F.A.S. PUBLIC INTEREST REPORT

Journal of the Federation of American Scientists (FAS)

NATURE OF ARMS RACES

Volume 40, No. 2 February 1987

END OF THE ARMS RACE: WAR, ARMS CONTROL, OR PETER OUT?

Three decades ago, the distinguished Harvard political scientist Samuel P. Huntington published a seminal analysis of arms races which is here reprinted with a view to helping FAS members understand the nature and prospects of the 1945-1987 superpower nuclear arms race.

This is already, according to Huntington's study, the longest of the 13 arms races of the 19th and 20th centuries (in the 17th and 18th centuries the major competition was first for monetary resources, e.g. gold and silver, and then for territories, e.g. colonies, rather than for armaments per se). According to Huntington, the qualitative arms races are safer than the quantitative ones. Indeed, in a concluding observation that many members will question, Huntington observes that a qualitative arms race "may well be a most desirable form of competition" between the United States and the Soviet Union, at least compared to limited wars that might otherwise sublimate the competition.

On the other hand, FAS members will appreciate how precisely Huntington predicted President Reagan's Star Wars program—and FAS's assessment of President Reagan's motivations—a quarter of a century before the President's announcement in 1983. Huntington observes in this 1958 article that states in such arms races tend to define "absolute qualitative goals," such as the erection of an "impenetrable system of defenses," and, he noted the "formulation by a state of its armaments goal in absolute terms is more likely to reflect the desire to obscure from its rivals the true relative superiority which it wishes to achieve or to obscure from itself the need to participate actively in the balancing process" [ed. note: i.e. arms control].

Other conclusions that FAS members will consider well established in the intervening period since the essay's publication are:

(Continued on page 2)

ARMS RACES: PREREQUISITES AND RESULTS

Samuel P. Huntington

Introduction

Si vis pacem, para bellum, is an ancient and authoritative adage of military policy. Of no less acceptance, however, is the other, more modern, proposition: "Armaments races inevitably lead to war." Juxtaposed, these two advices suggest that the maxims of social science, like the proverbs of folklore, reflect a many-sided truth. The social scientist, however, cannot escape with so easy an observation. He has the scholar's responsibility to determine as fully as possible to what extent and under what conditions his conflicting truths are true. The principal aim of this essay is to attempt some resolution of the issue: When are arms races a prelude to war and when are they a substitute for war?

Throughout history states have sought to maintain their peace and security by means of military strength. The arms race in which the military preparations of two states are intimately and directly interrelated is, however, a relatively modern phenomenon. The conflict between the apparent feasibility of preserving peace by arming for war and the apparent inevitability of competitive arms increases resulting in war is, therefore, a comparatively new one. The second purpose of this essay is to explore some of the circumstances which have brought about this uncertainty as to the relationship between war, peace, and arms increases. The problem here is: What were the prerequisites to the emergence of the arms race as a significant form of international rivalry in the nineteenth and twentieth centuries?

(Continued on page 3)

Samuel P. Huntington

Harrison Brown Dies, pg. 20

(Continued from page 1)

• that, in arms races, the "principal grievances and antagonisms of (the) states become concentrated upon each other and, as a result, this antagonism becomes the primary focus of their respective foreign policies" and "diplomatic maneuvering gives way to the massing of military force."

• that the arms race tends to focus on the type of military forces with which each side is "best able to harm" the other, often the weapon with longest effective range—here the ballistic missile in particular, and the strategic forces in general.

• that the Soviet Union is an example of Huntington's observation that, in the past, "countries which lagged behind in the twin processes of democratization and industrialization were severely handicapped in the race for armaments."

Two key questions posed by one article are:

• will the "likelihood of (this) arms race ending in war tend to vary inversely with the length of the arms race and directly with the extent to which it is quantitative rather than qualitative in character?" All this would be good to hear.

• have we passed Huntington's two danger points: a) the response of the challenged state to the initial increases in armaments by the challenging state and b) the reaction of the challenger who has been successful in initially achieving his goal to the frantic belated efforts of the challenged state to retrieve its former position? Or is the Star Wars effort really danger point b)—the "frantic belated" effort of the challenged state to retrieve its former position in the face of a parity achieved by the Soviet Union?

In any case, no better article exists to provoke our membership to review where the arms race may be heading especially under this administration. Following it is some commentary. Members are encouraged to write in with their views. —JJS

The article reprinted in this issue was originally published in "Public Policy: A Yearbook of the Graduate School of Public Administration," Harvard University, 1958, edited by Carl J. Friedrich and Seymour E. Harris. Extensive footnotes and a bibliographical note have been eliminated for space reasons. With the exception of the first box on page 3, the other boxed material is editorial commentary and questions. Researchers requiring the complete text may purchase it from FAS for $10.

FAS

Chairman: MATTHEW S. MESELSON
Vice Chairman: ANDREW M. SESSLER
Secretary: GEORGE A. SILVER
Treasurer: ROBERT M. SOLOW
Director: JEREMY J. STONE

The Federation of American Scientists is a unique, non-profit, civic organization, licensed to lobby in the public interest, and composed of 5,000 natural and social scientists and engineers who are concerned with problems of science and society. Democratically organized with an elected National Council of 24 members, FAS was first organized in 1945 as the Federation of Atomic Scientists and has functioned as a conscience of the scientific community for more than forty years.

SPONSORS

*Philip W. Anderson (Physics)
*Christian B. Anfinsen (Biochemistry)
*Kenneth J. Arrow (Economics)
*Julius Axelrod (Biochemistry)
*David Baltimore (Biochemistry)
Leona Baumgartner (Pub. Health)
Paul Beeson (Medicine)
Lipman Bers (Mathematics)
*Hans A. Bethe (Physics)
*Konrad Bloch (Chemistry)
*Norman E. Borlaug (Wheat)
Anne Pitts Carter (Economics)
*Owen Chamberlain (Physics)
Abram Chayes (Law)
Morris Cohen (Engineering)
Mildred Cohn (Biochemistry)
*Leon N. Cooper (Physics)
Paul B. Cornely (Medicine)
*Andre Cournand (Medicine)
Carl Djerassi (Organic Chem.)
*Renato Dulbecco (Microbiology)
John T. Edsall (Biology)
Paul R. Ehrlich (Biology)
*Val L. Fitch (Physics)
Jerome D. Frank (Psychology)
John Kenneth Galbraith (Economics)
Richard L. Garwin (Physics)
*Walter Gilbert (Biochemistry)
Edward L. Ginzton (Engineering)
*Donald Glaser (Physics-Biology)
*Sheldon L. Glashow (Physics)
Marvin L. Goldberger (Physics)
Walter W. Heller (Economics)
*Alfred D. Hershey (Biology)
John P. Holdren (Energy/Arms Con.)
*Robert W. Holley (Biochemistry)
Carl Kaysen (Economics)
*H. Gobind Khorana (Biochemistry)
*Arthur Kornberg (Biochemistry)
*Polykarp Kusch (Physics)
*Willis E. Lamb, Jr. (Physics)
*Wassily W. Leontief (Economics)
*William N. Lipscomb (Chemistry)
*S.E. Luria (Biology)
Roy Menninger (Psychiatry)
Robert Merton (Sociology)
Matthew S. Meselson (Biochemistry)
Neal E. Miller (Psychology)
Philip Morrison (Physics)
*Daniel Nathans (Biochemistry)
Franklin A. Neva (Medicine)
*Marshall Nirenberg (Biochemistry)
Robert N. Noyce (Indus. Exec.)
*Severo Ochoa (Biochemistry)
Charles E. Osgood (Psychology)
*Linus Pauling (Chemistry)
*Arno A. Penzias (Astronomy)
Gerard Piel (Sci Publisher)
Charles C. Price (Chemistry)
Mark Ptashne (Molecular Biology)
*Edward M. Purcell (Physics)
George Rathjens (Political Science)
*Burton Richter (Physics)
David Riesman, Jr. (Sociology)
Walter Orr Roberts (Solar Astron.)
*J. Robert Schrieffer (Physics)
*Julian Schwinger (Physics)
*Glenn T. Seaborg (Chemistry)
Stanley K. Sheinbaum (Economics)
*Herbert A. Simon (Psychology)
Alice Kimball Smith (History)
Cyril S. Smith (Metallurgy)
*Henry Taube (Chemistry)
*Howard M. Temin (Microbiology)
*James Tobin (Economics)
*Charles H. Townes (Physics)
Frank von Hippel (Physics)
*George Wald (Biology)
Myron E. Wegman (Medicine)
Victor F. Weisskopf (Physics)
Jerome B. Wiesner (Engineering)
Robert R. Wilson (Physics)
C.S. Wu (Physics)
Alfred Yankauer (Medicine)
Herbert F. York (Physics)

NATIONAL COUNCIL MEMBERS (elected)

Bruce Blair (Policy Analysis)
Rosemary Chalk (Pol. Science)
Thomas B. Cochran (Physics)
E. William Colglazier (Physics)
Hugh E. DeWitt (Physics)
John Harte (Energy)
William A. Higinbotham (Physics)
Gerald Holton (Physics)
Jerry F. Hough (Pol. Science)
Robert W. Kates (Geography)
Carl Kaysen (Economics)
Henry C. Kelly (Technology Policy)
Barbara G. Levi (Physics)
Francis E. Low (Physics)
Jessica Tuchman Mathews (Biochemistry)
Christopher E. Paine (Def. Policy)
Victor Rabinowitch (World Dev.)
Arthur H. Rosenfeld (Physics)
Carl E. Sagan (Astronomy)
Andrew M. Sessler (Physics)
George Stanford (Physics)
Lynn Sykes (Geophysics)
Archie L. Wood (Defense Policy)

Ex Officio: John P. Holdren, Frank von Hippel

*Nobel Laureate

FAS The Federation of American Scientists Fund, founded in 1971, is the 501 (c)(3) tax-deductible research and education arm of FAS.

Frank von Hippel, Chairman
Moshe Alafi
David Armington
David Baltimore
Proctor W. Houghton
Matthew S. Meselson (ex officio)
Rosalyn R. Schwartz
Stanley K. Sheinbaum
Jeremy J. Stone (ex officio)
Martin Stone
Martin S. Thaler
Alan M. Thorndike
Herbert F. York

The FAS Public Interest Report (USPS 188-100) is published monthly except July and August at 307 Mass. Ave., NE, Washington, D.C. 20002. Annual subscription $25/year. Copyright © 1986 by the Federation of American Scientists.
POSTMASTER: Send address changes to FAS, 307 Massachusetts Avenue, NE, Washington, D.C. 20002.

(Continued from page 1)

For the purposes of this essay, an arms race is defined as a progressive, competitive peacetime increase in armaments by two states or coalition of states resulting from conflicting purposes or mutual fears. An arms race is thus a form of reciprocal interaction between two states or coalitions. A race cannot exist without an increase in arms, quantitatively or qualitatively, but every peacetime increase in arms is not necessarily the result of an arms race. A nation may expand its armaments for the domestic purposes of aiding industry or curbing unemployment, or because it believes an absolute need exists for such an increase regardless of the actions of other states. In the 1880s and 1890s, for instance, the expansion of the United States Navy was apparently unrelated to the actions of any other power, and hence not part of an arms race. An arms race reflects disagreement between two states as to the proper balance of power between them. The concept of a "general" arms race in which a number of powers increase their armaments simultaneously is, consequently, a fallacious one. Such general increases either are not the result of self-conscious reciprocal interaction or are simply the sum of a number of two-state antagonisms. In so far as the arms policy of any one state is related to the armaments of other states, it is a function of concrete, specific goals, needs, or threats arising out of the political relations among the states. Even Britain's vaunted two-power naval standard will be found, on close analysis, to be rooted in specific threats rather than in abstract considerations of general policy.

Prerequisites for An Arms Race

Prior to 1789 certain antagonistic relationships among states did at times have some characteristics of the modern arms race. Such relationships, however, were exceptional, and they usually lacked many essential features of the modern type of race. Certain conditions peculiarly present in the nineteenth and twentieth centuries would appear to be responsible for the emergence of the arms race as a frequent and distinct form of international rivalry. Among the more significant of these conditions are: a state system which facilitates the balancing of power by internal rather than external means; the preeminence of military force-in-being over territory or other factors as an element of na-

THE THIRTEEN PAST ARMS RACES

Since an arms race is necessarily a matter of degree, differences of opinion will exist as to whether any given relationship constitutes an arms race and as to what are the precise opening and closing dates of any given arms race. At the risk of seeming arbitrary, the following relationships are assumed to be arms races for the purposes of this essay:

1. France v. England	naval	1840-1866
2. France v. Germany	land	1874-1894
3. England v. France and Russia	naval	1884-1904
4. Argentina v. Chile	naval	1890-1902
5. England v. Germany	naval	1898-1912
6. France v. Germany	land	1911-1914
7. England v. United States	naval	1916-1930
8. Japan v. United States	naval	1916-1922
9. France v. Germany	land	1934-1939
10. Soviet Union v. Germany	land	1934-1941
11. Germany v. England	air	1934-1939
12. United States v. Japan	naval	1934-1941
13. Soviet Union v. United States	nuclear	1946-

In the above table, the five arms races which ended in war averaged about 5 years in length, the three influenced by arms control averaged about 10 years and the five that petered out averaged 20 years. This provides some support for Huntington's theory that the danger of war varies inversely with the length of the arms competition.

(Editor's note: The arms races described at left seem to have had these characteristics according to Charles Fairbanks of Johns Hopkins SAIS and others, although these judgments are not explicit in Huntington's article.)

Length in years	Qualitative or Quantitative	End in war, arms control or petered out?
1. 26	qualitative and later qualitative with steamships and ironclads.	petered out
2. 20	quantitative	petered out
3. 20	quantitative	petered out
4. 12	qualitative and quantitative	ended through the world's first naval arms control agreement
5. 14	quantitative and then qualitative race in size and strength of Dreadnoughts (i.e. battleships)	petered out
6. 3	quantitative	World War I
7. 14	qualitative and quantitative (1916-1921), quantitative (1922-1930)	ended through arms control in the Washington Naval Treaty of 1922 and the London Treaty of 1930
8. 6	qualitative and quantitative	ended through arms control in the Washington Naval Treaty
9. 3	quantitative	World War II
10. 5	quantitative	World War II
11. 5	quantitative and qualitative (in the change from biplane to monoplane for example)	World War II
12. 7	quantitative	World War II
13. 40	Basically qualitative with catchup efforts by the Soviet Union	war, arms control or petering out?

tional power; the capacity within each state to increase its military strength through quantitative or qualitative means; and the conscious awareness by each state of the dependence of its own arms policy upon that of another state.

Balancing Power: External and Internal Means

Arms races are an integral part of the international balance of power. From the viewpoint of a participant, an arms race is an effort to achieve a favorable international distribution of power. Viewed as a whole, a sustained arms race is a means of achieving a dynamic equilibrium of power between two states or coalitions of states. Arms races only take place between states in the same balance of power system. The more isolated a nation is from any balance of power system the less likely it is to become involved in an arms race. Within any such system, power may in general be balanced in two ways: externally through a realignment of the units participating in the system (diplomacy), or internally by changes in the inherent power of the units. The extent to which the balancing process operates through external or internal means usually depends upon the number of states participating in the system, the opportunity for new states to join the system, and the relative distribution of power among the participating states.

The relations among the states in a balance of power system may tend toward any one of three patterns, each of which assigns somewhat different roles to the external and internal means of balancing power. A situation of *bellum omnium contra omnes* exists when there are a large number of states approximately equal in power and when there is an approximately equal distribution of grievances and antagonisms among the states. In such a system, which was perhaps most closely approximated by the city-states of the Italian Renaissance, primary reliance is placed upon wily diplomacy, treachery, and surprise attack. Since no bilateral antagonisms continue for any length of time, a sustained arms race is very unlikely. A second balance of power pattern involves an all-against-one relationship: the coalition of a number of weaker states against a single *grande nation.* The fears and grievances of the weaker states are concentrated against the stronger, and here again primary reliance is placed upon diplomatic means of maintaining or restoring the balance. European politics assumed this pattern in the successive coalitions to restrain the Hapsburgs, Louis XIV, Frederick II, Napoleon, and Hitler. At times, efforts may be made to bring in other states normally outside the system to aid in restoring the balance.

A third pattern of balance of power politics involves bilateral antagonisms between states or coalitions of states roughly equal in strength. Such bilateral antagonisms have been a continuing phenomenon in the western balance of power system: France *vs.* England, Austria *vs.* France and then Prussia (Germany) *vs.* France, Austria-Hungary *vs.* Russia, the Triple Alliance *vs.* the Triple Entente, and, now, the United States *vs.* the Soviet Union. In these relationships, the principal grievances and antagonisms of any two states become concentrated upon each other, and, as a result, this antagonism becomes the primary focus of their respective foreign policies. In this situation, diplomacy and alliances may play a significant role if a "balancer" exists who can shift his weight to whichever side appears to be weaker. But no balancing state can exist if all the major powers are involved in bilateral antagonisms or if a single overriding antagonism forces virtually all the states in the system to choose one side or the other (bipolarization). In these circumstances, the balancing of power by rearranging the units of power becomes difficult. Diplomatic maneuvering gives way to the massing of military force. Each state relies more on armaments and less on alliances. Other factors being equal, the pressures toward an arms race are greatest when international relations assume this form.

In the past century the relative importance of the internal means of balancing power has tended to increase. A single world-wide balance of power system has tended to develop, thereby eliminating the possibility of bringing in outside powers to restore the balance. At the same time, however, the number of great powers has fairly constantly decreased, and bilateral antagonisms have consequently become of greater importance. Small powers have tended to seek security either through neutrality (Switzerland, Sweden) or through reliance upon broadly organized efforts at collective security. The growth of the latter idea has tended to make military alliances aimed at a specific common foe less reputable and justifiable. Thus, the history of South American politics in the nineteenth century reveals a pattern of constantly shifting alliances and ententes. In 1851, the expansion of Argentine power led Brazil and Uruguay into an alliance. A hundred years later, the Argentine-Brazilian balance of power was still a key element in South American politics, but, with intra-American alliances discredited, the balance depended upon an equilibrium between Argentine and Brazilian military power. Alliances were perhaps the primary means of balancing power in Europe before 1870. Between 1870 and 1914 both alliances and armaments played important roles. Since 1918 the relative importance of armaments has probably increased. The primary purpose of the military pacts of the post-World War II period, with the possible exception of NATO, generally has been the extension of the protection of a great power to a series of minor powers, rather than the uniting of a number of more or less equal powers in pursuit of a common objective. In addition, the development of democratic control over foreign policy has made alliances more difficult. Alignments dictated by balance of power considerations may be impossible to carry out due to public opinion. Rapid shifts in alliances from friends to enemies also are difficult to execute in a democratic society. Perhaps, too, a decline in the arts of diplomacy has contributed to the desire to rest one's security upon resources which are "owned" rather than "pledged."

Elements of Power: Money, Territory, Armaments

Arms races only take place when military forces-in-be-

ing are of direct and prime importance to the power of a state. During the age of mercantilism, for instance, monetary resources were highly valued as an index of power, and, consequently, governmental policy was directed toward the accumulation of economic wealth which could then be transformed into military and political power. These actions, which might take a variety of forms, were in some respects the seventeenth century equivalents of the nineteenth and twentieth century arms races. In the eighteenth century, territory was of key importance as a measure of power. The size of the armies which a state could maintain was roughly proportional to its population, and, in an agrarian age, it population was roughly proportional to its territory. Consequently, an increase in military power required an increase in territory. Within Europe, territory could be acquired either by conquest, in which case a surprise attack was probably desirable in order to forestall intervention by other states, or by agreement among the great powers to partition a smaller power. Outside of Europe, colonial territories might contribute wealth if not manpower to the mother country, and these could be acquired either by discovery and settlement or by conquest. Consequently, territorial compensations were a primary means of balancing power, and through the acquisition of colonies, states jealous of their relative power could strive to improve their position without directly challenging another major state and thereby provoking a war.

During the nineteenth century territory became less important as an index of power, and industry and armaments more important. By the end of the century all the available colonial lands had been occupied by the major powers. In addition, the rise of nationalism and of self-determination made it increasingly difficult to settle differences by the division and bartering of provinces, small powers, and colonies. By expanding its armaments, however, a state could still increase its relative power without decreasing the absolute power of another state. Reciprocal increases in armaments made possible an unstable and dynamic, but none the less real equilibrium among the major powers. The race for armaments tended to replace the race for colonies as the "escape hatch" through which major states could enhance their power without directly challenging each other.

The increased importance of armaments as a measure of national power was reflected in the new emphasis upon disarmament in the efforts to resolve antagonisms among nations. The early peace writers, prior to the eighteenth century, placed primary stress upon a federation of European states rather than upon disarmament measures. It was not until Kant's essay on "Eternal Peace" that the dangers inherent in an arms race were emphasized, and the reduction of armaments made a primary goal. In 1766 Austria made the first proposal for a bilateral reduction in forces to Frederick the Great, who rejected it. In 1787 France and England agreed not to increase their naval establishments. In 1816 the Czar made the first proposal for a general reduction in armaments. Thenceforth, throughout the nineteenth century problems of armament and disarmament played an increasingly significant role in diplomatic negotiations.

Capacity for Qualitative and Quantitative Increases in Military Power

An arms race requires the progressive increase from domestic sources of the absolute military power of a state. This may be done quantitatively, by expanding the numerical strength of its existing forms of military force, or qualitatively, by replacing its existing forms of military force (usually weapons systems) with new and more effective forms of force. The latter requires a dynamic technology, and the former the social, political and economic capacity to reallocate resources from civilian to military purposes. Before the nineteenth century, the European states possessed only a limited capacity for either quantitative or qualitative increases in military strength. Naval technology, for instance, has been virtually static for almost three centuries: the sailing ship of 1850 was not fundamentally different from that of 1650, the naval gun of 1860 not very much removed from that of 1560. As a result, the ratio of construction time to use time was extremely low: a ship built in a few months could be used for the better part of a century. Similarly, with land armaments, progress was slow, and only rarely could a power hope to achieve a decisive edge by a "technological breakthrough." Beginning with the Industrial Revolution, however, the pace of innovation in military technology constantly quickened, and the new weapons systems inevitably stimulated arms races. The introduction, first, of the steam warship and then of the ironclad, for instance, directly intensified the naval competition between England and France in the 1850s and 1860s. Throughout the nineteenth century, the importance of the weapons technician constantly increased relative to the importance of the strategist.

U.S.-SOVIET ARMS RACE: QUALITATIVE?

The U.S.-Soviet arms race has moved from atom bombs to hydrogen bombs, from strategic bombers to ballistic missiles, from single-warheaded missiles to MIRVed missiles and from ballistic missiles to cruise missiles. When, for example, the Soviet Union caught up in land-based missiles, the U.S. moved on to MIRV. And the U.S. advantage in cruise missiles underlies the (transient) readiness of the present administration to talk of eliminating ballistic missiles. For the United States military industrial complex, an arms race based on qualitative change and constant outmoding is perfectly designed—and it exploits the weakness in the Soviet system that can produce, albeit with great effort, large numbers of any given system but is not flexible or technologically creative. This is the guiding perception of American conservatives who put little weight on the economic burden or danger of war that is associated with the contest.

Broad changes in economic and political structure were at the same time making quantitative arms races feasible. The social system of the *ancien regime* did not permit a full mobilization of the economic and manpower resources of a nation. So long as participation in war was limited to a small class, competitive increases in the size of armies could not proceed very far. The destruction of the old system, the spread of democracy and liberalism, the increasing popularity among all groups of the "nation in arms" concept, all permitted a much more complete mobilization of resources for military purposes than had been possible previously. In particular, the introduction of universal military service raised the ceiling on the size of the army to the point where the limiting factor was the civilian manpower necessary to support the army. In addition, the development of industry permitted the mass production and mass accumulation of the new weapons which the new technology had invented. The countries which lagged behind in the twin processes of democratization and industrialization were severely handicapped in the race for armaments.

In the age of limited wars little difference existed between a nation's military strength in peace and its military strength in war. During the nineteenth century, however, the impact of democracy and industrialism made wars more total, victory or defeat in them became more significant (and final), military superiority became more critically important, and consequently a government had to be more fully assured of the prospect of victory before embarking upon war. In addition, the professional officer corps which developed during the nineteenth century felt a direct responsibility for the military security of the state and emphasized the desirability of obtaining a safe superiority in armaments. As a result, unless one of the participants possessed extensive staying power due to geography or resources, the outcome of a war depended almost as much upon what happened before the declarations of war as after. By achieving superiority in armaments it might be possible for a state to achieve the fruits of war without suffering the risks and liabilities of war. Governments piled up armaments in peacetime with the hope either of averting war or of insuring success in it should it come.

Absolute and Relative Armaments Goals

A state may define its armaments goals in one of two ways. It can specify a certain *absolute* level or type of armaments which it believes necessary for it to possess irrespective of the level or type possessed by other states. Or, it can define its goal in *relative* terms as a function of the armaments of other states. Undoubtedly, in any specific case, a state's armaments reflect a combination of both absolute and relative considerations. Normally, however, one or the other will be dominant and embodied in official statements of the state's armaments goals in the form of an "absolute need" or a ratio-goal. Thus, historically Great Britain followed a relative policy with respect to the capital ships in its navy but an absolute policy with respect to its cruisers, the need for which, it was held, stemmed from the unique nature of the British Empire.

If every state has absolute goals, arms races would be impossible: each state would go its separate way uninfluenced by the actions of its neighbors. Nor would a full scale arms race develop if an absolute goal were pursued consistently by one power in an antagonistic relationship: whatever relative advantage the second power demanded would be simply a function of the constant absolute figure demanded by the first power. An arms race only arises when two or more powers consciously determine the quantitative or qualitative aspects of their armaments as functions of the armaments of the other power. Absolute goals, however, are only really feasible when a state is not a member of or only on the periphery of a balance of power system. Except in these rare cases, the formulation by a state of its armaments goal in absolute terms is more likely to reflect the desire to obscure from its rivals the true relative superiority which it wishes to achieve or to obscure from itself the need to participate actively in the balancing process. Thus, its Army Law of 1893 was thought to give Germany a force which in quantity and quality would be unsurpassable by any other power. Hence Germany was,

> in the eyes of her rulers, too powerful to be affected by a balancing movement restricted only to the continent . . . From this time on Germany considered herself militarily invulnerable, as if in a state of splendid isolation, owing to the excellence of her amalgam army.

U.S. EXPLOITS QUALITATIVE ADVANTAGE

"I have directed the deputy secretary to oversee the institutionalization of competitive strategies throughout the Defense Department" rather than to try to match "the Soviets tank for tank, ship for ship or aircraft for aircraft."

The objective of competitive strategies "is to exploit the historic Soviet concern with homeland defense by utilizing the superior low observable technology we can now embody in our aircraft and missiles."

"To cope with the [stealth bombers] the Soviets will be forced to make an enormous investment in new defensive systems over a span of many years, while their existing enormous investment becomes rapidly obsolete. . . . At the same time, Moscow will not be able to scrap its existing air defense system because the B1B [bomber] and the advanced cruise missile launched from our B52s will maintain the effectiveness of our conventional penetrating bomber force well into the 1990s.

—Statement by Secretary of Defense Caspar Weinberger, *Washington Post*, January 11, 1985

[Ed. note: Here we see the use of the qualitative arms race to outmode the adversaries arms and to compete with it. The Reagan Administration has formed a committee to institutionalize such strategies and to shape the future defense agenda after President Reagan leaves office.]

As a result, Germany let her army rest, turned her energies to the construction of a navy, and then suddenly in 1911 became aware of her landpower inferiority to the Dual Alliance and had to make strenuous last minute efforts to increase the size of her forces. Somewhat similarly, states may define absolute qualitative goals, such as the erection of an impenetrable system of defenses (Maginot Line) or the possession of an "ultimate" or "absolute" weapon, which will render superfluous further military effort regardless of what other states may do. In 1956 American airpower policy was consciously shaped not to the achievement of any particular level of air strength relative to that of the Soviet Union, but rather to obtaining an absolute "sufficiency of airpower" which would permit the United States to wreak havoc in the Soviet Union in the event of an all-out war. The danger involved in an absolute policy is that, if carried to the extreme, it may lead to a complacent isolationism blind to the relative nature of power.

The armaments of two states can be functionally interrelated only if they are also similar or complementary. An arms race is impossible between a power which possesses only a navy and one which possesses only an army: no one can match divisions against battleships. A functional relationship between armaments is complementary when two military forces possessing different weapons systems are designed for combat with each other. In this sense, an air defense fighter command complements an opposing strategic bombing force or one side's submarine force complements the other's antisubmarine destroyers and hunter-killer groups. A functional relationship is similar when two military forces are not only designed for combat with each other but also possess similar weapons systems, as has been very largely the case with land armies and with battle fleets of capital ships. In most instances in history, arms races have involved similar forces rather than complementary forces, but no reason exists why there should not be an arms race in the latter. The only special problem posed by a complementary arms race is that of measuring the relative strengths of the opposing forces. In a race involving similar forces, a purely quantitative measurement usually suffices; in one of complementary forces, qualitative judgments are necessary as to the effectiveness of one type of weapons system against another.

Even if both parties to an arms race possess similar land, sea and air forces, normally the race itself is focused on only one of these components or even on only one weapons system within one component, usually that type of military force with which they are best able to harm each other. This component or weapons system is viewed by the states as the decisive form of military force in their mutual relationship, and competition in other forces or components is subordinated to the race in this decisive force. The simple principles of concentration and economy of force require states to put their major efforts where they will count most. The arms race between Germany and England before World War I was in capital ships. The arms race between the same two countries before World War II was in bombers and fighters. The current race between the Soviet Union and the United States has largely focused upon nuclear weapons and their means of delivery, and has not extended to the massing of conventional weapons and manpower. In general, economic considerations also preclude a state from becoming involved at the same time in two separate arms races with two different powers in two different forms of military force. When her race in land forces with France slackened in the middle 1890s, Germany embarked upon her naval race with Great Britain, and for the first decade of the twentieth century the requirements of this enterprise prevented any substantial increase in the size of the army. When the naval race in turn slackened in 1912, Germany returned to the rebuilding of her ground forces and to her military manpower race with France.

SDI: COMPLEMENTARY ARMS RACE?

If the Soviet response to SDI is to build penetrating weapons rather than to match the SDI, as seems likely, it would constitute the unusual "complementary" arms race described here.

Two governments can consciously follow relative arms policies only if they are well informed of their respective military capabilities. The general availability of information concerning armaments is thus a precondition for an arms race. Prior to the nineteenth century when communication and transportation were slow and haphazard, a state would frequently have only the vaguest notions of the military programs of its potential rivals. Often it was possible for one state to make extensive secret preparations for war. In the modern world, information with respect to military capabilities has become much more widespread and has been one of the factors increasing the likelihood of arms races. Even now, however, many difficulties exist in getting information concerning the arms of a rival which is sufficiently accurate to serve as a basis for one's own policy. At times misconceptions as to the military strengths and policies of other states become deeply ingrained, and at other times governments simply choose to be blind to significant changes in armaments. Any modern government involved in an arms race, moreover, is confronted with conflicting estimates of its opponent's strength. Politicians, governmental agencies and private groups all tend to give primary credit to intelligence estimates which confirm military policies which they have already espoused for other reasons. The armed services inevitably overstate the military capabilities of the opponent: in 1914, for instance, the Germans estimated the French army to have 121,000 more men than the German army, the French estimated the German army to have 134,000 more men than the French army, but both countries agreed in their estimates of the military forces of third powers. Governments anxious to reduce expenditures and taxes pooh-pooh warnings as to enemy strength: the reluctance of the Baldwin gov-

ernment to credit reports of the German air build-up seriously delayed British rearmament in the 1930s. At other times, exaggerated reports as to enemy forces may lead a government to take extraordinary measures which are subsequently revealed to have been unnecessary. Suspicions that the Germans were exceeding their announced program of naval construction led the English government in 1909 to authorize and construct four "contingency" Dreadnoughts. Subsequently revelations proved British fears to be groundless. Similarly, in 1956 reports of Soviet aircraft production, later asserted to be considerably exaggerated, influenced Congress to appropriate an extra $900 million for the Air Force. At times, the sudden revelation of a considerable increase in an enemy's capabilities may produce a panic, such as the invasion panics of England in 1847-48, 1851-53, and 1859-61. The tense atmosphere of an arms race also tends to encourage reports of mysterious forces possessed by the opponent and of his development of secret new weapons of unprecedented power. Nonetheless, fragmentary and uncertain though information may be, its availability in one form or another is what makes the arms race possible.

Abortive and Sustained Arms Races

An arms race may end in war, formal or informal agreement between the two states to call off the race, or victory for one state which achieves and maintains the distribution of power which it desires and ultimately causes its rival to give up the struggle. The likelihood of war arising from an arms race depends in the first instance upon the relation between the power and grievances of one state to the power and grievances of the other. War is least likely when grievances are low, or, if grievances are high, the sum of the grievances and power of one state approximates the sum of the grievances and power of the other. An equality of power and an equality of grievances will thus reduce the chances of war, as will a situation in which one state has a marked superiority in power and the other in grievances. Assuming a fairly equal distribution of grievances, the likelihood of an arms race ending in war tends to vary inversely with the length of the arms race and directly with the extent to which it is quantitative rather than qualitative in character. This section deals with the first of these relationships and the next section with the second.

An arms race is a series of interrelated increases in armaments which if continued over a period of time produces a dynamic equilibrium of power between two states. A race in which this dynamic equilibrium fails to develop may be termed an abortive arms race. In these instances, the previously existing static equilibrium between the two states is disrupted without being replaced by a new equilibrium reflecting their relative competitive efforts in the race. Instead, rapid shifts take place or appear about to take place in the distribution of power which enhance the willingness of one state or the other to precipitate a conflict. At least one and sometimes two danger points occur at the beginning of every arms race. The first point arises with the response of the challenged state to the initial increases in armaments by the challenging state. The second danger point is the reaction of the challenger who has been successful in initially achieving his goal to the frantic belated efforts of the challenged state to retrieve its former position.

The formal beginning of an arms race is the first increase in armaments by one state—the challenger—caused by a desire to alter the existing balance of power between it and another state. Prior to this initial action, a pre-arms race static equilibrium may be said to exist. This equilibrium does not necessarily mean an equality of power. It simply reflects the satisfaction of each state with the existing distribution of power in the light of its grievances and antagonisms with the other state. Some of the most stable equilibriums in history have also been ones which embodied an unbalance of power. From the middle of the eighteenth century down to the 1840s, a static equilibrium existed between the French and British navies in which the former was kept roughly two-thirds as strong as the latter. After the naval race of 1841-1865 when this ratio was challenged, the two powers returned to it for another twenty year period. From 1865 to 1884 both British and French naval expenditures were amazingly constant, England's expenditures varying between 9.5 and 10.5 million pounds (with the exception of the crisis years of 1876-77 when they reached 11 and 12 million pounds) and France's expenditures varying from 6.5 to 7.5 million pounds. In some instances the equilibrium may receive the formal sanction of a treaty such as the Washington arms agreement of 1922

QUANTITATIVE RACES MORE DANGEROUS?

A common-sense rationale for Huntington's conclusion that quantitative arms races are more likely to end in war is that when war is seriously intended numbers of *current* weapons really matter and, accordingly, quantitative arms races are set in motion. But when political supremacy is at issue rather than impending war, long range research and development can be afforded with a view to better weapons years or decades away. This results in qualitative arms races which may have a better chance of avoiding war precisely because they are premised on the theory that war may, indeed, be avoided for some years.

(A major new element in the danger of the present arms race is, however, the potential for a war that nobody wants arising from the very short warning times, the consequent problems of command and control, and the overall dangers of escalation from lower-level conflict all combined with the cataclysmic nature of the war if it occurred. This, of course, is what motivates the FAS membership and others to prevent the arms competition—whether or not the parties believe that war is impending. Indeed, in this arms race, it is a cliche that nobody *wants* war.)

or the Treaty of Versailles. In each of these cases, the equilibrium lasted until 1934 when the two powers—Germany and Japan—who had been relegated to a lower level of armaments decided that continued inferiority was incompatible with their national goals and ambitions. In both cases, however, it was not the disparity of power in itself which caused the destruction of the equilibrium, but rather the fact that this disparity was unacceptable to the particular groups which assumed control of those countries in the early 1930s. In other instances, the static equilibrium may last for only a passing moment, as when France began reconstructing its army almost immediately after its defeat by Germany in 1871.

For the purposes of analysis it is necessary to specify a particular increase in armaments by one state as marking the formal beginning of the arms race. This is done not to pass judgment on the desirability or wisdom of the increase, but simply to identify the start of the action and reaction which constitute the race. In most instances, this initial challenge is not hard to locate. It normally involves a major change in the policy of the challenging state, and more likely than not it is formally announced to the world. The reasons for the challenging state's discontent with the status quo may stem from a variety of causes. It may feel that the growth of its economy, commerce, and population should be reflected in changes in the military balance of power (Germany, 1898; United States, 1916; Soviet Union, 1946). Nationalistic, bellicose, or militaristic individuals or parties may come to power who are unwilling to accept an equilibrium which other groups in their society had been willing to live with or negotiate about (Germany and Japan, 1934). New political issues may arise which cause a deterioration in the relationships of the state with another power and which consequently lead it to change its estimate of the arms balance necessary for its security (France, 1841, 1875; England, 1884).

Normally the challenging state sets a goal for itself which derives from the relation between the military strengths of the two countries prior to the race. If the relation was one of disparity, the initial challenge usually comes from the weaker power which aspires to parity or better. Conceivably a stronger power could initiate an arms race by deciding that it required an even higher ratio of superiority over the weaker power. But in actual practice this is seldom the case: the gain in security achieved in upping a 2:1 ratio to 3:1, for instance, rarely is worth the increased economic costs and political tensions. If parity of military power existed between the two countries, the arms race begins when one state determines that it requires military force superior to that of the other country.

In nine out of ten races the slogan of the challenging state is either "parity" or "superiority." Only in rare cases does the challenger aim for less than this, for unless equality or superiority is achieved, the arms race is hardly likely to be worthwhile. The most prominent exception to the "parity or superiority" rule is the Anglo-German naval race of 1898-1912. In its initial phase, German policy was directed not to the construction of a navy equal to England's but rather to something between that and the very minor navy which she possessed prior to the race. The rationale for building such a force was provided by Tirpitz's "risk theory": Germany should have a navy large enough so that Britain could not fight her without risking damage to the British navy to such an extent that it would fall prey to the naval forces of third powers (i.e., France and Russia). The fallacies in this policy became obvious in the following decade. On the one hand, for technical reasons it was unlikely that an inferior German navy could do serious damage to a superior British fleet, and, on the other hand, instead of making Britain wary of France and Russia the expansion of the German navy tended to drive her into their arms and consequently to remove the hostile third powers who were supposed to pounce upon a Britain weakened by Germany. One can only conclude that it is seldom worthwhile either for a superior power to attempt significantly to increase its superiority or for a weaker power to attempt to only reduce its degree of inferiority. The rational goals in an arms race are parity or superiority.

In many respects the most critical aspect of a race is the initial response which the challenged state makes to the new goals posited by the challenger. In general, these responses can be divided into four categories, two of which preserve the possibility of peace, two of which make war virtually inevitable. The challenged state may, first, attempt to counterbalance the increased armaments of its rival through diplomatic means or it may, secondly, immediately increase its own armaments in an effort to maintain or directly to restore the previously existing balance of military power. While neither of these responses guarantees the maintenance of peace, they at least do not precipitate war. The diplomatic avenue of action, if it exists, is generally the preferred one. It may be necessary, however, for the state to enhance its own armaments as well as attempting to secure reliable allies. Or, if alliances are impossible or undesirable for reasons of state policy, the challenged state must rely upon its own increases in armaments as the way of achieving its goal. In this case a sustained arms race is likely to result. During her period of splendid isolation, for instance, England met the French naval challenge of the 1840s by increasing the size and

TO WHAT EXTENT AN ARMS RACE?

Is the U.S.-Soviet contest still the result of "conflicting purposes or mutual fears"—still an "effort to achieve a favorable international distribution of power" and a "dynamic equilibrium of power"—or has it become something different: a political-bureaucratic competition divorced from any real purpose or real fear? Are we, instead, expanding armaments "for the domestic purposes of aiding industry or curbing unemployment, or because (we believe) an absolute need exists for such an increase regardless of the actions of other states [as in the theory of Star Wars.]

effectiveness of her own navy. At the end of the century when confronted by the Russo-French challenge, she both increased her navy and made tentative unsuccessful efforts to form an alliance with Germany. In response to the German challenge a decade later, she again increased her navy and also arrived at a rapprochement with France and Russia.

If new alliances or increased armaments appear impossible or undesirable, a state which sees its superiority or equality in military power menaced by the actions of another state may initiate preventive action while still strong enough to forestall the change in the balance of power. The factors which enter into the decision to wage preventive war are complex and intangible, but, conceivably, if the state had no diplomatic opportunities and if it was dubious of its ability to hold its own in an arms race, this might well be a rational course of behavior. Tirpitz explicitly recognized this in his concept of a "danger zone" through which the German navy would pass and during which a strong likelihood would exist that the British would take preventive action to destroy the German fleet. Such an attack might be avoided, he felt, by a German diplomatic "peace offensive" designed to calm British fears and to assure them of the harmless character of German intentions. Throughout the decade after 1898 the Germans suffered periodic scares of an imminent British attack. Although preventive action was never seriously considered by the British government, enough talk went on in high British circles of "Copenhagening" the German fleet to give the Germans some cause for alarm. In the "war in sight" crisis of 1875, the initial success of French rearmament efforts aimed at restoring an equality of military power with Germany stimulated German statesmen and military leaders carefully to consider the desirability of preventive war. Similarly, the actions of the Nazis in overthrowing the restrictions of the Treaty of Versailles in the early 1930s and starting the European arms build-up produced arguments in Poland and France favoring preventive war. After World War II at the beginning of the arms race between the United States and the Soviet Union a small but articulate segment of opinion urged the United States to take preventive action before the Soviet Union developed nuclear weapons. To a certain extent, the Japanese attack on the United States in 1941 can be considered a preventive action designed to forestall the inevitable loss of Japanese naval superiority in the western Pacific which would have resulted from the two-ocean navy program begun by the United States in 1939. In 1956 the Egyptians began to rebuild their armaments from Soviet sources and thus to disturb the equilibrium which had existed with Israel since 1949. This development was undoubtedly one factor leading Israel to attack Egypt and thereby attempt to resolve at least some of the outstanding issues between them before the increase in Egyptian military power.

At the other extreme from preventive action, a challenged state simply may not make any immediate response to the upset of the existing balance of power. The challenger may then actually achieve or come close to achieving the new balance of military force which it considers necessary. In this event, roles are reversed, the challenged suddenly awakens to its weakened position and becomes the challenger, engaging in frantic strenuous last-ditch efforts to restore the previously existing military ratio. In general, the likelihood of war increases just prior to a change in military superiority from one side to the other. If the challenged state averts this change by alliances or increased armaments, war is avoidable. On the other hand, the challenged state may precipitate war in order to prevent the change, or it may provoke war by allowing the change to take place and then attempting to undo it. In the latter case, the original challenger, have achieved parity or superiority, is in no mood or position to back down; the anxious efforts of its opponent to regain its military strength appear to be obvious war preparation; and consequently the original challenger normally will not hesitate to risk or provoke a war while it may still benefit from its recent gains.

Belated responses resulting in last-gasp arms races are most clearly seen in the French and British reactions to German rearmament in the 1930s . . .

A slightly different example of a belated, last minute arms race is found in the German-French and German-Russian competitions of 1911-1914 . . .

The danger of war is highest in the opening phases of an arms race, at which time the greatest elements of instability and uncertainty are present. If the challenged state neither resorts to preventive war nor fails to made an immediate response to the challenger's activities, a sustained arms race is likely to result with the probability of war decreasing as the initial action and counteraction fade into the past. Once the initial disturbances to the pre-arms race static equilibrium are surmounted, the reciprocal increases of the two states tend to produce a new, dynamic equilibrium reflecting their relative strength and participation in the race. In all probability, the relative military power of the two states in this dynamic equilibrium will fall somewhere between the previous status quo and the ratio-goal of the challenger. The sustained regularity of the increases in itself becomes an accepted and anticipated stabilizing factor in the relations between the two countries. A sus-

IS PREEMPTIVE CONFLICT CONCEIVABLE?

Would a successful Star Wars defense that seemed to be putting in place a pax Americana satellite defense that would or could shoot down all Soviet aircraft or missiles, produce Tirpitz's "danger zone" in which the Soviet Union, seeing "no diplomatic opportunities" and "dubious of its ability to hold its own in an arms race" decided to take "preventive action" to prevent this Maginot Line from being installed? Would the challenged state "precipitate war in order to prevent the change, or . . . provoke war by allowing the change to take place and then attempting to undo it."

tained quantitative race still may produce a war, but a greater likelihood exists that either the two states will arrive at a mutual accommodation reducing the political tensions which started the race or that one state over the long haul will gradually but substantially achieve its objective while the other will accept defeat in the race if this does not damage its vital interests. Thus, a twenty-five year sporadic naval race between France and England ended in the Middle 1860s when France gave up any serious effort to challenge the 3:2 ratio which England had demonstrated the will and the capacity to maintain. Similarly, the Anglo-German naval race slackened after 1912 when, despite failure to reach formal agreement, relations improved between the two countries and even Tirpitz acquiesced in the British 16:10 ratio in capital ships. Britain also successfully maintained her two-power standard against France and Russia for twenty years until changes in the international scene ended her arms competition with those two powers. Germany and France successively increased their armies from the middle 1870s to the middle 1890s when tensions eased and the arms build-up in each country slackened. The incipient naval races among the United States, Britain, and Japan growing out of World War I were restricted by the Washington naval agreement; the ten-year cruiser competition between the United States and England ended in the London Treaty of 1930; and eventually the rise of more dangerous threats in the mid-1930s removed any remaining vestiges of Anglo-American naval rivalry. The twelve-year arms race between Chile and Argentina ended in 1902 with a comprehensive agreement between the two countries settling their boundary disputes and restricting their armaments. While generalizations are both difficult and dangerous, it would appear that a sustained arms race is much more likely to have a peaceful ending than a bloody one.

Quantitative and Qualitative Arms Races

A state may increase its military power quantitatively, by expanding the numerical strength of its existing military forces, or qualitatively, by replacing its existing forms of military force (normally weapons systems) with new and more effective forms of force. Expansion and innovation are thus possible characteristics of any arms race, and to some extent both are present in most races. Initially and fundamentally every arms race is quantitative in nature. The race begins when two states develop conflicting goals as to what should be the distribution of military power between them and give these goals explicit statement in quantitative ratios of the relative strengths which each hopes to achieve in the decisive form of military force. The formal start of the race is the decision of the challenger to upset the existing balance and to expand its forces quantitatively. If at some point in the race a qualitative change produces a new decisive form of military force, the quantitative goals of the two states still remain roughly the same. The relative balance of power which each state desires to achieve is independent of the specific weapons and forces which enter into the balance. Despite the underlying adherence of both states to their original ratio-goals, however, a complex qualitative race produced by rapid technological innovation is a very different phenomenon from a race which remains simply quantitative.

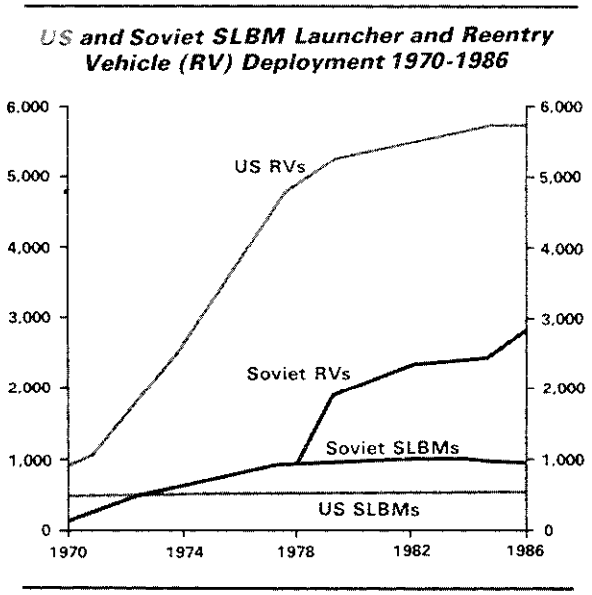
NAVAL BUDGETS AND NUMERICAL STRENGTHS

In the U.S.-Soviet arms race, the U.S. has been relatively unaware of Soviet budgets per se, and the hyped assessments of Soviet spending have played a relatively minor role. So also has the size of Soviet manpower. Even arms control enthusiasts have often preferred not to encourage limits on budgets lest this now neglected aspect of the arms competition become a contested arena. On the other hand, the Politburo, well aware of U.S. budget increases and decreases, may have been responding to them; the Soviet interest in a declining U.S. defense budget may be greater than we realize.

Probably the best examples of races which were primarily quantitative in nature are those between Germany and France between 1871 and 1914. The decisive element was the number of effectives each power maintained in its peacetime army and the number of reserves it could call to the colors in an emergency. Quantitative increases by one state invariably produced comparable increases by the other. The German army bill of 1880, for instance, added 25,000 men to the army and declared in its preamble that "far-reaching military reforms had been carried out outside of Germany which cannot remain without influence upon the military power of the neighboring countries." These increases it was alleged would produce "too considerable a numerical superiority of the enemy's forces." Again in 1887 Bismarck used Boulanger's agitation for an increase in the French army as a means of putting through an expansion of the German one. After the French reorganized their army in 1889 and drastically increased the proportion of young men liable to military service, the Germans added 20,000 men to their force in 1890. Three years later a still larger increase was made in the German army and justified by reference to recent French and Russian expansions. Similarly, the naval race of 1884-1905 between England, on the one hand, and France and Russia, on the other, was primarily quantitative in nature. Naval budgets and numerical strengths of the two sides tended to fluctuate in direct relation with each other.

A qualitative arms race is more complex than a quantitative one because at some point it involves the decision by one side to introduce a new weapons system or form of military force. Where the capacity for technological innovation exists, the natural tendency is for the arms race to become qualitative. The introduction of a new weapons system obviously is normally desirable from the viewpoint of the state which is behind in the quantitative race. The English-French naval rivalry of 1841-1865 grew out of the deteriorating relations between the two countries over Syr-

ia, Tahiti and Spain. Its first manifestation was quantitative: in 1841 the number of seamen in the French navy which for nearly a century had been about two-thirds the number in the British navy was suddenly increased so as to almost equal the British strength. Subsequently the large expansions which the French proposed to make in their dockyards, especially at Toulon, caused even Cobden to observe that "a serious effort seemed really to be made to rival us at sea." The Anglo-French quantitative rivalry subsided with the departure of Louis Philippe in 1848, but shortly thereafter it resumed on a new qualitative level with the determination of Napoleon III to push the construction of steam warships. The *Napoleon*, a screw propelled ship of the line of 92 guns, launched by the French in 1850 was significantly superior to anything the British could bring against it, until the *Agamemnon* was launched two years later. The alliance of the two countries in the Crimean War only temporarily suspended the naval race, and by 1858 the French had achieved parity with the British in fast screw ships of the line. In that year the French had 114 fewer sailing vessels in their navy than they had in 1852, while the number of British sailing ships had declined only from 299 to 296. On the other hand, the British in 1852 had a superiority of 73 sailing ships of the line to 45 for the French. By 1858, however, both England and France had 29 steam ships of the line while England had an enhanced superiority of 35 to 10 in sailing ships. A head start in steam construction and conversion plus the concentration of effort on this program had enabled the French, who had been hopelessly outnumbered in the previously decisive form of naval power, to establish a rough parity in the new form. In view of the British determination to restore their quantitative superiority and the superior industrial resources at their disposal, however, parity could only be temporary. In 1861 the British had 53 screw battleships afloat and 14 building while the French had only 35 afloat and two building.



The U.S.-Soviet Strategic Arms Race at sea.

By the time that the British had reestablished their superiority in steam warships, their opponents had brought forward another innovation which again threatened British control of the seas. The French laid down four ironclads in 1858 and two in 1859. The first was launched in November 1859 and the next in March 1860. The British launched their first ironclad in December 1860. The British program, however, was hampered by the Admiralty's insistence upon continuing to build wooden warships. The French stopped laying down wooden line of battle ships in 1856, yet the British, despite warnings that wooden walls were obsolete, continued building wooden ships down through 1860, and in 1861 the Admiralty brought in the largest request in its history for the purchase of timber. Meanwhile, in the fall of 1860 the French started a new construction program for ten more ironclads to supplement the six they already had underway. The British learned of these projects in February 1861 and responded with a program to add nine new ironclads to their fleet. In May 1861, the French had a total of fifteen ironclads built or building, the British only seven. From 1860 until 1865 the French possessed superiority or parity with the British in ironclad warships. In February 1863, for instance, the French had four ironclads mounting 146 guns ready for action, the British four ironclads mounting 116 guns. Thanks to the genius and initiative of the director of French naval construction, Dupuy de Lome, and the support of Napoleon III, there had occurred, as one British military historian put it,

> an astonishing change in the balance of power which might have been epoch-making had it not been so brief, or if France and Britain had gone to war, a reversal which finds no place in any but technical histories and which is almost entirely unknown in either country to-day. In a word, supremacy at sea passed from Britain to France.

This was not a supremacy, however, which France could long maintain. By 1866, Britannia had retrieved the trident. In that year England possessed nineteen ironclads, France thirteen, and the English superiority was enhanced by heavier guns. Thereafter the naval strengths of the two powers resumed the 3:2 ratio which had existed prior to 1841.

In general, as this sequence of events indicates, technological innovation favors, at least temporarily, the numerically weaker power. Its long-run effects, however, depend upon factors other than the currently prevailing balance of military strength. It was indeed paradoxical that France should make the innovations which she did make in her naval race with England. In the 1850s and 1860s France normally had twice as much timber on hand in her dockyards as had the British, and she was, of course, inferior to England in her coal and iron resources. Nonetheless she led the way in the introduction of steam and iron, while the Royal Navy, which was acutely hampered by a timber shortage, clung to the wooden ships. In this instance, on both sides, immediate needs and the prospects of immedi-

ate success prevailed over a careful consideration of long-term benefits.

The problem which technological innovation presents to the quantitatively superior power is somewhat more complex. The natural tendencies for such a state are toward conservatism: any significant innovation will undermine the usefulness of the current type of weapons system in which it possesses a superiority. What, however, should be the policy of a superior power with respect to making a technological change which its inferior rivals are likely to make in the near future? The British navy had a traditional answer to this problem: never introduce any development which will render existing ships obsolete but be prepared if any other state does make an innovation to push ahead an emergency construction program which will restore the previously existing ratio. While this policy resulted, as we have seen above, in some close shaves, by the beginning of the twentieth century it had become a fundamental maxim of British naval doctrine. Consequently, Sir John Fisher's proposal in 1904 to revolutionize naval construction by introducing the "all big gun ship" which would render existing capital ships obsolete was also a revolution in British policy. In terms of its impact upon the Anglo-German naval balance, Fisher's decision was welcomed by many Germans and condemned by many British. Although the construction of Dreadnoughts would force Germany to enlarge the Kiel Canal, the Germans seized the opportunity to start the naval race afresh in a class of vessels in which the British did not have an overwhelming numerical superiority. For the first few years the British by virtue of their headstart would have a larger number of Dreadnoughts, but then the German yards would start producing and the gap which had to be closed would be much smaller in the Dreadnoughts than in the pre-Dreadnought battle ships. The introduction of the Dreadnought permitted the Germans to raise their sights from a "risk" navy (which had become meaningless since the Anglo-French entente in any event) to the possibility of parity with Britain. To many Britishers, on the other hand, construction of the Dreadnought seemed to be tantamount to sinking voluntarily a large portion of the British navy. The tremendous number of pre-Dreadnought capital ships which the Royal Navy possessed suddenly decreased in value. Great Britain, one British naval expert subsequently argued, had to write off seventy-five warships, the Germans only twenty-eight. British naval superiority fell by 40 or 50 percent: in 1908 England had authorized twelve Dreadnoughts and the Germans nine; in pre-Dreadnought battleships the British had 63 and the Germans 26.

Fisher's policy, however, was undoubtedly the correct one. Plans for an all-big-gun ship had been under consideration by various navies since 1903. The Russo-Japanese War underwrote the desirability of heavy armaments. The United States authorized the construction of two comparable vessels in March, 1905, and the Germans themselves were moving in that direction. The all-big-gun ship was inevitable, and this consideration led Fisher to insist that Britain must take the lead. While the superiority of the Royal Navy over the German fleet was significantly reduced, nonetheless at no time in the eight years after 1905 did the Germans approach the British in terms of numerical equality. Their highest point was in 1911 when their Dreadnought battle-ship and battle-cruiser strength amounted to 64 per cent of the British strength. Thus by reversing the nineteenth century policy of the British navy, Fisher avoided the British experience of the 1850s and 1860s when technological innovations by an inferior power temporarily suspended Britain's supremacy on the seas.

The very incentive which an inferior power has to make a technological innovation is reason for the superior power to take the lead, if it can, in bringing in the innovation itself. The British Dreadnought debate of 1904-05 had its parallels in the problem confronting the American government in 1949-1950 concerning the construction of a hydrogen bomb. Like the British, the Americans possessed a superiority in the existing decisive type of weapons system. As in the British government, opinion was divided, and the arguments pro and con of the technicians and military experts had to be weighed against budgetary considerations. As with the Dreadnought, the new weapons system was pushed by a small group of zealots convinced of the inevitability and necessity of its development. In both cases, humanitarian statesmen and conservative experts wished to go slow. In each case, the government eventually decided to proceed with the innovation, and, in each case, the wisdom of its policy was demonstrated by the subsequent actions of its rival. In an arms race, what is technically possible tends to become politically necessary. Whether an arms race is primarily quantitative or primarily qualitative in nature has a determining influence upon its outcome. This influence is manifested in the different impacts which the two types of races have on the balance of military power between the two states and on the relative demands which they make on state resources.

MIRV OUTMODED U.S. LAND BASED MISSILES

Thus the British traditional approach would not have introduced MIRV in 1970 because they would have anticipated the Soviet matching of MIRV outmoding U.S. land-based missiles—as it has.

Similarly, the same sophisticated approach would notice that a Star Wars defense, once matched in any form by the Soviets, would require enormous further expenditures on the U.S. side to replace, supplement and modify existing ICBMs and SLBMs—not to speak of its effect in outmoding the deterrents of the British, French and Chinese.

In a qualititative arms race, as the article emphasizes, those who make advances are cannibalizing their own investments.

Qualitative and Quantitative Races and the Balance of Power

In a simple quantitative race one state is very likely to develop a definite superiority in the long run. The issue is simply who has the greater determination and the greater resources. Once a state falls significantly behind, it is most unlikely that it will ever be able to overcome the lead of its rival. A qualitative race on the other hand, in which there is a series of major technological innovations in reality consists of a number of distinct races. Each time a new weapons system is introduced a new race takes place in the development and accumulation of that weapon. As the rate of technological innovation increases each separate component race decreases in time and extent. The simple quantitative race is like a marathon of undetermined distance which can only end with the exhaustion of one state or both, or with the state which is about to fall behind in the race pulling out its firearms and attempting to despatch its rival. The qualitative race, on the other hand, resembles a series of hundred yard dashes, each beginning from a fresh starting line. Consequently, in a qualitative race hope springs anew with each phase. Quantitative superiority is the product of effort, energy, resources, and time. Once achieved it is rarely lost. Qualitative superiority is the product of discovery, luck, and circumstance. Once achieved it is always lost. Safety exists only in numbers. While a quantitative race tends to produce inequality between the two competing powers, a qualitative race tends toward equality irrespective of what may be the ratio-goals of the two rival states. Each new weapon instead of increasing the distance between the two states reduces it. The more rapid the rate of innovation the more pronounced is the tendency toward equality. Prior to 1905, for instance, Great Britain possessed a superiority in pre-Dreadnought battleships. By 1912 she had also established a clear and unassailable superiority in Dreadnoughts over Germany. But if Germany had introduced a super-Dreadnought in 1909, Great Britain could never have established its clear superiority in Dreadnoughts. She would have had to start over again in the new race. A rapid rate of innovation means that arms races are always beginning, never ending. In so far as the likelihood of war is decreased by the existence of an equality of power between rival states, a qualitative arms race tends to have this result. A quantitative arms race, on the other hand, tends to have the opposite effect. If in a qualitative race one power stopped technological innovation and instead shifted its resources to the multiplication of existing weapons systems, this would be a fairly clear sign that it was intending to go to war in the immediate future.

Undoubtedly many will question the proposition that rapid technological innovation tends to produce an equality of power. In an arms race each state lives in constant fear that its opponent will score a "technological breakthrough" and achieve a decisive qualitative superiority. This anxiety is a continuing feature of arms races but it is one which has virtually no basis in recent experience. The tendency toward simultaneity of innovation is overwhelming. Prior to World War I simultaneity was primarily the result of the common pool of knowledge among the advanced nations with respect to weapons technology. The development of weapons was largely the province of private firms who made their wares available to any state which was interested. As a result at any given time the armaments of the major powers all strikingly resembled one another. During and after World War I military research and development became more and more a governmental activity, and as a result, more and more enshrouded in secrecy. Nonetheless relative equality in technological innovation continued among the major powers. The reason for this was now not so much access to common knowledge as an equal ability and opportunity to develop that knowledge. The logic of scientific development is such that separate groups of men working in separate laboratories on the same problem are likely to arrive at the same answer to the problem at about the same time. Even if this were not the case, the greatly increased ratio of production time to use time in recent years has tended to diminish the opportunity of the power which has pioneered an innovation to produce it in sufficient quantity in sufficient time to be militarily decisive. When it takes several years to move a weapons system from original design to quantity operation, knowledge of it is bound to leak out, and the second power in the arms race will be able to get its own program under way before the first state can capitalize on its lead. The *Merrimac* reigned supreme for a day, but it was only for a day and it could be only for a day.

The fact that for four years from 1945 to 1949 the United States possessed a marked qualitative superiority over the Soviet Union has tended to obscure how rare this event normally is. American superiority, however, was fundamentally the result of carrying over into a new competitive rivalry a weapons system which had been developed in a previous conflict. In the latter rivalry the tendency toward simultaneity of development soon manifested itself. The Soviet Union developed an atomic bomb four years after the United States had done so. Soviet explosion of a hydrogen weapon lagged only ten months behind that of the United States. At a still later date in the arms race, both

PARITY INEVITABLE IN QUALITATIVE ARMS RACE?

If Huntington is right that a qualitative arms race tends to achieve and maintain parity—because of the way science operates to provide the two sides with equal access to new possibilities and because the qualitative advance itself outmodes previous advantages—then the conservatives may not find so much to be gained in the continuing arms race, i.e. it cannot be won or a superiority maintained.

powers in 1957 were neck and neck in their efforts to develop long-range ballistic missiles.

The ending of an arms race in a distinct quantitative victory for one side is perhaps best exemplified in the success of the British in maintaining their supremacy on the seas. Three times within the course of a hundred years the British were challenged by continental rivals, and three times the British outbuilt their competitors. In each case, also, implicitly or explicitly, the bested rivals recognized their defeat and abandoned their efforts to challenge the resources, skill and determination of the British. At this point in a quantitative race when it appears that one power is establishing its superiority over the other, proposals are frequently brought forward for some sort of "disarmament" agreement. These are as likely to come from the superior side as from the inferior one. The stronger power desires to clothe its *de facto* supremacy in *de jure* acceptance and legitimacy so that it may slacken its own arms efforts. From 1905 to 1912, for instance, virtually all the initiatives for Anglo-German naval agreement came from the British. Quite properly, the Germans regarded those advances as British efforts to compel "naval competition to cease at the moment of its own greatest preponderance." Such proposals only heightened German suspicion and bitterness. Similarly, after World War II the Soviet Union naturally described the American nuclear disarmament proposal as a device to prevent the Soviet Union from developing its own nuclear capability. A decade later a greater common interest existed between the Soviet Union and the United States in reaching an arms agreement which would permanently exclude "fourth powers" from the exclusive nuclear club. In disarmament discussions the superior power commonly attempts to persuade the inferior one to accept as permanent the existing ratio of strength, or, failing in this effort, the superior power proposes a temporary suspension of the race, a "holiday" during which period neither power will increase its armaments. In 1899 the Russians, with the largest army in Europe, proposed that for five years no increases be made in military budgets. In 1912-14 Churchill repeatedly suggested the desirability of a naval building holiday to the Germans who were quite unable to perceive its advantages. In 1936 the United States could easily agree to a six year holiday in 10,000 ton cruisers since it had already underway all the cruisers it was permitted by the London Treaty of 1930. Similarly, in its 1957 negotiations with the Soviet Union the United States could also safely propose an end to the production of nuclear weapons. The inferior participant in disarmament negotiations, on the other hand, inevitably supports measures based not upon the existing situation but either upon the abstract principle of "parity" or upon the inherent evil of large armaments as such and the desirability of reducing all arms down to a common low level. Thus, in most instances, a disarmament proposal is simply a maneuver in the arms race: the attempt by a state to achieve the ratio-goal it desires by means other than an increase in its armaments.

MOTIVES FOR ARMS CONTROL

Problem for the reader: which disarmament proposals of the two sides were fairly characterized as "simply a maneuver in the arms race?" What were exceptions and how does one distinguish between the sincere proposal and the politically motivated one if the proposal, as in most cases, is not agreed to by both parties?

The Domestic Burden of Quantitative and Qualitative Races

Quantitative and qualitative arms races have markedly different effects upon the countries participating in them. In a quantitative race the decisive ratio is between the resources which a nation devotes to military purposes and those which it devotes to civilian ones. A quantitative race of any intensity requires a steady shift of resources from the latter to the former. As the forms of military force are multiplied a larger and larger proportion of the national product is devoted to the purposes of the race, and, if it is a race in military manpower, an increasing proportion of the population serves a longer and longer time in the armed forces. A quantitative race of any duration thus imposes ever increasing burdens upon the countries involved in it. As a result, it becomes necessary for governments to resort to various means of stimulating popular support and eliciting a willingness to sacrifice other goods and values. Enthusiasm is mobilized, hostility aroused and directed against the potential enemy. Suspicion and fear multiply with the armaments. Such was the result of the quantitative races between the Triple Alliance and the Triple Entente between 1907 and 1914:

> In both groups of powers there was a rapid increase of military and naval armaments. This caused increasing suspicions, fears, and newspaper recriminations in the opposite camp. This in turn led to more armaments; and so to the vicious circle of ever growing war preparations and mutual fears and suspicions.

Eventually a time is reached when the increasing costs and tensions of a continued arms race seem worse than the costs and the risks of war. Public opinion once aroused cannot be quieted. The economic, military and psychological pressures previously generated permit only further expansion or conflict. The extent to which an arms race is likely to lead to war thus varies with the burdens it imposes on the peoples and the extent to which it involves them psychologically and emotionally in the race. Prolonged sufficiently, a quantitative race must necessarily reach a point where opinion in one country or the other will demand that it be ended, if not by negotiation, then by war. The logical result of a quantitative arms race is a "nation in arms," and a nation in arms for any length of time must be a nation of war.

A qualitative arms race, however, does not have this effect. In such a race the essential relationship is not between the military and the civilian, but rather between the old and the new forms of military force. In a quantitative race the principal policy issue is the extent to which resources and manpower should diverted from civilian to military use. In a qualitative race, the principal issue is the extent to which the new weapons systems should replace the old "conventional" ones. In a quantitative race the key question is "How much?" In a qualitative race, it is "How soon?" A quantitative race requires a continuous expansion of military resources, a qualitative race continuous redeployment of them. A qualitative race does not normally increase arms budgets, even when, as usually happens, the new forms of military force are more expensive than the old ones. The costs of a qualitative race only increase significantly when an effort is made to maintain both old and new forms of military force: steam and sail; ironclads and wooden walls; nuclear and nonnuclear weapons. Transitions from old to new weapons systems have not normally been accompanied by marked increases in military expenditures. During the decade in which the ironclad replaced the wooden ship of the line British naval expenditures declined from 12,779,000 pounds in 1859 to less than eleven million pounds in 1867. Similarly, the five years after the introduction of the Dreadnought saw British naval expenditures drop from 35,476,000 pounds in 1903-04 to 32,188,000 pounds in 1908-09. During the same period estimates for shipbuilding and repairs dropped from 17,350,000 to 14,313,900 pounds. The years 1953-1956 saw the progressive adoption of nuclear weapons in the American armed forces, yet military budgets during this period at first dropped considerably and then recovered only slightly, as the increased expenditures for the new weapons were more than compensated for by reductions in expenditures for nonnuclear forces.

Quantitative and qualitative arms races differ also in the interests they mobilize and the leadership they stimulate. In the long run, a quantitative race makes extensive demands on a broad segment of the population. A qualitative race, however, tends to be a competition of elites rather than masses. No need exists for the bulk of the population to become directly involved. In a quantitative arms race, the users of the weapons—the military leaders—assume the key role. In a qualitative race, the creators of the weapons—the scientists—rival them for preeminence. Similarly, the most important private interests in a quantitative race are the large mass production industrial corporations, while in a qualitative race they tend to be the smaller firms specializing in the innovation and development of weapons systems rather than in their mass output.

While rising costs of a quantitative race may increase the likelihood of war, they may also enhance efforts to end the race by means of an arms agreement. Undoubtedly the most powerful motive (prior to the feasibility of utter annihilation) leading states to arms limitations has been the economic one. The desire for economy was an important factor leading Louis Philippe to propose a general reduction in European armaments in 1831. In the 1860s similar motives stimulated Napoleon III to push disarmament plans. They also prompted various British governments to be receptive to arms limitation proposals, provided, of course, that they did not endanger Britain's supremacy on the seas: the advent of the Liberal government in 1905, for instance, resulted in renewed efforts to reach accommodation with the Germans. In 1898 the troubled state of Russian finances was largely responsible for the Tsar's surprise move in sponsoring the first Hague Conference. Eight years later it was the British who, for economic reasons, wished to include the question of arms limitation on the agenda of the second Hague Conference.

The success of rising economic costs in bringing about the negotiated end of an arms race depends upon their incidence being relatively equal on each participant. A state which is well able to bear the economic burden normally spurns the efforts of weaker powers to call off the race. Thus, the Kaiser was scornful of the Russian economic debility which led to the proposal for the first Hague Conference, and a German delegate to that conference, in explaining German opposition to limitation, took pains to assure the participants that:

> The German people are not crushed beneath the weight of expenditures and taxes; they are not hanging on the edge of the precipice; they are not hastening towards exhaustion and ruin. Quite the contrary; public and private wealth is increasing, the general welfare, and standard of life, are rising from year to year.

On the other hand, the relatively equal burdens of their arms race in the last decade of the nineteenth century eventually forced Argentina and Chile to call the race off in 1902. The victory of Chile in the War of the Pacific had brought her into conflict with an "expanding and prosperous Argentina" in the 1880s, and a whole series of boundary disputes exacerbated the rivalry which developed between the two powers for hegemony on the South American Continent. As a result, after 1892 both countries consistently expanded their military and naval forces, and relations between them staggered from one war crisis to another. Despite efforts made to arbitrate the boundary disputes,

> an uneasy feeling still prevailed that hostilities might break out, and neither State made any pretence of stopping military and naval preparations. Orders for arms, ammunition, and warships were not countermanded, and men on both sides of the Andes began to declaim strongly against the heavy expenditure thus entailed. The reply to such remonstrances invariably was that until the question of the boundary was settled, it was necessary to maintain both powers on a war footing. Thus the resources of Argentina and Chile were strained to the utmost, and public works neglected in order that funds might be forthcoming to pay for guns and ships bought in Europe.

These economic burdens led the presidents of the two countries to arrive at an agreement in 1899 restricting additional expenditures on armaments. Two years later, however, the boundary issue again flared up, and both sides recommenced preparations for war. But again the resources of the countries were taxed beyond their limit. In August 1901 the Chilean president declared to the United States minister "that the burden which Chile is carrying . . . is abnormal and beyond her capacity and that the hour has come to either make use of her armaments or reduce them to the lowest level compatible with the dignity and safety of the country." Argentina was also suffering from severe economic strain, and a result, the two countries concluded their famous *Pactos de Mayo* in 1902 which limited their naval armaments and provided for the arbitration of the remaining boundary issues.

In summary, two general conclusions emerge as to the relations between arms races and war:

1) War is more likely to develop in the early phases of an arms race than in its later phases.

2) A quantitative race is more likely than a qualitative one to come to a definite end in war, arms agreement, or victory for one side.

Arms Races, Disarmament, and Peace

In discussion of disarmament, a distinction has frequently been drawn between the presumably technical problem of arms limitation, on the one hand, and political problems, on the other. Considerable energy has been devoted to arguments as to whether it is necessary to settle political issues before disarming or whether disarmament is a prerequisite to the settlement of political issues. The distinction between arms limitation and politics, however, is a fallacious one. The achievement of an arms agreement cannot be made an end in itself. Arms limitation is the essence of politics and inseparable from other political issues. What, indeed, is more political than the relative balance of power between two distinct entities? Whether they be political parties competing for votes, lobbyists lining up legislative blocs, or states piling up armaments, the power ratio between the units is a decisive factor in their relationship. Virtually every effort (such as the Hague Conferences and the League of Nations) to reach agreement on arms apart from the resolution of other diplomatic and political issues has failed. Inevitably attempts to arrive at arms agreements have tended to broaden into discussions of all the significant political issues between the competing powers. On the other hand, it cannot be assumed that arms negotiations are hopeless, and that they only add another issue to those already disrupting the relations between the two countries and stimulating passion and suspicion. Just as the problem of armaments cannot be settled without reference to other political issues, so is it also impossible to resolve these issues without facing up to the relative balance of military power. The most notable successes in arms limitation agreements have been combined, implicitly or explicitly, with a resolution of other controversies. The Rush-Bagot Agreement, for instance, simply confirmed the settlement which had been reached in the Treaty of Paris. The *Pactos de Mayos* dealt with both armaments and boundaries and implicitly recognized that Argentina would not intervene in west coast politics and the Chile would not become involved in the disputes of the Plata region. The Washington naval agreements necessarily were part and parcel of a general Far Eastern settlement involving the end of the Anglo-Japanese alliance and at least a temporary resolution of the diplomatic issues concerning China. As has been suggested previously, in one sense armaments are to the twentieth century what territory was to the eighteenth. Just as divisions of territory were then the essence of general diplomatic agreements, so today are arrangements on armaments. If both sides are to give up their conflicting ratio-goals and compromise the difference, this arrangement must coincide with a settlement of the other issues which stimulated them to develop the conflicting ratio-goals in the first place. If one state is to retreat further from its ratio-goal than the other, it will have to receive compensations with respect to other points in dispute.

While arms limitation is seldom possible except as a part of a broader political settlement, it is also seldom possible if the scope of the arms limitation is itself too broad. One of the corollaries of the belief that arms races produce wars is the assumption that disarmament agreements are necessary to peace. Too frequently it has been made to appear that failure to reach a disarmament agreement leaves war as the only recourse between the powers. In particular, it is false and dangerous to assume that any disarmament to be effective must be total disarmament. The latter is an impossible goal. Military force is inherent in national power

COST OF WAR

	World War I	*World War II*
Total Force Mobilized	**65,038,810**	**100 million**
Military Deaths	**8,020,780**	**15,000,000**
Military Wounded	**21,228,813**	**no estimate**
Civilian Dead	**6,642,633**	**26-34,000,000**
Economic & Financial Cost	**282 billion**	**1,600 billion**

Source: ***The Encyclopedia of Military History***

and national power is inherent in the existence of independent states. In one way or another all the resources of a state contribute to its military strength. The discussions in the 1920s under the auspices of the League conclusively demonstrated that what are armaments for one state are the pacific instruments of domestic well-being and tranquility for another. The history of general disarmament conferences persuasively suggests the difficulties involved in deciding what elements of power should be weighed in the balance even before the issue is faced as to what the relative weight of the two sides should be. At the first Hague Conference, for instance, the Germans were quick to point out that the Russian proposal for a five year holiday in military budget increases was fine for Russia who had all the men in her army that she needed, but such a restriction would not prevent Russia from building strategic railways to her western border which would constitute a greater menace to Germany than additional Russian soldiers. The demand for total disarmament frequently reflects an unwillingness to live with the problems of power. A feasible arms limitation must be part of the process of politics not of the abolition of politics.

The narrower the scope of a proposed arms limitation agreement, the more likely it is to be successful. Disarmament agreements seldom actually disarm states. What they do is to exclude certain specified areas from the competition and thereby direct that competition into other channels. The likelihood of reaching such an agreement is greater if the states can have a clear vision of the impact of the agreement on the balance of power. The more restricted the range of armaments covered by the agreement, the easier it is for them to foresee its likely effects. In general, also, the less important the area in the balance of power between the two states, the easier it is to secure agreement on that area. Part of the success of the Washington agreements was that they were limited to capital ships, and, at that time, particularly in the United States the feeling existed that existing battleships were obsolete and than in any event the battleship had passed its peak as the supreme weapon of naval power. Similarly, in 1935 Germany and England were able to arrive at an agreement (which lasted until April 1939) fixing the relative size of the navies—something which had been beyond the capability of sincere and well-meaning diplomats of both powers before World War I—because air power had replaced sea power as the decisive factor in the arms balance between Germany and England. Restrictions on land armaments have generally been harder to arrive at than naval agreements because the continental European nations usually felt that their large armies were directly essential to their national existence and might have to be used at a moment's notice.

Successful disarmament agreements (and a disarmament agreement is successful if it remains in force for a half decade or more) generally establish quantitative restrictions on armaments. The quantitative ratio is the crucial

SIMULTANEITY OF INVENTION

Here the article takes a line that Federation scientists will find quite congenial: scientific advances cannot be restricted in any significant way. And as Andrei Sakharov once put it, the front-runner in the arms race is like a skier whose advances make it easier for the one following by breaking a trail.

one between the powers, and the quantitative element is much more subject to the control of governments than is the course of scientific development. Furthermore, a quantitative agreement tends to channel competition into qualitative areas, while an agreement on innovation tends to do just the reverse. Consequently, quantitative agreement tends to reduce the likelihood of war, qualitative agreement to enhance it. In the current arms race, for instance, some sort of quantitative agreement might be both feasible, since the race is primarily qualitative in nature, and desirable, since such an agreement would formally prohibit the more dangerous type of arms race. On the other hand, a qualitative agreement between the two countries prohibiting, say, the construction and testing of intercontinental ballistic missiles, might well be disastrous if it should stimulate a quantitative race in aircraft production, the construction of bases, and the multiplication of their forms of military force. In addition, the next phase in the arms race, for instance, may well be the development of defenses against ballistic missiles. A qualitative answer to this problem, such as an effective anti-missile, would, in the long run, be much less expensive and much less disturbing to peace than a quantitative answer, such as a mammoth shelter construction program, which would tax public resources, infringe on many established interests, and arouse popular concern and fear. Continued technological innovation could well be essential to the avoidance of war. Peace, in short, may depend less upon the ingenuity of the rival statesmen then upon the ingenuity of the rival scientists.

The balancing of power in any bipolar situation is inherently difficult due to the absence of a "balancer." In such a situation, however, a qualitative arms race may be the most effective means of achieving and maintaining parity

ARMS CONTROL AND BROADER SETTLEMENTS

Here the article suggests that arms controllers try to settle, simultaneously with the arms control agreement, the disputes that underly the competitive arms race? Have we been thinking too narrowly, therefore, about post-World War II settlements that could accompany a major arms control agreement? Should we be thinking much more comprehensively about arms control-political settlements?

of power over a long period of time. The inherent tendency toward parity of such a race may to some extent provide a substitute for the missing balancer. In particular, a qualitative race tends to equalize the differences which might otherwise exist between the ability and willingness of a democracy to compete with a totalitarian dictatorship. The great problem of international politics now is to develop forms of international competition to replace the total wars of the first half of the twentieth century. One such alternative is limited war. Another is the qualitative arms race. The emerging pattern of rivalry between the West and the Soviet bloc suggests that these may well be the primary forms of military activity which the two coalitions will employ. As wars become more frightening and less frequent, arms races may become longer and less disastrous. The substitution of the one for the other is certainly no mean step forward in the restriction of violence. In this respect the arms race may serve the same function which war served: "the intensely sharp competitive *preparation* for war by the nations," could become, as William James suggested, *"the real war,* permanent, unceasing . . . " A qualitative race regularizes this preparation and introduces an element of stability into the relations between the two powers. Even if it were true, as Sir Edward Grey argued, that arms races inevitably foster suspicion and insecurity, these would be small prices to pay for the avoidance of destruction. Until fundamental changes take place in the structure of world politics, a qualitative arms race may well be a most desirable form of competition between the Soviet Union and the United States. ■

QUALITATIVE ARMS RACE OR WHAT?

An assumption in this article is that if there were no qualitative arms race, there would be limited wars (or what?); is this true?

Another assumption is that it is an advance to have the specter of more dangerous wars if they become less frequent; is this true?

Finally, the article observes that a qualitative arms race "may well" be a "most desirable form of competition" until fundamental changes in the structure of world politics occur. But would not major arms control agreements limiting the qualitative arms race represent, presuppose and contribute to, such a fundamental change—and is this not one of the reasons they are desired? Accordingly, is not arms control itself more desirable than the qualitative arms race?

REAGAN'S STRATEGY AND THE ARMS RACE'S FUTURE

Jeremy J.Stone

Over and above the Huntington article's prediction of the Star Wars program, the article embodies the evolving strategy of the Reagan Administration: pursue relative superiority by emphasizing a qualitative arms race and be sanguine about the dangers of that contest. Will it work?

In the first place, it works only to the extent the Soviets play along. It takes two to make a contest and to the degree that the Soviets decide to minimize the significance of technological change, the whole highly irrelevant competition in unusable arms could be finessed. The Soviets will always have a highly credible deterrent of immense proportions no matter what we build or say. They do not need to respond in kind, or in any other way, to U.S. advances except to the extent that their own bureaucracy demands it of them. Like those past competitors in the Huntington article which accepted unfavorable ratios of one kind or another, the Soviets could just give up certain dimensions of the qualitative effort. None but the specialists would much care because this arms race is a symbol of political strength only to the extent that the parties themselves consider it to be. The real danger is a war nobody wants and, for this, comparative advantage is of no consequence.

In fact, economic strength will be a much better parameter of political supremacy in the next century than arms and, for this purpose, pursuit of qualitative advances in the arms race is counterproductive—draining capacity to compete economically. Indeed, this appears to be the hope of the new DOD effort to institutionalize competitive strategies in the Defense Department under Fred C. Ikle and Albert J. Wohlstetter—a full court press on the Soviets.

Over and above the possibility that the Soviets might just decide to devalue the significance of the contest, there is another weakness in the Reagan strategy. The strategy turns on the success of the Star Wars program—success both in getting funds for its deployment and success in avoiding easy ways to neutralize its tactics. If the program cannot be deployed, or will not plausibly "work', then the strategic balance may remain, for public consumption purposes, fully one of parity.

After all, it is no accident that the Star Wars program was chosen as a way of putting a "technological end-run on the Soviets', nothing else could shake a balance involving tens of thousands of warheads.

A third flaw lies in the unreadiness of the U.S., under other Administrations, to follow a policy of manipulating and encouraging arms race for purposes of political competition. A new Administration may just opt for arms control.

Finally, there is the standard assumption, made by our members and by Huntington also, that qualitative arms races do not provide a decisive lead since the weaker competitor can always follow in the footsteps of the stronger.

And the Soviets have shown, for 40 years, a readiness to seek parity even at great cost.

In any case, according to the chart on page 3, 25% of the past 12 arms races were halted by arms control agreement and so there is certainly a possibility of a negotiated truce under some subsequent Administration. And this is obviously the alternative toward which we should strive.

The likelihood of war may well be low in any given year but the contest remains a festering sore waiting for a political eruption or unanticipated event to turn it into a real war. The existence of the contest increases the probability of escalation from lower level violence and it precludes getting on with the business of dismantling the weapons that threaten us. From this point of view, two or three unnecessary decades of arms race that might otherwise have been avoided are, in fact, a really serious world danger. The failure to take this danger to heart is, from FAS's point of view, the greatest weakness in this important article.

But even for those conservatives who see no dangers in a continuing arms race, this article overlooks the possibility that the technologically weaker power might pull ahead. Through the skill of Soviet scientists, through an economic crisis in the West—as has occurred every half century for the last 200 years—or just through an unwillingness of Western society to pursue a contest that seems to it ever more irrelevant, the Soviet system might win a round. And while a Western lead in the competition requires only that the Soviet Union wait to catch up, that determined Soviet leadership which the conservatives fear might not permit the West to wait before pushing its luck. Accordingly, even by the lights of conservatives, running an unnecessary arms race is risky.

HARRISON BROWN DIES

Harrison Brown, the first Vice-Chairman of the Federation of Atomic Scientists (FAS), died on December 8 at his home in Albuquerque, New Mexico. For twelve years the Foreign Secretary of the National Academy of Sciences, he had also been everything from President of the International Council of Scientific Unions (ICSU)—the world's highest scientific office— to Editor of the *Bulletin of the Atomic Scientists*. A prolific and talented writer on science and society issues, he was in indefatigable traveler with enormous energy that kept him going even when, in later years, he was confined to a wheel-chair. Diplomatic in style, sensible and pragmatic, he never wavered, during four decades of arms competition, from a path of strenuous work for a safer world.

Harrison Brown

FAS PUBLIC INTEREST REPORT (202) 546-3300
307 Mass. Ave., N.E., Washington, D.C. 20002
Return Postage Guaranteed
Volume 40, No. 2, February, 1987

Second Class Postage Paid at Washington, D.C.

☐ I wish to renew membership for the calendar year 1987.
☐ I wish to join FAS and receive the newsletter as a full member. Enclosed is my check for 1987 calendar year dues.

☐ $25 Member ☐ $75 Supporting ☐ $150 Patron ☐ $1000 Life ☐ $12.50 Under $12,000

Subscription only: I do not wish to become a member but would like a subscription to:

☐ FAS Public Interest Report — $25 for calendar year

☐ Enclosed is my tax deductible contribution of_____to the FAS Fund.

NAME AND TITLE_____
Please Print

ADDRESS_____

CITY AND STATE_____
Zip

PRIMARY PROFESSIONAL DISCIPLINE_____