(not formalized into
official position) | Limited ground-based systems to deny Soviet confidence in an initial counterforce barrage. |
| 2. President Reagan,
March 1983 | Research on space-based intercept to protect population on a large scale...eventual security based on defense rather than retaliation. |
| 3. Atlantic Council,
May 1987
(Scowcraft & Woolsey) | Ensure survival of U.S. retaliatory forces...a partial alternative to a massive buildup of offensive weapons...to reinforce our position of deterrence. |
| 4. DoD Commission on
Long-Term Strategy
(1988) | Limited initial deployment of BMD... can reduce Soviet confidence in the success of his missile attack--be effective against missile attacks by minor powers...or accidental missile launch. |
| 5. CSIS Group on
Strategic Policy (1989) | ...need to guard against accidental or third country launch...may be necessary...in order to improve ICBM survivability and enhance deterrence. |
| 6. President Reagan,
1988 | First phase...strengthen deterrence by denying the Soviet Union confidence...in any use of ballistic missiles...and protect population of U.S. and allies against accidental launch. |

7. Secretary Cheney,
29 March 1989

A missile umbrella, Cheney said on NBC's *Today Show*, is 'an extremely remote proposition'. But if 'you look at it [SDI] as a system that could interfere with a Soviet first strike on the United States and thereby increase deterrence, then it becomes a very different proposition and has to be evaluated against other ways to modernize our land-based ICBM force.'

'You can argue,' Cheney said on CNN's *Daybreak* television program, 'that SDI will become more important in the future than it has in the past because the possibility exists that you'll have other nations with ballistic missiles--with nuclear weapons or chemical warfare capabilities--that could be used against the United States.'"

VI. SCENARIO: A SOVIET PROPOSAL.

The conventional wisdom has been that the Soviets oppose SDI, do not want to modify the ABM Treaty and want to continue to pursue an offensive-heavy doctrine.

Arguably, BMD of like effectiveness possessed by both sides would not degrade the political-military posture of the Soviet Union and might enhance it (by weakening the credibility of limited NATO first use while degrading the perceived capabilities of the UK, French and Chinese missile systems). Soviet objections to BMD, then, might be rooted more in a concern about whether BMD would really yield equal effectiveness to both sides than in a concern about strategic doctrines or military ideologies.

On the U.S. side, were there not an existing ABM Treaty, it would be hard to argue against some defenses on doctrinal grounds alone, if the technological progress since 1983 did offer both some population protection and some preferential defenses (e.g., of command control or leadership) at less expense than adding some new offensive systems.

However, given the ABM Treaty, then objections to SDI can be raised on the grounds of possible Soviet reactions, including:

- A Soviet buildup of defense and offense, abrogating existing and potential arms control agreements and necessitating a costly U.S. buildup in response;
- Resulting instability and, on paper, cost-exchange yields which favor the side which launches first.

According to this theory, U.S. beliefs about Soviet reactions are central to U.S. decisions about SDI, and Soviet reactions will depend heavily upon Soviet assessments of U.S. versus Soviet technologies and systems engineering and the resulting net capabilities if both sides deploy defenses.

The most recent (23 September 1989) Soviet proposal is to proceed with START delinked from a specific new agreement about the ABM Treaty but with the "understanding" that violation of the treaty by one side is grounds for the other to withdraw from the terms of START. This appears to give the Soviets veto power over any U.S. SDI, because it shapes the U.S. domestic debate in either/or terms: either the U.S. achieves reductions through cooperative arms control or the U.S. pursues some defenses, but not both.

However, the Soviet proposal at a minimum indicates a willingness to try to reach an understanding.

What if.....

What if the conventional wisdom about Soviet obduracy is wide of the mark?

What if the Soviets modify their position on SDI and the ABM Treaty?

President Reagan, in a news conference in 1983, suggested that strategic defense could involve U.S.-Soviet technology sharing. Later interpretations suggested the benefits of technology, but not the actual research, might be shared. [*"If, after 1991, either side should decide to deploy such a (defensive) system, that side would be obliged to offer a plan for sharing the benefits...and for eliminating offensive ballistic missiles."*]

The issue is whether Gorbachev and the Soviet military could find common ground, such that both benefitted from U.S.-Soviet cooperation in strategic defense.

(At the appendix are a few news articles on recent Soviet proposals for joint military-related ventures.)

VII. MOVE ONE: Charge to Soviet Teams.

Gorbachev Memo to His Advisors.

1. The issue is how we deal with the U.S. SDI over the next year.
2. We should be prepared for the U.S. to pursue R&D of SDI at, say, \$3-\$4 billion for another ten years, perhaps longer. If we look long-term, does this gradually give them a breakout capability, or can we match their progress at that funding level?
3. Suppose we agreed to certain technology sharings in a cooperative venture (as they once alluded to).

Could we benefit politically?

Technologically?

Militarily?

In Economic Terms?

Given this guidance, the players were divided into Soviet Teams A and B and asked to discuss and respond.

A. Team A as Soviets: Discussion Results

1. Soviet Goal: Stop SDI in space.
2. However, Soviets take N Country ballistic capability (especially PRC) seriously. So LPS is not ruled out.
3. Our preferred Soviet strategy is the status quo: insist that the U.S. cease threatening an arms race in the heavens. However, if the Americans remain obdurate and persist with serious SDI R&D, we need a fallback position to use a year from now.
4. Via backchannel, eventually we would entertain a discussion about ground-based LPS.
5. Assured destruction remains our baserock strategy, however.

B. Team B as Soviets: Discussion Results

1. We would like some technical/technology upgrades.
2. So we can see advantages in some cooperative Ground Based Interceptors (GBI) versus accidental or unauthorized Third Nation launch.
3. We would rather not amend the ABM Treaty, although we will agree with the U.S. about new interpretations, some perhaps novel.
 - Perhaps -- just perhaps -- more than one launch site could be permissible.
 - Cooperative, open test range(s) on both sides.
 - Perhaps do so by on-site inspection of launch sites and even payloads.
 - Some cooperation in space.
4. If possible, place the onus on the U.S. to modify the treaty.
5. In short, we are prepared to endorse LPS (look at Moscow!) if we can gain technically by sharing and if it gives us leverage against any American serious space-based efforts.

VIII. MOVE TWO: Charge to U.S. Teams

Memo From a Senior U.S. Official.

1. You are my advisors and I need advice.
2. Since we believe a Soviet first strike would be counterforce, Phase I essentially offers direct protection to some of our C3, land-based missiles, and leadership.
3. We have been pursuing Phase I R&D as a unilateral American program with emphasis upon space-based systems.
4. We might be able to agree to strategic arms reductions with a routine treaty provision allowing withdrawal whenever either side believed its "supreme national interests" were jeopardized. Under this scenario, we would proceed to test and deploy perhaps BSTS within the ABM Treaty guidelines. We might even test and deploy some ground-based interceptors (GBI). But Phase I cannot be credibly tested, let alone deployed, without either abrogation of the treaty or a new level of U.S.-Soviet cooperation.
5. On the one hand, SDI must be cooperative or mutual to succeed. On the other hand, sharing seems bizarre.

How does U.S. determine if it is better off without sharing, if this means not deploying for the foreseeable future?

6. Since, as long as glasnost persists, cooperation is the key to any serious strategic defense, are there areas in which we and the Soviets might cooperate?

Technically, is it out of the question to share in a serious manner? In 1983, we said we should share the benefits of SDI. Did we mean we would share R&D; or joint production; or joint deployment?

Given this guidance, again the players were split into Teams A and B and asked to discuss/respond.

A. Team A - as Blue: Discussion Results

1. LPS provides a base which can be expanded in a crisis mobilization case.
2. For the 90s, we must develop a theology of R&D without production. This applies across DoD, not just to SDI.
3. In the Congress, there is a middle group who can be persuaded about a robust SDI R&D coupled with some LPS deployment, provided the spirit of the ABM Treaty is preserved and assured destruction is not precluded.
4. The future of SDI will be driven by the changes in the U.S. domestic setting and in the international setting.
5. To preserve \$4 billion per year for SDIO will require a different policy stance than Phase One.
6. Europe is in the throes of extraordinary change. SDI is not central to their thoughts. NATO will not spend much political capital jawboning the U.S. about LPS. Other concerns are predominant: Eastern Europe, German reunification, the European Economic Community, etc.
7. Technology sharing by itself does not advance U.S. interests. In exchange we want political support -- domestic and international -- for deploying some sort of defense, probably GBILPS.

B. Team B - as Blue: Discussion Results

1. In the current climate, the Executive Branch cannot dominate The Hill on defense matters, not in comparison to 1983.
2. It is useful for the U.S. to preserve the new harmony with the Soviet Union. So we should seek to merge technical developments with political developments and avoid stirring fears in the Soviet Union. Make allowances for a dual deployment.
3. Associate ATBM or LPS with U.S. capabilities and seriousness of purpose in enforcing the Non-Proliferation Treaty. This eventually could lead to limited SBI to provide an umbrella against a small launch, an umbrella which could be tilted, as crises developed, to shield Europe (defense of a common home -- Western and Eastern Europe), or the Mideast, etc.

IX. PARTICIPANTS AND TEAMS.

A. Participants

Richard D. Bleach is the Assistant Deputy for Projects, Strategic Defense Initiative Organization. He is responsible for the management of all major technology demonstration and validation projects that can form the basis for a decision to develop and deploy a future strategic defense system. Dr. Bleach is a graduate of Rensselaer Polytechnic Institute (B.S., Physics) and the University of Maryland (PhD, Physics).

Larry Burger is Deputy for Ballistic Missile Defense in the Office of the Under Secretary of Defense for Acquisition. Mr. Burger holds a degree in chemical engineering from Auburn University. He worked for five years in the Airborne Optical Adjunct program with the U.S. Army Strategic Defense Command prior to assuming his current position with OSD (A).

James E. Burke, Lieutenant Colonel, USAF, is Assistant Director for the Industrial and Operational Interfaces Directorate, Strategic Defense Initiative Organization. LTC Burke began his Air Force career with the Office of Special Investigation at March Air Force Base, California and later served with OSI in the Republic of Korea. He has been a Missile Combat Crew Member and Commander of the 44th Headquarters Squadron at Ellsworth Air Force Base. Prior to his service with SDIO, LTC Burke was a missile systems analyst at Strategic Air Command and was Chief of the Missile and Space Branch on the Air Staff.

James D. Carlson is the Deputy for Projects at the Strategic Defense Initiative Organization. He returned to government service after five years as Corporate Vice President of the Science Applications International Corporation where he was manager of the Strategic Defense and Intelligence Analysis Operation. Prior to that Mr. Carlson was Director of the U.S. Army's BMD Advanced Technology Center with responsibility for the investigation and development of many of the technologies which formed the baseline for the current Strategic Defense Initiative program. A graduate Electrical Engineer, he received the PhD (Honoris Causa) for work in technology advancement supporting both the Air Force and the Army.

Albert Carnesale is Lucius N. Littauer Professor of public policy and administration and academic dean at Harvard's John F. Kennedy School of Government. His teaching and research focus on American foreign policy and international security with emphasis on policies and issues associated with nuclear weapons. He holds a Ph.D. in nuclear engineering, served on the U.S. delegation to SALT I, is a consultant to several government agencies, and testifies often before congressional committees. Widely published, Carnesale is coauthor and coeditor of *Fateful Visions: Avoiding Nuclear Catastrophe*; *Superpower Arms Control: Setting the Record Straight*; *Hawks, Doves, and Owls: An Agenda for Avoiding Nuclear War*; and *Living with Nuclear Weapons*.

Eugene Fox, Major General, USA, recently retired as Deputy Director of the Strategic Defense Initiative Organization, following 33 years of military service. His service includes command at each level from Platoon Leader through Commander, 10th Air Defense Artillery Group, and a combat tour in Vietnam with the Military Assistance Command. A graduate of the United States Military Academy, MG Fox earned his M.S. degree from the University of Arizona in Aerospace Engineering. He has been actively involved in the Army's Ballistic Missile Defense program for two decades, including service as an instructor for the Sentinel and Safeguard programs, Commanding General, Ballistic Missile Defense Systems Command, and Program Manager for Ballistic Missile Defense in the Office of the Army Chief of Staff.

George Grieve is the Senior Intelligence Analyst for Soviet Strategic Defenses with the CIA. He is a graduate of St. Thomas (B.A.) and Georgetown (M.A.) and served for nine years as an intelligence analyst with the U.S. Army. During his service with the CIA, Mr. Grieve has specialized in Soviet strategic force development. In 1983 he managed the National Intelligence Estimate on Soviet Capabilities for Strategic Nuclear Conflict. Between 1985 and 1988, Mr. Grieve was the Assistant National Intelligence Officer for Strategic Programs.

Douglas R. Graham is Deputy Assistant Secretary of Defense (Designee) for Strategic Defense, Space and Verification Policy. Mr. Graham was formerly Deputy Assistant Secretary of Defense (Senate Affairs) in the Office of the Secretary of Defense. Mr. Graham is a former professional staff member on the Committee on Armed Services in the U.S. Senate where he was responsible for oversight of strategic offensive and defensive forces, including SDI. Mr. Graham holds degrees from Amherst College (B.A.) and Georgetown University (M.A.).

Edward Luttwak holds the Arleigh Burke Chair for Strategy at the Center for Strategic and International Studies. He is the author of seven books on national security, nuclear strategy and international affairs.

George L. Monahan, Jr., Lieutenant General, USAF, is the director of the Strategic Defense Intelligence Organization. LTG Monahan is a graduate of the U.S. Military Academy (B.S.), and the University of New Hampshire (M.S.), as well as the Army Command and General Staff College and the Air War College. While assigned to the 20th Tactical Air Support Squadron, Da Nang Air Base, he flew 75 missions over North Vietnam and throughout Southeast Asia. General Monahan contributed to the development of the F-16, first as the chief of the F-16 European Systems Program Office, and later as system program director for the F-16 multinational fighter program. Prior to assuming his current post, LTG Monahan was principal deputy assistant secretary of the Air Force for acquisition.

Robert J. Murray was the national security adviser to Gov. Michael Dukakis during the 1988 Presidential campaign. He is currently Public Policy and Director of the National Security Program at the Kennedy School of Government, Harvard University. He was previously Dean of the Naval War College and Director of the War College's Center for Advanced Research and Center for Naval Warfare Studies, where he directed the Global War Game series in 1982-1983. He has served in various positions in government since 1961, including Under Secretary of the Navy, two jobs at the deputy assistant secretary of defense level (International Security Affairs, and Manpower and Reserve Affairs), and as Assistant to the Secretary and Deputy Secretary of Defense under Elliott Richardson and James Schlesinger. His areas of interest are national security policy, defense strategy, resources, and public management. Mr. Murray is co-director of the Harvard Project on Defense System Acquisition. He was a member of the Long Commission investigating the bombing of Marines in Beirut (1983) and consultant to the President's Special Review Board (The Tower Commission) in 1986-1987.

James R. Schlesinger is Counselor at the Center for Strategic and International Studies. He has served as Acting Director of the Bureau of the Budget, Chairman of the Atomic Energy Commission, Director of the Central Intelligence Agency, Secretary of Defense, and Secretary of Energy.

Wayne Schulz, Brigadier General, USA, is Chief of Staff in the Strategic Defense Initiative Organization. BG Schulz was educated at the University of Tampa (B.S.) and the University of Kansas (M.A.) and has attended the Army Command and General Staff College and the Naval War College. His over 29 years of military service include a tour as a District Senior Advisor in Vietnam and command at every level from platoon to brigade. BG Schulz' most recent assignments were as Commander of the 10th Air Defense Artillery Brigade in Germany, and Chief of the Firepower Division, Office of the Deputy Chief of Staff for Operations and Plans.

Thomas G. Ward is Director of Security Intelligence and Countermeasures with the Strategic Defense Initiative Organization. Dr. Ward was educated at Johns Hopkins University and Princeton where he earned a PhD in Chemical Engineering. Dr. Ward has served in a wide variety of assignments in the Intelligence Community including Executive Officer for the Directorate of Science and Technology and Deputy Director for Planning on the IC Staff. His most recent assignment was as Vice Chairman, Comtrex, IC Staff.

Francis J. West, Jr. is President of the GAMA Corporation. He served as the Assistant Secretary of Defense for International Security Affairs, 1981-1983, and has held other senior posts in government. He was educated at Georgetown University (BA) and Princeton University (MA) and served in Vietnam as a Marine platoon leader. He has been an analyst at the RAND Corporation and the Dean of Research at the Naval War College. He served as the Assistant to Secretary of Defense, James R. Schlesinger, in 1974-1975. He directed the Department of the Navy Force Planning Study in 1977-1978. Before starting his own business, he was Vice President of The Hudson Institute, 1984-1985.

B. Teams

Move One

Mr. Carnesale
LTG Monahan
BG Schulz
Mr. Carlson
Dr. Ward
Mr. Burger
Mr. Murray

Dr. Schlesinger
Mr. Graham
MG Fox
Mr. Grieve
Dr. Bleach
Dr. Luttwak
COL Worrall

Move Two

Mr. Carnesale
BG Schulz
Mr. Carlson
Dr. Ward
Mr. Burger
Dr. Luttwak
COL Worrall

Dr. Schlesinger
LTG Monahan
Mr. Graham
MG Fox
Mr. Grieve
Dr. Bleach
Mr. Murray

APPENDIX

Recent Soviet Ideas About Joint Military-Related Ventures

1. SS-20

"In an effort to turn swords into plow-shares, the Soviet Union is trying to turn its SS-20 missile into a commercial rocket for launching small satellites into space."

"...with the help of a Houston-based company, Moscow wants its SS-20 factory to make a space launcher that could be transported to launching sites around the world. It would be the first Soviet-American joint venture derived from military armaments."

The New York Times, 22 October 1989, p. 14

2. Joint Mission to Inspect Satellites

"The Antonov Design Team has sketched out a way to launch a two-person inspector into space from the back of the huge Soviet AN-225 transport plane -- at 600 tons the largest aircraft in the world. The midair launch from the AN-225, Balabuyev said, could be done for one-fourth the cost of rocketing a shuttle-like vehicle into space from a ground launching pad. He said one crew member should be an American and the other a Soviet. The United States and the Soviet Union engaged in a joint space mission in 1975, when the Apollo and Soyuz spacecrafts linked."

The Washington Post, 5 November 1989, p. A12