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THE WHITE HOUSE

WASHINGTON

November 10, 1982

MEMORANDUM FOR MORTON BLACKWELL

FROM: RED CAVANEY

Morton, Elizabeth would like a Memo by COB today on the attached item re "500 cities hold Veterans Day teach-ins on arms control beyond the freeze".

11/10 mailgram

Called Ann

2:5,

THE WHITE HOUSE

WASHINGTON

November 10, 1982

MEMORANDUM FOR ELIZABETH H. DOLE

FROM: MORTON C. BLACKWELL MCB

SUBJECT: Veterans Day "Teach-Ins on Arms Control Beyond the Freeze"

Per your request this afternoon, we have the following information on the "teach-ins" scheduled for tomorrow.

There will be events on 375 campuses and 125 events elsewhere. The major events are scheduled for Portland, Oregon, San Francisco, Boston, Dallas, and Atlanta.

The principle sponsor is Union of Concerned Scientists. Other listed sponsor organizations are: United Campuses to Prevent Nuclear War, Lawyers Alliance for Nuclear Arms Control, and Physicians for Social Responsibility.

This is the opening of the next phase of the nuclear freeze movement and was planned as a followup on the referenda of November 2.

The format of the teach-ins: In most cases the nuclear freeze proponents display slides of Hiroshima and Nagasaki. They project a map on the screen presuming a thermo-nuclear device had landed in the city where the rally is being held. They produce left wing scientists and physicians to estimate total number of casualties and describe in gruesome detail the inadequacy of local medical facilities to cope with an atomic explosion.

The projected solution is always to impact only on U.S. policy. They give short shrift to any thought that the Soviets constitute the principal menace to world peace. Some speakers generally advocate unilateral disarmament. In short, it is a propaganda extravaganza.

Neither the Defense Department nor any other arm of the Administration has in operation a plan to give the grassroots our side of the nuclear freeze and national defense issues.

Shirley - Please ask Norton for memo on item below for COB Wed.

Tuesday, November 9 (continued)

- Environmentalist Ron Arnold speaks to National Press Club Breakfast about Sec. Watt
- The Free Congress Research and Educational Foundation sponsors news conference to release new book, "At the Eye of the Storm: James Watt & the Environmentalists"
- News conference by Al Keller of American Legion to present $1 million to the Vietnam Veterans Memorial Fund
- News conference by Brookings's Henry Aaron about economic effects of Social Security
- National Press Club Forum on elections with Jack Germond, Hedrick Smith, Patrick McGuigan, and Andrew Mulligan

Wednesday, November 10

- VP leaves for Africa
- Beginning of 2-day meeting of Greenspan Commission on Social Security
- Sec. Shultz attends Joseph Sterne, Baltimore Sun, editorial writers luncheon
- Ed Meese honored as "American of Year" at Thomas Jefferson Research Center Center banquet & addresses Academy of Television Arts & Sciences, Los Angeles
- Sec. Weinberger hosts editorial board breakfast with editors of 10 major papers
- Sec. Weinberger address to French-American Chamber of Commerce, New York
- Carlucci speech in New York on overview of defense budget
- Entertainers salute to Vietnam Vets, D.C.
- Senator Robert Dole addresses Washington Press Club

Thursday, November 11

- RR Veterans Day Ceremony - Rose Garden
- Veterans Day Ceremony at Arlington Cemetery
- RR Press Conference (T)
- Visit of Egyptian Foreign Minister
- Over 500 cities hold Veterans Day teach-ins on arms control beyond the freeze

all referred to Called top 12 Freeze Pros Union of Concerned Scientists Press Packet on the way

2nd ANNUAL NATIONWIDE
VETERANS DAY

CONVOCATION: NOVEMBER 11, 1982

SOLUTIONS TO THE NUCLEAR ARMS RACE

NATIONAL SPONSORS:

UNION OF CONCERNED SCIENTISTS

LAWYERS ALLIANCE FOR NUCLEAR ARMS CONTROL

PHYSICIANS FOR SOCIAL RESPONSIBILITY

UNITED CAMPUSES TO PREVENT NUCLEAR WAR

NO FIRST USE

CTB

SALT

FREEZE

START

PROGRAM HIGHLIGHTS:

DATE: TIME: PLACE:

FOR MORE INFORMATION:

Union of Concerned Scientists

NEWS RELEASE

For Release:
November 3, 1982

For more information, please contact:
Lois Traub (617) 547-5552
Diane MacEachern (202) 223-3988

500 TEACH-INS WILL EXPLORE ARMS SOLUTIONS BEYOND THE FREEZE

Over 500 nuclear arms teach-ins, slated for Veteran's Day, November 11, will provide the first major public forum to analyze the impact of last Tuesday's FREEZE votes, as well as to explore the "next steps" for Americans concerned with halting the arms race.

The teach-ins, sponsored by the Union of Concerned Scientists (UCS), the Lawyers Alliance for Nuclear Arms Control (LANAC), Physicians for Social Responsibility (PSR), and United Campuses to Prevent Nuclear War (UCAM), also mark the largest cooperative effort by scientists, physicians, and lawyers to explore solutions to the arms race.

Highlights of programs around the country include: Boston: UCS Chairman Henry Kendall will argue the case for No-First-Use; Randy Forsberg will make her first major public address since the November 2 FREEZE vote, and Nobel Laureate Hans Bethe and cardiologist Dr. Bernard Lown will speak on "Annihilation or Cooperation?". Dallas: outspoken FREEZE advocate Major General William Fairbourn, and arms control expert Alan Neidle will head a program entitled, "What, If Any, Peaceful End Is There to the Nuclear Arms Race?". San Francisco: two leading defense scientists, Sidney Drell of the Stanford Linear Accelerator Center and Robert Barker of Lawrence Livermore Labs will debate, "Who's Ahead in the Arms Race?". Atlanta: Vice Admiral John Lee will refute the controllability of limited nuclear war, and Niki Tsongas, wife of the Massachusetts Senator and principal member of the controversial Peace Links, will address the role of women in the arms control movement. Portland: Herbert Scoville, former Deputy Director CIA, and Abram Chayes, former State Department Legal Advisor and LANAC board member, will head a panel of arms control specialists. Chicago: Brookings Institution Director John Steinbruner will debate military strategist John Mearsheimer on No-First-Use, following an opening address by Helen Caldicott, President of PSR.

In what is believed to be the largest simultaneous screen premiere by a non-profit group, 300 of the programs will show UCS's new film: "No-First-Use: Preventing Nuclear War," featuring interviews with former Secretary of Defense Robert S. McNamara, SALT I negotiator Gerard Smith, and Admiral Noel Gayler.

A list of all 500 participating colleges and universities is enclosed.

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Union of Concerned Scientists

NEWS RELEASE

For Release:
October 26, 1892

For more information, contact:
Lois Traub (617) 547-5552
Diane McEachern (202) 223-3988

Veteran's Day Convocations Now Expected on over 375 Campuses

From Fort Kent, Maine, to San Diego, California, more than 375 universities and colleges now plan to hold teach-ins on November 11 that focus on ways to prevent nuclear war.

The teach-ins are being co-sponsored by the Union of Concerned Scientists (UCS), Lawyers Alliance for Nuclear Arms Control (LANAC), Physicians for Social Responsibility (PSR), and United Campuses to Prevent Nuclear War (UCAM). According to UCS Board Chairman Henry Kendall, "These events confirm the undying interest in and commitment to arms control that exists in this country. A solid, 'mainstream' arms control movement is developing in America."

UCS's new film, "No-First-Use: Preventing Nuclear War" will be shown for the first time at 300 locations. The film features recent interviews with: Robert S. McNamara, former Secretary of Defense; Admiral Noel Gayler; SALT Negotiator Gerard C. Smith, and others. Major events include:

Boston: an all day program of speakers, including a panel discussion featuring Henry Kendall on No-First-Use and Randall Forsberg on the FREEZE, as well as a discussion led by Nobel prize winner, Hans Bethe, entitled "Annihilation or Cooperation?".

San Francisco: a day-long program featuring a debate entitled "Who's Ahead?" between Sidney Drell, Deputy Director, Stanford Linear Accelerator Center, and Robert Barker of Livermore Laboratories, as well as presentations from Nobel Laureate Owen Chamberlain and others on the topic of "The Next Two Years, the Next One Hundred Years: Realizing a Lasting Security."

Dallas: An evening discussion to explore "What Peaceful End is there to the Nuclear Arms Race?" Participants include: economist Lloyd Dumas; Alan Neidle, author and expert on the Comprehensive Test Ban Treaty; and Robert Buchheim, formerly of the standing consultative committee for the United States Delegation on SALT Verification.

Atlanta: Daytime workshops at Emory University, Georgia Technological Institute, Atlanta University, Agnes Scott University, Georgia State University, and Columbia Theological Seminary will culminate in an evening panel discussion in downtown Atlanta featuring: Admiral John M. Lee, retired naval policy expert and strategist; Dr. Alexander Leaf of the Physicians for Social Responsibility; and Niki Tsongas, wife of Massachusetts Senator Paul Tsongas and a leading member of Peace Links.

Portland: An all-day program featuring: Abram Chayes, former State Department Legal Advisor; author Arthur Macy-Cox who will address the Soviet Perspective on Arms Control; Herbert Scoville, former Deputy Director of the CIA; and Anne Cahn who will speak on the role of the individual and the public in stopping the arms race.

Chicago: Day-long and evening events will feature: Dr. Helen Caldicott of Physicians for Social Responsibility; Senator Gary Hart, (D. Colorado); John Steinbrunner of the Brookings Institution speaking on No-First-Use; and Jerome Wiesner, President Emeritus of the Massachusetts Institute of Technology.

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A sampling of other events around the country follows:

University of Texas - Austin: A joint, simultaneous Convocation will be held with the University of Texas Law School featuring a series of speakers and debates, films, a map project, and an audience participatory discussion on "what would happen if. . . ."

Northwestern University - Evanston: November 11 events will take a multi-disciplinary, academic focus. Professors in the following disciplines will give half-hour talks on different aspects of the arms race and solutions to it: political science, psychology, physics, biology, economics, and history.

University of Michigan - Ann Arbor: This Convocation will feature a twelve-day video/film series, including "No-First-Use: Preventing Nuclear War." Nationally prominent speakers will include Senator Carl Levin (D. Michigan) and Representative John Conyers (D. Michigan).

Tulane University: A joint Convocation with Tulane Medical School will feature a week of films, with a full day of lectures, films, and discussions on November 11. The program will culminate on the night of the 11th with a panel discussion among: Valentin Berezhkov, First Secretary of the Soviet Embassy; John Gunderson, U.S. State Department; and John Burton, Stanford Law School.

University of Kansas - Lawrence: faculty members who fought in World War II, Korea, and Vietnam will present their views on alternatives to the nuclear arms race. Local sponsors also plan to set up a bookstore exhibit, distribute literature on both sides of the arms issue, and bring the teach-in into a local high school.

University of Maine - Fort Kent: three days of events including daytime debates among students, as well as evening meetings, a craft fair, and Sunday morning involvement of local churches.

University of Alabama - Birmingham: November 11 events will include a press conference by community leaders, two educational fairs including videotapes of Carl Sagan's "Who Speaks for the Earth?," and a lecture by Sanford Gottlieb, Executive Director of UCAM.

Duke University: the UCS film, "No-First-Use: Preventing Nuclear War" will be supplemented by a Common Cause videotape featuring Paul Warnke, Leslie Gelb, and Strobe Talbott.

St. Mary's University - San Antonio, Texas: a panel of clergy representing different denominations will discuss alternative solutions to the arms race.

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University of Arkansas - Fayetteville: evening program featuring films and local faculty addressing the medical consequences of nuclear war and arms reduction policies.

Montana State University - Bozeman: the solutions theme of the November 11 event will be highlighted by a showing of the UCS film on No-First-Use and an address by Don Clark, Director of International Studies at Montana State and member of the SALT II Liason Team.

University of North Dakota - Grand Forks: members from LANAC and PSR will make a series of presentations around campus, sharing their views on the nuclear arms race.

Dartmouth College - Hanover: an all-day program featuring presentations by local faculty and arms control groups will culminate with an evening address by Bishop Peter Rosazza entitled, "The Catholic Bishops: Peace and the Arms Race."

University of Toronto - Toronto: all-day program featuring films and a panel discussion: "Nuclear Arms and Canadian Policy" led by the Director of Strategic Studies Institute at York University and Paul McRay, member of the Canadian Parliament.

Case Western Reserve - Cleveland Heights: showings of "No-First-Use" and "Hiroshima, Nagasaki - 1945," and a speech by Richard Garwin, noted physicist and defense consultant.

University of Tulsa - Tulsa: films and an evening panel focusing on: "Can Nuclear War be Limited?," "The Economic Impact of the Arms Race", and "Strategies for Peace."

Carnegie-Mellon - Pittsburgh: all-day series of films and workshops on arms control, focusing on perceptions of the U.S. and USSR and verification of arms control agreements.

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Union of Concerned Scientists

NEWS RELEASE

For Release:
October 8, 1982

For More Information, Contact:
Lois Traub (617)547-5552
Diane McEachern (202)223-3988

NATIONWIDE TEACH-INS PLANNED

The growing public concern about the nuclear arms race will be highly visible this fall as more than 400 colleges and universities hold teach-ins on the ways to avoid nuclear war.

The gatherings, scheduled for Veterans Day, November 11th, are currently slated for Portland, Boston, Atlanta, San Francisco, and Chicago, as well as hundreds of other cities. They are being sponsored by the Union of Concerned Scientists, Lawyers Alliance for Nuclear Arms Control, Physicians for Social Responsibility, and United Campuses to Prevent Nuclear War.

Last year, the Union of Concerned Scientists organized similar teach-ins on 150 campuses, meetings that drew over 100,000 participants and catalyzed public awareness of the threat of nuclear war.

"The time has come to stop talking about the problem, however," Henry Kendall of MIT, the Chairman of UCS said. "It's time to start talking about realistic solutions."

In addition to the FREEZE and other solution strategies, the teach-ins will focus on the major UCS recommendation: that the United States should adopt a policy of No-First-Use of nuclear weapons.

According to Kendall, implementation of a No-First-Use policy by the U.S. would "substantially reduce the chance that an uncontrollable nuclear conflict would develop out of a conventional war involving the U.S." Kendall believes that the U.S. must be prepared to provide for its defense, but "not in a way that risks escalation of conventional war to all out nuclear catastrophe."

UCS's recommendations on No-First-Use and other measures are outlined in a new UCS book, Beyond the FREEZE: The Road to Nuclear Sanity, prepared especially for the November 11 teach-ins.

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The UCS Position and November Activities

UCS is joined in its call for a No-First-Use Policy by more than 500 members of the prestigious National Academy of Sciences, and forty-two of the 106 living American Nobel laureates, all of whom have signed on to a five-point proposal circulated by UCS this past summer that recommends:

1. The NATO Alliance should announce its intention to adopt a policy of No-First-Use of nuclear weapons in Europe.

2. The U.S. should announce its intention to adopt a policy of No-First-Use of nuclear weapons elsewhere in the world. In both recommendations 1 and 2, such a policy will be contingent on the development of adequate conventional strength.

3. The U.S. and the USSR should immediately begin negotiations covering strategic and medium-range nuclear forces, that aim for greatly reduced arsenals by the end of the decade.

4. The U.S. should announce its readiness to engage in an immediate bilateral freeze on the build-up of strategic nuclear weapons and on the flight testing of new strategic missiles, and announce its intention to renew negotiations leading to a Comprehensive Test Ban Treaty covering all nuclear explosions.

5. The U.S. and the USSR should develop and implement a joint program for curtailing the spread of nuclear weapons.

In addition to the teach-ins, UCS's fall campaign includes:

Beyond the Freeze: The Road to Nuclear Sanity, a paperback book published by the Beacon Press and authored by UCS's Kendall, Daniel Ford, and Steven Nadis, that concisely details the history of the arms race and offers a step-by-step description of measures that can be taken to reduce the threat of nuclear war.

No-First-Use: Preventing Nuclear War, a 16mm color film which outlines the risks inherent in escalation of conventional or limited nuclear war to all-out nuclear war, and analyzes the implications of a No-First-Use policy for the defense of Western Europe.

A fifty-page study, headed by retired Vice Admiral John Marshall Lee, that analyzes the conventional balance in Europe and outlines the steps that must be taken to allow the U.S. to adopt a No-First-Use policy without jeopardizing its security or that of its allies.

Union of
CONCERNED
SCIENTISTS

NOVEMBER 11/11/82 CONVOCATION

Description of Schedule for District of Columbia Teach-ins:

GEORGE WASHINGTON U.

Coordinator: John Leonard, Washington, D.C. (202) 676-7590
Place: Marvin Center, George Washington U.
Program: Daytime statements and film festival and evening panel discussion and debate

12:30 "Call to Peace Making" - singing and statements in the library quad
1:15 Film Festival - "No-First-Use, "Hiroshima", "Nuclear Countdown" and others in Rm. 426
7:30 Panel discussion on the freeze with Soc. Professor Thomas Dietz, Rev. Bill Crawford and a Law Professor Debate on the Freeze followed by questions and answers

GEORGE WASHINGTON U. LAW SCHOOL

Coordinator: W.T. Mallison, International and Comp. Law Program (202) 676-6790
Place: Stockton Hall, George Washington U.
Program: Panel discussion and film

2:00 Panel discussion on how to control the nuclear arms race with Professor David Koplow and professor Harry Almond, both lawyers with background on U.S. Arms Control
3:00 Questions and answers in Rm. 101
4:00 Film on "No-First-Use

Catholic U.

Coordinator: Ronald Pagnucco, Peace Studies Group, Washington, D.C. (202) 635-5080, (202) 526-5695
Place: 701 Monroe St.,NE
Program: Slide show and lecture on nuclear weapons and their effects, discussion on No-First-Use and other films

1384 Massachusetts Avenue • Cambridge, Massachusetts 02238 • Tel. (617) 547-5552

1346 Connecticut Avenue, N.W. • Suite 1105 • Washington, D.C. 20036 • Tel. (202) 296-4644

11/9 12:00	Presentation on Nuclear Weapons and their Effects with Dr. David Ebert, a professor in Nuclear Engineering, at Gibbons Chapel
12:30	Slide show and lecture on the presentation
7:30	Film on "War Game" in the Caldwell Auditorium
11/11 12:00	Film on "No-First-Use", followed with a discussion by Professor William Fox of the law school in Rm. 111, Leahey Hall

GEORGETOWN U. LAW CENTER

Coordinator:	Father Robert Drinan, (202) 624-8097
Place:	Moot Court Room at Georgetown U. Law Center
Program:	Film Festival and panel discussion on the weapons approach, ways to stop the arms race and converting the defense industry so it's more productive
11/8 3:30	Films on "No-First-Use" and "One Trillion Dollars for Defense" in Rm. 1B 32
11/10 3:30	Films on "Nuclear Battlefield" and "No-First-Use"
11/11 3:30	A broad view of the history of nuclear arms and where the movement is going, by Adam Yarmolinsky, arms control expert, in the Moot Court Room
4:00	Panel discussion with William Arkin from the institute for Policy Studies, Robert Sherman, a legislative assistant to Congressman Downey, Michael Winpinsinger. with the Machinists and Aero Space Workers and David McKillop from the Center for National Security

GEORGETOWN U.

Coordinator:	Jan Fritz, Sociology department, (202) 625-4205
Place:	Georgetown University
Program:	Case Study on the Rocky Flats Nuclear Weapons Facility, the great debate with the Progressive Student Coalition, and Democratic Socialists of America
10:15	Film on "War Without Winners" followed with a discussion by Richard McSorluy of the Theology Department in Reiss 103

1:15 Executive Director, Susan Leighton, of Physical Social Responsibilities to talk about health effects in White Grauner 211

3:15 Lecture and discussion on the Immorality of R.O.T.C. at Georgetown U. by Richard McSorluy

4:15 Film on "Gods of Metal" followed with a discussion on the Christian Perspective of the Arms Race, in in Launger Library, Rm. 134

6:00 Case Study on the Rocky Flats Nuclear Weapons Facility; Conversion Issue, with speaker Anna Gyorgy, director of Critical Mass and author of, No Nukes: Everyone's Guide to Nuclear Power

8:30 The Great Debate - young Americans for freedom, with Keith Payne, Vice President of National Institute for Public Policy and Phil Cox of the American Security Council vs. Christopher Paine of the American Federation of Scientists and Matthew Murray, a Legislative Assistant for Senator Kennedy in White Grauner 208

Convocation: November 11, 1982

THE 1982 ARMS CONTROL DEBATE

Nuclear Parity: The Arms Race Standoff

In March 1981, President Reagan alleged that "the Soviet Union does have a definite margin of superiority" over the U.S. in nuclear striking power. Many experts disagree, however, and the President's statement remains a point of debate today.

The problem is that the strategic arsenals of the United States and the Soviet Union are not mirror images of one another. Comparing them to see who's ahead or who's behind cannot simply be based on any one measure of nuclear strength.

The strategic nuclear forces of both nations consist of a triad of land-based intercontinental ballistic missiles (ICBMs), submarine-based missiles (SLBMs) and long-range bombers. (Both NATO and the Warsaw Pact also deploy thousands of tactical or battlefield nuclear weapons in Europe.) Here any similarity between the arsenals ends.

The greatest difference is in the basing schemes used by the two superpowers. Of the 7,700 warheads in the Soviet triad, approximately 70 percent are on land-based missiles. The remaining Soviet warheads are divided between submarines (about 25 percent) and bombers (about 4 percent). Of the U.S. total of about 9,500 strategic warheads, only 23 percent are carried by ICBMs. Almost 50 percent of the U.S. strategic nuclear force is carried by submarines. Moreover, the U.S. keeps more than half of its missile submarines on patrol at any given time. Only about 15 percent of Soviet submarines are on patrol at sea at any one time.

Comparison is further complicated by the fact that Soviet land-based missiles are generally larger than their American counterparts and have greater lifting power and larger warheads. U.S. missiles are considered more accurate than Soviet missiles, although the accuracy of Soviet missiles is improving.

When broken down into their component parts, some measures show a U.S. lead, and other measures a Soviet lead. Both nations, however, clearly have a sufficiently large number of diverse and survivable weapons systems so that neither can confidently attack the other without risking devastating retaliation. The end result: nuclear parity and mutual deterrence.

Total Strategic Nuclear Weapons United States–Soviet Union

The curves above show the total number of nuclear warheads and bombs that the two superpowers can deliver via long-range missiles and bombers.

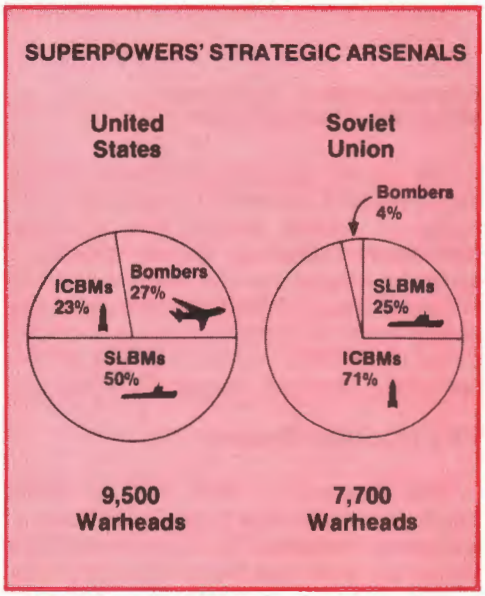
Sources: 1982 Pentagon Annual Report; Center for Defense Information.

Strategic Expansion Continues

Despite this condition of apparent nuclear parity, the Reagan Administration is advocating a huge expansion in the nuclear forces of the United States. The Administration's build-up is expected to cost about $200 billion over six years. The six major components of the program are:

- Deployment of 100 MX missiles with at least ten highly accurate warheads per missile.
- Continued production of Trident submarines (two are currently in operation) and development of the more accurate Trident D-5 missile.
- Production of 100 B-1 bombers to replace the fleet of B-52s, and deployment of thousands of air-launched cruise missiles.
- Improved command, control, and communications systems.
- Continued research and development of anti-ballistic missile systems, and development of anti-satellite weapons; and
- Improved civil defense and air defense.

The Soviets are also expanding and improving their strategic forces. The deployment of Soviet SS-18 and SS-19 ICBMs, with their improved accuracy and large payloads, has added a new round of instability to the arms race, as has the introduction of the mobile SS-20s which threaten Western Europe. The Soviets are also testing new SLBMs and large missile-carrying submarines, such as the Typhoon. They may also be developing a new long-range bomber.



Are We Closer to the Brink?

Fear of nuclear war has increased substantially in the past year. This renewed anxiety is not unfounded and can be traced to several sources:

- widely publicized policy directives in which the U.S. Secretary of Defense has instructed the military services to prepare for fighting "limited" and "protracted" nuclear wars;
- continued emphasis on building the highly accurate MX missile to close a fictitious "window of vulnerability," even though the wisdom of proposed basing schemes has been seriously challenged. Many believe that deployment of first-strike weapons like the MX will lead to a situation in which each superpower will feel vulnerable to an attack by the other, and might launch a pre-emptive strike in a crisis situation as a means of self-defense.
- increased risk of nuclear accidents as the number of nuclear weapons increases and as the short delivery time of new weapons forces both countries to consider computerized "launch-on-warning" decision systems;
- renewed discussion of anti-ballistic missile systems (ABMs) resulting in fear that the Administration is preparing to scrap one of the most successful arms control agreements yet concluded – the ABM Treaty of 1972; and

UCS / LANAC / PSR / UCAM

- continued explicit reliance on nuclear weapons for the defense of Europe and other "hot spots" such as the Middle East. In a serious conflict with the Soviet Union, the U.S. would almost certainly be forced to initiate the use of nuclear weapons in response to a setback in a conventional conflict.

Arms Control Options: What Do They Mean?

The public response to these policies, combined with extensive grassroots organizing on nuclear issues, has stimulated widespread debate on various options for achieving arms control and reducing the threat of nuclear war. Numerous arms control proposals are now under discussion, including a nuclear FREEZE, SALT II, START, a Comprehensive Test Ban, and No-First-Use.

The Nuclear Freeze

First discussed in 1964, the most recent freeze proposals have become the basis for a national movement. In calling for a halt to the nuclear arms race, freeze advocates seek: a "mutual freeze on the testing, production and deployment of nuclear weapons and of missiles and new aircraft designed primarily to deliver nuclear weapons." At present, the Senate is considering a proposal (the Kennedy-Hatfield Resolution) which advocates a moratorium on the testing, production, and deployment of nuclear weapons and calls for subsequent negotiations to reduce the number of weapons possessed by the two superpowers. A companion resolution in the House of Representatives was narrowly defeated (204 – 202) in August 1982. Instead, the House passed a resolution calling for negotiated reductions followed by a freeze. This position was preferred by President Reagan, at least in part because it permits continued production of nuclear weapons.

SALT II

After years of negotiation, SALT II was signed in 1979. Ratification of it by the U.S. Senate was indefinitely suspended not long after, largely because of reaction to the Soviet invasion of Afghanistan. More recently however, the Reagan Administration has said the U.S. would do nothing to undermine the Treaty so long as the Soviets concurred. A complex agreement, SALT II would:

- permit each side a total of 2,400 strategic systems (launchers for ICBMs, SLBMs and long-range bombers) at the outset, to be reduced to 2,250 during the duration of the treaty;
- set a sub-limit of 1,320 on launchers for multiple warhead (MIRV'd) ICBMs, SLBMs, and bombers with long-range cruise missiles; a sub-limit of 1,200 on MIRV'd ICBMs and SLBMs; and a sub-limit of 820 on MIRV'd ICBMs;
- restrict the testing and deployment of new types of ICBMs to one on each side;
- limit the number of MIRVs permitted on new and existing ICBMs;
- ban the Soviet SS-16—an intercontinental ballistic missile which may be converted into a mobile, intermediate-range ballistic missile (the SS-20);
- set ceilings on the launch-weight and throw-weight of strategic ballistic missiles;
- prohibit rapid reload ICBM systems.

START Strategic Arms Reduction Talks

On May 9, 1982, President Reagan announced a two-phased U.S. proposal for the START talks, the successor to SALT I, and a replacement for SALT II. The U.S. proposed reducing *warheads* to equal ceilings of about 5,000 for each side (down from 9,500 for the U.S. and about 7,700 for the Soviets). To enhance stability by reducing any incentive or capacity each side might have to attack first, no more than half the remaining warheads would be land-based. The total number of ballistic *missiles* (ICBMs) would be reduced to 850, about half of the current U.S. level. The U.S. also proposed a second-phase reduction in ballistic missile throw-weight (the useful weight carried by a missile, i.e., guidance components and re-entry vehicles containing warheads) to below the current U.S. level. The replacement of existing systems with newer ones would be permitted under the proposal, including production of systems such as the MX and Trident.

At the same same time, however, President Reagan has said everything is "on the table," and all offers would be considered. In fact, the Soviets have countered by proposing a ceiling of 1,800 on ballistic missiles and heavy bombers on each side. The Reagan Administration regards this Soviet proposal as unacceptable, since in the Administration's view it does not focus sufficiently on land-based missiles, which are seen as the most serious threat to the U.S. (and which make up the greater part of the Soviet triad).

CTB—Comprehensive Test Ban

A Comprehensive Test Ban, which some have proposed as one component of a freeze, would prohibit underground nuclear tests, except possibly for tests of a few kilotons, which may be too small to detect using existing seismic techniques. Tests in the atmosphere, outer space, and underwater are already prohibited by existing agreements (the Partial Test Ban Treaty), as are underground tests having a yield above 150 kilotons (Threshold Test Ban Treaty).

In 1977, the United States, the Soviet Union, and the United Kingdom began negotiations on a comprehensive test ban. By 1980, when negotiations were suspended, they had made progress toward completion of a treaty. The parties had resolved some difficult verification issues, and had agreed in principle to permit on-site inspection of suspicious events. However, the Reagan Administration indefinitely postponed resumption of these talks, in part because the Administration wants to develop a variety of new nuclear warheads and delivery systems that might be seriously constrained by a CTB. Some U.S. officials also hold the widely disputed view that the U.S. would be unable to check the reliability of existing warheads, and as a result, confidence in our deterrent would decline.

No-First Use

This proposal would make it a matter of U.S. policy not to be the first to use nuclear weapons. No-First-Use is advocated as an alternative to current policy which calls for the NATO Alliance to initiate the use of nuclear weapons, if necessary, to turn back a conventional Soviet attack against Western Europe. Presently, nuclear weapons are viewed as a way of balancing numerically superior Warsaw Pact ground forces.

Because no plausible argument has been put forward that would guarantee that the use of nuclear weapons would remain "limited," a No-First-Use declaration would create a clear line of demarcation between conventional and nuclear war. Advocates of a No-First-Use policy believe that selected use of nuclear weapons to counter a setback in conventional conflict might not be stopped short of total escalation to all out nuclear war between the superpowers. No-First-Use, if adopted and accompanied by certain improvements in NATO's conventional defenses, would reduce the reliance of the U.S. and NATO on nuclear weapons, diminish the risk that nuclear war will occur, and strengthen the credibility of the Western deterrent to Soviet aggression.

The nationwide November 11, 1982 Convocation is sponsored by:

Union of Concerned Scientists
1384 Massachusetts Avenue
Cambridge, MA 02238

Lawyers Alliance for Nuclear Arms Control
43 Charles St., Suite 3
Boston, MA 02114

Physicians for Social Responsibility
639 Massachusetts Avenue
Cambridge, MA 02139

United Campuses to Prevent Nuclear War
1346 Connecticut Avenue NW
Suite 1101
Washington, D.C. 20036

Convocation: November 11, 1982

NO-FIRST-USE

In April, 1982, UCS issued a set of recommendations calling for a bi-lateral freeze on strategic weapons and delivery systems, a comprehensive test ban, negotiated deep cuts in the nuclear arsenals of the U.S. and the USSR, and adoption of a policy of No-First-Use of nuclear weapons by the U.S. and its NATO allies. These recommendations have been widely endorsed by thousands of members of the scientific community, including more than 500 members of the National Academy of Sciences and forty-two out of 100 living Nobel laureates. The material below explains why UCS believes No-First-Use would be particularly important in reducing the threat of nuclear war.

Waging Limited Nuclear War? It Can't Be Done

The flat land of the North German Plain is considered by many strategists to be a likely starting point for a Soviet tank assault on Western Europe. If such an assault were to occur, defending NATO forces would first respond with a combination of armor and anti-tank weapons. The ensuing ground battle would be accompanied by a fierce air war with Russian attack and reconnaissance aircraft attempting to destroy NATO anti-tank detachments. If NATO forces were unable to halt the Soviet attack, NATO's long standing strategy to initiate the use of nuclear weapons might finally become reality. The Western Alliance could be forced to start a nuclear war.

Although no one expects such an attack in the near future, it remains a possibility. There are massive concentrations of Warsaw Pact troops deployed along the German border, an area which historically has been the locus of many military confrontations. Instability in a Soviet-dominated Eastern European nation or a crisis in the Middle East could spark a confict there again.

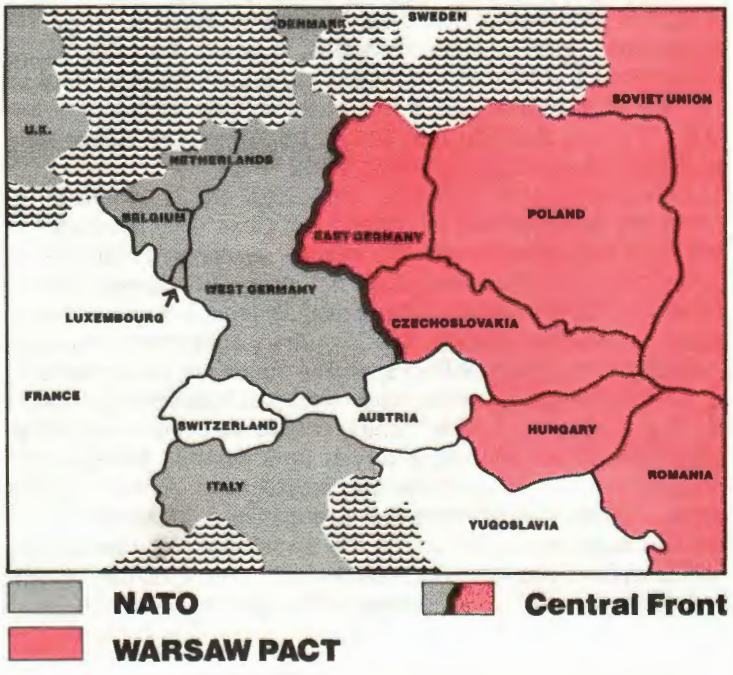
Current U.S. and NATO doctrine calls for the "limited" use of battlefield nuclear weapons in Europe to counter a Soviet assault if conventional defenses fail. To this end, more than 6,000 "battlefield" (tactical) and intermediate-range (theater) nuclear weapons are deployed by the U.S. and NATO in Europe–some in or very near the likely areas of combat along the Central Front, the border separating East and West Germany. If necessary, these weapons are to be used on a limited basis to break up concentrations of advancing Warsaw Pact tanks, to block mountain passes, or to destroy air bases and logistics centers.

This strategy has a fatal flaw, however: limited nuclear operations are not controllable. For a limited nuclear engagement to remain limited–to stop short of complete catastrophe–both sides would have to agree to and observe mutually acceptable restraints in the midst of a fast moving, rapidly escalating, 1980s high-technology war. Faced with different information, different weapons, different operational goals, and under appalling stresses of time with the continued existence of both nations in the balance, rational agreements would have to be struck. The mutually accepted restraints would have to include limits on the types and locations of targets and the kinds of weapons used. In the middle of a nuclear exchange, with only minutes in which to make decisions affecting the future of mankind, the adversaries would have to agree on a stopping point–although each side would have more than ample forces to destroy the other. In short, one side would have to accept defeat long before it had exhausted all its nuclear options. In such circumstances, escalation to an all-out nuclear war is more probable than not.

Creating the Firebreak

A No-First-Use declaration by the U.S. and NATO, accompanied by a strong conventional deterrent, would end this frightening scenario before it could begin. No-First-Use would create a "firebreak" – a clear and firm demarcation between conventional and nuclear war. Under No-First-Use, nuclear forces would be maintained *only* as a deterrent to hostile use of nuclear forces. Conventional forces would be counted on to defend against conventional attack. Preparing to wage limited nuclear war or developing nuclear war-fighting capabilities would no longer be part of NATO nuclear doctrine. Though the Russian nuclear threat would still exist and NATO could not abandon its retaliatory capability, the Alliance would no longer rely on nuclear weapons as the ultimate means to deter a conventional attack by the Warsaw Pact.

The Central Front Where East Meets West



UCS

A No-First-Use policy would significantly affect the execution of military policy in Europe. Weapons such as the neutron bomb would have no place on the battlefield. Dangerous and vulnerable tactical nuclear weapons that are currently concentrated near the border could be thinned out, moved back to less provocative positions, and ultimately removed – alleviating the "use them or lose them" situation now in effect. Invulnerability, reliability, and endurance would replace "limited war fighting" capabilities as the primary factors influencing weapons procurement.

The Debate over No-First-Use

A No-First-Use declaration by the U.S. could be viewed by its NATO allies as undermining the deterrence to conventional attack that for thirty years has been guaranteed by the U.S. nuclear umbrella. Many Europeans, however, realize that a defense which relies on the threat of a nuclear Armageddon makes no sense. They are aware that they cannot be defended by nuclear warfare, but would be destroyed by it. And while they lean on the power of nuclear deterrence, they recognize the danger of its failing catastrophically, sooner or later, in one crisis or another. They need, as does the U.S., a strategy that does not depend on nuclear deterrence of conventional aggression, a doctrine that is no longer rational or credible.

Critics argue that No-First-Use would be merely declaratory diplomacy. Could a commander really refrain from using nuclear weapons in a crisis if national security were threatened? If No-First-Use were an integral part of military preparations and structure, the whole spectrum of military thinking would change.

Contingency planning, preparation, troop deployment, weapons procurement, and battle strategy would no longer be dependent upon nuclear weapons. It would be understood throughout the military command structure that *any* kind of nuclear exchange would not be in the interest of NATO or the U.S. This is a decision that should be made now, rather than under the stress of some future crisis.

Others argue that the threat of nuclear war is necessary to offset the Warsaw Pact's conventional superiority. It is true that the Pact has more troops and military equipment than NATO. This advantage, however, does not mean that Soviet leaders could confidently expect to successfully launch a conventional attack on Western Europe. NATO's military equipment is superior in quality to the Warsaw Pact's, and its troops are better trained.

If certain improvements were made, such as better pre-positioning of supplies, better training of reserve troops, and better preparations for slowing a Soviet tank assault, NATO could provide the kind of defense that would allow a No-First-Use pledge without weakening the strength of its deterrent. Successful negotiations to reduce the conventional forces of both NATO and the Warsaw Pact, coupled with a No-First-Use pledge by both sides, would, of course, be the optimal solution.

No-First-Use and Other Arms Control Proposals

Adoption of a No-First-Use policy would fill a critical gap left by other existing and proposed arms control measures. Current treaties eliminate specific weapons (e.g., the ABM Treaty, the Seabed Treaty, the Anti-satellite negotiations); some proposals which are now being debated would reduce or cap the numbers of weapons (e.g., SALT II and the FREEZE); while still others would create nuclear-free zones in Europe and elsewhere around the world. These proposals all share the common, long-term goal of bringing the nuclear threat under control and ultimately mastering it.

None of the above measures would directly constrain the *use* of nuclear weapons, however. Even if the whole list were negotiated and implemented, both superpowers would retain awesome forces capable of destroying each other and their respective allies many times over. And military planners might continue the ill-fated search for a way to use the weapons they still had to win a "limited" nuclear battle or wage a "protracted" nuclear war.

No-First-Use would put an end to that kind of thinking, explicitly by addressing the way in which nuclear weapons are proposed to be used. No-First-Use would signify to the world that the U.S. recognizes one and only one role for nuclear weapons – deterrence of their use by others.

For more information on the new UCS film *No-First-Use: Preventing Nuclear War*, and a UCS report which outlines the steps the U.S. and NATO will have to take to implement No-First-Use, please contact:

Union of Concerned Scientists

1384 Massachusetts Avenue
Cambridge, MA 02238
(617) 547-5552

October 21, 1982

NOVEMBER 11/11/82 CONVOCATION BIG SIX PARTICIPANTS & PROGRAMS

PORTLAND, OREGON

Co-ordinator: Dr. Warren Sherman (503) 225-8754
Press Contact: Del Greenfield (PSR) (503) 239-8556

Place: Portland State University, Smith Memorial Center
Time: 1:00-5:00PM /7:00-10:00PM
Program: Daytime Worshops and Evening Panel Discussion/ No-First-Use film
Discription of Schedule:

12:15 Registration
1:00 Opening Remarks , yet to be decided
1:15 Abram Chayes ,Nuclear Arms Development & Control(former legal advisor to the State Department)
1:45 Arthur Macy-Cox, Soviet Perspective on Negotiations (former CIA and State Dept. official)
2:15 DISCUSSION
3:15 WORKSHOPS AND FILM

7:00 Opening Remarks , yet to be decided
7:15 Herbert Scoville, An International Approach to Reversing the Arms Race (President, Arms Control Assoc., former deputy Director CIA, UCS Board Member.)
7:45 Anne Cahn , Role of the Individual and Public, (Exec. Dir Comm. for National Security)
8:15 DISCUSSION AND CLOSING REMARKS

SAN FRANCISCO, CA

Co-ordinator: Michael H. Shuman (415) 328-5137
Press Contact: Rachel Lodge (PSR) office in Berkeley

Place: St. Mary's Cathedral
Time: All Day and Evening Program
Program: "Solutions to the Weapons Crisis: Towards a Survivable Future."
Discription of Schedule:

10:00-12:15 "Tackling the Hard Questions"
Benediction, Stan Stefanick, Sr. Minister First Unitarian Church of SF .
David Brower ; (Founder of Friends of the Earth) ,"Can We End the War against the Earth and Ourselves."
Debate ; Sidney Drell,(Deputy Dir. SLAC) vs. Robert Barker, (Livermore Labs) "Who's Ahead". Stanford Linear Accelerator Center

Moderator; Bill Brocket, Chair LANAC for Bay Area.

1:30-2:00PM UCS Film
2:00-6:00PM: "The Search for New Answers"
Amory & Hunter Lovins (energy analysts)
David Mc Fadden (Dir. of Mid-Peninsula Conversion Project)
Philip Morrison, (MIT physicist)
Gloria Duffy (Dir. of Plowshares)
Michael Shuman (Dir. of UCAM-West)
Moderator will be: Peter Joseph,(Pres. Bay Area PSR)

NOVEMBER 11/11/82 CONVOCATION BIG SIX PARTICIPANTS & PROGRAMS

SAN FRANCISCO, CA cont.

7:30PM-10:00PM---"The Next Two Years, The Next One Hundred Years: Realizing a Lasting Security"
Introductory talk- Harold Willens (Wealthy Peace Businessman and Calif FREEZE Organizer and Fund Raiser)
Barton Bernstein (Stanford Hist, Professor)
Owen Chamberlain (Nobel Laureate and Berkeley physics professor)
John Holdren (Dir. of UC Berkeley Energy and Resourses)
Bennet Skewes-Cox (Dir. of the Academy of World Studies)
Moderator: Lila Peterson, KCBS radio personality in SF.

BOSTON, MA
CO-ordinator : Greg Smutney, Waging Peace; (617) 495-3945
Press Contact: Lois Traub, UCS (617) 547-5552

Place: Sanders Theater, Harvard University
Time: 1:00PM-3:30 PM
Program: Panel, Discussion on No-First-Use, FREEZE, Pro Administration.
Discription: Jonathan Moore (Institute of Politics,Director) Moderator.
Henry W. Kendall ,(UCS , Board Chairman) No-First-Use
Randall Forsberg, (Pres. Institute for Defense and Disarmament) and FREEZE architect.
Administration person , yet to be determined.

Discussants ;
Seymour Society (HU Black Student Group) ??????
Harvard Society for Social Responsibilty
Stanley Hoffman .(Harvard Professor.) to be contacted.

4:30PM--HANS BETHE TO SPEAK ON"REVERSING THE NUCLEAR ARMS RACE"

Evening Program - Harvard School of Public Health
Hans Bethe and Bernard Lown
Contact Paula Gutlove , Greater PSR (617) 497-7440 for details

UCS NO-FIRST-USE FILM SHOWING

Time: 7:00-10:00 PM
Place: Harvard University Science Center
Admission: Donations

DALLAS, TX
Co-ordinator Henry Simpson , lawyerLANAC (214) 742-9205
Press Contacts: Margaret Jordan (214) 640-9682 and Co-
Robert Maris (214) 528-5511

NOVEMBER 11/11/82 CONVOCATION BIG SIX PARTICIPANTS & PROGRAMS

DALLAS,TX _ cont.

Place: Kartcher Auditorium, SMU Law School , Dallas TX
Time: 7:00Pm -10:00Pm
Audience Size: 400-800
Program Discription: What, If Any, "Peaceful" End Is There To The Nuclear Arms Race?
7:00-7:30 UCS Film on NO-FIRST-USE
Introductory Remarks by participants
Lloyd Dumas,(Economist) Uof Texas
Alan Neidle, (Author, Nuclear Negotiations--U.S./Soviet;) CTB expert
Robert Buchheim (former member on standing consulting Committee for the U.S. Delegation on SALT verification)
QUESTIONS AND ANSWERS

Moderated by SMU Law School Professor

(214) 692-2830

ATLANTA, GA
CO-ordinator: Dr. Robert De Haan, Emory University (404) 329-6237
Press Contact: Gayila Melchior (404) 892-7053

Place: Video Chanel Theater , Downtown Atlanta
Time: Day Workshops at Emory, Ga. Tech, Atlanta U, Agnes Scott, and Ga. State., Columbia Theological Seminary
7:30- 10:30PM , VIDEO CHANEL
Audience: 800-1,000
Program Discription:
Introductory speech Andy Young (Atlanta Mayor) unconfirmed
UCS Film
Panel Discussion:
1. Adm.J.M. Lee (Ret. Naval Policy Expert & Strategist)
2. Thomas Halsted (Exec. Dir. PSR)
3. Dr. Alexander Leaf (MGH Cardiologist)
4. Administration rep . to be confirmed
5. Psychologist
6. Peace Links Rep.
7. Mr. Tanimoto(Hiroshima Victim and hero of John Hersey book)

Moderator to be confirmed : Forest Sawyer, CBS affiliate in Atlanta

NOVEMBER 11/11/82 CONVOCATION BIG SIX PARTICIPANTS & PROGRAMS

CHICAGO, IL
Co-ordinator: Michael Griffin , Bulletin of Atomic Scientists (312) 363-5225
Press contact: Ralph Deodelfino (312) 363-1220

November 10-
OPENING ADDRESS - Helen Caldicott , 7:30PM location to ba announced

November 11- IDA NOYES HALL , 1212 E. 59th Street

9:30-11:30AM WORKSHOPS: unemployment, inflation, and military budget
Nancy Meyers- Exec. Sec. Business Exec. Move
Stephen Daggett , Dir. Coalition for a New Foreign and Military Policy

12:30- MANDEL HALL, 57& University St.
Plenary Session
OPENING REMARKS - Jerome Weisner

1:00PM-Debate on NFU.
John Steinbruner vs. yet to be determined

2:45PM-Debate on Nuclear FREEZE.
Randy Kehler vs. yet to be determined

4:30PM-CLOSING REMARKS , Senator Gary Hart

LARRY P. McDONALD
7TH DISTRICT, GEORGIA

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June 8, 1982

file Nuclear Energy

Mr. Morton Blackwell
Special Assistant
Office of Public Liaison
The White House
Washington, D. C. 20500

Dear Morton:

Enclosed please find the text of the Resolution passed, and subsequently rescinded by the Rome City Commission. It would be greatly appreciated if someone could write to Rome City Commissioner, Jerry Dunwoody at P. O. BOX 1433 in Rome, Georgia, 30161, and point out very succinctly that is is most assuredly not the position of this administration and most certainly is not the position the President has taken and give the reasons. I do not want to give Mr. Dunwoody an out. A copy of this letter for my files would be greatly appreciated.

Best possible regards.

Sincerely,

Larry

Larry P. McDonald

LPM/fbw

enclosure

RESOLUTION

ROME CITY COMMISSION

ROME, GEORGIA

FOR A HALT TO THE NUCLEAR WEAPONS RACE

First: The Rome City Commission advocates that the United States and the Soviet Union agree to halt the nuclear weapons race through the adoption of a mutual and verifiable nuclear weapons freeze.

Second: The Rome City Commission advocates that the United States and the Soviet Union immediately resume serious bilateral negotiations on all relevant issues related to the nuclear weapons race.

Third: The Rome City Commission advocates, proceeding from this freeze and resumption of serious negotiations, that the United States and the Soviet Union pursue major, mutual and verifiable reduction in nuclear weapons systems, in a manner that enhances deterrence stability.

Convocation: November 11, 1982

Solutions to the Nuclear Arms Race

Briefing Manual

Union of Concerned Scientists
Lawyers Alliance for Nuclear Arms Control
Physicians for Social Responsibility
United Campuses to Prevent Nuclear War

CONVOCATION: NOVEMBER 11, 1982

SOLUTIONS TO THE NUCLEAR ARMS RACE

BRIEFING MANUAL

This briefing manual has been prepared to provide organizers of the November 11, 1982 Convocation a compendium of accurate background information on the nuclear arms race, the history of arms control agreements, the means by which agreements are verified, and alternative arms control proposals now undergoing widespread public debate. It is designed to provide a concise, thought-provoking introduction to the subject matter for use in planning program agendas, developing Convocation literature, and preparing individual presentations. The views expressed herein are not necessarily those of the signatory organizations.

Beyond its use for the 1982 Convocation, the material is applicable to planning a wide-range of educational activities both within and outside the academic community. UCS encourages such use whenever appropriate.

This manual was prepared with the assistance of Stephan Leader of L. & L. Associates, Washington, D.C.

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I. THE NUCLEAR ARMS RACE: PAST, PRESENT, AND FUTURE

What is the present status of the nuclear arms competition between the U.S. and the Soviet Union?

How did we get to where we are today?

Where is this arms competition taking us?

A. Present Status

On March 31, 1982 President Reagan made headlines by alleging that "on balance, the Soviet Union does have a definite margin of superiority" in nuclear striking power.* Within hours the statement was rebutted by nuclear arms experts. But the controversy that was generated left many Americans shaking their heads in confusion, wondering whom to believe. And many remain confused. Where do we stand with respect to the Soviets? Are we really behind? Or are we ahead? And how is one to decide?

At first glance it seems relatively easy to tally the numbers of nuclear weapons, missiles, and bombers on both sides. But on closer examination, counting numbers of weapons provides only one set of numbers and not necessarily the best measure by which to judge. At least a dozen or more different measures of comparative strength are available and depending on which measures are judged most important, it is possible to arrive at different conclusions. That may be one reason why the President and the Secretary of Defense say the Soviets are ahead of us.

Because U.S. and Soviet nuclear forces are asymmetrical, comparing them is similar to comparing the athletic ability of a nine-man baseball team and an eleven-man football team. Both nations have triads of land-based missiles, submarine-based missiles, and long-range bombers. However, each nation has built different kinds of missiles and bombers, with varying characteristics. Moreover, each has emphasized different components of its triad. For example, some 70 percent of the Soviet strategic nuclear force (measured in terms of numbers of thermonuclear warheads and bombs) consists of land-based missiles (ICBMs), while the largest part of the U.S. nuclear arsenal (about half) is carried by submarine-borne missiles. The U.S. may be "ahead" in terms of numbers of warheads and bombs--a tally some consider the most important--but Soviet missiles are larger than their American counterparts, and carry warheads with greater explosive power. And some believe size and throw weight are important measures of capability.

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* The New York Times, April 1, 1982.

Fuel-type and missile accuracies vary as well. Most Soviet missiles use liquid fuel. Because of liquid fuel's volatility, virtually all American liquid-fuel missiles were scrapped years ago. (All but about fifty Titan IIs use solid fuel today.) As a result, American missiles are probably more reliable and more are available to be fired at any given moment. Another measure of capability -- some experts say the most important -- is missile accuracy. U.S. missiles are generally more accurate but the Soviets are improving the accuracy of their missiles and the combination of improved accuracy and greater explosive power gives the Soviets a theoretical capability to destroy hardened targets such as missile silos. This is the basis for the Reagan Administration's concern about the "window of vulnerability." The U.S. also has a significant capability to destroy hard targets with its ICBMs and bombers. In time this capability may cause the Soviets more worry than the U.S. because of Soviet concentration on land-based missiles. But for the moment ICBM, vulnerability is a source of anxiety to both.

A comparison of U.S. and Soviet nuclear forces can be carried further. The Soviets have built more missile-carrying submarines than the U.S., but keep a much smaller percentage at sea (about 15 percent compared to about 50 percent for the U.S.). One reason for the lower at-sea rate may be that Soviet missile submarines are far less reliable mechanically than their American counterparts. For example, Secretary of the Navy John Lehman noted in 1982 that the Soviets seem to have experienced more than a few accidents aboard their missile submarines. On several occasions the U.S. Navy has observed them transferring injured sailors to other ships. There also may be many Soviet sailors who may have suffered from radiation sickness as a result of faulty shipboard nuclear reactors.* Furthermore, Soviet submarines are noisier than American boats, making them potentially vulnerable to superior U.S. anti-submarine warfare technology.

Bombers represent still another category for comparison. The U.S. has more long-range bombers than the Soviets and our bombers carry considerably more weapons than the Soviets. And while U.S. B-52s have been in service for many years, many Soviet bombers are at least as old. On the other hand, if one counts as part of the intercontinental force medium-range Soviet Backfire bombers,** the number of bombers on both sides is more nearly equal. The Soviets have more extensive air defenses against bombers than the U.S. The deployment of air-launched cruise missiles on U.S. bombers in the next few years is of particular concern to the Soviets, because the low-flying cruise can evade their radar.

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* Comments at Pentagon Press Breakfast, March 16, 1982.

** The name Backfire is the NATO code name for what the Soviets designate the Tu-22m or the Tu-26. The name derives from the practice of assigning jet bombers two syllable names beginning with B, jet fighters, two syllable names beginning with F. Thus the MiG-21 is code named "Fishbed." Most experts agree that the Backfire is designed for use against maritime and European targets but can reach the U.S.under special conditions. See Robert Berman, Soviet Airpower in Transition (Washington, D.C., The Brookings Institution, 1978) p. 26.

How does it all add up? By some indicators the U.S. is ahead; by others the Soviets are ahead. Many people believe this is a pretty good description of nuclear parity. Both countries possess large numbers of nuclear and thermonuclear weapons as well as diverse and secure delivery systems. So long as that condition exists, neither side can be confident of its ability to carry out an attack that would preclude retaliation by the other. The explosion of tens or hundreds of thermonuclear warheads on the territory of either country would certainly be a catastrophe of unparalleled proportions. Yet, the ability of each side to retaliate even after an attack is the essential condition of mutual deterrence. This uneasy stand-off is a source of considerable anxiety, although it may have effectively prevented the use of nuclear weapons and even direct hostilities between the U.S. and the USSR for more than thirty years.

In the first article that follows, the Joint Chiefs of Staff provide their 1983 (Fiscal Year) annual assessment of the strategic nuclear balance. They do not go quite as far as the President in alleging that the Soviets are superior. However, they note that 1) the U.S. no longer enjoys strategic superiority; 2) the Soviets lead in several measures of capability; and 3) the effectiveness of the U.S. deterrent has been undermined by Soviet improvements and delay (or deferral) of U.S. strategic modernization programs. While reading this analysis and assessment, it is important to sort out the assumptions behind the analysis as well as the criteria used to judge "effectiveness". For example, the Chiefs are concerned about ICBM vulnerability and the relative strengths of both countries <u>following</u> a nuclear exchange. The scenario they discuss is one in which the Soviets first attack our ICBMs, destroying most of them. Some analysts doubt the plausibility of this scenario.

In the second article, former MIT President and Science Advisor to President Kennedy, Jerome Wiesner, presents his own assessment of U.S.-Soviet nuclear strength. Wiesner disagrees with Reagan Administration's arguments that the U.S. is inferior to the Soviets. Moreover, he disputes the existence of a window of vulnerability and the scenarios usually associated with that idea.

From Military Posture for FY 1983, Prepared by the Organization of the Joint Chiefs of Staff, pp. 19-26.

STRATEGIC FORCES

The prime objective of US strategic forces and supporting C^3 is deterrence of Soviet nuclear attack on the US and its allies. Deterrence depends on the assured capability and manifest will to inflict damage on the Soviet Union disproportionate to any goals that rational Soviet leaders might hope to achieve. Any US strategic retaliation must be controlled by and responsive to the NCA, tailored to the nature of the Soviet attack, focused on Soviet values, and inevitably effective. Assured strategic C^3 connectivity across the spectrum of conflict is essential for NCA control of US strategic forces.

Strategic Offensive Forces

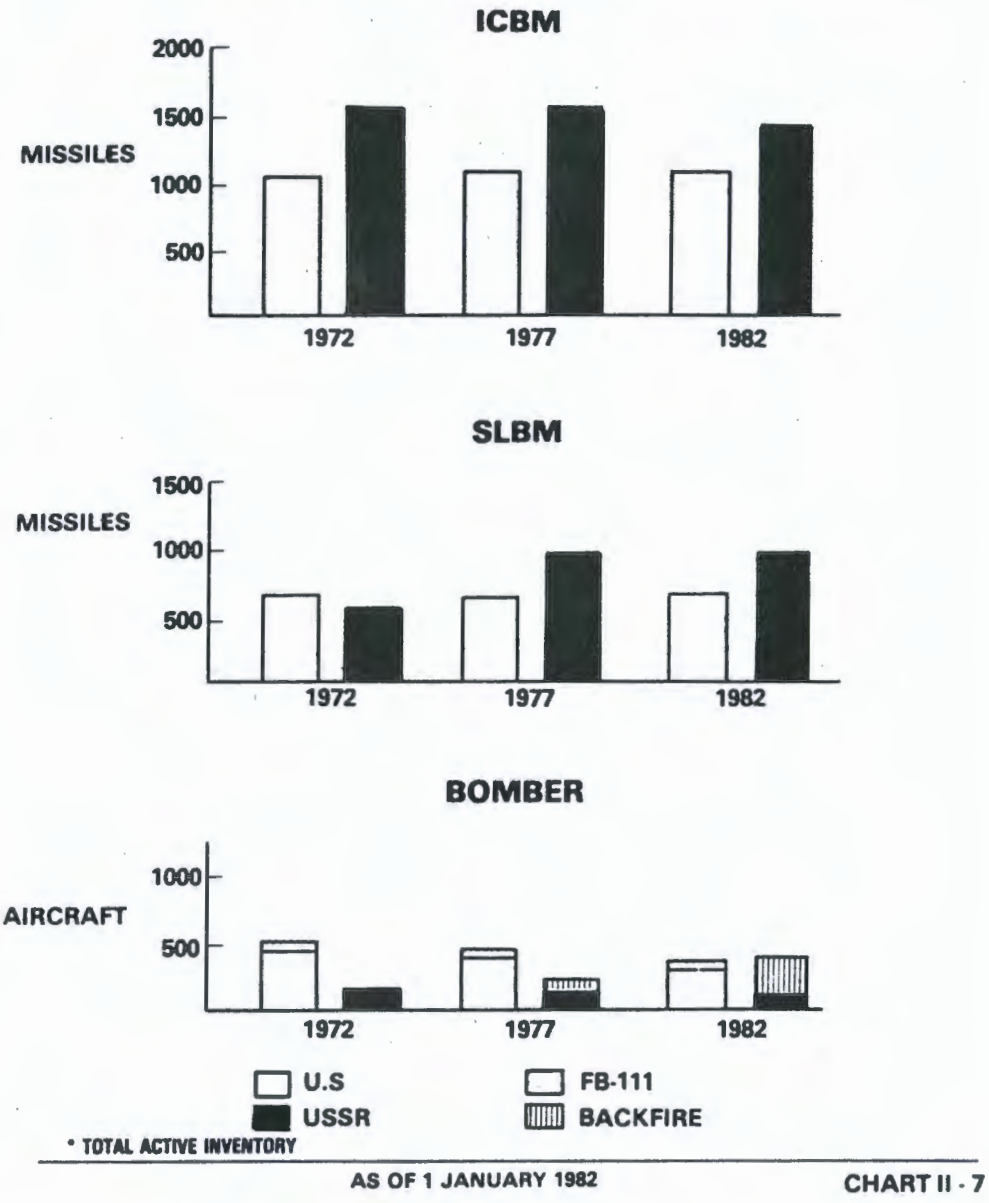
US strategic offensive forces consist of a TRIAD of ICBMs, SLBMs, and intercontinental manned bombers equipped with gravity weapons and air-launched missiles. The TRIAD of mutually supporting systems provides a mix of force characteristics for appropriate response to a number of possible Soviet attacks, complicates Soviet attack and defense planning, and insures the effectiveness of a US nuclear response.

Soviet intercontinental nuclear forces also consist of ICBMs, SLBMs, and manned bombers, but the Soviets currently place greatest emphasis on ICBMs. The Soviets have steadily increased the capability of these forces until they now exceed US forces in several measures of capability (Chart II-7 depicts the trends in numbers of US and Soviet long-range nuclear systems). The US no longer enjoys strategic nuclear superiority, and the overall effectiveness of our retaliatory capability has become increasingly uncertain.

Sources of Deterrent Uncertainty

The increased uncertainty in the effectiveness of the US strategic deterrent has resulted from Soviet stra-

LONG-RANGE NUCLEAR SYSTEMS*



AS OF 1 JANUARY 1982 CHART II - 7

tegic force modernization and delays and deferrals of US modernization programs. Since the early 1960s, the Soviets have placed heavy sustained emphasis on improving strategic force capabilities. This emphasis corresponds to Soviet doctrinal writings, which assign little importance to the concept of deterrence and comparisons of balance such as are common in the West. Soviet doctrine talks instead of sufficiency to achieve objectives by the possession of credible warfighting capabilities. To gain strategic sufficiency, the Soviets have focused primarily on modernizing their ICBM forces by deployment of new systems and by block modifications to deployed systems. These initiatives have yielded more Soviet weapons per missile, greater throw-weight, improved C^3, and improved weapon accuracy. As a result of these improvements — and in line with Soviet doctrinal emphasis on mass and surprise — Soviet ICBMs are now capable of destroying time-urgent targets in an initial attack.

The Soviets are also continuing to strengthen the SLBM leg of their forces. The new TYPHOON-class submarine is undergoing initial sea trials and should soon join a fleet of DELTA- and YANKEE-class ships which already far outnumber US ballistic missile submarines. The TYPHOON-class submarine, which exceeds the US TRIDENT-class in size and may rival it in technology, should become fully operational in the mid-1980s. Like DELTA, TYPHOON will provide the Soviets with the same operational advances the US will make with TRI-

DENT — longer range SLBMs, expanded patrol areas, shorter travel distances to patrol stations, and the capability to launch against targets in the US from home waters.

For their bomber force, the Soviets have retained the BEAR and BISON while continuing to add BACKFIRE. Although apparently designed primarily for peripheral missions, BACKFIRE has sufficient range to attack the US by employing either aerial refueling or post-strike recovery in the Western Hemisphere. Long-range air-to-surface missiles (ASMs) have been deployed, and a new bomber and a new tanker are projected for the 1980s.

For a variety of reasons, US strategic force modernization efforts have not kept pace with the steady improvement of Soviet capabilities. As noted in the previous section, overall US military expenditures have been relatively limited over the past decade, largely as a result of competing priorities for national resources. Of the US defense funding made available, less than 10 percent was devoted to strategic capabilities. Further, the US has chosen in some instances to delay force modernization in favor of increasing the readiness of existing forces. Modernization and readiness are both essential for a balanced defense program, which must provide an adequate deterrent now and in the future. US strategic force modernization has also been hampered by our tendency to delay or defer the fielding of new systems while pursuing the development of even more advanced capabilities. Waiting for these more advanced capabilities may help to lessen the risk of early obsolescence, but in the interim, deployed US systems tend to fall even farther behind in their ability to meet the existing threat. As a result of these factors, US strategic forces have been supported largely by capital investments made in the 1950s and 1960s. A sustained commitment over several years will be required to rectify this situation and reduce uncertainties in the US deterrent posture.

Crucial Problem Areas

Our primary concerns with the US TRIAD of strategic offensive forces are ICBM vulnerability and declining effectiveness against increasingly hard Soviet targets, SLBM limitations against hard targets, and decreasing ability of US manned bombers to penetrate Soviet defenses. A fourth concern, which affects all elements of the TRIAD, is the problem of assured C^3 connectivity between the NCA and the strategic nuclear forces. (C^3 connectivity is addressed below after discussion of TRIAD problem areas and modernization efforts.)

Today, ICBM vulnerability is the most serious problem facing any one leg of the US strategic TRIAD. Over the past two decades, the Soviet Union has introduced four generations of ICBMs as well as multiple independently targetable reentry vehicles (MIRVs) on many of its newer ICBMs. As a result, the Soviet ICBM force has evolved from a few missiles with multi-megaton warheads and limited accuracy to a very large force possessing sufficient accuracy and warhead yield to menace the US ICBM force in an initial attack. Analyses project that a Soviet strike against US missile fields could destroy a major portion of the US ICBM force if the US chooses to ride out the attack before responding. However, the Soviets would still have to contend with the US SLBM force — secure and survivable at sea — and the manned bombers that had been launched for survival at the first confirmed warning of attack.

The SLBM force possesses the highest survivability and best endurance of the US TRIAD, and thus contributes greatly to crisis stability and maintenance of a strategic reserve. Currently deployed SLBMs are effective against economic and soft military targets, but the combination of accuracy and warhead yield is such that the existing SLBM capability against hardened targets is limited. In addition, there is some uncertainty concerning required communications connectivity in a wartime environment between the NCA and ships submerged in distant ocean patrol areas.

Bombers are the most flexible component of the TRIAD. With man continuously in control from takeoff to weapon release, bombers can respond to direction after launch — including recall and target changes — and attack both hard and soft targets with gravity bombs or stand-off air-to-surface missiles. The bomber force, along with other land- and sea-based aircraft, compels the Soviets to spend massively for air defense and thus it diverts funds from other military investments. By the late 1980s, however, increasingly dense and sophisticated Soviet air defenses, if not confronted with modernized US capabilities, will decrease the probability of bomber weapons reaching their targets. Soviet air defense interceptors are projected to be equipped with an improved look-down/shoot-down capability against low altitude penetrators the size of B-52s.

US Strategic Force Modernization

In recognition of deficiencies in US strategic capabilities and of their underlying causes, the US has embarked on a program of strategic force modernization. The program has five segments, three of which directly concern elements of the TRIAD. The remaining segments concern C^3 connectivity and strategic defense, which will be addressed in following sections. The limitations of current US strategic forces did not evolve overnight; neither will their solutions.

The deployment of 100 MX missiles — each with at least ten reentry vehicles (RVs) — will address the problem of ICBM vulnerability as well as increase the number and accuracy of ICBM weapons. At least 40 of these missiles will be deployed in MINUTEMAN silos, with initial operational capability scheduled for 1986. In the meantime, an aggressive research and development program is pursuing survivable, long-term basing modes. A decision on one or more permanent, highly survivable basing modes is expected in Fiscal Year (FY) 1983.

Modernization of the sea-based missile force includes the TRIDENT nuclear-powered ballistic missile submarine (SSBN) program and development of an advanced SLBM, the TRIDENT II (D-5). The D-5 missile will equip the 24 launch tubes of each TRIDENT submarine, providing some increase in range and — more importantly — greater payload and accuracy for increased capability against the full spectrum of targets. The TRIDENT D-5 will be available in late 1989. In addition, nuclear-armed sea-launched cruise missiles (SLCMs) will be deployed on attack submarines beginning in FY 1984. Although SLCM-equipped attack submarines will have a primary sea control/antisubmarine mission, they will contribute to the strategic reserve capabilities.

A variant of the B-1 bomber will become operational in 1986, with a force of 100 aircraft scheduled to be in place by in the late 1980s. The new B-1B will have a much smaller radar signature than the B-52, thus enhancing bomber penetrativity well into the 1990s. In addition, an advanced technology bomber (ATB) is programmed to supplement the B-1B beginning in the early 1990s. If the threat dictates, the ATB could assume the bulk of the penetration role while the B-1, equipped with air-launched cruise missiles (ALCM), performs the stand-off mission.

Some important quantitative effects of US TRIAD modernization are shown in Charts II-8 through II-10. Chart II-8 uses four standard measures of capability to display trends in pre-attack (or static) force potential. Charts II-9 and II-10 use the same four measures to depict the results of dynamic analyses. These dynamic analyses are based on simulated strategic force exchanges that attempt to model real-world operational considerations. US forces used in both the static and dynamic comparisons reflect the current US program of strategic force initiatives. Soviet force data are derived from the latest intelligence projections.

Chart II-8 shows that static force trends favoring the Soviet Union will be arrested or even reversed in the mid-to-late 1980s, assuming the Soviets do not deploy forces in excess of projected levels. The US advantage in total weapons count will continue to decline until 1985, but then stabilize slightly above parity. Estimated growth in Soviet weapons will be offset by deployments of the TRIDENT SSBN, ALCM, MX, and B-1B. The chart also shows that the US will soon lose its slight advantage in hard-target kill potential, a measure of bomber and missile counter-force capabilities, but that the trend will move back toward parity as the US deploys ALCM, MX, and the TRIDENT D-5 SLBM. US deployments will also reverse the trend in equivalent megatonnage, but continuing Soviet emphasis on relatively large warheads will insure a Soviet advantage through the early 1990s. During the same period, the Soviets will continue to enjoy a significant advantage in time-urgent hard-target kill potential, chiefly a result of the increasing accuracy of their modern ICBMs. The trend should reverse sharply by the late 1980s as the US deploys the highly accurate MX and TRIDENT D-5 missiles.

Trends in static or pre-launch force potential, such as shown in Chart II-8, are useful tools for describing the balance of US and Soviet forces. However, only the more sophisticated dynamic methods are capable of introducing into force comparisons such critical real-world considerations as estimated force performance, target systems, and attack strategies. The dynamic simulations, results of which are shown in Charts II-9 and II-10, involved military judgment and thus accommodated many subjective inputs that would pertain to an operational environment. Although such dynamic methods are useful for indicating the degree of uncertainty faced by force planners, they cannot predict the course or outcome of an actual force exchange. Because of the assumptions involved, the results do not indicate absolute capabilities for each side, but rather trends in relative capabilities.

Charts II-9 and II-10 display the computed outcomes of strategic force exchanges in which the Soviets first attack the US target system and the US retaliates in kind. Results are shown for 1987 and 1991, after the US modernization program has begun to have a major effect on the strategic balance. For the analyses depicted in Chart II-9, the forces on each side were assumed to be in a normal, day-to-day alert posture at the start of the Soviet attack. For the analyses of Chart II-10, all forces were assumed to be in a fully generated posture.

In each exchange, targeting approaches for each side were assumed to be the same: attacking all of the opponent's ICBM silos with nuclear weapons and then, using weapons not allocated to that task, inflicting moderate damage on a specified percentage of the remainder of the opponent's target system. The damage goals set in this analysis for US and Soviet targets are different,

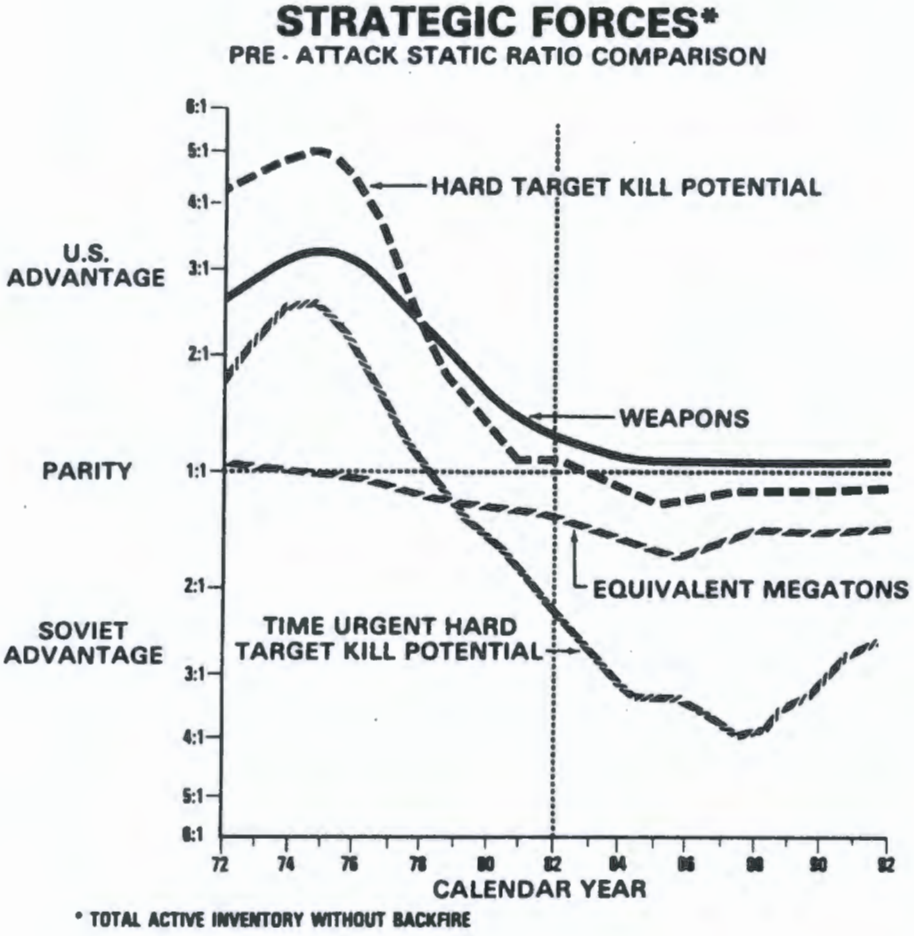


CHART II - 8

but attempt to reflect intended objectives for each side. In addition, the target data bases used in the analysis reflect differences between the US and Soviet target systems in numbers of key targets and vulnerability to nuclear effects.

It was also assumed that the conflict leading to the strategic nuclear exchange did not attrite any strategic delivery systems, the Anti-Ballistic Missile Treaty remained in effect, and the opposing sides employed only nuclear weapons in the homeland-to-homeland exchanges. Additionally, C^3 connectivity was assumed for both sides, meaning that all surviving forces received and executed a launch order. This was an important assumption because US strategic C^3 systems would probably be degraded in the initial Soviet attack.

The measurements presented in Charts II-9 and II-10 portray the qualities of the respective remaining forces after the damage has been done to opposing weapons and the required forces have been expended against designated targets. Chart II-9 shows that while both sides would have residual capabilities, the Soviets would have an advantage in 1987 and 1991, should they initiate an attack with both sides in a day-to-day alert posture and the US choose to ride out the Soviet attack before retaliating. The relative improvement in computed US post-exchange capabilities is a result of the current US strategic force modernization program.

Chart II-10 displays the computed outcomes of exchanges initiated after full generation of US and Soviet forces; again, it is assumed that the Soviets strike first and the US elects to ride out the Soviet attack before retaliating. Unlike the day-to-day alert attack outcomes, which favor the USSR, the generated attack outcomes show much more balanced post-exchange capabilities.

As noted above, Charts II-9 and II-10 both display the results of exchanges in which the US chooses to ride out a Soviet first strike before retaliating. In both cases, the relative US post-exchange posture would be considerably improved if the US were to launch under attack (LUA). Although the US has no policy that assumes or requires launch under attack, the availability of the LUA

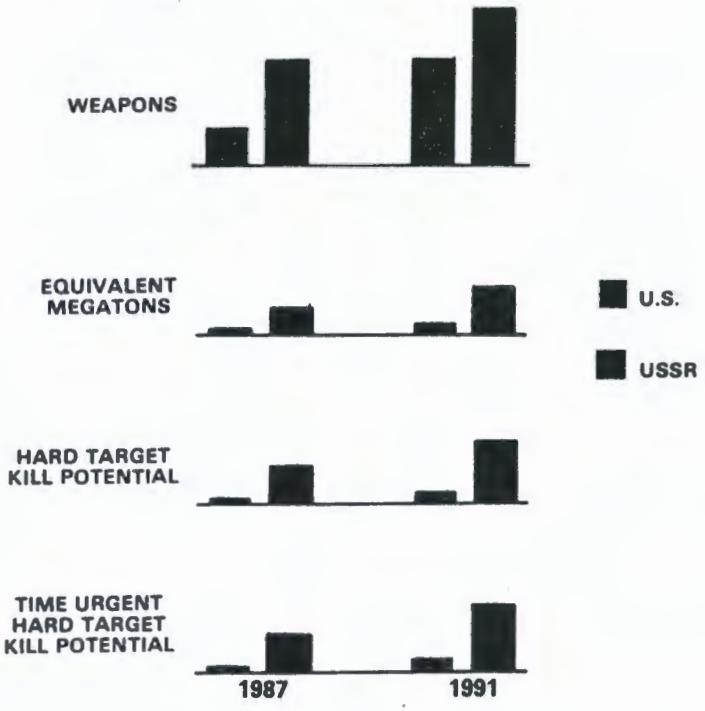


CHART II - 9

option is important because it leaves the Soviets uncertain about how we might respond to an attack.

Finally, it should be noted that the residuals displayed in Charts II-9 and II-10 do not imply an excess capability for either the US or Soviet strategic forces. The actual effectiveness of the post-exchange forces must be considered in view of opposing defenses, responsiveness to targeting requirements, unexpectedly poor system performance, and secure reserve force requirements. Allowance must also be made for possible target base growth and additional hardening (not assumed except for nuclear forces).

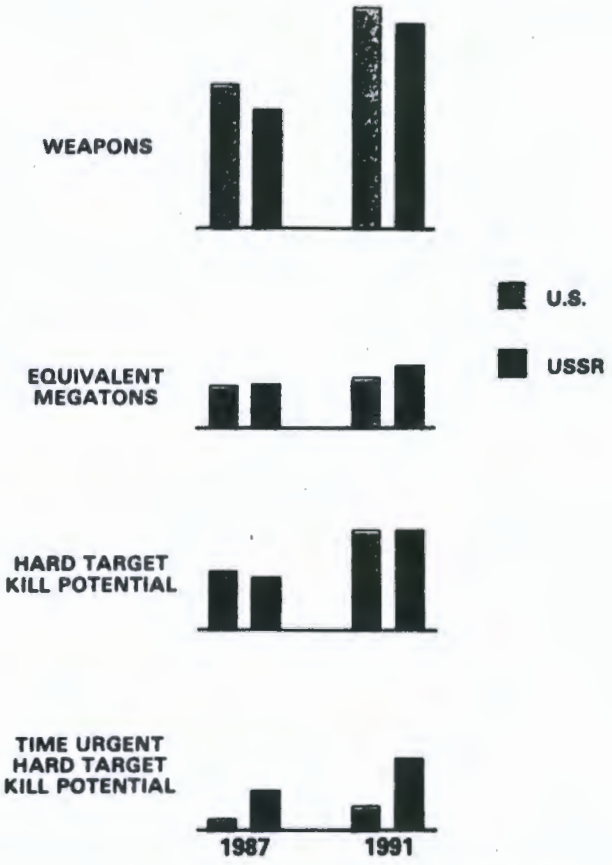
The foregoing analyses, although limited in several respects, provide additional evidence that the US must achieve the programmed modernization of TRIAD forces. US strategic force modernization will not have its full impact on the US-Soviet balance until late in this decade, but the adverse trends can be arrested and reversed with the sustained commitment of resources to TRIAD improvement. Sustained US modernization is essential if the US is to respond effectively to a continuing Soviet force buildup while at the same time inducing the Soviets to move toward equitable and verifiable strategic arms control agreements. To insure the effectiveness of the US deterrent, it is also essential that the offensive force improvements be accompanied by the programmed modernization of US strategic C^3 and strategic defensive capabilities.

Strategic C^3 Connectivity

Strategic connectivity encompasses C^3 systems that link the NCA and commanders of unified and specified commands to forces in the field. To insure a credible deterrent posture, strategic connectivity must be assured during all phases of a nuclear exchange. In such a conflict, C^3 systems will likely be subjected to power outages, jamming, EMP, atmospheric disruption, and physical destruction. Thus force execution, escalation control, and post-strike reconstitution hinge on survivable and enduring C^3 capabilities.

C^3 improvement has a high priority within the new strategic modernization program. The program includes

STRATEGIC FORCES*
POST EXCHANGE RESIDUALS
(GENERATED ALERT)



BARS INDICATE RESIDUALS IF U.S. RIDES OUT ATTACK BEFORE RETALIATING
* ON-LINE INVENTORY WITHOUT BACKFIRE

CHART II - 10

numerous measures for improving the timeliness and clarity of assured tactical warning and attack assessment, and for enhancing communications connectivity from the NCA to the strategic forces. C^3 improvements include enhanced satellite communications; EMP hardening of bombers, C^3 aircraft, and aircraft which relay communications to the SSBNs; and an extremely low frequency system to enable SSBNs to maintain continuous communications while operating submerged at greater depth and speed. To avoid possible confusion and delay, these improvements must be managed as an integrated system rather than on a piecemeal basis.

Strategic Defense

Strategic defensive capabilities contribute to deterrence in ways frequently overlooked. These capabilities include active defenses such as interceptor aircraft, surface-to-air-missiles (SAMs), and ballistic missile defense (BMD) systems; and passive defenses such as surveillance and warning systems, hardening, electronic countermeasures (ECM), and civil defense. All of these capabilities contribute to denying an adversary confidence that he can fully achieve his objectives. This point is not lost on the Soviets, who have deployed more than 7,000 air defense radars, 2,500 interceptors, some 10,000 SAM launchers, and 32 ABM launchers and have devised the most comprehensive civil defense program in the world. By contrast, the US deploys fewer than 120 ground and Airborne Warning and Control System (AWACS) air defense radars, no SAMs for defense of the Continental US (CONUS), and less than 300 interceptors (most of 1950s vintage). Moreover, the US has had no BMD capability since 1976, when the single SAFEGUARD site was phased out, and currently has a very limited civil defense capability.

The fifth aspect of the US strategic modernization program addresses the major deficiencies in strategic defense. One of the most critical of these deficiencies is the lack of adequate air defense. The existing Distant Early Warning (DEW) line and US coastal radars do not provide sufficient all-altitude surveillance coverage for CONUS defense against airbreathing threats. And as noted above, the small US interceptor force is obsolete. Programmed initiatives to improve long-range surveillance for tactical warning of atmospheric attack include modern microwave radars for the DEW line and over-the-horizon-backscatter (OTH-B) radars looking east, west, and south. At least six additional AWACS aircraft will be procured to provide survivable surveillance and command and control for air defense for North America. In addition, five squadrons of F-15 interceptors are programmed to begin replacement of the 1958-vintage F-106.

The strategic modernization program also provides for a US space defense capability as well as the vigorous pursuit of research and development (R&D) on BMD. Currently, the US has no counterpart to the operational Soviet antisatellite (ASAT) interceptor. A US ASAT system would serve to deter Soviet use of ASAT or, if necessary, neutralize satellites that support Soviet wartime objectives. Current R&D programs for BMD are being conducted as a hedge against Soviet treaty abrogation or unconstrained offensive threat growth, and as a potential active defense for US ICBMs. BMD is one of the three major options being considered for long-term enhancement of MX survivability.

The US/Soviet imbalance in passive civil defense is striking. The Soviets are investing more than $2 billion annually in civil defense and employing about 115,000 personnel to manage and exercise the program. A sheltering program exists for government personnel and 11 percent of the urban population. Almost half of the shelter spaces are for essential workers. The balance of the Soviet population is supported by a program for evacuation. The US currently has no civil defense program comparable in scope, structure, or performance to the existing Soviet effort. The US civil defense program is centered on state and local governments and by statute is a dual-use effort in which the same measures serve natural disaster relief and nuclear attack preparedness. In the past, the US has allocated funding for planning of crisis relocation for selected risk areas, but there are currently no provisions for supporting a dispersed population or protecting war-supporting industry and its labor force.

Conclusion

The steady modernization of Soviet strategic offensive and defensive capabilities has continued for more than two decades. This trend, coupled with the failure of US modernization efforts to keep pace, has resulted in the loss of US strategic nuclear superiority and increased uncertainty in US capabilities to deter both nuclear and nonnuclear conflict. The relative decline in US strategic and theater nuclear capabilities has reduced the ability of the US to deter or control lower level conflicts by the threat of nuclear escalation. To enhance the deterrence of both nonnuclear and nuclear conflict, the US must modernize the strategic TRIAD and associated C^3 systems and upgrade homeland defense capabilities. A sustained commitment is required to correct asymmetries in the strategic balance and create a more stable and secure deterrent.

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RUSSIAN AND AMERICAN CAPABILITIES

BY JEROME B. WIESNER

OVER THE PAST THIRTY YEARS, THE NUCLEAR-ARMS race has been propelled by political tensions, by technical innovations, and by rivalries inside the governments of the United States and the Soviet Union. But at the moment, on the American side one overriding concern promotes the buildup of nuclear weapons—the fear that the United States might be denied its ability to inflict a devastating retaliatory blow if the Soviet Union struck first. This fear presumes that a nuclear war, far from being an act of mutual annihilation, might be a controllable, survivable, even "winnable" encounter, and that the Soviet Union may be better equipped than the United States to prevail in a nuclear war.

Such an anxiety, if well grounded, would compel any responsible American leader to search seriously for new nuclear-weapons projects, beginning with the MX missile and perhaps extending to antiballistic-missile systems and greater efforts for civil defense, in the hope of redressing the balance. The Reagan Administration, of course, is pushing ahead on several such fronts and says that it cannot persuade the Soviet Union to negotiate for reductions in strategic weapons unless we first show our determination to increase American strength. Even if the strategic-arms-reduction talks (START) that President Reagan has proposed eventually lead to an agreement, that welcome development would not come sooner than several years from now. In the meantime, American policy need not be driven by a fear of a Soviet first strike. Instead, it should rest on a recognition of the basic reality of the nuclear age: that the only option open to either the Soviet Union or the United States is deterrence. Given today's weapons, neither side can do anything to protect itself against the retaliatory threat the other poses; by the same logic, neither side need fear that its threat to the other will be called into question. This balance hardly justifies political or moral complacency. Because of the catastrophe that would occur if deterrence failed, our best efforts must be directed to preventing the circumstances in which nuclear weapons would ever be used. But the concept of deterrence suggests a very different direction for American action from the one indicated by anticipation of a Soviet first strike.

The current era has often been spoken of as a "window of vulnerability," in which America's nuclear force is uniquely at risk. But it can instead be a "window of opportunity" in which to negotiate an end to the arms race. The most obvious and the most sensible step for the United States at the moment is to add *nothing* to our nuclear forces, and to seize this opportunity to press for a freeze on the develop-

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ment, testing, and deployment of all nuclear weapons and new delivery systems by each side.

As has happened before in the arms race, we have been told that technical progress has created a theoretical vulnerability for our force. The Soviet missile force has increased in size and accuracy, and supposedly poses fresh dangers to our land-based nuclear missiles. The Soviet Union's theoretical ability to destroy nearly all of these missiles in a surprise attack, it is argued, will psychologically upset the balance of deterrence, and will thereby make the United States vulnerable to Soviet blackmail. This will happen, it is further argued, even though the great majority of the American nuclear weapons are carried on bombers or by ballistic-missile submarines, rather than by the Minuteman and Titan missiles that are based in silos throughout the Midwest. An American President might be afraid to retaliate after a Soviet attack on the U.S. missiles, because the Soviet Union would then respond with a major attack on American cities. The conclusion of this line of reasoning is that the U.S. cannot contemplate any slackening of the pace until it has redressed the imbalance by building the MX missile or other systems.

I accepted this scenario myself until I made a few simple calculations concerning how vulnerable the Minuteman system actually is and what the strategic situation would be even if it were somehow totally destroyed. It emerges from any such calculation that neither side can escape the risk of devastating retaliation if it launches a pre-emptive attack. This is the only vital issue for each side—the actual capabilities for responding after attack, not guesses about what the other side's intentions might be. Intentions may change, and they are always difficult to discern. But the meaning of the capabilities is unambiguous: *under present technology, either side could devastate the other after enduring any conceivable attack.*

The U.S. has more deliverable nuclear warheads than the Soviet Union does. A 1978 study prepared for the Congressional Budget Office estimated that in the mid-1980s, when the "window of vulnerability" will allegedly stand open, the U.S. will have 13,904 warheads on its strategic delivery systems, versus 8,794 for the Soviet Union. The Soviet Union, for reasons we have never fully understood, has chosen to build missiles larger than ours, with larger warheads; and its force, though smaller in numbers, contains more "equivalent megatons" than ours does. (The measure "equivalent megaton" takes account of the fact that small nuclear warheads do proportionately more damage than large ones, since the area a warhead destroys does not increase linearly with the size of the warhead.) The same Congressional Budget Office study estimated that in the mid-1980s the U.S. force would represent 4,894 equivalent megatons, versus 8,792 for the Soviet Union. Paul Nitze, of the Committee on the Present Danger, which has been among the most strident of the groups warning about a window of vulnerability, has estimated that if both sides built up to the limits allowed by the SALT II treaty (whose ratification the committee opposed), the U.S. would have 12,504 nuclear warheads and the Soviet Union 11,728. It foresees roughly the same advantage for the Russians in equivalent megatons as does the Congressional Budget Office.

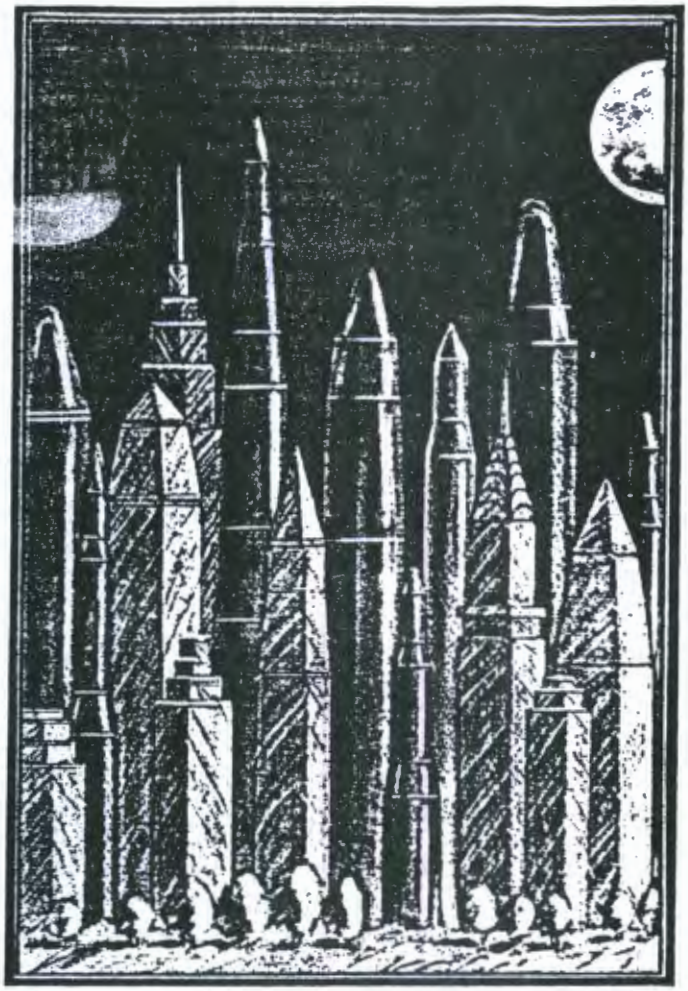
Of the 13,000 to 14,000 warheads projected for the American force, roughly 2,100 are on the Minuteman and Titan missiles. The land-based force represents some 1,507 equivalent megatons. Therefore, if every single Titan and Minuteman were destroyed in a successful surprise attack, the U.S. would be left with somewhere between 11,000 and 12,000 nuclear warheads. The submarine fleet would account for approximately 6,000 of these weapons, and the rest would be carried by bombers. All together, these remaining American warheads would represent about 3,500 equivalent megatons.

IN PLANNING AMERICAN NUCLEAR FORCES IN THE early 1960s, Robert McNamara came to the conclusion that 400 equivalent megatons would be sufficient to inflict unacceptable damage—and that the U.S. could have absolute confidence in its deterrent if it built such a retaliatory capacity three times over, once on the bomber fleet, once on land-based missiles, and once with the submarine force, for a total of 1,200 equivalent megatons. In other words, the 11,000 or 12,000 warheads, representing 3,500 equivalent megatons, that the U.S would retain even after a perfectly successful first strike against our land-based missiles would be three times larger than the force that was itself designed to be able thrice to destroy the Soviet Union. The accuracy of nuclear weapons has improved since McNamara's day, further increasing their effective power. These figures do not even count the several thousand American warheads that are left in Europe and other parts of the world, some of which could be used for retaliation.

Nearly all scenarios for a first strike assume that an attacker would have to target two warheads against each missile silo it hoped to destroy. The U.S. has 1,000 Minuteman missiles and several dozen Titans. The Soviet Union would, therefore, have to devote about 2,200 warheads to an attack. The most generous estimates put the mid-1980s Soviet force at slightly fewer than 12,000 warheads; so after launching its first strike, the Soviet Union would end up with fewer than 10,000 warheads, or several thousand *fewer* than the United States.

So far, these calculations have been based on extreme assumptions: that the Soviet Union would be able to destroy totally the force of Minuteman and Titan missiles, but that it would leave the submarine and bomber fleets intact. More realistic assumptions yield the same conclusion: that a first strike would be suicidal irrationality, which is the premise upon which deterrence is based.

Moreover, first-strike scenarios rest on the assumption



that large numbers of men and machines will perform exactly as planned. The weapons used in a first strike would have to perform reliably and very accurately, and the detonations of several thousand warheads would have to be coordinated with perfect skill, or else the whole scenario becomes immediately implausible. Yet no complex system ever works as predicted when it is first used. In carefully controlled tests, involving small numbers of weapons, it may be possible to attain the levels of accuracy required for a first strike, but I am convinced that the necessary levels of accuracy and reliability are simply not attainable in an operational force. It would require many more test flights than either nation normally conducts to get enough data to establish the actual facts about these systems. How many trial runs of a surprise attack could the U.S. or the Soviet Union carry out?

Three factors make it seem especially unlikely that a surprise attack could be successfully carried out. First, the accuracy of the attacking warheads is uncertain. Because their targets, the missile silos, are so greatly "hardened," warheads must come much closer to a silo than to "softer" targets to do damage. But it may be impossible for either side to know how accurate its warheads will be when they are fired in large fleets on a trajectory that has never before been tested.

Second, the reliability of the missiles themselves is open to deep question. Optimists assume that 80 percent of the missiles that are fired will perform satisfactorily. The likely rate may be closer to 50 or 60 percent. This would mean that even assuming maximum accuracy and accepting the formula that two warheads fired at a silo will have a 95 percent probability of destroying it, the Soviet Union might fire 2,200 warheads at our missiles and destroy only 500 to 600 of them.

Third, such an exercise would require prodigious feats of timing. It would involve very precise firings of the individual missiles, so that the two warheads attacking each Minuteman would be so perfectly spaced that the detonation of the first would not destroy the second, and warheads attacking neighboring sites would not disable each other. (These very probable accidents are known as fratricide.) A successful first strike would depend on flawless communication within the Soviet command structure. It is generally recognized that the command-and-control system is the weakest link in the nuclear forces of both sides.

In principle, the Soviet Union could improve its possibilities of success by firing more than two warheads at each missile, but then the potential for destructive interference becomes even greater, as do the complications of command and coordination. Most experts believe that two warheads per target is the practical limit.

All in all, the result is this: even after a surprise Soviet attack on the American Minuteman force, *U.S. strength would actually be slightly greater than the Soviet Union's.* If the Soviet Union could carry out the worst attack that the alarmists have been able to imagine, the United States would not only retain its relative position but would have enough nuclear weapons to destroy several Soviet Unions. And by the same logic, the Soviet Union would certainly retain the capacity to inflict unacceptable punishment on the United States, no matter how large and clever a surprise first strike the U.S. were to launch. Theorists may claim that it would not be "logical" for the side that had endured the first strike to order a retaliation, since that would lead to further devastation, but such forbearance on the part of a badly wounded but still armed nation is hard to credit.

Theorists defending the first-strike hypothesis often refer to the issues of the Cuban missile crisis. In 1962, the U.S. had many more nuclear weapons than the Soviet Union, and this superiority, many advocates of the MX now say, forced Nikita Khrushchev to back down. But in the early sixties, the Soviet Union had so few *deliverable* nuclear weapons that its leaders had legitimate reason to fear that a first strike might take away their ability to threaten destructive retaliation. The imbalance *may* have affected Soviet behavior—although American superiority in conventional naval forces seems to have weighed more heavily in the Soviets' calculations. At the comparatively low levels of nuclear weaponry of twenty years ago, a difference in size between the arsenals could have political

significance; indeed, much of the impetus in American policy has been to regain the first-strike potential the U.S. enjoyed for many years. But when each side has a superabundance of weaponry, which is the case today, small differences in size no longer matter.

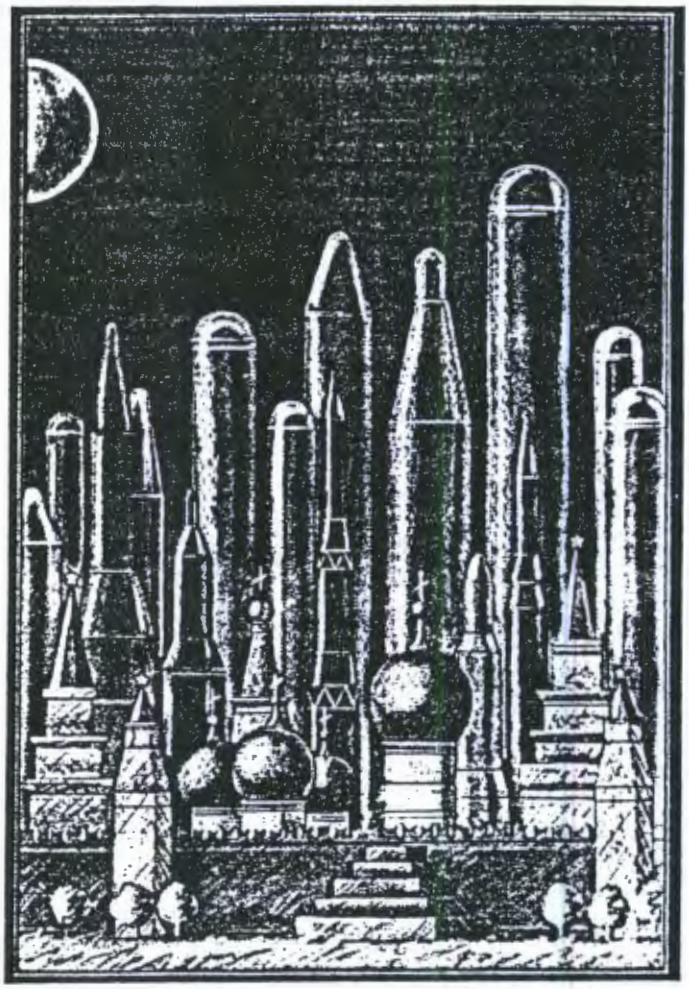
AT THE MOMENT, NEITHER THE U.S. NOR THE SOVIET Union has a meaningful strategic advantage. A window of vulnerability does not exist. Furthermore, it is almost impossible to imagine how either side could achieve a usable advantage. Both sides are thoroughly deterred from using their strategic forces, because a decision to use them would be a decision to commit national suicide. And this seems sure to remain true no matter what either side deploys in the way of new weapons.

Though the Soviets might theoretically increase the capacities of their missiles in such a way as to pose significant new threats to the Minuteman force, it would require a major breakthrough in both technology and production to do so. The same is obviously true for American forces. The MX and the cruise missiles based in Europe might be the American entry into such a competition. But at the moment, such capabilities do not exist and so cannot be deployed. Thus, now is the time for a disarmament agreement, one that would freeze all missile developments, leaving both sides with an unquestioned deterrent but without any plausible threat of a first strike. Now we have a "window of opportunity" for safer, saner alternatives to a major arms buildup. This might mean ratification of the SALT II agreement, whose limitations the Reagan Administration has so far chosen to observe, or a comprehensive freeze on the testing and development of nuclear weapons, which I favor.

An agreement to halt all testing of nuclear weapons, and of the vehicles that would deliver them, could dramatically change the political cloud that surrounds these weapons. Military technologists will strenuously resist the enactment of any such program. They will be reluctant to give up new weapons already in the pipeline. Moreover, they will maintain that if they cannot test-fire weapons, they cannot guarantee that they will work as planned. That is true, but scarcely a problem. While no one could be sure that the weapons would work as planned—which further reduces the certainty essential for a first strike—neither could anyone be certain that they won't work. They would not suffice for pre-emptive attack, but they would still represent a secure deterrent.

If this opportunity for arms control is not taken, the job will only grow more difficult in the future. The weapons of today are easy to count and monitor, but those of tomorrow won't be. The cruise missile, the stealth bomber, and far more accurate guidance systems would lead us to a nightmare world, one in which our fears would increase. That is why the opportunity must be seized now.

A limited solution to the arms race is not pleasing to many religious and ethical leaders who are emphasizing the immorality of relying on the very weapons that may threaten the extinction of the species. For contrary reasons, a nuclear-arms freeze irritates conservative political leaders, who imagine that this dimension of military force should somehow be made more "usable," and who object to a policy—deterrence—that places the civilian population of the nation at risk. Deterrence is unsatisfactory—except by contrast with the alternatives. The weapons that create the threat of annihilation cannot be uninvented. The sad fact of this era is that our populations cannot conceivably be protected except through political skill and courage applied to the task of minimizing the chances that nuclear weapons will ever be used.



Seizing this opportunity to freeze the arms race would be one demonstration of such skill and courage. It would free both sides from the fear of a first strike and would leave them with such security as a deterrent can provide. It would set the stage for further safety measures, including the reduction of nuclear forces. Meanwhile, the fear of unknown new weapons would be eliminated. And with less money devoted to strategic nuclear weapons, more would be available to repair the deficiencies in our conventional forces, to right the economy, and especially to work on the ever-growing set of civilian problems facing the world. □

B. History and Evolution of the Nuclear Arms Race

Since the late 1940s, the United States and the Soviet Union have been locked in a nuclear weapons competition neither seems able to control. During these years the U.S. and the Soviet Union gradually but inexorably expanded and improved their nuclear arsenals. The pace has varied and although the growth on both sides has not always been steady, the long term trends are clear. From a few hundred primitive atomic bombs in the late 1940s carried by propeller driven B-29, B-50, and B-36 bombers, the U.S. force has expanded to more than 9,500 strategic warheads and bombs, with about half carried by submarines, 25 percent by land-based missiles (ICBMs) and 25 percent by bomber aircraft. In addition, thousands of tactical, that is battlefield, nuclear weapons in the form of bombs, missile warheads, and artillery shells are deployed around the world with U.S. land, air, and naval forces.

The Soviets started later (they did not explode their first atomic bomb until 1949), but their nuclear force has grown, too, especially in recent years. Starting with a few crude bombs carried by a copy of the U.S. B-29 (the Tu-4), they have rapidly expanded their force since the early 1970s. Today the Soviets have more than 7,500 strategic warheads and bombs, divided (in very different proportions) among three different types of delivery systems. Approximately 70 percent of Soviet nuclear weapons are carried by land-based ICBMs and the remainder divided among submarine-based missiles and a small force of bombers. The U.S. tendency to place primary reliance on different types of delivery systems, and the Soviet concentration on ICBMS have been a source of substantial difficulty in arms control negotiations.

Both nations have spent billions of dollars building, maintaining and modernizing these forces with the avowed purpose of deterring an attack by the other side. Without mutual agreement to substantially reduce these weapons, such expenditures and the programs they support are likely to continue.

The roots of the competition can be traced to the ideological and political differences between the two countries, as well as to their mutual fear of attack. While the weapons are themselves a source of tension, conflict and rivalry between the two countries existed before nuclear weapons were invented. In addition, both nations have created enormous military-industrial establishments to design, build, maintain, and operate their nuclear weapons. Neither side wants nuclear war, but there are enormous vested interests in both countries committed to maintaining the weapons and their delivery systems. The momentum of increasingly sophisticated technology also helps propel the arms race down new and unexplored paths.

As one looks back over the history of the arms race (see the chronology that follows), it is easy to see some of these forces at work. At key points where decisions were made about whether to develop and deploy an H-bomb, an ICBM, or a MIRV warhead, each side seems to have reacted not so much to the capabilities of the other side at the time but more to expectations of future technological developments by the other side. In a recent article on the decision to build the H-bomb, McGeorge Bundy notes

that in 1950 the scientific members of the General Advisory Committee of the Atomic Energy Commission unanimously opposed the development of the H-bomb.* However, the Joint Chiefs of Staff aruged that even if the U.S. decided not to develop the bomb, the Soviets would not be prevented from doing so. According to Bundy, President Truman asked, "can the Russians do it?" When told they could, he said, "in that case we have no choice, we'll go ahead."** The long lead-times of modern weapons' development -- weapons may require ten or more years from design to deployment -- make it vital to plan ahead and make it crucial there be no fear of technological surprise. These factors, combined with the fear that the other side will exploit whatever advantage it might achieve, have all created a situation in which each side responds to the technological imperatives created by its own bureaucracy, which in turn responds to expectations and fears of what the other side might do in the future. The Robert Scheer interview with former Secretary of Defense Robert McNamara which concludes this section illustrates this point well.

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* "The H-Bomb: The Missed Chance," New York Review of Books, May 13, 1982, pp. 14.

** "The H-Bomb: The Missed Chance," p. 16.

A POLITICAL AND TECHNOLOGICAL CHRONOLOGY OF THE NUCLEAR ARMS RACE

1945 to the Present

Period of U.S. Nuclear Monopoly

1945 The U.S. tests the first atomic bomb, code named Trinity, at Alamagordo, New Mexico, July 16, 1945.

An atomic bomb, called "Little Boy," is dropped on Hiroshima, Japan, August 6, 1945. It has an explosive yield equal to 12,500 tons of TNT and kills 140,000 people.

A second atomic bomb, called "Fat Man," is dropped on Nagasaki, August 9, 1945. It has an explosive yield equivalent to 22,000 tons of TNT and results in 70,000 deaths.

1947 U.S. atomic bombers are based in the United Kingdom to put them in range of the Soviet Union.

George Kennan proposes policy of "containment" of Soviet expansion into Europe and Asia.

The National Security Act creates the Defense Department, the Air Force as a separate service, the CIA, and a National Security Council in the White House.

Coup backed by Soviets installs Communist government in Czechoslovakia.

1948 The Soviets blockade Berlin and the U.S. organizes the Berlin airlift.

The B-36 long-range bomber joins the U.S. Air Force.

President Truman asks Congress to establish a peacetime draft.

1949 NATO formed, April. U.S. pledges to use nuclear weapons in defense of Europe, if necessary.

Soviet Union tests its first atomic bomb, August.

Communists win Chinese Civil War.

1950 NSC-68, seminal document on U.S. defense and foreign policy prepared. NSC-68 urges policy of containment, augmentation of U.S. military power, production of the H-bomb, and the use of U.S. military power to deter a Soviet attack. Warns of growing Soviet atomic weapon capability and capability to attack U.S. by 1954.

1950 North Koreans invade South Korea. U.S. feels compelled to respond to aggression, and military spending increases sharply.

U.S. carrier-based aircraft equipped with nuclear weapons.

1951 First jet bomber joins the U.S. Air Force, the B-47.

1952 U.S. conducts first test of thermonuclear or Hydrogen device.

United Kingdom tests atomic bomb and becomes third member of nuclear club.

1953 Korean War ends.

Technical breakthrough by Soviets reduces size of H-bombs from 9,000 to 3,000 pounds and thus makes ballistic missiles feasible nuclear delivery systems.

U.S. deploys first short-range nuclear missile, Honest John, in Europe.

Soviet Union tests its first H-bomb.

Period of Superiority

1954 U.S. articulates policy of "massive retaliation" as first line of defense -- reliance on threat of nuclear retaliation at time and place of own choosing to deter Soviet aggression.

First jet bomber, Tu-16, joins Soviet Air Force.

Work on U.S. ICBM, Atlas, begins.

1955 First long-range jet bombers join U.S. Air Forces, B-52.

Soviets test medium-range ballistic missile.

President Eisenhower offers "Open Skies" proposal to permit U.S. and Soviet reconnaissance flights over each other's territory as confidence-building measure to improve chances for negotiated arms reductions.

First long-range bombers join Soviet air force, Tu-20 Bear and Mya-4 Bison. A few Bisons are flown past Red Square over and over again creating the impression of more planes than the Soviets actually have.

1956 Warnings of potential "bomber gap," i.e., Soviet advantage in Strategic bombers by 1958-60, begin to appear in the U.S.

U.S. begins U-2 reconnaissance flights over Soviet territory to collect intelligence on Soviet military preparations.

1957 Soviets conduct first full-range ICBM test, August.

Soviets launch first man-made satellite, Sputnik, October. U.S. leaders shocked.

U.S. begins several major strategic programs to "catch-up" with Soviets.

1958 U.S. conducts first test of Atlas, ICBM.

1959 U.S. intermediate-range missiles (1,500-mile-range Thor and Jupiter) first deployed in U.K., Italy, and Turkey.

U.S. Gaither Committee warns of a possible "missile gap."

Antarctic Treaty establishing continent as a weapons-free zone signed, December.

Soviets deploy first SS-4 medium-range missiles aimed at European targets.

1960 U.S. U-2 reconnaissance plane shot down over Soviet Union, May.

U.S. Titan heavy ICBMs become operational.

U.S. launches first Polaris missile from submerged submarine, July; later U.S.S. George Washington becomes first operational ballistic-missile submarine.

U.S. launches first reconnaissance satellite.

France detonates atomic bomb, becomes fourth member of nuclear club.

U.S. proposes multilateral nuclear force for NATO.

1961 U.S. begins major expansion of nuclear and conventional forces.

U.S. bombers put on constant airborne alert.

U.S. cancels B-70 bomber program. Soviets have to figure out what to do with MiG-25 interceptors designed to defend Soviet Union against B-70.

1961 U.S. has approximately 1,700 long-range bombers, sixty-three ICBMs and ninety-six submarine-launched missiles in six submarines. The Soviets have only 160 to 190 long-range bombers, and about twenty operational ICBMs, but have more than 1,200 medium-range bombers and nearly 600 medium-range missiles capable of attacking Europe.

U.S. Arms Control and Disarmament Agency created by act of Congress.

Soviets deploy first SLBMs (very short range) on a few diesel submarines.

1962 U.S. abandons policy of massive retaliation and adopts flexible-response and counterforce. Emphasis placed on responding to conventional and nuclear threats with forces appropriate to nature and seriousness of threat. U.S. begins to plan for attacks on enemy military forces not only population centers.

U.S. develops high-speed reentry vehicles for increased missile accuracy.

Cuban Missile Crisis pushes U.S. and Soviet Union closer to war than ever before or since. Major turning point in arms race and leads to major Soviet military build-up and stimulates arms-control efforts.

1963 U.S. and Soviets sign "Hot Line" agreement establishing a direct communications link between the two countries, June.

Treaty banning nuclear tests in the air, outer space, or under water signed, August. (488 nuclear and thermonuclear weapons tests had been conducted since 1945, mostly in the atmosphere.)

U.S. intermediate-range Thor and Jupiter missiles in Europe retired.

1964 Soviet strength grows to what has been called a "token" intercontinental retaliatory force of about 200 ICBMs and 200 long-range bombers.

U.S. conducts first anti-satellite weapon tests.

Chinese detonate first nuclear weapon, becoming the fifth member of nuclear club.

U.S. launches first Vela satellite to detect nuclear explosions.

Soviets deploy improved SLBM. U.S. deploys improved Polaris A3.

1965 Airborne alerts of U.S. bombers discontinued.

U.S. abandons idea of NATO multilateral nuclear force.

Soviets deploy first of giant SS-9 ICBMs.

1966 First improved Minuteman II ICBMs become operational.

Johnson Administration articulates idea of deterrence by assured destruction. A planning device for sizing the force later becomes "mutual assured destruction" (MAD).

Evidence of Soviet ABM system appears around Moscow called Galosh.

Soviets begin deployment of SS-11 ICBM.

1967 U.S. and Soviets sign Outer Space Treaty banning nuclear weapons in orbit or on celestial bodies, January.

Treaty of Tlatelolco signed, banning nuclear weapons in Latin America.

U.S. announces decision to build a "thin" ABM system to defend against Chinese ICBM threat anticipated for early 1970s.

NATO adopts flexible-response strategy.

British deploy first missile submarines.

1968 Nuclear Nonproliferation Treaty signed, July.

U.S. tests MIRV warhead, August.

Soviets invade Czechoslovakia, August, beginning of SALT I negotiations delayed.

Soviets launch first nuclear-powered missile submarine.

Soviets deploy limited number of SS-13 solid fuel ICBMs.

Soviets conduct their first anti-satellite weapon tests.

1969 Nixon Administration announces it will build an ABM system called Sentinel to defend U.S. land-based missiles against Soviet attack, March.

Senate fails to defeat ABM by one vote.

SALT I negotiations begin, November.

Period of Nuclear Parity

1970 Soviets equal U.S. in numbers of ICBMs and SLBMs.

First U.S. MIRVed ICBMs, Minuteman III, become operational.

1971 Seabed Arms Control Treaty banning weapons of mass destruction from ocean floor, signed in February.

MIRV Poseidon submarine-based missiles added to U.S. force.

Agreements to modernize hotline and to reduce risk of nuclear war signed by U.S. and Soviet Union, September.

U.S. launches first early-warning satellite capable of detecting missile launches ninety seconds after lift-off.

1972 SALT I Interim agreement limiting offensive weapons, and ABM Treaty limiting ABMs signed in May.

U.S. bombers equipped with short-range attack missiles (SRAM).

1973 Agreement on Prevention on Nuclear War signed by U.S. and Soviets in June.

Soviets conduct first MIRV tests.

SALT II negotiations begin

First Delta-class missile submarines join Soviet fleet.

1974 U.S. announces new strategic doctrine designed to permit nuclear war fighting. Calls for ability to attack soft and hard targets while limiting collateral damage.

ABM Treaty protocol signed, further limiting U.S. and Soviet ABM deployments, July.

Threshold Test Ban Treaty signed, limiting underground nuclear tests to no more than 150 kilotons, July. (Has not been ratified).

Soviet Backfire bomber first appears.

Vladivostok accords, setting guidelines for SALT II agreement signed, November. Two sides agree to ceilings of 2,400 missile launchers and bombers, and 1,320 MIRV launchers.

1975 Soviets begin deployment of first of second-generation ICBMs, SS-17, 18, 19.

1976 U.S. conducts first air-launched cruise missile (ALCM) flight test.

Soviets test SS-18-- their first MIRV SLBM.

1977 Soviet SS-20 mobile intermediate-range missile first appears.

Comprehensive test ban negotiations begin.

President Carter cancels B-1, but decides to equip B-52 bombers with long-range cruise missiles.

1978 First Soviet MIRV submarine-launched missile, SS-N-18, enters service.

Anti-satellite negotiations between U.S. and Soviets begin, June.

U.S.-Soviet Indian Ocean talks stop as result of Soviet activities in Horn of Africa.

U.S. offers five-year, zero-yield test ban proposal.

1979 First Trident missiles join U.S. force.

SALT II Treaty signed.

NATO decides to modernize theater nuclear weapons by deploying Pershing II and ground-launched cruise missiles beginning in 1983 and to pursue negotiations with Soviets to limit nuclear weapons in Europe.

Soviets begin testing long-range cruise missiles.

Carter Administration announces plans to build multiple protective shelter system to protect proposed MX ICBMs from attack.

Soviets invade Afghanistan, December.

1980 First Trident submarine -- U.S.S. Ohio -- joins fleet.

Carter Administration completes Presidential Directive 59 which emphasizes importance of developing means to fight limited nuclear wars as way of enchancing deterrence, but Secretary of Defense Brown says he doubts nuclear war can be limited.

1981 Reagan Administration begins major defense build-up program. bomber to be built.

Intermediate Nuclear force talks begin.

1982 U.S. bombers are equipped with long-range air-launched cruise missiles.

START talks begin.

Secretary of Defense Weinberger instructs services to prepare for fighting a protracted nuclear war.

From The Los Angeles Times, April 8, 1982.

FEAR OF A US FIRST STRIKE SEEN AS CAUSE OF ARMS RACE by ROBERT SCHEER.

An interview with Robert McNamara

Q: We hear how the Soviets have gotten stronger and how they've made gains all over the world.

A: I, myself, believe they've gotten weaker. That may sound naive when one says it in the face of what has clearly been an increase in the number of their nuclear weapons and an increase in their conventional forces — not nearly as great, by the way, as many say, but still an increase. But I think they've gotten weaker because, economically and politically, there have been some very serious failures. In my opinion, they are in a weaker position today than they were 14 to 15 years ago.

Q: You said that the increase in Soviet conventional forces is not as great as many say.

A: Soviet conventional strength is not as great as many state it to be, and the NATO conventional weakness is not as great as it is frequently said to be. Therefore, the conventional balance is not as favorable to the Soviets as is often assumed. The Soviet advantage in tanks is frequently used to illustrate the strength of the Soviets and the weakness of the West. I believe the Warsaw Pact countries have three times as many tanks as the NATO countries. But our response to the Soviet tanks should not necessarily be a one-to-one expansion of our tank force, but rather an expansion of our antitank weapons, and that is exactly the way NATO has responded. So the fact that the Soviets have three times as many tanks as NATO is not necessarily an indication of Soviet strength and NATO weakness. One could argue whether NATO has adequate antitank forces, but they certainly have very strong antitank forces. I simply use that as an illustration of the point I'm making. In this country we commonly exaggerate the imbalance of Warsaw Pact and NATO conventional forces. In my opinion, NATO conventional forces are very strong indeed. They are not as strong as I would like to see them, not as strong as they ought to be, not as strong as they can be by applying modern technology within realistic budget constraints. But, still, they are a much greater deterrent to Soviet aggression than we commonly recognize.

. . . We overstate the Soviets' force and understate ours, and we therefore greatly overstate the imbalance. This is not something that is new; it has been going on for years.

Q: Did it go on while you were secretary of defense?

A: Of course it did. I tried to correct it; I frequently made statements correcting it, but because it appears to serve the interests of some to consciously or unconsciously overstate the Soviet strength and understate ours, that frequently occurs.

Q: Who are the "some"?

A: Well, particular elements of our society that feel their programs are benefited by that. The missile gap of 1960 was a function of forces within the Defense Department that, perhaps unconsciously, were trying to support their particular program — in that case, an expansion of U.S. missile production — by overstating the Soviet force. I don't want to state that they were consciously misstating the facts, but there is an unconscious bias in all of us. In any case, it was a total misreading of the information, and by early 1961 all who had examined the evidence concluded that there was no missile gap, despite the fact that in the latter part of 1960 it was a rather common belief.

Robert Scheer, a reporter for The Los Angeles Times, is the author of the forthcoming book "With Enough Shovels: Reagan, Bush and Nuclear War."

Q: Going back to the showdown over the missiles in Cuba, [what] do you feel . . . compelled or encouraged the Russians to engage in that buildup?

A: That was October 1962 — by 1962 they had under way a plan to substantially build up their nuclear forces. One possible explanation of their action, and I don't put it forward as the only explanation, is that they were moved to rapidly expand their forces because they thought we were trying to achieve a first-strike capability, that is to say, a large enough numerical superiority to give us the power to attack their nuclear weapons and destroy so many that the remainder would be inadequate to carry out a second strike against us. That was never our intention. It was not only not our intention, but we didn't believe we could possibly achieve such a capability. But they, looking at our force and the substantial numerical superiority of that force, might have believed that we either had that capability or were trying to achieve it. And they might have looked upon the movement of the weapons into Cuba as a means of reducing that capability.

Q: On the first-strike question, was there a shift? You are always associated with the "mutually assured destruction" deterrence notion. Yet some people have argued that within the period in which you were in charge, there was a shift in the targeting scenario, and that was when the beginning of the notion of limited nuclear war actually started.

A: No, no. We moved from Dulles' strategy of massive retaliation to what was called "flexible response." That was, I think, a major advance, because it substantially reduced the risk of nuclear war. And the level at which nuclear weapons might be used under flexible response was raised so high that it was, in effect, the equivalent of mutual assured destruction.

The point on the Soviet concern about our first strike is an important one. [McNamara lifts a document]. This is a recently declassified "top secret" memorandum from me to President Kennedy, dated Nov. 21, 1962 [a month after the Cuban missile crisis]. In the memorandum I state, "It has become clear to me the Air Force proposals are based on the objective of achieving a first-strike capability. In the words of an Air Force report to me, 'The Air Force has rather supported the development of forces which provide the United States a first-strike capability.' " This is my memo to the president and that is a proper quote from the Air Force. The Soviets didn't have this document, at least I hope they didn't. But they may have heard talk that we were trying to achieve a first-strike capability and, in any case, they saw the size force we had. The issue of first-strike capability is absolutely fundamental. And I have no question but that the Soviets thought we were trying to achieve a first-strike capability. We were not. We did not have it; we could not attain it; we didn't have any thought of attaining it. But they probably thought we did. If I had been the Soviet secretary of defense, I'd have been worried as hell at the imbalance of force. And I would have been concerned that the United States was trying to build a first-strike capability.

Q: If you couldn't have achieved a first-strike capability then, how could one make the claim that the Soviets could do it now?

A: They no more have a first-strike capability today than we had then. No one has demonstrated to me that the Soviets have a capability of destroying our Minutemen [land-based intercontinental ballistic missiles]. But even if they could destroy our Minutemen, that doesn't give them a first-strike capability, not when they are facing our Polaris submarines and our bombers. The other two legs of the triad are still there.

Q: The argument that is made is that they would destroy enough of ours that they could come back —

A: The argument is without foundation. It's absurd. To try to destroy the 1000 Minutemen, the Soviets would have to plan to ground-burst two nuclear warheads of one megaton each on each site. That is 2,000 megatons, roughly 160,000 times the megatonnage of the Hiroshima bomb. What condition do you think our country would be in when 2,000 one-megaton bombs ground-burst? The idea that, in such a situation, we would sit here and say, "Well, we don't want to launch against them because they might come back and hurt us," is inconceivable! And the idea that the Soviets are today sitting in Moscow and thinking, "We've got the U.S. over a barrel because we're capable of putting 2,000 megatons of ground-burst on them and in such a situation we know they will be scared to death and fearful of retaliation: therefore we are free to conduct political blackmail," is too incredible to warrant serious debate.

Q: Those in the United States who put forward such a Soviet view stress that the argument is one of nerve and perception, and that the Soviets will perceive us as being weak and take advantage.

A: The world isn't run that way. Political leaders, responsible political leaders, don't behave that way. The first responsibility of a political leader is to preserve the safety of his people. No political leader I know of — including the Soviet political leaders — would run that kind of a risk.

Q: Their argument is that an American president would not order our submarines to fire their missiles once our Minutemen were destroyed because that would just invite a greater retaliation from the Russians.

A: But when they say that, they fail to take account of the fact that the Soviets know that he might, and I am convinced he would. No Soviet leader would wish to accept that risk.

Q: Let's return to the issue of the buildup of nuclear forces. How did it occur?

A: Go back to 1960 when many in the U.S. believed there was a missile gap favoring the Soviets. With hindsight it became clear there wasn't any missile gap. But Kennedy had been told there was. What actually happened was this: In the summer of 1960, there were two elements in the U.S. intelligence community disagreeing on the relative levels of the U.S. and Soviet strategic nuclear forces. One element greatly overstated the level of the Soviet nuclear force. When one looked over the data, it didn't justify this conclusion.

And within two years of that time, the advantage in the U.S. warhead inventory was so great vis-a-vis the Soviets that the Air Force was saying that they felt we had a first-strike capability and could, and should, continue to have one. If the Air Force thought that, imagine what the Soviets thought. And assuming they thought that, how would you expect them to react? The way they reacted was by substantially expanding their strategic nuclear weapons program.

Now, when they did that, we sat back here and saw the way they were moving — and we always had to take account of their capability more than their intentions, because we were not sure of their intentions — we looked at their capability and they were building submarines, missiles and planes, and experimenting with new warheads, at such a rate that we had to respond. We probably over-responded because it is likely that their capability, which we observed, exceeded their intentions. So you have an action-reaction phenomenon. And the result is that during the last 25 years, and particularly during the last 15, there has been a huge buildup, much more than people realize, in the nuclear strength of these two forces. That has changed the nature of the problem and increased the risk greatly. I have read that the inventory of nuclear warheads in the two arsenals is on the order of 50,000.

Q: What is so scary about this, and it's not just from you, I've interviewed hundreds of people who end up using words like, "They are crazy!" or "Madmen!" But how did this happen?

A: Because the potential victims have not been brought into the debate yet, and it's about time we brought them in. I mean the average person. The average intelligent person knows practically nothing about nuclear war — the danger of it, the risk of it, the potential effect of it, the changes in the factors affecting the risk.

Q: I interviewed Hans Bethe, the nuclear physicist, and he said, "I was very scared in 1945, 1947, and I thought the world would only last two years. Then I stopped being scared because I realized that the leaders, certainly in our country and hopefully on the other side, would recognize the danger. Now I'm scared again because —

A: He is scared again because there are some people talking about nuclear bombs being no different than rifle shells or artillery shells. And some people are talking about fighting and winning nuclear wars and preparing for a six-month nuclear war. The problem is, there is no counter to that. There should be. And I think there is going to be one; one is beginning to bubble up.

Q: Have we been drifting towards the direction that, when you have weapons, you want to use them?

A: I don't really put it that way. I think, though, that as you vastly increase the number of weapons and as you try to develop characteristics that in some people's minds bring them closer to conventional weapons, such as a neutron bomb, you increase the risk of use of those weapons.

More and more there are suggestions that we should be prepared to fight and win a nuclear war — that we can recover from a full strategic exchange in from two to four years. And while others are not prepared to go that far, they say we should be equipped, and perhaps are equipped, to fight and win a limited nuclear war.

Q: When you push people, even in the Reagan administration, they'll say, "Well, we don't welcome this, but we think that is what the Russians are aiming at, otherwise how do you explain their continuous buildup of — "

A: The way you explain it — and you must understand that I am not justifying it — the way you explain it is by putting yourself in their shoes. When I've done that on several occasions, I must say I would do some things that were very similar to what they did. I'm talking about the action they took to build up their force. Read again my memo to President Kennedy. It scares me today to even read the damn thing: "The Air Force has rather supported the development of forces which provide the United States a first-strike capability credible to the Soviet Union by virtue of our ability to limit damage to the United States and our allies to levels acceptable in light of the circumstances and the alternatives available." My God, if the Soviets thought that was our objective, how would you expect them to react?

Q: When I interviewed Ronald Reagan as a candidate, he said that the problem with that whole calculation — and he mentioned your name and MAD (mutual assured destruction) and everything — is that the Russians are monsters, they don't have the same respect for human life that we do, therefore they could take the 20 million, 30 million or 40 million casualties.

A: The Russians are people that I would not trust to act in other than their own narrow national interest, so I am not naive. But they are not mad. They are not mad. They have suffered casualties, and their government feels responsible to their people to avoid those situations in the future. They are more sensitive to the impact of casualties on their people than we appear to be in some of our statements and analyses of fighting and winning nuclear wars which would extend over a period of months. So they are not mad. They are aggressive; they are ideological; they need to be restrained and contained by the existence of our defensive forces. But they are not mad, and I see no evidence that they would accept the risks associated with a first strike against the United States.

Robert Strange McNamara is now 66. Born in San Francisco, he graduated from the University of California and received a masters degree in business administration from Harvard. He spent 15 years as an executive of the Ford Motor Co. before becoming secretary of defense in 1961. From 1968 until last year, McNamara was president of the World Bank. He lives in Washington.

C. Trends in Technology and Doctrine

A review of developments in nuclear weapons technology and strategic doctrine over the years reveals several fundamental trends. First, delivery systems on both sides have evolved from mostly aircraft to mostly missiles. As a result, time of flight from launch (or take-off) to target has been reduced from many hours to fifteen minutes for submarine launched missiles, thirty minutes for ICBMs and as little as seven minutes for the proposed Pershing II medium-range (1,000 miles) missile and the Soviet SS-20 it is intended to counter.* (New U.S. cruise missiles are an exception to this trend but the significance of this development is not yet clear). Obviously, the time available to decision-makers has been enormously fore-shortened.

A second important trend is the gradual increase in the accuracy of missile delivery systems. As a result, virtually all fixed targets, however well hardened, are at least theoretically vulnerable to attack. However, these accuracy improvements are not only limited to ICBMs. As the accompanying New York Times article on the Trident system makes clear, submarine-launched missiles are approaching the accuracy that only ICBMs could attain a few years ago. And cruise missiles, with their miniature computers and terrain-contour-matching guidance systems (TerCoM) have also demonstrated great precision.

A third trend is in the so-called MIRVing of missiles. As missiles equipped with but a single warhead have been replaced by missiles equipped with multiple independently targetable warheads (MIRVs), the size of individual nuclear warheads has declined but their efficiency and, of course, their number, has increased. The bomb dropped on Hiroshima weighed about four tons and had a yield of 12.5 kilotons, equivalent to 12,500 tons of TNT. A Minuteman III warhead (MK 12) has a yield of 170 kilotons but weighs no more than a few hundred pounds; most Minuteman III missiles carry three warheads. The proposed MX may carry as many as ten warheads of 335 kilotons each. The largest Soviet missile, the SS-18, carries eight two-megaton warheads but could carry as many as twenty or perhaps thirty smaller warheads. General David Jones, the recently retired Chairman of the Joint Chiefs of Staff, expects this trend toward MIRVed missiles to continue, and, in the absence of agreed limitations, he expects to see "a doubling of strategic weapons within a decade." **

Perhaps the most troubling trend of all is the doctrinal shift from deterrence (avoiding nuclear war) to the considerations of actually fighting a nuclear war. For about the first twenty years of the nuclear age, governments and strategic analysts were most concerned with the requirements of stable deterrence and how to avoid nuclear war. They paid little attention to how a nuclear war would actually be waged. However, in the last decade, there has been a gradual shift of concern to the dynamics of escalation, to the possibility of "controlled" nuclear war limited to military targets (counterforce): in short, to questions of nuclear war fighting. This

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* NATO agreed in 1979 to begin deployment of 108 Pershing IIs and 564 ground launched cruise missiles in Europe in 1983.

** The Washington Post, June 23, 1982, p. 2.

development seems related to increases in the accuracy and number of nuclear weapons as well as to decreases in their size.

In a recent policy directive, for example, Secretary of Defense, Caspar Weinberger instructed the services to plan for waging protracted nuclear war.* He told them to prepare to conduct controlled nuclear counterattacks over a protracted period, while maintaining a reserve for later protection and coercion. Weinberger has insisted that all these steps are intended only to enhance deterrence. However, critics believe the shift poses enormous dangers, because despite improvements in the accuracy of nuclear weapons and reductions in their size, nuclear weapons are still enormously destructive, and once let loose there is little reason to believe (given what we know about the passions of war and the fog of battle, not to mention the likelihood of human or mechanical error) that escalation could be controlled and destruction limited. Shortly before he retired, General David Jones criticized efforts to prepare for protracted nuclear war, saying, "I don't see much chance of a nuclear war being limited or protracted [without] a tremendous likelihood of its escalating."** His concerns are shared by many former high ranking military officials. (See Nuclear Illusion and Reality, by Solly Zuckerman, Viking Press: New York, 1982. pp. 59-78.)

The second and third articles of this section ("The Status of U.S. Nuclear Weapons Programs" from the Center for Defense Information, and a section on Soviet strategic and theater nuclear forces from the Joint Chiefs 1982 posture statement) outline planned developments in the strategic nuclear forces of both the United States and the Soviet Union. The U.S. program is, of course, now under Congressional review as the various components advance through the authorization/appropriation cycle of weapons procurement.

In the fourth article, "The Ultimate Battleground: Weapons in Space," Gerald Steinberg reviews the evolution of U.S. space-weapon programs and examines anti-satellite (ASAT) weapons now under development. He also discusses ongoing programs to develop laser and particle beam weapons and points to a new era of arms competition in space. Steinberg believes space weapons will place a premium on first strikes and therefore regards them as dangerously destabilizing. He believes both the U.S. and the Soviets would benefit from a treaty limiting space weapons, but doubts such a treaty could be negotiated in the present political climate.

Finally, in an article which first appeared in the journal Foreign Policy, Colin Gray and Keith Payne illustrate the Administration's concern,

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* New York Times, July 22, 1982.

** New York Times, June 19, 1982; The Washington Post, June 19, 1982, p. A3.

alluded to earlier, with how a nuclear war might actually be fought. In fact, Gray and Payne believe the difference between winning and losing a nuclear war would not be trivial and believe we must find ways to improve our chances of winning if deterrence were to fail. They believe we must have the ability to wage nuclear war "rationally," based on a strategy which combines selective targeting of Soviet political and command centers with enhanced survivability of U.S. strategic forces and civilian population.

From
THE NEW YORK TIMES, TUESDAY, JULY 13, 1982

Trident's Technology May Make It a Potent Rival to Land-Based Missiles

By PHILIP M. BOFFEY

AS public attention focuses on such land-based missiles as the MX and the Pershing 2, the United States Navy is accelerating development of a submarine-launched ballistic missile expected to dramatically increase naval destructive power.

The missile, known as Trident 2, is intended to give the Navy's missile submarines a potency comparable to virtually any land-based weapons system. It also may complicate efforts to bring the arms race under control.

"Trident 2 will be the most destabilizing first-strike weapon ever built," Representative Thomas J. Downey, a member of the House Budget Committee study group on defense, asserted early this year. The Suffolk Democrat's opinion is shared by some, but by no means all, arms controllers.

The new missile will be designed to have the greatest accuracy and largest nuclear payload of any undersea missile in the United States arsenal, and possibly the longest range. If the Trident 2 performs as expected, it will give American missile submarines for the first time the ability to destroy virtually any target in the Soviet Union, even missile silos built to withstand nuclear attack.

These characteristics will result from the advance of technology in virtually all aspects of the Trident system, from submarine navigation and the performance of the submarine's firing control system to the stability of the missile in flight and its warheads in descent.

The first submarine-launched ballistic missile, the Polaris, carried a single warhead. It could hit targets 1,200 nautical miles away within a probable error of a mile or two. There has been constant improvement in the missile's range, payload and accuracy, according to unofficial estimates in this highly classified field.

In time, the Polaris was upgraded to carry three warheads 2,500 nautical miles with a probable error of about 3,000 feet. Its successor, the Poseidon, which is still in use, has the same range but is more potent, being able to drop 10 warheads within 1,800 feet of their targets.

And the most advanced missile in the Navy's arsenal, the Trident 1, has even better accuracy at the far greater range of 4,000 nautical miles. Accuracy is considered the most important factor in a warhead's ability to destroy a target; payload is a close second.

Perhaps the chief advance leading to the increase in accuracy thus far has been a marked improvement in the submarine's navigational system. To hit a target in the Soviet Union, for example, it is necessary to know a missile's precise location at the time of firing, the precise location of the target and factors affecting the missile's flight between the two. These factors can be calculated with considerable accuracy for a missile fired from a fixed land silo. But for submarines that are moving under water for extended periods, with little opportunity to take a navigational "fix," the point of firing is less certain.

That uncertainty has been steadily reduced through improvements in submarine inertial navigation system, an array of gyroscopes, accelerometers and computers used to calculate the ship's position based on its direction and speed of movement after submerging. One such advance is an electrostatically supported gyro monitor, which provides virtually frictionless support to a rapidly spinning rotor used to measure the ship's movement.

These shipboard improvements have been matched by a greater accuracy in navigational aids, or signals from shore-based radio transmitters and satellites circling above, which allow submarines to obtain accurate fixes on their position. As knowledge of the size, shape and gravitational field of the earth has increased, for example, the orbits of satellites can be more closely calculated, thus increasing the accuracy of navigational fixes based on the satellites as reference points.

Ideally, a submarine would prefer not to take fixes in the normal manner, because to do so it must raise an antenna close to or above the surface. The navigational improvements have lengthened to several weeks the time a submarine can stay submerged without external fixes.

Scientists are working on underwater sound systems that would enable a submarine to recognize underwater topographic features and on instruments that would measure gravitational effects on shipboard navigational instruments, conceivably freeing the ship from external navigational aids.

There have also been improvements in the submarine's firing control system, which recomputes the path to the target every few seconds and in missile guidance and stability. The Trident 1, for example, has an aerospike that may be extended from its nose after launch and reduces aerodynamic drag. And it is the first Navy missile with a stellar guidance system, which takes a star sight immediately after launching and corrects the flight path of the missile accordingly.

Even so, none of the submarine-launched missiles in use, including Trident 1, has the necessary combination of accuracy and payload to destroy targets hardened with steel and concrete, such as missile silos and command centers. The existing missiles are generally thought potent enough to destroy cities and other "soft" targets, such as military airfields, but not to threaten the Soviet Union's primary strategic force, its land-based intercontinental missiles.

But now the development program for Trident 2 is expected to produce the first naval weapon that can, in fact, destroy hardened targets. This will be accomplished chiefly by improving still further the accuracy of the missiles. One approach, considered the least likely by the Navy, would rely on satellite signals to provide mid-course corrections or on a terminal guidance system to provide last-minute aim to the warheads, thus overcoming any errors in navigation or firing control. The more likely approach will be to improve still further the inertial guidance system.

The expected potency of Trident 2 evokes a mixed response from experts concerned with arms issues.

Military leaders welcome the added punch of the Trident 2 because they believe the Soviet Union is forging ahead in strategic weapons. If the Soviet Union some day launches a surprise attack on American land-based missiles, they say, the United States needs the ability to retaliate with a submarine-launched strike against Soviet command centers and other hardened targets.

However, many interested in the field of arms control fear that Trident 2 will increase the likelihood of nuclear war. They say that the missile might be perceived by the Russians as a first-strike weapon, one capable of destroying their missiles in a surprise attack. This is particularly so since Trident 2 could be fired from submarines near the Soviet coast, giving far less warning time than the flight of intercontinental missiles launched from the United States.

"Trident 2 is a serious arms control problem — I think it's basically a mistake," said Herbert Scoville, Jr., president of the Arms Control Association and a former deputy director of the Central Intelligence Agency.

'A Good Deterrent Weapon'

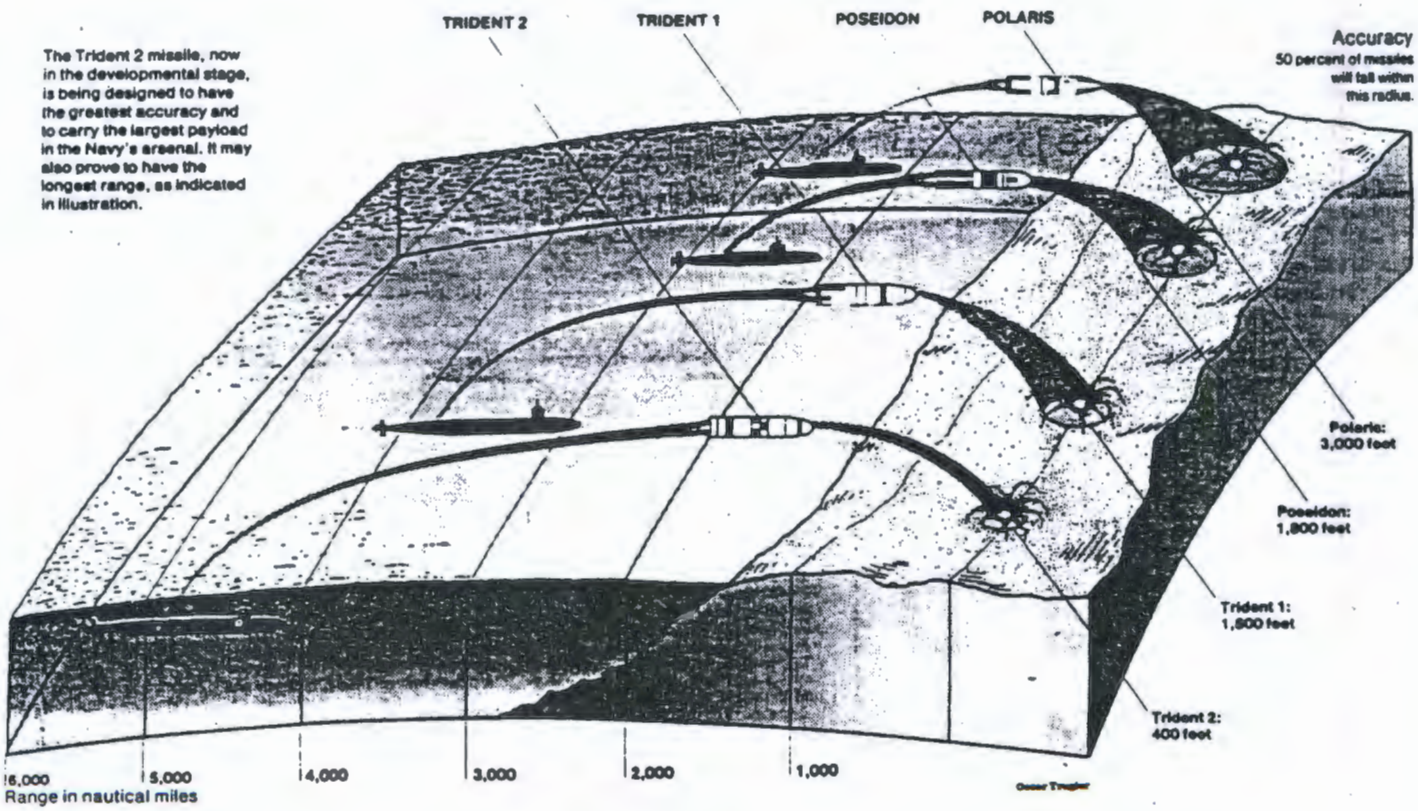
Mr. Scoville says he considers Trident 1 "a good deterrent weapon" but that Trident 2 "a step backward" because it would give Soviet leaders a strong incentive to put their missiles on hair-trigger alert. Such an anticipatory action would increase the possibility of accidental war through computer or human error. "I'm in

favor of submarines," Mr. Scoville said, "but not of first-strike submarines."

That opinion is not shared by all arms controllers and military analysts. Some believe Trident 2 will cause only slight instability between the superpowers. They consider it preferable to land-based missiles, which are easier to target and thus might invite a pre-emptive Soviet attack. Submarines, moreover, are much easier to count and verify for arms control purposes than mobile land-based systems.

In an article for publication in the July-August issue of Survival, a publication of the International Institute for Strategic Studies in London, Joel S. Wit, a defense consultant in Washington, calls Trident 2 an "attractive strategic option" that could be "more attractive" from an arms control standpoint than its competitors. He acknowledges that the Soviet Union might be driven to a dangerous launch-on-warning policy, but says the role of Trident 2 in causing this "should not be overemphasized." The Russians are also being driven in that direction by the MX, Pershing 2 and cruise missiles, he asserts.

The Trident 2 missile, now in the developmental stage, is being designed to have the greatest accuracy and to carry the largest payload in the Navy's arsenal. It may also prove to have the longest range, as indicated in illustration.



From
THE CENTER FOR DEFENSE INFORMATION, "The Defense Monitor" Vol. X No. 8, pg.3-16

THE STATUS OF U.S. NUCLEAR WEAPONS PROGRAMS

Land-based Missiles

Missile Experimental (MX). The Reagan Administration has decided to cancel the Carter Administration's multiple shelter basing plan but move ahead with the missile itself. The Reagan plan calls for placing some portion of 100 MX missiles in existing Minuteman silos beginning in 1986 and hardening them. The problem of how to base MX continues to plague the Reagan Administration. They state hardened silos are an interim or temporary solution while further study is done on three, more permanent basing options, one or more of which will be decided upon in 1984. The three are: MX deployed aboard continuous airborne alert aircraft; deep underground missile basing (DUMB); and a Ballistic Missile Defense (BMD) system to protect fixed silos. These decisions have neither quelled the controversies surrounding MX nor answered basic questions about the strategic requirements for MX or its contribution to our national defense.

The most important question about MX, but the least discussed, is whether the U.S. needs a hard target-killing missile. If we are preparing to fight and win a nuclear war by initiating a preemptive disabling strike on Soviet nuclear forces, the answer is yes. Otherwise, we do not need it, for there are very few hard targets other than missile silos which require the power and accuracy of an MX system.

Minuteman Improvements. There are 550 Minuteman III (MM III) ICBMs and 450 Minuteman II ICBMs. The former carry three nuclear weapons each and the latter carry one.

Airborne Launch Control System (ALCS)—Under the third phase of this program, a communications system will be installed on 200 MM III missiles and EC-135 aircraft. This will give commanders the ability to re-target and launch missiles from the air, if ground launch centers are destroyed in an attack. This system, to include three missile squadrons at Grand Forks Air Force Base, North Dakota, and one at Malmstrom Air Force Base, Montana, is scheduled for initial operation in 1984 and completion by 1985.

Mark 12A Retrofit—Three hundred MM III missiles are being retrofitted with the Mark 12A reentry vehicle (RV). Each of these 900 Mark 12A RVs (three weapons per missile) will have twice the accuracy and double the explosive power (335 kilotons-kt.) of the weapons on other MM IIIs. This will give each retrofitted MM III ten times the lethality of a MM II. The retrofitting has been completed on about 150 missiles at Minot Air Force Base and Grand Forks Air Force Base, North Dakota. The Minot program will be completed in the fall of 1982, Grand Forks in early 1983.

Launch control systems—Improvements in communications for 300 MM II silos have been completed at Malmstrom Air Force Base, Montana, and Whiteman Air Force Base, Missouri.

Other Recent Improvements. The *Command Data Buffer System,* completed in 1977 on 500 Minuteman III missiles, allows remote retargeting of each missile in 25 minutes and the entire force in ten hours, a process which used to take weeks. A *silo upgrade* program for Minuteman silos, completed in January 1980, provided all Minuteman wings with a substantial increase in hardening against nuclear effects, resulting in a significant improvement in survivability for Minuteman. *Minuteman Ground Launch Centers* are being upgraded by connecting them to the Air Force Satellite Communications System (AFSATCOM), the 616A survivable Low Frequency Communications System, and the SAC Digital Information Network (SACDIN). These systems will reduce the processing time for emergency messages as well as missile crew workload during crises. Scheduled completion is Fiscal Year (FY) 1985.

Maneuverable Reentry Vehicles (MARV). The Air Force's Advanced Ballistic Reentry System (ABRES) program develops reentry technology in support of existing and future missile systems. ABRES provides the funding for development of the Advanced Maneuvering Reentry Vehicle (AMARV). AMARV was ostensibly designed as a hedge against any future Soviet anti-ballistic missile (ABM) threat. But AMARV's ability to correct its trajectory during the reentry and terminal phases of flight will give it nearly 100 percent accuracy. Such accuracy, when combined with a large number of missiles—perhaps the MX and Minuteman III—could pose a potent first strike threat against the Soviet ICBM force. Additionally, the Navy is developing its own maneuvering RV, the Mark 500 "Evader," for possible use on the Trident II missile.

Advanced Ballistic Reentry Vehicle (ABRV). Recently, ABRES has focused on other innovations in missile technology, including penetration aids (decoys, chaff, etc.) for Pershing II, Trident, and MX and demonstration of an Advanced Ballistic Reentry Vehicle (ABRV). There are reports that the Pentagon has tentatively decided to use the ABRV instead of the MK12A on the MX ICBM. Each ABRV may have almost double the explosive power (about 600 kt) of the MK12A and will be more accurate.

Long-Range Bombers

B-52 Modifications. The United States presently has 347 B-52s and 62 FB-111s as active parts of the

The Drive for Superiority

"We will build toward a sustained defense expenditure sufficient to close the gap with the Soviets, and ultimately reach the position of military superiority that the American people demand."

Republican National Platform
1980 Campaign

strategic bomber force. Twenty years ago our bombers carried 97 percent of our nuclear weapons. Because of the shift of emphasis to ICBMs and submarines, the bomber force now carries approximately 23 percent of our nuclear weapons but still half the megatonnage.

While the Air Force has been the strongest proponent for a replacement to our "aging" B-52s they have also actively sought and received a wide variety of programs to modernize them as well. These programs include electronic countermeasures, sensors, communications systems via satellite, warning radar receivers, jammers and terrain guidance systems, and hardening against the effects of electromagnetic pulse generated by nuclear explosions, among others. Additionally, B-52Gs have begun carrying air-launched cruise missiles (ALCM). Former Secretary of Defense Harold Brown concluded that these improvements would ensure that "the B-52 force can remain effective into the 1990's."

B-1B Bomber. Despite the extensive cruise missile program and the FB-111 and B-52 modifications programs, the Air Force has been trying to revive the B-1 long-range penetrating bomber since Carter's 1977 decision to terminate the program and accelerate cruise missile development. President Reagan recently decided to build a force of 100 B-1 variant aircraft (B-1B) as a successor to the B-52. The Reagan budget for FY 1982 includes $2.4 Billion for procurement and research and development for the B-1B.

The B-1 had been designed primarily as a manned penetrating bomber to carry nuclear bombs to targets inside the Soviet Union. Its ability to carry out this mission against early-1990s Soviet air defenses is doubted by many military experts.

The Reagan Administration now claims the B-1B will also perform other missions, including: cruise missile carriage; conventional bombing; and theater support, both conventional and nuclear. While the B-1B may have such add-on capabilities, to risk an aircraft which costs $300-400 million per copy for conventional and theater missions is questionable strategy.

The B-1B will be similar in design to the four prototypes Rockwell built in the 1970's (at a total development cost of $6 Billion). It will also incorporate advances in avionics, cruise missile carriage, air defense penetration, and radar cross-section reduction which are currently available. The Reagan Administration claims a squadron of 15 B-1Bs will be operational in 1986. It is estimated that the force of 100 B-1B aircraft will cost between $30-40 Billion.

Advanced Technology Bomber ("Stealth"). "Stealth" technology incorporates improvements in design and countermeasures to reduce an airplane's radar cross-section making it nearly "invisible" to radar and able to elude current Soviet air defenses. These innovations include: improvements in propulsion; reduced aircraft weight; non-metallic and radar absorbing materials; fewer engines; refined avionics; improved defensive countermeasures; modifications of air intakes; reduced engine exhaust temperatures; and treatment of fuels to lower infra-red signatures.

The Reagan Administration says it will accelerate research and development of the Stealth bomber aircraft, and predicts that it will become available in the early 1990s. Some Congressional critics claim that the Administration is downplaying Stealth so that it can pay for the B-1B. Actual cost figures for Stealth are classified but estimates range from $22 to $56 Billion depending on the number of aircraft. The Air Force has recommended production of 110 Stealth bombers. The Pentagon has estimated the total cost of the B-1B, Stealth and ALCM programs until the end of the 1990s to be $115 Billion in FY 1981 dollars. The Administration has allocated $78 Billion for 1982-87 for all bomber programs.

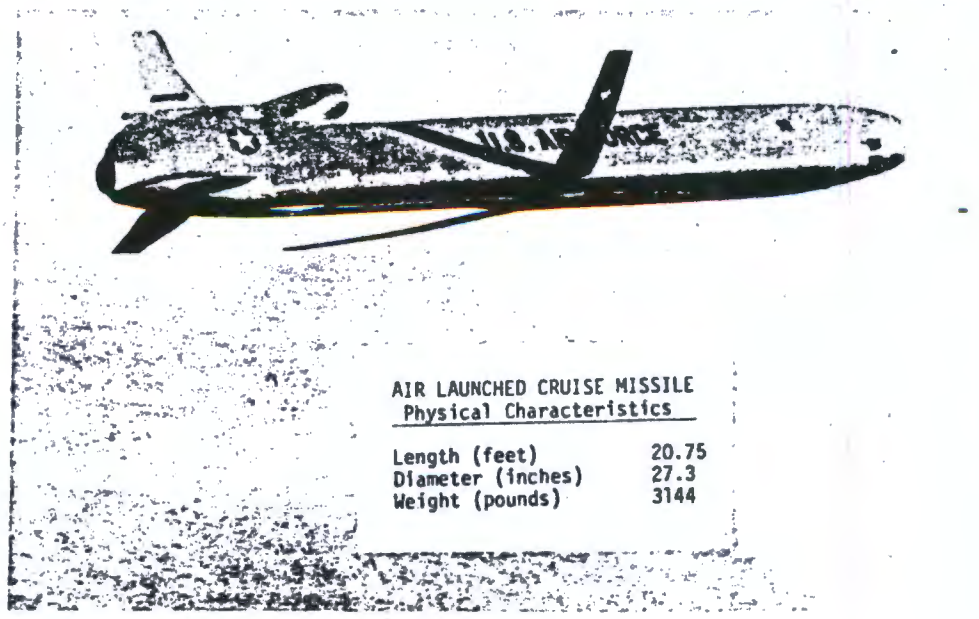
Overspending on Nuclear Weapons

"It is naive to assume that the defense budget is open ended. If we allocate so much of our defense budget to strategic programs that we allow our conventional posture to suffer, we will inadvertently decrease our options in protecting our vital interests without resorting to the use of nuclear weapons."

Senator Sam Nunn
Senate Armed
Services Committee
December 3, 1981

Submarines

Trident I Backfit Program. The program to backfit Trident I (C-4) missiles on 12 Lafayette and Benjamin Franklin Class Poseidon sub-



marines continues. Seven retrofittings have been completed and the entire program is scheduled to be finished in FY 1982. Trident I weapons are two and one half times more powerful than Poseidon (C-3) weapons and have a range of over 4,000 miles as opposed to 2,500 for the Poseidon. The greater range increases the patrol area of these subs by a factor of 10, allowing them to operate in much larger regions of the Pacific and the Atlantic, thereby hedging against the possibility of major Soviet anti-submarine advances.

The estimated cost for producing Trident I missiles for 12 Poseidon submarines is $4.5 Billion and for 15 Trident submarines is now $11.3 Billion.

One Poseidon squadron which will carry the Trident missiles was relocated in July 1979 from Rota, Spain to Kings Bay, Georgia. Other Poseidon squadrons are located in Holy Loch, Scotland and Charleston, South Carolina. Eight Polaris submarines have been redesignated attack submarines and have been withdrawn from the strategic force. The USS Theodore Roosevelt and USS Abraham Lincoln have been dismantled.

Trident Submarine Program. The first nine Trident submarines have been authorized and are all scheduled to be completed by 1987. Advance funding for the tenth, eleventh and twelfth was recently approved by Congress. The Trident is the largest submarine the U.S. has ever built and a most formidable weapon. It displaces almost 19,000 tons (a Poseidon submarine is about 8,000) and is 560 feet long. Each Trident sub will carry 24 missiles compared to 16 missiles on Poseidon and Polaris. Its 168-192 warheads will give each submarine a total destructive power of 15-20 megatons. For comparison, it has been estimated that all the U.S. bombs dropped on Europe and Japan during World War II totalled about two megatons in explosive power. Each Trident submarine can cover more targets than ten Polaris subs.

Reagan's $222 Billion Program

Bombers/Cruise missiles	$78 Billion
Sea-based weapons	$51 Billion
ICBMs	$42 Billion
Nuclear defense (air defense, civil defense, etc,)	$29 Billion
Command-Control-Communications	$22 Billion
TOTAL	$222 Billion for 1982-87

Note: Additional expenditures on nuclear weapons in the Department of Energy budget will add $30-35 Billion. Does **not** *include tactical nuclear weapons.*

The first ten Trident submarines will be based in Bangor, Washington and subsequent ones at Kings Bay, Georgia. The total cost estimate for building the Bangor base is $700.7 million. The total cost estimate for building the Kings Bay facility is $1.25 Billion. While the Trident submarine construction program at Electric Boat in Groton, Connecticut has been plagued with problems—cost over-runs, design changes, delays, faulty workmanship and failure to meet design specifications—the first Trident sub, USS Ohio, was commissioned on November 11, 1981. It will begin active patrol in 1982. The second Trident, USS Michigan, will follow one year later with subsequent subs scheduled to be delivered every 8-10 months. How many Trident subs the Navy will buy in all depends on many factors still to be resolved, but will probably be at least twenty. The cost of each Trident sub (without nuclear reactor and missiles) now exceeds $1.2 Billion. The cost of the total Trident submarine program is more than $30 Billion.

Trident II. President Reagan has decided to step up development of a larger, more accurate Trident II (D-5) missile for deployment on Trident submarines to replace Trident I missiles beginning in 1989. In its advanced development program, the Navy has already begun working on a number of options, though more testing will be necessary before certain design criteria are established. Whatever type of Trident II is decided upon, it will have some combination of greater accuracy, range, explosive power and/or number of weapons than the Trident I.

Advances in guidance will give the Trident II missile accuracy comparable to a cruise missile or MX. The weapon chosen could be the W-78, which in combination with the missile's high accuracy would give the Trident II a substantial hard target kill capability. The missile is being specifically designed to give our sea-based forces the ability to destroy the Soviet land-based missiles in their silos, a capability that the other two legs of our triad will have soon. As noted previously, the MK500 "Evader" maneuvering reentry vehicle is also being considered as an option on both the Trident I and II.

In 1980 the cost of the research and development effort alone was estimated to be $8 Billion. Total cost of the Trident II missile program is estimated at $20 Billion.

Cruise Missiles

Cruise missiles are pilotless, jet-powered, subsonic, miniature airplanes which carry nuclear or conventional warheads. The German V-1 "buzz bomb" was an early, but crude and inaccurate example of a cruise missile. Technological advances have made American cruise

"A Pre-War World"

"We are living in a pre-war and not a post-war world."

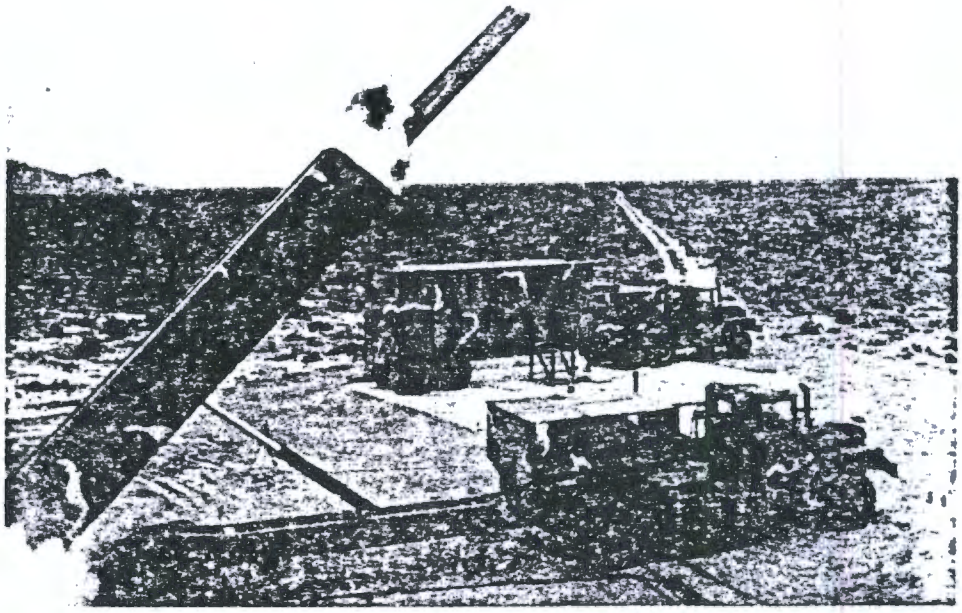
Eugene Rostow
Currently Director,
U.S. Arms Control
and Disarmament Agency
June 1, 1976

missiles into formidable weapons, able to change direction and altitude in flight. U.S. cruise missiles use the TERCOM guidance system to compare terrain features enroute with information stored on an on-board computer. With regularly updated guidance the cruise missile is able to follow an evasive course, hugging the ground below radar coverage, and strike within 200 feet of its target.

Its small jet engine propels it at 500 miles per hour with ranges of up to 1,500 miles. Three nuclear versions, each of which have the explosive power of 200 kilotons, are planned to be deployed in the near future. The total cost for all cruise missile programs is $15 Billion. While its size, mobility, penetrability, and accuracy make it popular with some, those same factors pose serious arms control problems.

Air-Launched Cruise Missiles (ALCM). Boeing recently began full-scale production of the AGM-86B air-launched cruise missile. One bomber is now equipped with ALCMs. A squadron of B-52G's at Griffiss Air Force Base, Rome, New York will be the first one armed to carry 12 external ALCMs, beginning in December 1982. By FY 1990 all 172 B-52G's will be equipped to carry 20 ALCMs each, with 151 operational at any one time. The total cost for 3,418 missiles is estimated to be $6 Billion. The Reagan Administration has decided to deploy ALCMs on 100 B-1B bombers and 96 B-52Hs as well. This could mean the addition of hundreds or thousands more ALCMs beyond the 3,418 now planned.

Ground-Launched Cruise Missiles (GLCM). On December 12, 1979, NATO Defense and Foreign Ministers agreed to deploy 464 GLCMs in Europe: 160 in the United Kingdom; 112 in Italy; 96 in Germany and 48 each in Belgium and The Netherlands. Decisions have been made and announced on the sites for cruise missile bases in the United Kingdom and Italy. The first operational site will be at Greenham Common and is scheduled to be ready in December 1983. The other location in the United Kingdom is RAF Molesworth. The Italian site was publicly announced in August 1981 and will be at Comiso in southern Sicily. It is planned to be operational in 1984. The total cost for the GLCM program is estimated to be $3.2 Billion. The program remains highly controversial in all the countries scheduled for deployment. The ultimate fate of GLCMs in Europe may be determined during the current negotiations between the U.S. and the Soviet Union on nuclear weapons in Europe.



Ground-Launched Cruise Missile

Sea-Launched Cruise Missiles (SLCM). Over the next decade the Navy plans to build up to 4000 sea-launched cruise missiles for a large number of submarines and surface ships. Some will carry nuclear weapons. Initial plans call for SLCMs to be put on thirty surface ships and seventy-four attack submarines. There are three versions of sea-launched cruise missiles: a conventional anti-ship, a conventional land-attack, and a nuclear land-attack missile.

In January 1982 Los Angeles-class nuclear-powered attack submarines will begin to carry conventionally-armed, land-attack cruise missiles with a range of 700 miles. Each submarine will have twelve launchers. In mid-1982 the anti-ship version (250 mile-range) launched from submarines will be deployed and a year later they will be put on surface ships for land-attack and anti-ship missions. Hundreds of nuclear tipped SLCMs with a range of 1500 miles will be deployed on surface ships and attack submarines beginning in mid-1984. Admiral Hayward, Chief of Naval Operations, has said, the introduction of these missiles "will play [a] pivotal role in changing the nature of naval warfare in the future."

Other Theater Nuclear Weapons

Pershing II. With the introduction of the Pershing II, the U.S. Army will join the Navy and the Air Force in having a long-range ballistic missile system. Restricted to short- and medium-range nuclear missiles in the past, the 1979 NATO decision to replace 108 U.S. Pershing IA launchers in West Germany with the same number of Pershing II launchers will give the Army the ability to strike deep into Soviet territory.

The range of Pershing II is 1,000 miles as compared to 100-450 miles for the Pershing IA. A potential extended range version could increase

(continued on page 14)

it to 2,400 miles. The Pershing II will be the most accurate ballistic missile in the world. Its reentry vehicle will be terminally guided by an on-board radar system to strike within about 100 feet of its target, as against 1300 feet for the Pershing IA. Because of this precise guidance, the explosive power of the new W-85 warhead has been reduced to 10-20 kt from the 60-400 kt yield of the Pershing IA. Present plans do not include production of the W-86 earth penetrator warhead. Other features of the Pershing II will be its four-to-six minute flight time to the Soviet Union from West Germany and its high state of readiness.

Seventy-two additional Pershing IA launchers are deployed with the West German Air Force. There are no present plans to replace these with Pershing IIs. The first Pershing IIs are scheduled to be in place in December 1983 with all in place by the end of 1985. However, deployment could be delayed due to political considerations or cancelled as a result of the negotiations on nuclear weapons in Europe.

Enhanced Radiation Weapons (Neutron "Bomb"). The Reagan Administration has decided to move forward on production of enhanced radiation warheads or "neutron bombs" for use with Lance short-range surface-to-surface ballistic missiles and eight-inch artillery shells. The estimated production is 380 warheads for the Lance and 800 for the eight-inch shell. For the time being, at least, the neutron warheads will be stored in the United States, ready for rapid deployment to Europe.

Enhanced radiation weapons are designed to permit the release of the high-energy "fast" neutrons produced in thermonuclear (fusion) reactions so that a higher percentage of the energy released will be in the form of prompt radiation, with blast and thermal damage somewhat reduced, in comparison to battlefield fission weapons.

Its proponents claim that the neutron weapon will reduce "collateral damage" (damage to property, buildings, etc.) while killing enemy soldiers through massive doses of radiation. Thus, they assert, it is the perfect deterrent to a mass Soviet tank attack in Western Europe—it would kill tank crews but leave villages intact.

These assertions fail to consider: that NATO already has excellent anti-tank capabilities; that the weapon would still cause vast amounts of blast and thermal damage, especially if large numbers were used against a mass attack; and that Soviet tank crews might not be immediately incapacitated and could fight on for several hours. But its most dangerous effect will be to lower the nuclear threshold and make nuclear war in Europe more likely. Further, it is probable that the Soviets will now build a neutron bomb of their own.

Command, Control, Communications, and Intelligence (C^3I) Programs

An extensive global network gives command and control centers such as the White House, the Pentagon, and SAC headquarters the ability to communicate with all elements of U.S. strategic forces. Command, control, communications, and intelligence (C^3I) systems are designed to warn command authorities of imminent nuclear attack, assess the attack and possible responses, send out orders to our strategic nuclear forces, and evaluate the damage to both sides from a nuclear exchange. These systems include satellites, computers, underground antenna grids, special aircraft, ground-based radars, space-based sensors, and, soon, even lasers.

With the implementation of a nuclear war-fighting strategy comes the need for a C^3I network that can continue to operate throughout the course of a nuclear war. Steps are now underway to make our C^3I systems more survivable, jam-resistant and secure so that our nuclear forces can conduct a protracted nuclear war at any level of escalation. The Administration plans to spend $22 Billion over the next six years for this purpose.

Present improvements in our C^3I system are designed to provide redundancy to the network, so that should part of it be destroyed in a nuclear war our commanders could control the course of a nuclear war from the execution of "limited nuclear options" through a full-scale nuclear attack.

While redundancy of communications and close control over nuclear weapons is a desirable end, certain improvements in C^3I could also delude military and civilian leaders into believing that a nuclear war is controllable, fightable and winnable. While it is essential to maintain the credibility of our nuclear retaliatory threat, some measures for improving this credibility have the added effect of both inducing our leaders to contemplate limited nuclear warfighting and persuading the Russians that we are trying to achieve just such a capability.

It will be extremely difficult to design a C^3I system that is more survivable than the strategic force it is intended to support. The uncertainties that would inevitably remain concerning command and control make the use of nuclear weapons for controlled escalation a very difficult problem.

Some Current and Projected Improvements in C^3I

- E-4B Advanced Airborne National Command Post (AABNCP)—(A modified 747 aircraft. Enables President to command U.S. nuclear forces from the air during a nuclear crisis)
- Strategic Air Command Digital Network (SACDIN)—(Survivable communications between SAC H.Q. and missiles/bombers)
- MILSTAR EHF Communications Satellite
- Ground-based Electro Optical Deep Space Surveillance System (GEODSS)—(Satellite monitoring)
- Two Additional PAVE PAWS sites—(Early warning of SLBM launches)
- Air Force Satellite Communications (AFSATCOM)—(Allows President and military commanders to communicate with and send out orders to U.S. nuclear forces)
- Extremely Low Frequency (ELF) System—(Communications with submarines)
- Satellite survivability enhancement

Haig: "U.S. Very, Very Strong"

"In a contemporary sense, the United States is very, very strong and very, very capable, especially in the strategic area. Our systems are both more sophisticated and reliable and more technologically sound."

Secretary of State Alexander Haig
September 11, 1981

Other Programs

Air Defense. The Reagan Administration will undertake a large and expensive effort to upgrade continental United States (CONUS) air defense. The CONUS system is primarily responsible for detecting and shooting down enemy bombers which attempt to strike the United States. The Soviet Union presently has about 150 aging long-range bombers.

Five squadrons of F-106 interceptors will be replaced with F-15s. At least six additional AWACS airborne surveillance aircraft will be purchased to supplement the 17 AWACS now assigned to CONUS. AWACS provide sea and air surveillance and control interceptors in wartime. Also, a combination of new over-the-horizon backscatter (OTH-B) radars and improved versions of present ground radars will be built.

Ballistic Missile Defense (BMD). Though the Anti-Ballistic Missile (ABM) Treaty of 1972 and its protocol severely limited testing and deployment of ballistic missile defense systems, research and development have continued under a vigorous program directed by the Department of the Army. Possible deployment of a BMD system for defense of MX, Minuteman, or other sites is currently receiving a great deal of attention. The Reagan Administration is pursuing missile defense as one of its three possible options for long-term basing of MX.

LoADS (Low Altitude Defense System) is the BMD system now under development which could be deployed the most rapidly. It is designed to attack incoming weapons at altitudes below 50,000 feet with an interceptor missile which would carry a nuclear warhead of a few kilotons yield. Each LoADS unit would probably contain three interceptors (each about half the size of the old Sprint missile of the Safeguard program), a small radar, and a computer. A LoADS unit would have to locate incoming missiles, discriminate between weapons and decoy devices or other electronic countermeasures, and then destroy the attacking weapon, in less than ten seconds—a formidable task.

LoADS was being considered most immediately for application in conjunction with the MX in a mobile basing scheme, but it is also being designed to defend fixed silos.

Research is also being conducted on other BMD systems, including long-range, non-nuclear ones, for parallel use with LoADS in a "layered defense." Further long-term BMD research involves the use of space-based lasers and other mechanisms with potential BMD application.

As now envisioned, the deployment of BMD would be prohibitively expensive (some experts suggest a minimum of $11 Billion for a baseline LoADS system alone), would probably violate the ABM Treaty, would prompt the Soviets to build their own BMD system, and would have many serious operational problems. LoADS intercept would occur at such low altitudes that only one shot would be possible, leaving no margin for error. The Soviets could develop countermeasures, such as a maneuvering reentry vehicle (MARV), to evade LoADS interceptors and they could simply put more weapons on their missiles to overwhelm the system.

The Reagan Administration's request for funding of a total BMD program for FY 1982 is about $600 million.

Anti-satellite warfare (ASAT). The United States is now accelerating development of weapons designed to destroy enemy satellites. Anti-satellite (ASAT) weapons are attractive to the military because destruction of enemy satellites would eliminate important military capabilities of the adversary.

The most important near-term U.S. effort is the Miniature Homing Intercept Vehicle, a small device that would home in on the infra-red radiation of a target satellite and collide with it at high speed. Initially, this vehicle will be tested on a small, two-stage rocket launched from an F-15 jet fighter. Testing will begin in early 1983. If the testing proves successful, this ASAT weapon would be capable of being launched from virtually any modified F-15 and perhaps other aircraft. It could also be launched from a land-based rocket. Plans now call for this first generation ASAT weapon to be ready for operation by 1985.

The ASAT program will also pursue methods for attacking satellites in high and geosynchronous orbits of about 22,300 miles, where many important military satellites are stationed.

Some backers of a large U.S. ASAT program imply that we can move armed conflicts into outer space and prevent mass destruction on earth. However, at least for the near future, space-based weapons are being designed to contribute to fighting on earth, not replace it. Space may be a place where wars will start, but it will not make war safe for mankind. What the extension of military competition into space does is add to the complexity and cost of the arms race and further complicate arms control measures.

Laser and Particle-Beam Weapons. Research is also being conducted on longer-term, more exotic ASAT weapons such as high-energy lasers and charged particle beam weapons. These programs are largely under the auspices of the Defense Advanced Research Projects Agency (DARPA).

Lasers are intense beams of light

that can be narrowly focused at great distances. There are many problems to be solved before lasers could be used as long-range weapons, but both the U.S. and U.S.S.R. are engaged in this research.

Lasers based on satellite battle stations are being contemplated as a way to attack other satellites, such as warning and communications satellites. This could increase fear of surprise attack on both sides, adding to instability.

Further, the overlap in the application of exotic technologies to both ASAT and BMD is an important aspect that has received little attention. Space-based lasers might also be used as an anti-ballistic missile system. Laser BMD systems could stimulate a new round in the arms race, as each side attempted to cancel out the other's BMD capability.

Particle beams are another form of directed energy which are concentrated beams of sub-atomic charged particles. Particle beams may have several advantages over lasers as space weapons and may have longer range in the atmosphere if the problem of beam scattering can be overcome.

Anti-Submarine Warfare (ASW). In the past decade, the U.S. has spent substantial funds in an intense effort to develop an effective anti-submarine warfare capability. A significant breakthrough (by either side) in ASW might prove to be highly destabilizing in a field of warfare where the U.S. now maintains a clear lead over the Soviet Union. Although U.S. ASW capabilities are principally structured to preserve sea lines of communication and protect carrier battle groups, major improvements in ASW might create a serious threat to the Soviets' ballistic missile submarines. At present, despite some advances in detecting Soviet submarines, the U.S. still has no real protection against missile attack from the sea.

Civil Defense. Over the past thirty years the United States has spent $2.6 Billion on civil defense, from a low of $26 million in 1951 to a high of $207 million in 1962. The Reagan Administration requested $132.8 million for FY 1982 for civil defense, a 13 per cent increase over the FY 1981 funding level. The Reagan Administration has emphasized civil defense as a significant part of its nuclear weapons package.

Very Expensive Nuclear Weapons

B-1 Bomber	$40 Billion
Trident Submarine	+$30 Billion
MX Missile	$30 Billion
Stealth Bomber	$22-56 Billion
Trident II Missile	$20 Billion
Air-Launched Cruise Missile	$6 Billion
Ground-Launched Cruise Missile	$3.2 Billion
Pershing II Missile	$1.8 Billion

Note: *These estimated program costs do not include costs of nuclear weapons in the Department of Energy budget or the costs of operating those weapons.*

From Military Posture for FY 1983, Organization of the Joint Chiefs of Staff, pages 106-109.

Strategic Offensive Nuclear Forces

For the past two decades, the Soviet Union has devoted substantial resources to the development and deployment of ICBM and SLBM forces, and to a lesser extent, deployment of an intercontinental bomber force. As a result of these efforts, the Soviet Union has moved from a position of relative inferiority in the strategic nuclear field to a position of equivalence, or superiority, in many weapon systems.

SOVIET ICBM FORCE

SYSTEM	INVENTORY
SS - 11	580
SS - 13	60
SS - 17	150
SS - 18	308
SS - 19	300
	1,398

AS OF 1 JANUARY 1982 CHART B 1

Intercontinental Ballistic Missiles

The Soviet Union has nearly completed the deployment of fourth generation ICBMs (SS-17, SS-18, SS-19) (Chart B-1, Map B-1), with approximately half of the 1,398 deployed launchers now containing new missiles. New missile silos are considerably harder than earlier versions, and thus potentially less vulnerable. The remainder of the force consists of older generation SS-11s and SS-13s. Most of the RVs are on the fourth generation ICBMs, of which certain versions of the SS-18 and SS-19 have significantly improved accuracies. Also, the Soviets are apparently ready to begin flight testing of two new solid propellant ICBMs; either or both could reach IOC by the mid-1980s.

SOVIET ICBM DEPLOYMENT

AS OF 1 JANUARY 1982 MAP B - 1

DRAWING OF SS-19/17/18

Conversion of all SS-9 launchers to the SS-18 configuration has been completed.

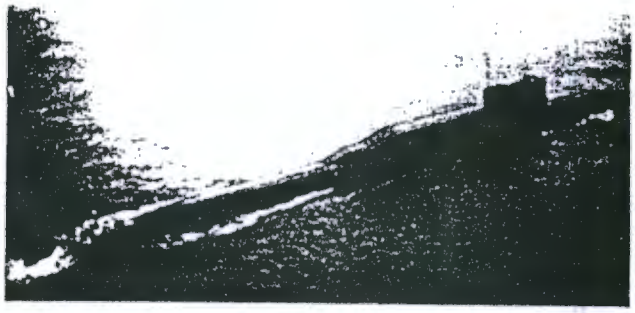
The retrofit of SALT II-accountable MIRVed launcher silos associated with the SS-19 is underway. The program to convert silos from SS-11 to SS-19 Mod 3 configuration will probably require several years to complete. There were little or no changes in the deployment of the SS-13 and SS-17. The majority of the 150 SS-17 launchers contain the four-RV MIRVed missiles.

According to accumulating evidence, the Strategic Rocket Forces may have plans to reconstitute and reload at least a portion of their silo-based ICBMs during a protracted nuclear conflict. Contingency plans for reloading and refiring of silos probably have been developed. The cold-launched SS-17 and SS-18 are well suited for refiring. Additional evidence supports the hypothesis that the hot-launch systems also have a reload and refire capability.

Submarine-Launched Ballistic Missiles

The Soviet Union has 70 modern SSBNs with 950 SLBM launchers. Of these, 62 SSBNs were accountable under SALT II. YANKEE-class SSBNs are routinely on station in the western Atlantic, or in transit; overlap may raise the number of units on patrol temporarily. DELTA-class SSBNs are normally on patrol in the Greenland, Norwegian, and Barents Seas.

The Soviets normally maintain YANKEEs in the eastern Pacific patrol area, with an additional unit in transit. DELTA I/III SSBNs are routinely on patrol in the Pacific. Both the SS-N-8, carried on DELTA I/II SSBNs, and the SS-N-18, carried on the DELTA III, can strike targets in



DELTA SUB

the United States from adjacent Soviet waters or even home ports. Readiness of the Soviet SSBN force is assessed as high.

The TYPHOON, latest class of Soviet SSBNs, commenced sea trials in 1981. The SS-NX-20 missile, which is to be carried by the TYPHOON, has been test fired. The TYPHOON will likely soon finish sea trials, but the complete weapon system probably will not be operational until the mid-1980s.

Soviet Air Force Strategic Bombers

The strategic bomber force consists of over 880 aircraft (Chart B-2). Bombers form the core of the force for strategic air operations in the European and Asian theaters. Three-fourths of the bombers remain poised

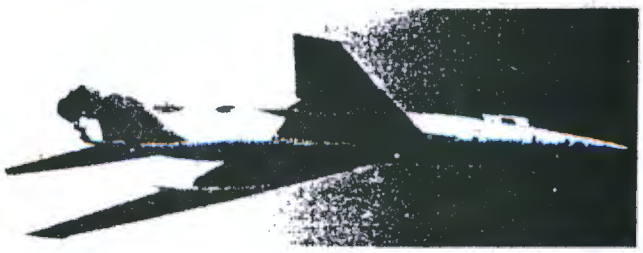
SOVIET AIR FORCE BOMBER INVENTORY

BEAR	100
BISON	75
BACKFIRE	70+
BADGER/BLINDER	600
	880+

AS OF 1 JANUARY 1982 — CHART B 2

opposite NATO, while the remainder are located along the Chinese border.

BADGER, BLINDER, and BACKFIRE aircraft assigned to the Soviet Air Force strategic bomber force would carry out missions primarily against Europe and Asia.



BLINDER

BEAR and BISON bombers could perform theater roles as well, but are primarily reserved for strategic maritime

BACKFIRE

BEAR

or intercontinental missions. Age is a major limiting factor in the theater bomber force. About 75 percent of the bombers are over 10 years old.

Evidence would indicate that the Soviets are in the process of developing a new long-range bomber and probably a strategic cruise missile carrier. Additionally, the Soviets are developing a tanker version of their IL-76/CANDID transport aircraft.

The Soviets are also working on a program to develop long-range cruise missiles.

Theater Nuclear Forces

The Soviet Union continues to expand and modernize its theater nuclear forces at a rapid pace. The Soviets view TNF assets in both strategic and tactical contexts, with some forces serving a dual function. In particular, TNF provide a layered threat to Europe, allowing concentrations of theater forces to exist independently of Soviet strategic forces. Soviet TNF doctrine stresses mobility and readiness.

Soviet and Warsaw Pact nuclear and nuclear-capable conventional force modernization programs continue. For every ground-launched missile or rocket system which existed prior to 1976, the Soviets have fielded or are in the process of deploying a replacement system with a new level of accuracy. Chart B-3 shows older Soviet theater systems on the left and replacement systems on the right.

The number of long-range TNF (longer-range INF) ballistic missile launchers has remained relatively stable over the years. The Soviets have deployed well over 260 SS-20 launchers since 1977 and deactivated over 200 SS-4 and SS-5 launchers.

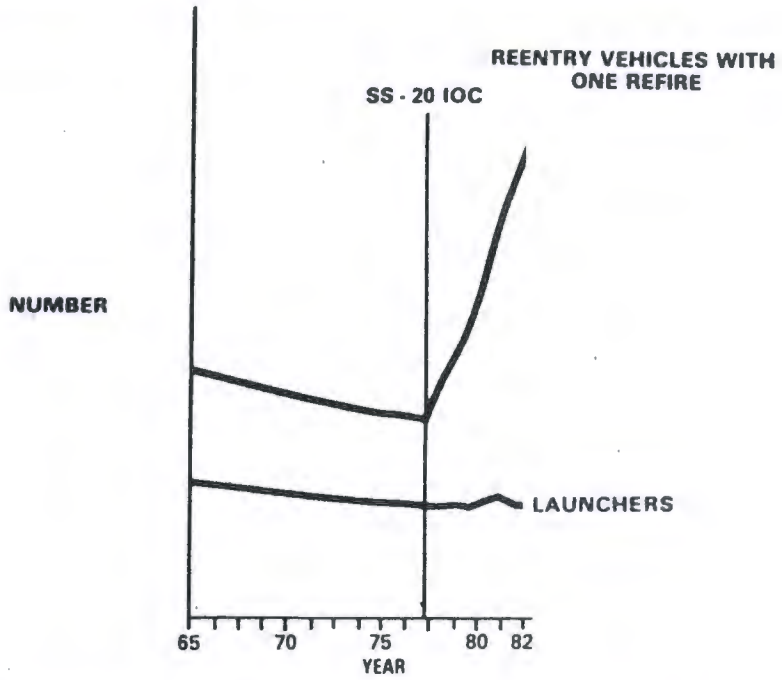
In 1981, the Soviets initiated construction of additional new SS-20 bases, from which missiles are capable of striking NATO Europe. The remaining SS-20 deployments likely will be located in the western Soviet Union. The number of launchers probably will be less than SS-4 and SS-5 levels, but the number of RVs will be considerably greater because of the three-MIRV payloads (Chart B-4). If one refire is allocated each missile, the number of IRBM RVs have more than doubled between 1977 and 1982.

The wider deployment pattern of the SS-20 and its increased range capability over the SS-4 and SS-5 have

MAJOR SOVIET THEATER MISSILES AND ROCKETS

SYSTEM	RANGE	REPLACEMENT SYSTEM	RANGE
SS-4	2000KM	SS-20	5000KM
SS-5	4100KM		
FROG	70KM	SS-21	120KM
SCUD B	300KM	SS-23	500KM
SS-12	900KM	SS-22	900KM

SOVIET
LONG-RANGE TNF (LONGER-RANGE INF)
BALLISTIC MISSILE WARHEADS 1965-1982

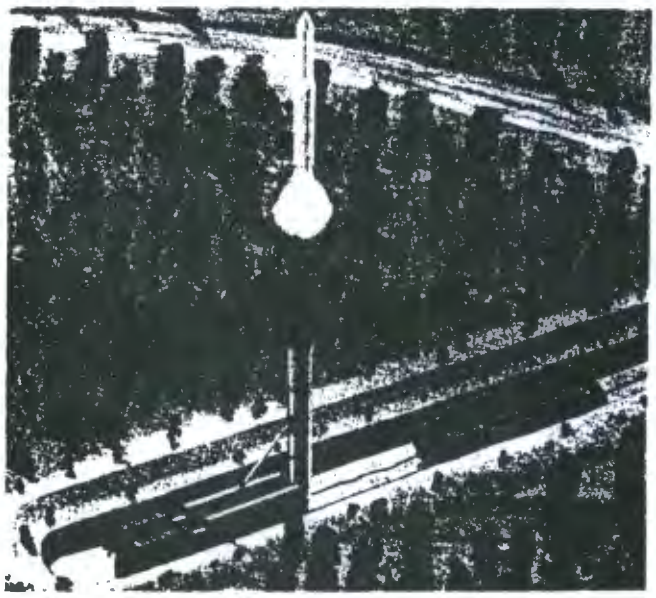


NOTE: THE SYSTEMS INCLUDED IN THIS CHART INCLUDE THE SS-4, SS-5 AND THE SS-20. THE TOTAL NUMBER OF LAUNCHERS HAS REMAINED CONSTANT WITH THE INTRODUCTION OF THE SS 20 DUE TO A DRAW DOWN IN THE NUMBERS OF SS-4s AND SS-5s.

AS OF 1 JANUARY 1982 CHART B - 4

enabled the Soviets to extend their LRTNF capability to the Middle East, Southwest Asia, and East Asia.

The growth in the number of Soviet short-range ballistic missile launchers and free-rockets-over-ground (FROGs) has also continued. There is currently no indication that the Soviets will draw down these older systems to counterbalance the introduction of newer systems.



SS-20

From Technology Review, October 1981, pgs. 57-63.

The Ultimate Battleground: Weapons in Space

Increasingly widespread notions of orbiting death rays and celestial Waterloos are mainly the stuff of speculation, for wars in space are more picturesque than practical.

by Gerald Steinberg

THE space shuttle, two recent tests of the Soviet antisatellite system, and the burgeoning budget for the development of space-based laser weapons have led to increased talk of the prospects for space warfare. Often punctuated by illusions of extravagant spacecraft and weapons paraphernalia, these discussions usually take place without historical, strategic, and technical perspectives. The strategic value of space weapons is generally overstated and the risks and technological obstacles to their deployment trivialized.

Early Antisatellite Programs

The first U.S. antisatellite program, designated SAINT for "satellite interceptor," was funded in 1957 in response to fears that the Soviet Union would develop orbital bombs, satellites, and antisatellites to "seize the high ground of space." Advocates of SAINT proposed that the Soviet Union would be able to occupy "strategic areas in space vital to future scientific, military, and commercial programs" and thus deny the United States access.

As originally conceived, the orbiting SAINT interceptor would maneuver to a target, inspect it with sensors, and if ground observers directed, blow up close enough to the target to alter its orbit, incapacitate its instruments, disrupt its power and communications systems, or destroy it entirely. However, the SAINT mission was actually limited to orbital inspection, by far the most difficult task—satellites are fragile and unprotected instruments, and their destruction is very simple once they are located. Other potential antisatellite systems were developed and tested by the air force using B-47 and F-4 aircraft as launch platforms, and the army proposed that the Nike-Zeus anti-ballistic-missile system be adapted to perform an antisatellite mission.

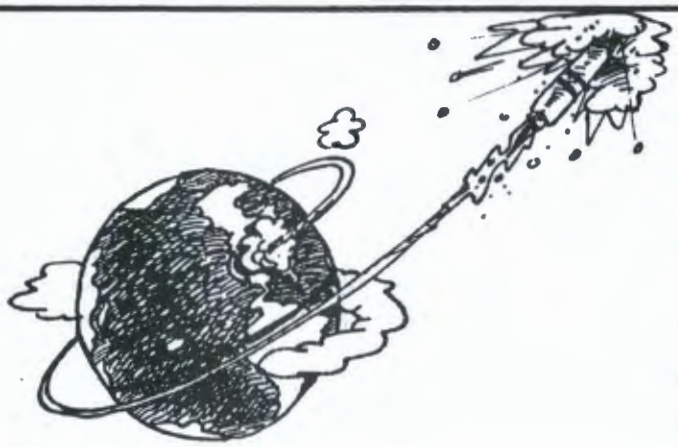
In the early 1960s, U.S. reconnaissance satellites revealed that the Soviets' deployment of intercontinental ballistic missiles (ICBMs) was far less than claimed. The Soviets condemned these U.S. space reconnaissance programs: Prime Minister Nikita Khrushchev declared that "a spy is a spy, no matter at what height it flies," and claimed that the Soviets would "shoot down" or disrupt the operation of "espionage satellites." Although this would have required an antisatellite system, it was an entirely credible threat in view of the variety of capabilities in space the Soviets had by then demonstrated. For example, in August 1962, two Soviet spacecraft were launched into similar orbits that brought them to within three miles of each other, leading analysts to warn that the Soviets were rapidly approaching an antisatellite capability. Meanwhile, the Soviet Union introduced a resolution in the United Nations that would have justified the use of antisatellites against espionage satellites.

Why Orbital Weapons Bombed

AFTER *Sputnik* was launched, space was considered a likely place to park nuclear weapons. Noting that an orbital warhead could reenter the earth's atmosphere and hit a target in half the time needed by an ICBM, air force officers testified before Congress that "in Major Titov's orbital flight of last August (1961), his *Vostok* spaceship passed within 150 miles of this building." This image of a hammer-and-sickle-inscribed "sword of Damocles" hovering over the United States was enough to prompt development of orbital antisatellites such as SAINT.

Yet space is the single medium not used as a base for nuclear weapons, a fact cited by some as a major arms-control success. Early evidence of this lack of enthusiasm for orbital weaponry appeared in 1962, when the deputy secretary of defense announced that the United States would not be the first to put bombs in outer space. In October 1963 after some negotiation, the United States and Soviet Union agreed to a U.N. resolution pledging not to station weapons of mass destruction in space, even though neither side could verify compliance. Four years later, these pledges were codified in the Outer Space Treaty. The fundamental reason for the agreement was not merely goodwill but the realization that space-based nuclear weapons would create more problems than they would solve.

First, orbiting nuclear weapons could hit only targets directly in their flight path—a satellite could take hours or even days to line up with and then hit Moscow or New York. Second, orbital weapons would be far less accurate than ICBMs and bombers: controlling reentry of satellites is difficult and inaccuracies of many miles are common.



Some U.S. government advisors opposed to SAINT claimed that deployment of U.S. antisatellites would stimulate the Soviet Union to develop or strengthen its military antisatellite capabilities. George Kistiakowsky, President Eisenhower's science advisor, pointed out that any Soviet antisatellite system would probably be used to interfere with U.S. reconnaissance satellites. He reasoned that since the United States relied far more than the Soviet Union on such satellites, we would suffer the greater loss if antisatellite development were stimulated.

On the strength of such criticisms, the Kennedy adminstration in 1962 reviewed U.S. programs that appeared to be contributing to an arms race in space, and in December of that year Secretary of Defense Robert S. McNamara cancelled the SAINT program prior to its first scheduled tests. Six months later Soviet policy also changed: support for the section on "espionage satellites" of the U.N. resolution on space was quietly withdrawn, the Soviet Union began its own reconnaissance satellite program, threats to "shoot down" U.S. satellites gradually ceased, and evidence of Soviet efforts to develop an antisatellite capability diminished. The United States and the Soviet Union separately declared shortly thereafter that each would forego systems such as orbiting bombs and warheads, and the "age of space combat" was at least postponed.

The pace of antisatellite activity varied from 1963 to 1977. Two ground-based antisatellite systems armed with nuclear warheads were deployed by the United States in the Pacific in 1963. These systems were not based on placing interceptors into orbit. They were instead designed to launch antisatellite devices to intercept enemy satellites as they passed over the launch points at altitudes of between 100 and 400 miles. Depending on its orbit, a potential target could come within range as often as every 90 minutes or as infrequently as once in 18 days (for a satellite in polar orbit). Obviously, this system had limited potential for a timely response. A further drawback was that these antisatellite missiles were armed with nuclear warheads and could have damaged U.S. satellites orbiting in the region of the target. After 1963, the testing or use of these systems would have violated the Limited Test Ban Treaty, and the systems were finally decommissioned in 1975.

During the mid-1960s, first the United States and then the Soviet Union developed the capability to maneuver and rendezvous in space, essential to orbital antisatellite systems. In 1965, following the civilian Gemini flights, the air force proposed a number of ways to exploit their techniques in antisatellite systems. These programs, including the Blue Gemini, the Manned Orbital Development System, and the Manned Orbiting Laboratory, were all cancelled by Defense Secretary McNamara for political, econom-

Finally and probably most important, orbital weapons would be difficult to operate. Unlike bombers and missiles directly launched by pilots and ground officers, satellites carrying nuclear weapons would be controlled remotely. They would also be subject to various forms of interference, making them unreliable in a crisis. In addition, satellites are subject to technical failures that lead to unscheduled and uncontrollable reentry. Problems enough were caused when the U.S. *Skylab* landed in a remote section of Australia and the Soviet *Cosmos 954* deposited its radioactive debris in Canada; imagine the havoc had such satellites been armed with nuclear weapons.

Despite the view that orbital weapons were more costly and less effective than other forms of delivery systems, reaching agreement on their restraint was not simple. As Raymond Garthoff, who served in a variety of arms-control positions in the State Department, notes, President John Kennedy pursued this ban only after receiving "a unanimous recommendation of all interested agencies and departments *against* such a ban." The military wanted to keep its options open, while other groups, questioning whether such an agreement could be verified, sought to keep space arms control within the larger package of "general and complete disarmament." It was only through the forceful action of the president and his advisors that the agreement was reached.

The lessons for arms control are clear. While a new weapons system may be neither effective nor useful, mutual restraint is not automatic. Only persistent efforts to reach successful agreements can counteract bureaucratic inertia and parochial interests.—*G.S.* □

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ic, and technical reasons.

In contrast, the Soviet Union continued to pursue development of its antisatellite capability in three distinct series of tests. The first series, beginning in 1968, consisted of seven trials in which a "target" satellite was placed in orbit, followed the next day by a "hunter-killer" satellite launched from the same site into a highly elliptical orbit with a similar inclination. After the second (interceptor) satellite completed one or two orbits, its path was altered to allow the two spacecraft to intersect. The antisatellite was then moved into another orbit and detonated, scattering fragments in all directions. U.S. analysts credited the Soviets with "possible successes" in five of these seven tests based on the fact that the two spacecraft apparently closed to within one kilometer. (However, there is some question whether a detonation at this distance would ensure damage to the satellite. A "miss" distance of 0.1 kilometer is probably a better requirement.) In the second series of tests between 1976 and 1978, the Soviets launched eight pairs of spacecraft, and a third series included three tests—a failure in April 1980 and two "probably" successful tests in February and March 1981.

The United States responded to the initial antisatellite tests in 1968 by funding and expediting programs to "harden" and protect U.S. space systems against an antisatellite attack, including radiation from nuclear detonations. A test program to develop "survivable" satellites was initiated, as was research on power systems to replace highly vulnerable solar cells. The role of the space shuttle as a system to facilitate the rapid replacement of damaged satellites was emphasized.

In 1977, Secretary of Defense Harold Brown declared that the Soviets had developed an antisatellite capability. He announced that the United States would shift from its defensive posture to deterrence and develop a system similar to the Soviet antisatellite program: the "miniature homing vehicle" (MHV). Thus, after 20 years of successfully skirting an arms race in space, both the United States and the Soviet Union were aggressively at work on orbital antisatellites.

Launched from either an aircraft or the ground, the MHV destroys its target by ramming into it. The effectiveness of the MHV is difficult to judge, but most experts agree that in the absence of countermeasures, this system will probably be quite reliable against targets at modest elevations—those with perigees (points of closest approach to the earth) of less than 1,000 kilometers. More energy would be required to reach targets in significantly higher orbits, and air-launched vehicles are not likely to have sufficient thrust. In addition, interception of targets at higher altitudes would require greater accuracy, since small angular deviations become large misses at great distances.

Some reliable estimates place the cost of the air-launched version of the MHV, currently under development, at approximately $1 million per booster, with the simplest ground-launched system expected to cost $2 to $3 million per unit. Advanced MHV systems for reaching targets higher than 1,000 kilometers will probably require more fuel for maneuvering and a variety of auxiliary systems, increasing both their weight and cost.

Beyond the MHV

Given the limited capabilities of MHV, what are the likely next stages in the development of antisatellite

capabilities? The space shuttle and directed-energy (particle-beam and laser) systems are frequently cited as alternatives, but an examination of their technical properties reveals several weaknesses.

The space shuttle is capable of intercepting and retrieving defective U.S. satellites. But Soviet analysts and some Western journalists have argued that this function can be extended to an antisatellite role in which "enemy" satellites would be intercepted, damaged, or even captured. However, upon close examination of the shuttle's capabilities, this possibility is very small, perhaps even nonexistent. In the first place, the shuttle is confined by its design to orbits below 600 miles (960 kilometers); many satellites, including potential targets, are in higher orbits. Second, the shuttle has limited maneuverability; the interception of many satellites in low orbits would be costly if not impossible because of the large amount of fuel required to shift the shuttle into position. Finally, any shuttle-based antisatellite operation involving retrieval could be readily countered by "booby-trapping" potential targets. For example, the Soviets could simply rig their less costly satellites to explode under contact with a foreign object.

However, the shuttle may be capable of rapidly inserting an MHV into orbit for interception of a target satellite. Thus, the shuttle gives the United States an orbital antisatellite capability comparable to that apparently under development by the Soviet Union.

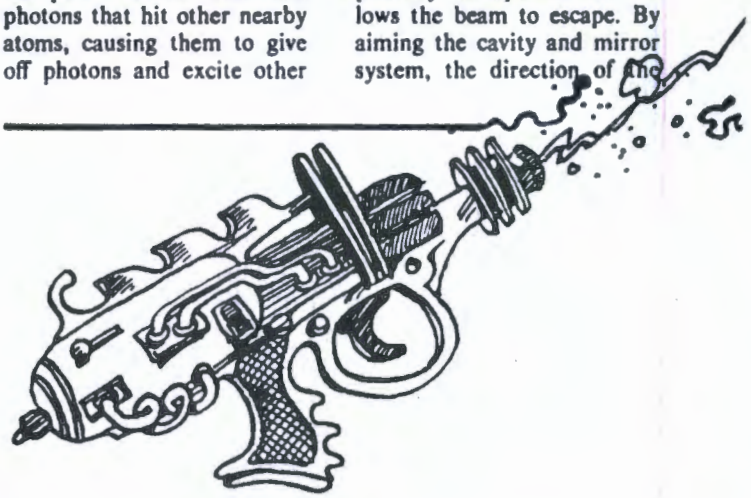
Laser and Particle Beams in Space

The shuttle is frequently portrayed as a potential platform for the development, testing, and deployment of exotic antisatellite weapons based on directed-energy systems such as lasers or particle beams. These devices are popularly considered a means of destroying enemy ballistic missiles before they reach their targets, but they can also cause target satellites to crack, melt, or vaporize.

There have been persistent reports of Soviet efforts in these areas, and the U.S. Department of Defense has allocated over $1 billion to directed-energy research and development programs. Since particle-beam and laser-beam antisatellites could be used repeatedly, they would be far superior to devices such as the MHV in which each antisatellite can destroy only a single target. In addition, while conventional antisatellites must come very close to or even intersect their targets, laser-based antisatellites could cause damage at large distances.

How Directed-Energy Systems Work

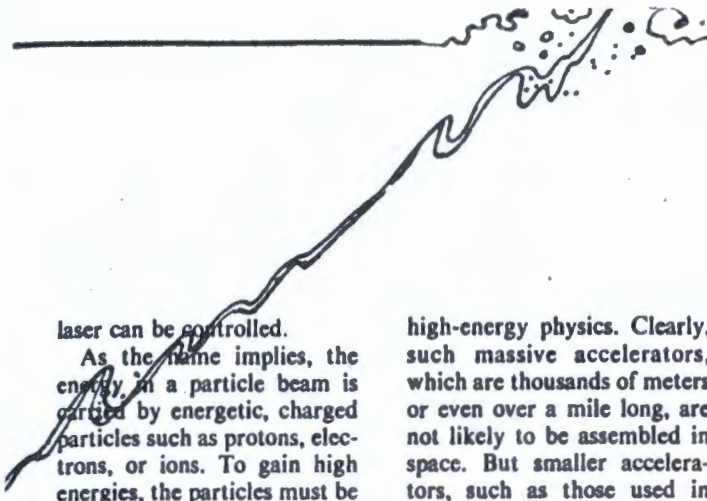
DAMAGE from laser weapons is caused by the impact of a highly focused monochromatic beam of light that carries a great deal of energy. The atoms inside the laser cavity are excited by an external power source and emit photons that hit other nearby atoms, causing them to give off photons and excite other atoms. The result of this multiplying effect is a steady stream of photons locked in phase and of equivalent energy—a laser beam. The laser cavity is bounded at each end by mirrors, one of which is partially transparent and allows the beam to escape. By aiming the cavity and mirror system, the direction of the



While the physical principles behind laser weapons systems are straightforward, the technological requirements and the obstacles to developing operational systems are controversial. Proponents of a crash program to develop the systems argue that the technical obstacles can be readily overcome, and that, in fact, the Soviet Union has or is close to solving them. Critics, on the other hand, argue that these obstacles are formidable and while perhaps not insurmountable, would increase the cost of the system beyond a reasonable level. To complicate this debate, much of the relevant information is classified and selectively leaked by both sides.

In theory, directed-energy antisatellite systems could be based either on the ground or in space. Ground-based systems are easier to build but are limited by weather and location; line-of-sight contact between satellite and ground site would be required, for example. Furthermore, the atmosphere between the ground and the target would significantly reduce the amount of energy reaching the target. And a relatively small investment in shielding and insulating satellites could probably protect even sensors, electronics, and other highly sensitive systems from such ground-based lasers or particle beams.

By contrast, space-based directed-energy systems could deliver substantially larger amounts of energy to many more targets. A laser or particle-beam antisat-



laser can be controlled.

As the name implies, the energy in a particle beam is carried by energetic, charged particles such as protons, electrons, or ions. To gain high energies, the particles must be accelerated through a magnetic field such as those generated by the large linear and circular accelerators used in high-energy physics. Clearly, such massive accelerators, which are thousands of meters or even over a mile long, are not likely to be assembled in space. But smaller accelerators, such as those used in ordinary cathode-ray tubes in televisions, do not provide sufficient energy. A space-based particle-beam accelerator must lie somewhere between the two extremes—large enough to generate sufficient energy but small enough to be placed in orbit. Energy beams capable of depositing a few thousand joules per fraction of a second per square centimeter on a target are required. (By comparison, the noonday sun produces about one-tenth of a joule per second per square centimeter.) Such energies would be sufficient to damage the target through melting, vaporization, or the impact of a mechanical impulse. Damage to more sensitive systems (sensors, electronics, power supply, or thermal balance) could occur at lower energies.—*G.S.* □

ellite above 40,000 kilometers would have a very wide field of view, and three such satellites could maintain all potential targets in view.

But the situation is complicated by the fact that the amount of energy delivered to a target decreases with the square of the distance. And since most targets for such a three-satellite system would be far away, a great deal of energy would be required to do serious damage. Moreover, very large satellites must accommodate massive accelerators for particle-beam generators and large mirrors for laser weapons.

A beam of charged particles in space is affected by "self-repulsion"—the interaction of similarly charged particles—which causes the beam to spread. Such beams are also affected in space by the earth's magnetic field, which fluctuates rapidly in intensity and direction. Together these two effects could be large enough to eliminate the possibility of damage to a target by a particle beam generated at a distance of 1,000 kilometers or more. Substitution of a beam of neutral particles created by stripping excess electrons from hydrogen ions would eliminate some of these frustrations, but this option has a number of technical problems. An orbiting accelerator that could produce high-energy hydrogen ions and strip them of their electrons would have to be massive, and the resulting neutral hydrogen beams could easily be countered with a variety of protective measures.

Laser antisatellite systems involve lesser technical obstacles, and a number of demonstration and development programs are currently underway. In 1978, the navy demonstrated the potential of laser weapons systems by shooting down a specially prepared missile at a distance of less than one kilometer. The air force is testing an airborne laser laboratory (ALL), but this system failed to shoot down a target missile in its first two attempts.

A similar but considerably more powerful system could be placed in earth orbit by the space shuttle. If a current laser weapon deposited just enough energy to damage its target at a distance of 1 kilometer, the power of the system would have to be increased by a factor of 1 million to damage targets at a range of 1,000 kilometers. Furthermore, if this system is to have significant advantages over the conventional MHV antisatellites, it must be capable of destroying multiple targets in a short period of time. The entire system weighing many tons would have to be rapidly rotated into a series of precise positions. This problem alone may make the entire program infeasible. Finally, even if a laser antisatellite were successfully deployed, the mirror and other vital components could be readily damaged by conventional antisatellites such as the current Soviet system or the U.S. MHV.

As a result, most analysts, including many in the U.S. defense community, have determined that deployment of an operational directed-energy antisatellite would be a waste of resources. In a study of space-based missile defense, the Defense Science Board concluded that "it is too soon to attempt to accelerate space-based laser development toward integrated space demonstration for any mission," including antisatellites. In particular, it cited the "technical uncertainties" in the development of laser power and optics. While relatively unsophisticated systems may be technically feasible for both the United States and the Soviet Union, the costs of deploying effective systems make them impractical for the foreseeable future.

Despite these stumbling blocks, the United States and (according to some reports) the Soviet Union are spending large sums on research and development in these areas. Senator Wallop of Wyoming, a major supporter, sought to add $250 million to the defense budget for the development of a laser weapons system. This was reduced to $50 million, but the supporters of a crash program have not given up, citing

The shuttle gives the U.S. an orbital antisatellite capability comparable to that apparently under development by the U.S.S.R.

the possibility that a technological breakthrough could give the Soviets major strategic and political advantages. According to Wallop, the Soviets will be testing an orbital laser weapon by mid-decade. Such competition is reminiscent of the "nuclear airplane" project of the late 1950s and early 1960s, on which billions of dollars were spent despite widespread belief that such a system would never get off the ground.

Increasing First-Strike Incentives

The role perceived for U.S. antisatellites has changed significantly since the SAINT program of the early 1960s. While plans for orbital bombs have disappeared, protection of other military assets in space is now of major importance.

Over the past two decades satellites have assumed major roles in U.S. military support systems for photographic and electronic reconnaissance, command, control, and communications; early warning; and navigation. For example, the satellite-based navigation system NAVSTAR is designed to be used by ground troops and tanks as well as ballistic missiles launched from Trident submarines. By interfering with NAVSTAR satellites, the Soviets could seriously impair U.S. military capabilities.

The availability of effective antisatellites would also significantly affect arms-control negotiations. Surveillance satellites monitor compliance with arms-control policy, and a threat to them is a threat to any such agreements. In addition, if a nuclear exchange appeared imminent, each side would probably seek to impair the other's satellite-based systems, which could be interpreted as a prelude to a nuclear first-strike. Such an attack might critically impair the ability of the other side to coordinate its response with conventional as well as nuclear weapons.

Just as the development of railroads increased the ability and incentives for both sides to begin World War I by allowing rapid mobilization of troops, the development of antisatellites would increase incentives for rapid action in times of international tension. The incentives for one nation to strike first, before its satellite support systems were disrupted, would be great. A second nation whose satellite systems had been destroyed would also be motivated to act before its adversary could capitalize on this advantage. The existence of antisatellite systems could also lead to the development of anti-antisatellites, further contributing to an expensive arms race in space.

A Question of Policy

The Reagan administration has inherited a multifaceted antisatellite research and development program. Within the next year, it must decide whether to proceed with tests of the MHV and choose a level of funding for research programs in directed-energy systems. Advocates of a relatively unrestricted U.S. program argue that efforts must be expanded to counter the perceived Soviet antisatellite system. Without such an effort, advocates say, the Soviets' antisatellite program will be capable of disrupting U.S. military satellites without risking a similar U.S. response, giving them a major advantage in either a conventional or nuclear conflict. A U.S. antisatellite capability could deter the Soviets from such action, and if deterrence failed, would allow the United States to impair the Soviet military satellite system in kind.

Advocates also argue that with our technological superiority in this area, we could easily outdistance the Soviets. They do not see the technical obstacles as insurmountable; Senator Wallop claims that "actual physical pieces of the system exist. Only the money and the will to put them together is lacking." Current policy is consistent with this opinion, and there is support in Congress for increasing the allocations for antisatellite and directed-energy research and development programs.

Critics argue that the development of a U.S. antisatellite system will not, in itself, discourage the Soviet Union from using its system. They note that since the Soviets are less dependent on their space systems than the United States, they would have less to lose in a conflict in space. Some supporters of the U.S. antisatellite effort, including Seymour Zeiberg, former deputy undersecretary of defense for research and development, acknowledge the logic of this argument and advocate a more measured policy. Rather than deploying antisatellites, they propose to increase the survivability of U.S. military support satellites and earth-based alternatives.

Opponents also note the apparent limitations of the Soviet antisatellite system: it has been used only against targets in low orbits of the same inclination as the hunter-killer satellites. The interception of satellites in orbits of radically different inclinations at altitudes above 1,000 kilometers is beyond Soviet capability, and there is little evidence the system could be readily extended to perform such tasks. Since most U.S. military satellites are in either very low orbits or well above 1,000 kilometers, the current Soviet anti-