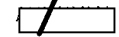




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A Comparison of Soviet and US Defense Activities, 1973-87

A Research Paper

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A Comparison of Soviet and US Defense Activities, 1973-87

A Research Paper

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**A Comparison of Soviet and US
Defense Activities, 1973-87**

Scope Note

This Research Paper revises and updates CIA comparisons of Soviet and US defense activities. It also extends the period covered by the comparisons to 15 years to include trends since the early 1970s. Like our earlier comparisons,¹ this update uses physical measures such as the number of weapons procured as well as a monetary valuation—estimated dollar costs. Dollar valuations of Soviet defense activities provide a common denominator to summarize the diverse activities that are associated with Soviet military programs and to portray the relative magnitudes of these programs and general trends in defense activities in terms that take account of both quantitative and qualitative differences.

Dollar valuations should not be used to measure actual Soviet defense spending, the impact of defense on the Soviet economy, or Soviet leaders' perceptions of defense activities. Valuations in rubles should be used for these purposes. Also, dollar valuations should not be used to compare military capabilities. Such assessments must take account of accumulated stocks of military weapons, equipment, and supplies; military doctrine and battle scenarios; the tactical proficiency, readiness, and morale of forces; the effectiveness of weapons; logistic factors; and many other considerations.

For the readers' convenience, dollar values of defense programs presented in this paper are shown in graphs and tables as point estimates rather than as ranges. The reader should remember, however, that around each estimate is an implicit confidence band and that, in general, our certainty is greater for higher levels of aggregation.

¹ For our most recent publication, see DI Intelligence Assessment SOV 86-10028 (Secret May 1986, *A Comparison of Soviet and US Defense Activities, 1976-85*.

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A Comparison of Soviet and US Defense Activities, 1973-87

Summary

*Information available
as of 1 June 1988
was used in this report.*

During the period 1973-87, the Soviet Union and the United States built up their military forces in ways that reflected fundamental differences in doctrine, strategy, and the relative costs of resources. Soviet procurement policy has traditionally put more emphasis on quantity, and less on quality, than that of the United States. The USSR procured more than four times as many intercontinental ballistic missiles (ICBMs), almost twice as many submarine-launched ballistic missiles (SLBMs), five times as many strategic bombers, three times as many helicopters, 12 times as many artillery weapons, nearly five times as many armored personnel carriers and infantry fighting vehicles, more than three times as many tanks, almost three times as many attack submarines, and about the same number of major surface combatants as the United States.

For the most part, Soviet weapons were less technologically complex than their US counterparts and lacked the same high-performance, multirole capabilities. As the period progressed, the Soviets increased their procurement of higher technology, higher performance weapon systems. Still, such weapons generally account for only a small share of current Soviet weapon holdings.

In comparison with the Soviet Union, the United States stressed quality rather than quantity in improving its national defense; it did not seek to match the Soviet Union in the number of weapons procured. US policy focused on the acquisition of more advanced, and thus individually more costly, weapons to counter the Soviets' numerical superiority.

The two countries also followed different approaches to operating and maintaining their military forces. Soviet operating procedures have been designed to preserve equipment and maintain a high level of equipment readiness. The Soviet forces typically have not used their equipment as much as US forces. The United States, in keeping with its emphasis on personnel and unit readiness, conducted more intensive and sophisticated training, with consequent heavier demands on its peacetime logistics and maintenance system.

Some sense of how these differences in the quantities and qualities of weapons procured and in the two countries' approaches to the operation and maintenance of military forces affected the overall levels of their defense activities can be gained by comparing the estimated dollar value of the Soviet activities with US defense outlays. The dollar valuations of Soviet

activities attempt to measure the cost—at prevailing US prices, wages, and efficiencies—to develop, deploy, and maintain a military force of the same size and with the same weapons as the USSR's and to operate that force as the Soviets do. Although this measure is a useful way to aggregate and compare diverse defense activities and programs, it has important limitations. Dollar valuations do not measure actual Soviet defense spending, the impact of defense on the Soviet economy, the Soviet perception of defense activities, or the overall capabilities of US and Soviet military forces. They do, however, provide a common denominator to summarize the diverse activities that are associated with Soviet military programs and to portray the relative magnitudes of these programs and general trends in defense activities in terms that take account of both quantitative and qualitative differences. ()

The cumulative dollar value of Soviet defense activities for 1973-87 was 25 percent greater than that of comparable US activities. The degree of difference, however, has been narrowing since 1976, when Soviet activities were 45 percent larger in dollar terms. By 1987 the dollar value of Soviet activities was almost the same as US outlays. The closing of this difference resulted mainly from differing trends in the growth of military investment:

- US military investment outlays almost tripled in real terms during 1973-87 and have grown at an average of almost 12 percent per year since 1980.
- While exceeding comparable US outlays during the first 11 of the last 15 years, estimated Soviet military investment measured in dollars leveled off in the mid-1970s after dramatic increases in the late 1960s and early 1970s. Since 1984, however, the estimated dollar value of Soviet military investment has grown by 3.5 percent a year.

For the period as a whole, Soviet investment costs exceeded comparable US outlays in each of the three major missions—strategic, general purpose, and support. ()

The dollar value of Soviet operating activities—military personnel and operations and maintenance (O&M)—was about 20 percent greater than US outlays during 1973-87. Because the Soviets maintained more men in uniform, the dollar value of military pay and allowances was 55 percent greater than comparable US outlays. In contrast, US outlays for O&M were about 20 percent greater than the dollar value of Soviet O&M, a result of the differences in equipment technology and usage levels noted above. ()

The Soviet Union and the United States also engage in other activities that enhance national security or serve foreign policy objectives. The estimated dollar value of other Soviet national security activities exceeded comparable US activities by about 10 to 20 percent:

- The USSR has a more extensive wartime mobilization and preparedness program than the United States, with a dollar valuation roughly two times greater than US outlays.
- The dollar value of Soviet military and economic aid to allies and clients and related international activities was roughly equal to comparable US outlays.
- The dollar costs of Soviet veterans' benefits were about three-fourths of corresponding US outlays.

On the basis of available evidence on the pace of weapons production and development programs, we expect the recent trends in Soviet military modernization to continue through the remainder of the 12th Five-Year Plan (1986-90). The heavy investments made in Soviet defense industries in the late 1970s and early 1980s have imparted considerable momentum to weapons production programs. We believe that the Soviets are unlikely to make substantial unilateral cuts in ongoing military programs. The requirements of General Secretary Gorbachev's civilian industrial modernization program, however, are tightening the competition for resources and increasing the need to allocate more resources to consumption and civilian investment. These pressures may increasingly impinge on future defense programs. If Soviet economic growth should continue to be slow, the pace of some military programs could slow as well. Nonetheless, even at slightly lower levels of procurement, improvements in both Soviet strategic and conventional programs would be substantial. (c NIE)

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A Comparison of Soviet and US Defense Activities, 1973-87

Introduction

This paper compares US and Soviet defense activities during the period 1973-87, using both physical and value measures. The physical measures used include data on the quantity of weapons and equipment produced and delivered to military units, inventories of major weapon systems, and levels of military manpower. Such measures are useful in portraying the weapons mix and the relative sizes of the two opposing forces and their components. They cannot, however, be used to produce summary measures of diverse kinds of defense programs and military units such as tanks, tactical aircraft, and infantry regiments. ()

To aggregate such diverse activities, some value must be assigned that captures the relative worth of each—in terms of physical and operational characteristics, resource costs, or some other quality. Because prices are a useful way to combine incommensurable quantities and because trends in defense activities are often related to overall developments in an economy, we have developed aggregate measures based on the costs of the resources devoted to various defense activities. These costs can be calculated in any currency, but dollars are the frame of reference of US policymakers and force planners, who are familiar with what a "defense dollar" can buy. ()

The dollar valuations of Soviet defense activities used in this paper measure the cost—at prevailing US prices, wages, and efficiencies—to develop, deploy, and maintain a military force of the same size and with the same weapons as the USSR's and to operate that force as the Soviets do. Used in conjunction with US defense program data, dollar valuations of Soviet programs capture differences in the technical characteristics of military hardware, the number and mix of weapons procured, manpower strengths, and the operating and training levels of the forces being compared. They can be useful in portraying the relative magnitudes of similar programs, general trends in defense

activities, and—in very rough terms—shifts in resources among those activities. ()

Dollar valuations, however, have the following important limitations:

- *They do not measure actual Soviet defense spending, the impact of defense on the economy, or the Soviet perception of defense activities.* The Soviets do not spend dollars. Issues of defense burden are properly analyzed with estimates of defense expenditures in the Soviet domestic currency—rubles (see inset).² Because the price structures in the Soviet Union and the United States are substantially different, Soviet costs in rubles are distributed differently among the resource categories than they would be in US dollars. For example, Soviet military investment in rubles accounts for about half of total costs, but measured in dollars it accounts for only about one-fourth. We do not address the question of whether the Soviets would choose to have the same military establishment if they had to pay dollar prices instead of ruble prices for their weapons and manpower. Presumably, if they were to make their decisions on this basis, they would buy a different mixture of weapons and manpower.
- *Dollar valuations are not a measure of the overall military capabilities of US and Soviet forces.* Assessments of capability must take into account the accumulated stocks of military equipment and supplies; military doctrine and battle scenarios; the tactical proficiency, readiness, and morale of forces; the effectiveness of weapons; logistic factors; and a host of other considerations. Dollar valuations of defense activities do not provide a reliable measure of these disparate factors. ()

² See also DI Reference Aid SOV 87-10069 (Unclassified), November 1987, *A Guide to Monetary Measures of Soviet Defense Activities*. ()

Defense's Claim on National Resources in the Soviet Union and the United States

In addition to comparing the size of US and Soviet defense activities—which requires the use of a common currency—it is also useful to compare the shares of gross national product (GNP) that the United States and the Soviet Union allocate to defense. To do so requires that each country's defense expenditures and GNP be expressed in its indigenous currency—the monetary terms in which the national leadership would measure its commitment of resources to defense.

After peaking during the Vietnam war, the share of GNP going to defense in the United States fell sharply—from 10 percent in the late 1960s to 5 percent by the mid-1970s. US defense spending increased in the early 1980s, pushing the defense share of GNP to about 7 percent in 1986. The Soviets, on the other hand, allocated to defense a fairly steady share of GNP of about 16 percent over the 1965-87 period.

These estimates are based on a definition of defense that includes the following US activities and their Soviet counterparts: national security programs funded by the Department of Defense, defense-related nuclear programs funded by the Department of Energy, Selective Service activities, and the defense-related activities of the Coast Guard. It does not include those activities that might be considered to be related to a broader concept of national security, such as strategic reserves, industrial surge capacity, civil defense, and military aid. Inclusion of such activities in a definition of defense would result in a higher burden for both countries.

In addition to the valuation of Soviet defense activities in dollars, we include in appendix A estimates of US military outlays valued in rubles for comparison with Soviet ruble outlays. In principle, ruble comparisons provide as valid a measure of the resources devoted to US and Soviet defense activities as dollar comparisons

do. It should be noted, however, that using the currency of either country as a basis for comparison imposes on the other an artificial choice on resource allocation. The difference in results is the consequence of differences in the relative prices of defense goods and services produced in the two countries.

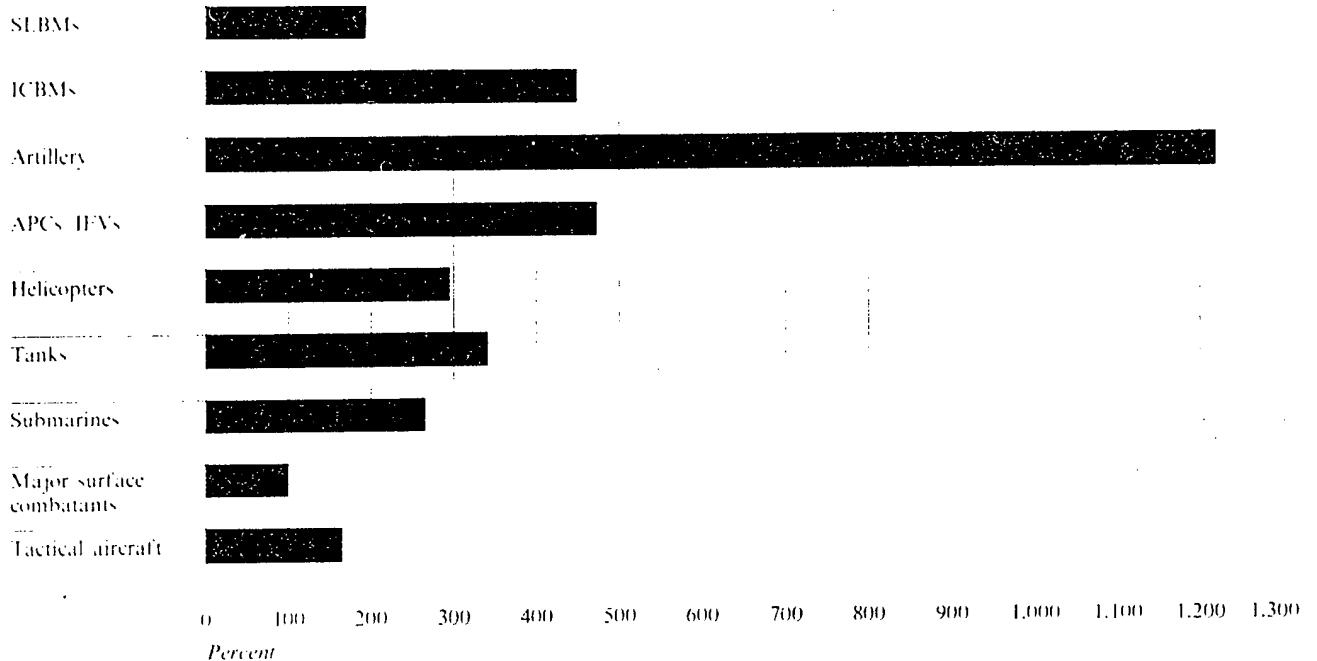
Methods

The estimates of the dollar value of Soviet defense activities presented in this paper were derived using a building-block methodology (see appendix A). The values for these activities are developed by identifying all the Soviet forces to be compared with those of the United States, including their support elements, and estimating their order of battle, equipment inventories, and new equipment purchases. To these detailed estimates of physical resources, we apply appropriate 1986 dollar costs.

Because the building-block approach is based on the individual components of the Soviet defense effort, we can estimate the dollar value of defense program values by resource categories—investment, operating, and research, development, testing, and evaluation (RDT&E)—and by mission—strategic, general purpose, and support missions. We are not yet able to apportion RDT&E costs by mission because we lack sufficiently detailed data.

US data in this paper are expressed in terms of calendar-year outlays derived from the *Five-Year Defense Program (FYDP)* issued by the Department of Defense in January 1986 and from the *Budget of the United States Government, Fiscal Year 1988*. Defense-related activities of the Department of Energy, the Coast Guard, and the Selective Service have been added to improve the comparison with Soviet programs. The outlays are expressed in constant 1986 dollars so that trends in the value estimates reflect real changes in military forces and activities and not the effects of inflation. US order-of-battle data were also derived from the FYDP; US production data were provided by the Department of Defense.

Figure 1
Soviet Acquisition of Major Equipment
as a Share of US Acquisition, 1973-87



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Force Trends and Comparisons

Weapons Acquisition

During 1973-87 the Soviet Union acquired greater quantities of weapons than the United States in every category except ships. The USSR procured more than four times as many intercontinental ballistic missiles (ICBMs), two times as many submarine-launched ballistic missiles (SLBMs), three times as many helicopters, 12 times as many artillery weapons, five times as many armored personnel carriers (APCs) and infantry fighting vehicles (IFVs), more than three times as many tanks, and almost three times as many attack submarines. The Soviets acquired about the same number of major surface combatants¹ as did the United States (see figure 1).

¹ Major surface combatants are defined as combat-capable ships of over 1,000 tons displacement.

Differences in Weapons Acquisition Policies. The large acquisition of weapons by the Soviet Union during this period reflects its strong commitment to modernizing its armed forces and maintaining the quantitative advantage it has historically enjoyed over the United States in the area of conventional weaponry. Indeed, in 1987 the Soviets had substantially more arms in most major categories than the United States, particularly in land arms (see table 1).

In general, the large Soviet weapons acquisitions consisted of systems that, while improving force capabilities and potential effectiveness, were less technologically complex than their closest US counterparts.⁴

⁴ For comparisons of several US and Soviet weapon systems, see DI Research Paper SOV 87-10077 (Secret December 1987, *A Comparison of Warsaw Pact and NATO Defense Activities, 1976-86*.

Table 1
Soviet and US Inventories
of Selected Weapons, 1987

Weapon Category	Soviet Union	United States
ICBMs	1,391	1,000
SLBMs	942	640
Fighter/interceptor and ground attack aircraft	7,850	6,050
Major surface combatants ^a	280	204
Submarines ^b	320	132
Tanks	53,860	15,575
Helicopters	7,250	10,500
APCs/IFVs	56,300	18,825
Artillery	35,580	6,775

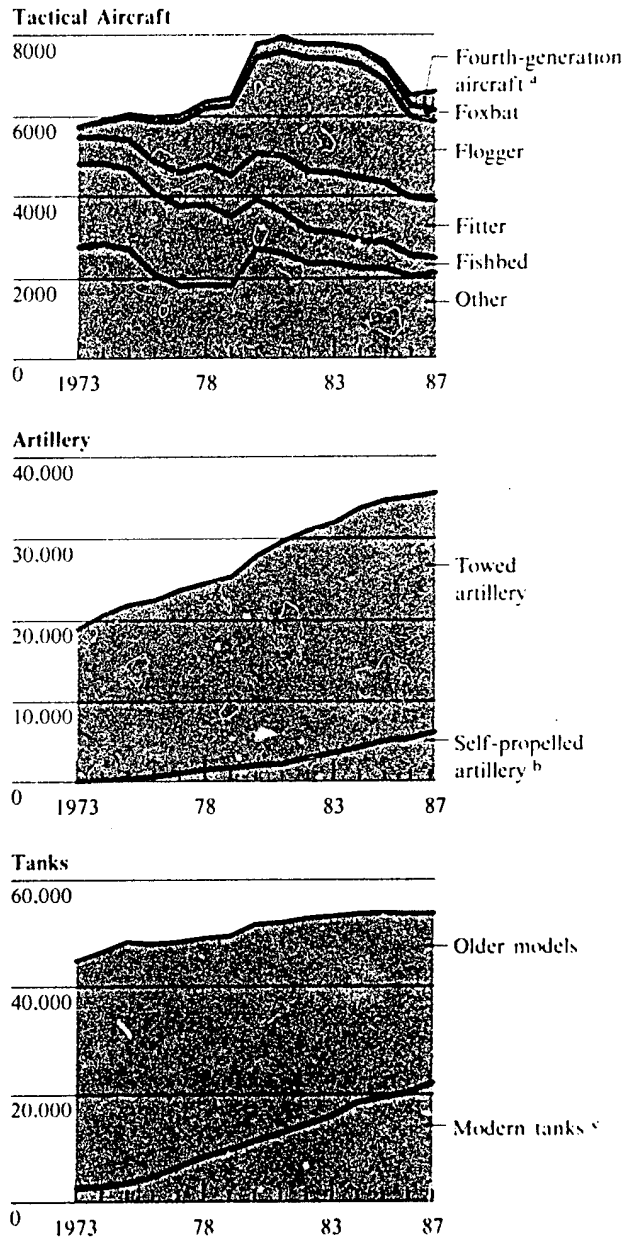
^a The category "major surface combatants" includes ships as small as 1,000 tons. The USSR has 144 such ships; the United States has none less than 3,000 tons.

^b Includes SSBNs.

and that, if produced in the United States, would have been less costly per unit. The USSR has also placed less emphasis than the United States on pushing the state of the art in designing its weapons. Many Soviet weapon systems were developed through an evolutionary design process, drawing on older weapon designs. US weapons, in contrast, are generally designed from scratch, and, as a result, are more technologically advanced and more costly.

As the period progressed, in an effort to narrow the US lead in weapons technology, the Soviets increased their emphasis on more advanced systems such as the T-80 tank and the MIG-29, MIG-31, and SU-27 fighter aircraft. They also began to outfit their ships with more advanced and sophisticated weapons. These advanced systems, however, generally represent only a small share of Soviet weapons inventories (see figure 2). In 1987, for example, only about 10 percent of the Soviet inventory of tactical combat aircraft and 14 percent the inventory of artillery consisted of these newer systems. There are exceptions to this general rule; for example, 40 percent of the Soviet tank inventory in 1987 was modern.

Figure 2
Selected Soviet Weapons Inventories, 1973-87



^a Fourth-generation tactical aircraft include the SU-27 Flanker, MIG-29 Fulcrum, and MIG-31 Foxhound

^b Self-propelled artillery consists of the following systems: 2S1 (122 mm), 2S3 (152 mm), 2S7 (203 mm), 2S5 (152 mm), and 2S9 (120 mm).

^c Modern tanks include the T-64, T-72, and T-80.

During the period the Soviets also built up stockpiles of ground and air supplies in Central Europe. This was done at the same time that supplies in the Far East Military District were increased to keep pace with the growth of Soviet conventional forces opposite China. These improvements would allow the Soviets to replenish successive front operations without pause and would permit rapid early reinforcement with forces moving from the western USSR. In addition, the Soviets have recently made a determined effort to improve their nuclear logistic posture opposite NATO, which has increased force readiness and reduced warning time. []

The United States, in keeping with its geographical position, superior technology, and greater emphasis on nuclear deterrence, pursued a different weapons acquisition strategy than the USSR. In general, the United States procured smaller numbers of conventional weapons than the USSR and focused on the acquisition of more advanced weapon systems to counter the Soviets' quantitative advantage. In addition, the United States devoted an increasing share of its procurement outlays to improving both the combat readiness and sustainability of its forces by increasing war reserve stockpiles of munitions and spare parts. []

Differences in Weapons Acquisition Programs. The broad differences between Soviet and US weapons acquisition strategies were also reflected in differences in the mix and number of specific weapons procured (see table 2). []

Strategic Forces. To improve the capabilities and enhance the survivability of their strategic offensive forces—especially ballistic missiles—the Soviets over the past 15 years have:

- *Sharply increased the number of nuclear weapons* available for strategic offensive operations—from about 2,500 in 1973 to about 9,000 in 1987—by replacing many older, single-warhead missiles with MIRVed systems. The majority of deliverable strategic weapons are deployed on SS-17, SS-18, and SS-19 ICBMs.

- *Improved the accuracy of their weapons*, in particular ICBMs. The most accurate Soviet strategic missile, the SS-18 Mod 4 has a circular error probable (CEP)³ of about []
[]
- *Improved the survivability of their forces* by introducing the SS-25 road-mobile ICBM and increasing the number of nuclear weapons carried on submarines. Deployment of the SS-25 began in 1985, and, by the end of 1987, 11 bases with a total of 99 launchers were operational. In the early 1980s the Typhoon and the Delta-IV SSBNs reached initial operational capability (IOC). These submarines carry two new SLBMs—the SS-N-20 and SS-N-23, respectively—both of which can deliver more warheads with greater accuracy and over longer distances than their predecessors.
- *Been modernizing their heavy bomber force* by converting 46 Bear B and Bear C air-to-surface missile carriers to Bear G's to provide increased survivability as well as improved maritime strike and defense suppression capabilities. They have also introduced the Bear H bomber, a new production model with cruise missile capability. The Blackjack bomber, which becomes operational in 1988, can be used for either standoff air-launched cruise missile (ALCM) delivery or low-level penetration. []

A major goal of the US strategic offense program is to bolster and maintain a credible deterrent that enhances global stability. Over the period, the United States concentrated its efforts on:

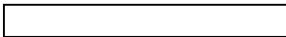
- *Introducing new strategic offensive systems.* These included the Peacekeeper ICBMs, which have a combination of yield and accuracy that places even the hardest of Soviet missile silos at risk, and eight Ohio-class SSBNs, which are quieter and faster than the SSBNs they replaced. The United States also introduced a new bomber—the B-1B—deploying 77 by the end of 1987.

³ CEP is defined as the radius of a circle around the target within which there is a 50-percent chance the reentry vehicle will fall. []

Table 2
Selected Soviet and US Procurement
of Major Weapon Systems, 1973-87

	Soviet Union	United States
Strategic forces	More than 1,000 SS-17, SS-18, and SS-19 fourth-generation ICBMs and about 170 SS-25 ICBM launchers; five Typhoon and four Delta-IV nuclear ballistic missile submarines; nearly 2,000 SLBMs, mostly SS-N-18s, SS-N-20s, and SS-N-23s, all of which carry MIRVs; introduction of the Bear H and Blackjack strategic bombers with a cruise missile capability; more than 700 SS-20 IRBMs and about 200 Backfire bombers for peripheral attack; more than 61,000 SAMs for strategic defense, including about 12,000 SA-10s.	About 150 ICBMs, including 12 Peacekeepers; 350 retrofitted Minuteman III ICBMs; almost 900 SLBMs, including the new D-5 missile; eight Ohio-class ballistic missile submarines; about 77 B1-B bombers; more than 250 Pershing II IRBMs.
Tactical combat aircraft	More than 8,000 tactical aircraft, including almost 2,500 MIG-23 and MIG-27 Floggers, 1,900 SU-17 Fitters, and about 700 late-model aircraft such as the SU-27 Flanker, MIG-31 Foxhound, and MIG-29 Fulcrum.	Nearly 4,900 tactical combat aircraft, including over 850 F-15s, about 1,200 F-16s, and more than 700 A-10s for the Air Force and over 300 A-7s, 500 F-14s, and 400 F/A-18s for the Navy.
Major surface combatants*	112 major surface combatants, including four Kiev-class carriers, 16 cruisers, 16 destroyers, and 76 frigates—most equipped with guided missiles.	113 major surface combatants, including four Nimitz-class aircraft carriers, seven guided-missile cruisers, 31 destroyers, and 47 frigates.
General purpose submarines	57 nuclear-powered submarines and 37 diesel-powered submarines.	44 Los Angeles-class nuclear-powered attack submarines.
Tanks	About 35,000 tanks, primarily T-64s and T-72s, but including almost 5,000 T-80s; modernization of T-55s and T-62s.	More than 10,000 tanks, including 4,700 M-1 Abrams models, and 4,900 M-60 models; modernization of M-48 and M-60 models.
Helicopters	About 7,200 helicopters, mostly MI-8 Hips and MI-24 Hinds, but including over 100 MI-26 Halo heavy-lift helicopters introduced in the early 1980s.	More than 1,000 UH-60 Black Hawks, over 100 modernized CH-47D Chinooks, over 400 AH-1 attack helicopters, and over 300 AH-64 attack helicopters.
Armored personnel carriers and infantry fighting vehicles	About 66,000 armored vehicles, including about 1,200 BTR-80s and 11,300 BMP-2s; modernization of BMP-1s with improved ATGMs.	Nearly 13,000 armored vehicles, including over 3,300 M-2 Bradley infantry fighting vehicles.
Artillery	About 42,700 towed and self-propelled artillery pieces, multiple rocket launchers, and heavy mortars.	About 3,500 artillery pieces, over half of which are self-propelled.

* Major surface combatants include all combat-capable ships of over 1,000-tons displacement. Since 1973 the USSR has acquired 48 ships of 1,000 to 3,000 tons; all ships procured by the United States were over 3,000 tons.



- *Extensively refurbishing existing forces.* About 350 Minuteman III ICBMs were retrofitted with improved guidance systems and higher yield Mark 12A warheads; existing Minuteman silos were hardened. The United States also modernized its bomber force by retrofitting 98 B-52Gs to carry ALCMs and began to outfit all 96 B-52Hs as ALCM carriers.

Theater Air Forces. In the early to middle 1970s, the Soviets began a large effort to reequip their air forces with new, more advanced, and more capable aircraft. This effort continues, and the advanced technology of the new generation of Soviet fighter aircraft makes these forces far more capable than in the past. These new aircraft include:

- The MIG-31 Foxhound interceptor—a strategic air defense fighter capable of tracking and engaging low-altitude bombers, cruise missiles, and other low-flying targets. It can engage four targets simultaneously.
- The MIG-29 Fulcrum fighter, which will replace the MIG-23 Flogger as the backbone of Soviet tactical air forces. This twin-engine aircraft carries pulse-Doppler radar and compatible missiles and has a true lookdown/shutdown capability.
- The SU-27 Flanker fighter, which, like the Fulcrum, carries pulse-Doppler radar, has a lookdown/shutdown capability, and is armed with the AA-10 missile.

The procurement of the MIG-23 and MIG-27 Flogger, the SU-17 Fitter, and the MIG-21 Fishbed, however, was more representative of the period. Although these aircraft have advanced avionics, and better range and payload capabilities than the previous generation of Soviet combat aircraft, they are technologically and operationally inferior to NATO aircraft such as the F-15 and F-16.

The Soviets have stressed the importance of combat helicopters to counter the potential threat of NATO's antitank weapons and provide increased mobility for

troop movement. Since the 1970s they have relied increasingly on helicopters for ground attack and support operations, and they continue to emphasize these missions—as witnessed in Afghanistan. They have also been developing helicopter air-to-air combat capabilities. Production of the MI-24 Hind multirole attack helicopter and the MI-26 Halo heavy-lift helicopter has increased the size of Soviet helicopter forces. Two new attack helicopters—the Havoc and the Hokum—apparently will supplement the Hind. The Havoc will have a primary ground attack mission while the Hokum will probably have air-to-air combat as its primary mission.

The United States regards tactical combat aircraft as a flexible and responsive element of its general purpose forces—one that can be equipped to support a variety of military operations at land and sea. During 1973-87 the United States sought to build on its qualitative advantage over the USSR in tactical aircraft by continuing to replace older aircraft in the active and reserve forces with newer models; upgrading capabilities on the proven, newer aircraft; and pursuing the development of new aircraft incorporating more advanced technologies.

Key US aircraft programs include:

- The A-6 Intruder, in production since the early 1960s. The A-6 is an all-weather strike aircraft capable of operating from a carrier. Its primary mission is deep interdiction of both land and sea targets. Repeated upgrades will prolong the life of the A-6 in its role in the all-weather attack force.
- The F-15 Eagle, in production since 1975. The initial variant was an air-superiority aircraft. The newer F-15E variant is a dual-role aircraft designed primarily for ground attack but retaining capability for air-superiority missions. It has night and all-weather capabilities and enhanced avionics and serviceability.

- The F-14 Tomcat, in production since 1975. The F-14 is a Navy all-weather air-superiority fighter designed for fleet defense. It is armed with long-range Phoenix missiles for carrier-group defense and shorter range Sparrow and Sidewinder missiles for close-in engagements. It is currently replacing F-4 aircraft in naval reserve units.
- The AV-8A/B Harrier, in production since 1975. This vertical/short takeoff and landing (V/STOL) aircraft is designed to provide close air support and is capable of operating from unprepared airfields near the battle area or from aircraft carriers. Second-generation (Harrier II) AV-8B aircraft will replace the older AV-8A/C and A-4M in Marine Corps air wings.
- The F-16 Falcon, in production since 1978. This Air Force multirole fighter is gradually replacing older F-4 aircraft throughout the active and reserve forces.
- The F/A-18 Hornet, in production since 1980. The F/A-18 is a dual-mission fighter/attack aircraft with demonstrated high performance and reliability. As the backbone of the US naval air modernization effort, it is replacing the F-4 and A-7 in US Navy and Marine Corps units.

The United States relies on helicopters in Army aviation units to support battlefield operations by providing responsive lift and mobile direct-fire support. Major US helicopter programs during 1973-87 included:

- The AH-1S Cobra, in production from 1975 to the early 1980s. The AH-1S has a light antiarmor capability and is equipped with rockets, guns, and TOW missiles.
- The UH-60 Black Hawk, in production since 1978. The UH-60 is a combat assault-transport helicopter designed to increase the effectiveness of Army air assault and combat support operations. It can be equipped with guns, missiles, and rockets.

- The AH-64 Apache, in production since 1984. The AH-64 has an improved antiarmor capability and is equipped with 16 missiles, including the Stinger to provide counterair capability.

Naval Forces. The Soviet general purpose submarine construction program reflects Moscow's intention to close the technological gap between Soviet and Western submarines. The Soviets are currently producing three new classes of general purpose submarines—the Sierra- and Akula-class nuclear-powered attack submarines (SSNs) and the Oscar-class nuclear-powered cruise missile attack submarines (SSGN)—all of which incorporate substantial advances in sound-quieting and war-fighting capability. In addition, the Victor-III, an extensive modification of the earlier Victor designs, became operational in 1979, and 22 units were produced during 1973-87. The Victor-III is significantly quieter than its forerunners and incorporates the best Soviet communications and hull-mounted acoustic antisubmarine warfare (ASW) systems. Diesel-powered submarines, constituting about 55 percent of the force, remain an important element of the Soviet general purpose submarine program.

During 1973-87 the Soviets also vigorously continued the expansion of their surface ship fleet. They have introduced two classes of large destroyers—Sovremenny and Udaloy—as well as the Slava-class cruiser and the 28,000-ton Kirov-class nuclear-powered cruiser. The Slava class carries the SA-N-6 surface-to-air missile (SAM) system and the Kirov class carries the SA-N-9 and SA-N-6 systems. The Soviets also acquired four Kiev-class aircraft carriers for V/STOL aircraft and helicopters—a major advance in their surface fleet. These carriers have an early warning radar that uses advanced signal-processing and data-handling techniques to detect and track multiple targets. The Soviets also began construction in the 1980s of a class of carrier that will probably be capable of handling conventional-takeoff jet aircraft. The first of these ships, the Leonid Brezhnev, is fitting out, with about one more year of work remaining, and the second is under construction.

The US Navy made significant strides in modernizing its submarine forces during 1973-87 by achieving operational advantages in low noise generation and superior acoustic tracking capabilities. It produced 44 Los Angeles-class nuclear-powered attack submarines, each of which can fire 12 to 15 Tomahawk cruise missiles as well as torpedoes. []

The US Navy also strengthened its surface fleet considerably. During 1973-87 it procured 113 major surface combatants, including four Virginia-class nuclear-powered cruisers, nine Ticonderoga-class Aegis cruisers, four Kidd-class and 31 Spruance-class destroyers, and 47 Perry-class frigates. The Navy also procured four Nimitz-class nuclear-powered aircraft carriers and recommissioned three modernized Iowa-class battleships. These battleships each carry nine 16-inch guns, 32 Tomahawk and 16 Harpoon missiles, and four Phalanx close-in weapon systems and have a top speed of 35 knots. []

Ground Forces. During 1973-87, the Soviet Ground Forces, the largest element of the general purpose forces, increased the number of maneuver divisions from 190 to 218 and expanded the divisional table of organization and equipment. The Soviets also created two unified army corps made up of brigades with combined-arms battalions. In addition, Soviet divisions have been reorganized and enlarged to better integrate armored, infantry, and artillery forces. The goal of this activity has been primarily to provide Soviet commanders with the means to counter increased NATO antiarmor capabilities. []

The USSR has long believed that *tanks* are the most important weapon systems in the ground forces because they give these forces the firepower and mobility needed to conduct high-tempo offensive operations. From the early 1970s to the mid-1980s, the USSR fielded several new tank models and variants of the T-64, T-72, and T-80. In the mid-1980s, another tank, referred to as the FST (Future Soviet Tank), entered production. The new tanks have better armor protection, better firepower, and greater cross-country speed than their predecessors—the T-55 and T-62. []

The Soviet Union also expanded the size and increased the capability of its artillery forces from 1973 to 1987:

- Soviet goals were to increase the density, accuracy, and range of fire and to improve survivability and mobility, particularly for the artillery components of tank and motorized rifle divisions. They increased the use of self-propelled artillery (122 mm, 152 mm, 203 mm, and 240 mm) with armor protection.
- Equipment holdings in artillery battalions at the army and front levels were expanded from 18 to 24 weapons. Artillery battalions were formed in the maneuver regiments of most divisions; artillery brigades were established in some armies; and the number of artillery divisions and heavy artillery brigades at the front level was increased.
- Improved conventional munitions and upgrades in target acquisition and fire control have given the Soviets a far more lethal fire-support capability. New munitions include nuclear projectiles for 152-mm cannon systems and laser-guided projectiles for 122-mm and 152-mm artillery that were introduced in 1983.
- The 220-mm BM-22 multiple rocket launcher was introduced in artillery divisions to supplement cannon artillery and strike targets beyond cannon range; approximately 1,000 were deployed. []

The USSR also increased the number of *tracked IFVs* and the capabilities of its *wheeled APCs*:

- The use of tracked IFVs increased in the mid-1980s. Motorized rifle divisions in the Western Theater of Military Operations (TMO) began converting to a structure consisting of two motorized rifle regiments with tracked IFVs and one regiment with wheeled APCs. Formerly only one of a division's regiments had IFVs. Some motorized rifle divisions in the groups of forces in Central Europe and in the western military districts are being equipped entirely with tracked IFVs.

- The Soviets produced three types of wheeled APCs during the period—a BTR-60 variant, the BTR-70, and, beginning in 1984, the BTR-80. The BTR-80 has a single diesel engine (instead of the BTR-70's two gasoline engines), better nuclear-biological-chemical (NBC) protection, and a heavy machine-gun with improved anti-aircraft capability.
- In addition to various command vehicles, the USSR produced three types of tracked IFVs. The BMD airborne/air-assault vehicle has an armament system similar to that of the BMP-1. The BMP-2, introduced in 1980, is an improved version of the BMP-1, with a 30-mm automatic high-velocity cannon and a newer anti-tank missile.

The United States strengthened its ground forces during 1973-87 with the introduction of a new tank, an armored fighting vehicle, a target-acquisition radar, anti-tank missiles, and laser-guided munitions, providing an improved capability to engage Soviet forces. To respond quickly to worldwide emergencies, the United States developed light infantry forces that can be deployed rapidly to face forces less capable than those of the Warsaw Pact. In 1980 the United States began fielding the M-1 tank, and in 1985 it introduced an improved model, the M-1A1, which incorporates better armor and a 120-mm gun. M-60 tanks continued to be produced and fielded with active units and used for modernization of the Army Reserve and National Guard. Armored forces were modernized with the M-2 Bradley IFV.

The US ground forces acquired increased capabilities to detect enemy formations and to mass large volumes of accurate and effective firepower against them:

- Automated fire-control systems linked to target-acquisition radars were introduced.
- Increased numbers of multiple-launch rocket systems were fielded in the 1980s to supplement cannon artillery fire or to strike targets beyond cannon range.
- Improved conventional munitions, 155-mm scatterable mines, and 155-mm laser-guided Copperhead artillery projectiles were fielded.

Readiness Strategy. In addition to following different approaches to weapons acquisition, the Soviet Union and the United States have different policies for preparing their forces for war. The Soviet Union believes that the better preserved its equipment, the readier it is for combat; thus, Soviet forces generally have lower operating levels than US forces. In its Ground Forces, for example, only a small share of equipment is used for training; most equipment is kept in storage. Soviet forces do not use their combat aircraft and vehicles as much as US forces use theirs, or conduct nearly as many live-fire exercises.

The US military believes that the more practiced its people are in the use of their equipment, the readier they are for combat. In comparison with Soviet military training, US training tends to be more sophisticated, involving more realistic and complex combat scenarios.

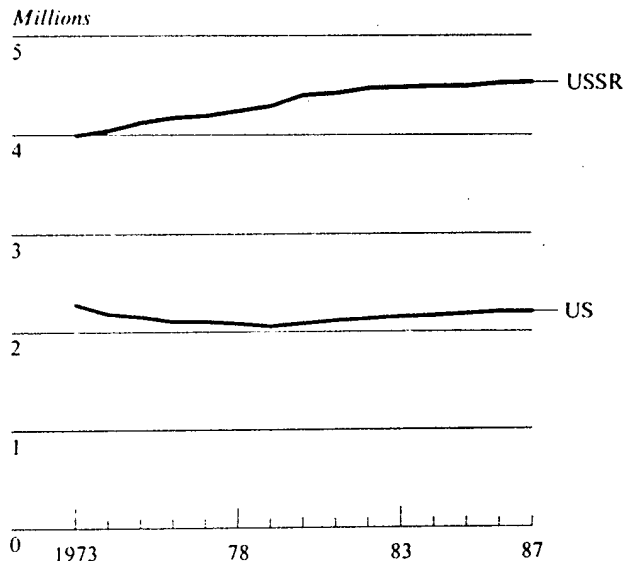
Manpower

In 1987, Soviet military manpower was about 4.5 million men—double that of the United States. Soviet manpower rose every year during 1973-87 (see figure 3). The Soviets added about 540,000 men to their forces over the period, with most of the increase—some 350,000 men—occurring in the land forces (see table 3). In contrast, US manpower levels declined by about 230,000 through 1979, mainly because of post-Vietnam-war retrenchment and conversion to an all-volunteer force. After 1979, US manpower levels rose by about 150,000 men. Most of the increase occurred in the general purpose forces mission (some 135,000 men).

The comparison of manpower levels in table 3 highlights several differences in Soviet and US missions and force structures:

- Soviet strategic offensive manpower is three times as large as that of the United States, primarily because the Soviets maintain a large peripheral strategic strike force for which the United States

Figure 3
Soviet and US Military Manpower Totals,
1973-87



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has no equivalent. In addition, the Soviet intercontinental attack force includes a large force of liquid-propellant ballistic missiles, which require considerably more manpower to operate than the solid-propellant missiles that make up the US force.

- The Soviets commit a large force of men to strategic defense because of their concern about the threat posed by US bombers and the USSR's proximity to potential war theaters in Europe and the Far East. The United States has only a small force dedicated to the strategic defense mission. When the Soviet and US ballistic missile buildup began in the 1960s, the United States decided against investing in what would be only a partial defense.
- Soviet manpower levels for general purpose forces are almost twice as large as those of the United States. The Soviet land forces, which are about three times as large as their US counterparts,

Table 3 *Thousand men*
Soviet and US Military Manpower, 1987

Mission ^a	United States	Soviet Union
Total	2,210	4,540 ^b
Strategic offensive forces	75	230
Intercontinental	75	140
Peripheral		90
Strategic defense forces ^c	20	340
General purpose forces	1,050	2,010
Land	575	1,600
Tactical air	215	115
Navy	225	220
Mobility	40	20
Support forces ^d	1,060	1,955

^a Because of rounding, components may not add to the totals shown.

^b Total includes only those Soviet personnel who fill what in the United States are considered to be national security roles. Thus, it does not include military personnel assigned to the militarized security forces of the Ministry of Internal Affairs, to military construction and railroad troops, or to civil defense troops.

^c Includes strategic control, surveillance, and nuclear weapon activities.

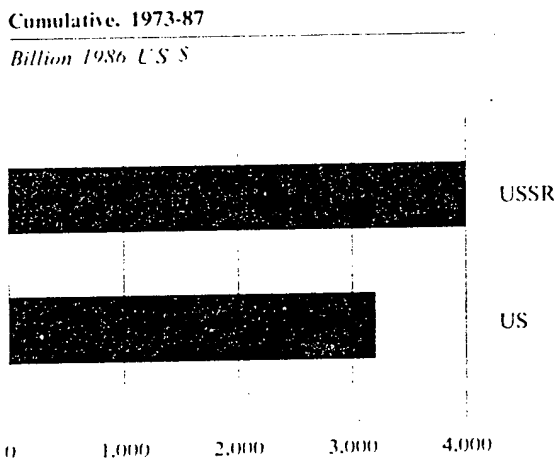
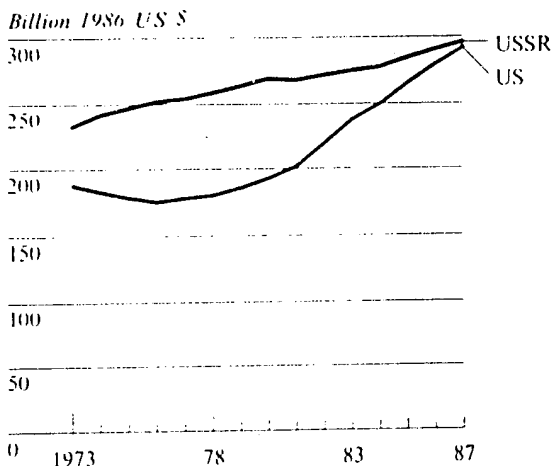
^d Includes research, development, testing, and evaluation and space activities.

account for this difference. The disparity in land forces reflects Moscow's decision to maintain large forces opposite China in the East and NATO in the West.

Trends in the Dollar Value of Total Defense Activities

Because the Soviets maintained larger military forces than the United States and procured large numbers of weapons and support systems, the estimated cumulative dollar cost of Soviet defense activities exceeded comparable US outlays by 25 percent during the period 1973-87. Since 1976, however, the margin of difference has narrowed: in 1976 the dollar value of Soviet defense activities was about 45 percent greater

Figure 4
Soviet and US Defense Activities, 1973-87



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but by 1987 was about the same as US defense outlays (see figure 4). Appendix B presents our estimates of the dollar value of Soviet defense activities compared with US defense outlays.

Growth in the dollar value of Soviet defense activities averaged about 2 percent a year during 1973-87. Among the major resource categories, RDT&E was the primary source of growth, although the dollar value of operating activities also increased because of increasing weapons inventories and the introduction of more advanced weapons and equipment into the Soviet Armed Forces. The dollar value of Soviet military investment was fairly level over the period but began to increase in 1985. Among the major military missions, the dollar costs of general purpose forces and support activities grew at an average annual rate of 1 to 2 percent. The dollar costs of Soviet strategic programs followed a cyclical pattern, largely determined by missile procurement.

US defense outlays, after peaking during the Vietnam war, decreased through 1976 and then grew at an average annual rate of 5 percent through 1987. The most rapid growth occurred after 1980 because of large increases in military investment—about 12 percent a year on average—and operating costs for all the major missions.

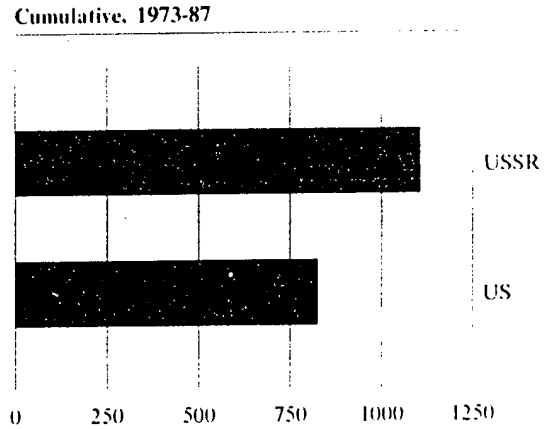
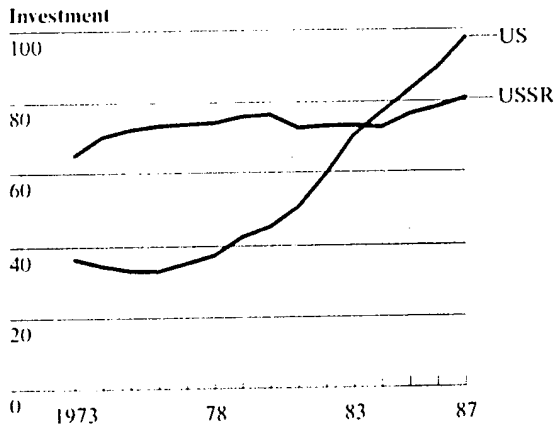
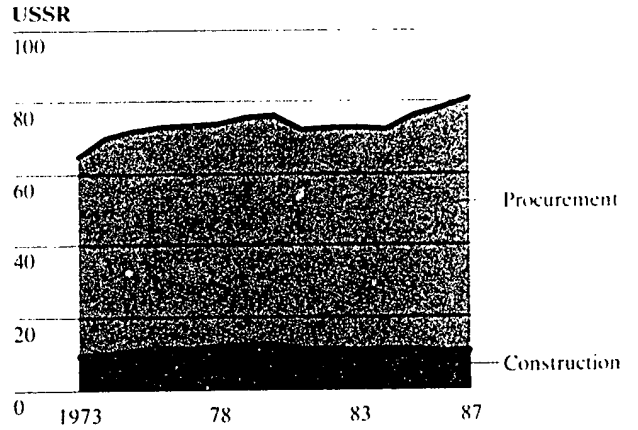
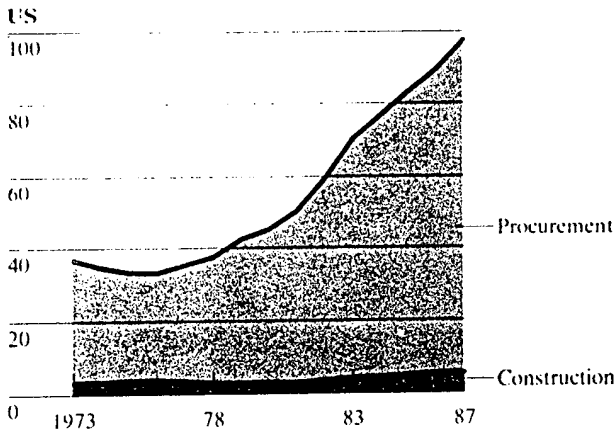
Comparison of Investment Trends

- Investment activities comprise two categories:
- Procurement—the acquisition of weapon systems and support equipment including major spare parts.
 - Construction—the building of military facilities.

During 1973-87 the estimated cumulative dollar value of Soviet military investment was almost 35 percent greater than US investment outlays (see figure 5). The dollar value of Soviet military procurement exceeded comparable US procurement by almost 25 percent, and the value of Soviet military construction was nearly three times that of US construction outlays. Over time, however, the relationship between the estimated dollar value of Soviet military investment and US military investment outlays changed sharply. At the beginning of the period, the dollar value of

Figure 5
Soviet and US Military Investment, 1973-87

Billion 1986 US \$



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Soviet investment was about twice that of the United States. By 1987, however, US investment outlays were 20 percent larger than the dollar value of comparable Soviet military investment.

The sharp change in the relative sizes of the annual dollar values of Soviet and US military investment resulted from different trends in the growth of both

procurement and construction in the Soviet Union and the United States (see appendix B). During 1973-84, Soviet procurement, measured in US dollar terms, remained stable at about \$62 billion annually, but then began increasing so that by 1987 procurement had reached \$70 billion. Soviet military construction measured in dollar terms experienced almost no growth.

US investment in military programs, by contrast, declined during the first part of the 1973-87 period and then increased on average nearly 12 percent per year after 1980. The rise in US investment reflected an across-the-board modernization of military forces that emphasized the procurement of technologically sophisticated weapons. It also reflected a decision in the early 1980s to improve the combat readiness and sustainability of US forces by building up war reserve stocks of ammunition and major spare parts.

Although the cumulative dollar value of Soviet procurement was about 25 percent greater than comparable US outlays during the period 1973-87, the USSR, as already noted, produced substantially more weapons than the United States in almost every major category. This apparent paradox is explained by the differences in the quality and the mix of weapons that the two countries bought, as well as industrial factors affecting production of weapon systems.

Soviet equipment is generally less technologically and operationally advanced than comparable US weapons and therefore has a smaller dollar value. For instance, the majority of Soviet tactical combat aircraft acquired during 1973-87 are single-mission aircraft that lack many of the capabilities of US combat aircraft, such as the ability to conduct lookdown/shutdown operations against multiple targets. In an effort to narrow the US technological lead, the Soviets are now producing aircraft that incorporate many of the features of advanced US models, including pulse-Doppler radars and turbofan engines, and are using composite materials in airframes. Our estimates of the dollar values of these more complex systems are approaching

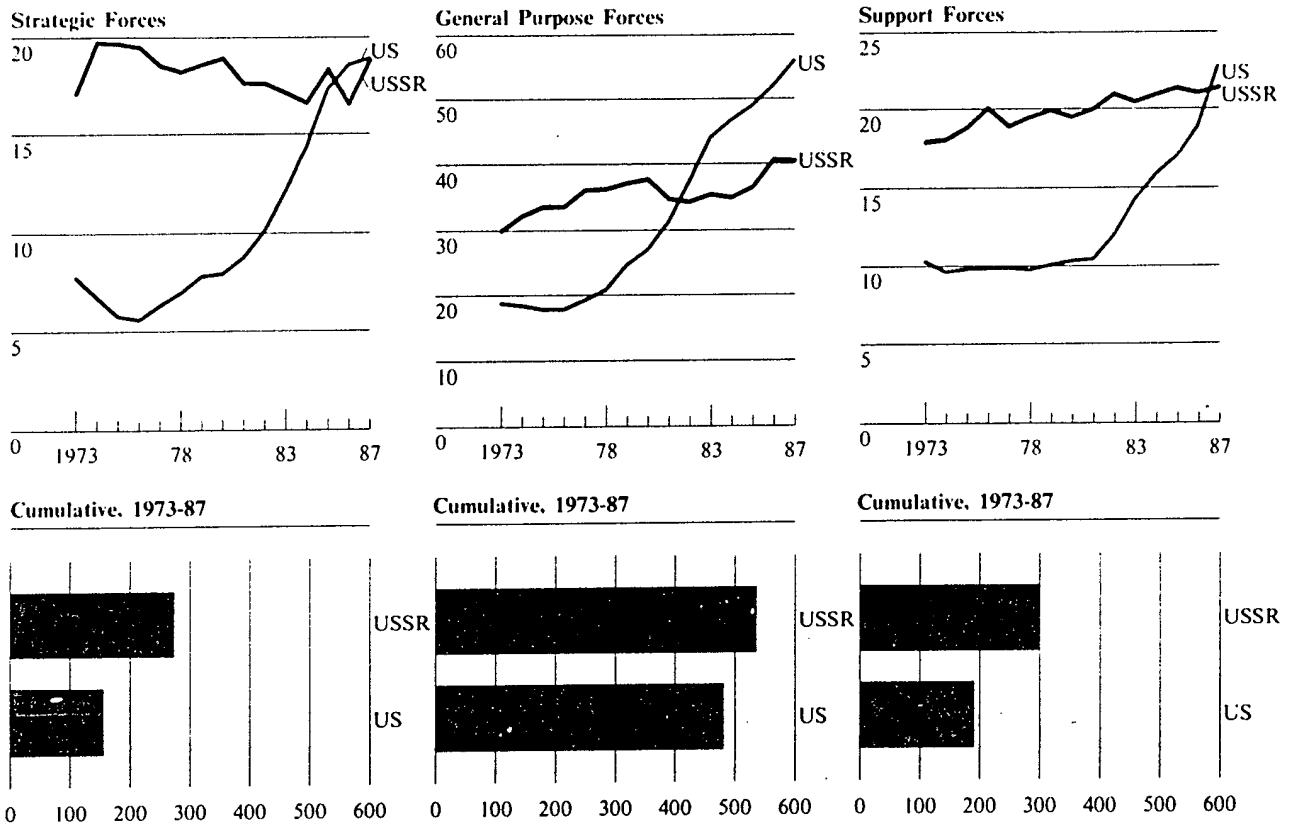
the costs of their US counterparts. These more advanced weapons, however, generally made up only a small percentage of the current Soviet inventory during 1973-87.

Another reason for the apparent "procurement paradox" is that, since about 1980, the United States has been investing heavily in procurement categories other than new weapons. Comparisons of production of major weapons do not capture the value of product improvement programs undertaken by the United States such as retrofitting older aircraft with improved avionics and weapon systems. Although such improvement programs are costly and can substantially improve the operational capabilities of the aircraft, they are not counted as newly acquired systems. In contrast, the Soviets generally have not retrofitted older aircraft with new equipment but rather have chosen to begin series production of a modified version, which is counted as new series production. In addition, the United States has made a major effort to improve the combat readiness and sustainability of its tactical forces by significantly increasing its war reserve stocks of munitions and major spare parts.

US companies engaged in the production of weapons and supporting subsystems have found that the cost of manufacturing a product may be systematically reduced over time because of a phenomenon known as "product specific-learning." As a product continues to be manufactured in the same facility, the managers and workers of the facility become more proficient in its production and often find cheaper ways to produce the product. This learning is achieved through a wide variety of mechanisms such as better organization of the assembly process, better handling of supplies, and minor design changes to speed assembly. Thus, even if the prices of material and labor inputs are held constant, fewer inputs are required as learning takes place. The degree of cost reduction experienced as a production run continues is termed a "learning curve."

Figure 6
Soviet and US Investment by Mission, 1973-87

Billion 1986 US \$



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The Soviet approach to weapons acquisition, which is characterized by long production runs and few changes to weapon systems that disrupt production, benefits greatly from product-specific learning. This approach, however, has some drawbacks. By sustaining production rates, the Soviets may delay the incorporation of new weapon technologies that result in a better weapon.

The high level and slow growth in Soviet military investment after 1973 were apparent in each of the three major military missions—strategic, general purpose, and support (see figure 6). Before 1972, Soviet investment—measured in dollars—in each of these missions grew more rapidly because of the need to both equip and modernize a rapidly expanding military establishment. After 1972 the size of most

military forces stabilized, and investment growth in each of the major missions slowed. Even so, investment remained at high levels as the USSR continued to modernize its weapons inventories with the addition of newer, more capable systems.

US investment in the three major military missions followed a different pattern, with outlays declining through the mid-1970s and then beginning to increase sharply after 1980. US investment in general purpose and support forces declined after the Vietnam conflict. The downturn in US investment in strategic programs reflected the completion of the Polaris SSBN and Minuteman I ICBM programs. Since the mid-1970s, however, the United States has invested heavily in each mission in an effort to both modernize its forces and rebuild its stockpiles of war reserve materials.

Strategic Forces

This mission includes all nuclear weapons and forces assigned to intercontinental attack, strategic defense, and strategic control and surveillance. It also includes Soviet forces for peripheral attack, for which there are no US counterparts.

During 1973-87, the estimated dollar value of Soviet investment in strategic forces (excluding RDT&E) was about \$275 billion, exceeding corresponding US outlays by about 75 percent. Soviet military investment in strategic forces measured in dollars, however, increased less than 2 percent per year on average, while US strategic investment outlays increased at an average of 6 percent a year. In 1973 the dollar value of Soviet strategic investment was more than twice as large as comparable US outlays, but by 1987 the two were about equal.

The estimated dollar cost of Soviet investment in *intercontinental attack forces*—ICBMs, SLBMs, SSBNs, and heavy bombers—exceeded comparable US outlays by more than 25 percent during 1973-87. During the period, however, a number of Soviet modernization programs that had been started before the mid-1970s wound down and the pace of follow-on programs was slow. The United States, on the other hand, initiated several programs that resulted in a

significant rise in investment outlays (see figure 7). As a result, these outlays, which had been much lower than the estimated dollar cost of Soviet investment in 1973, exceeded the dollar value of Soviet investment by almost 70 percent by 1987:

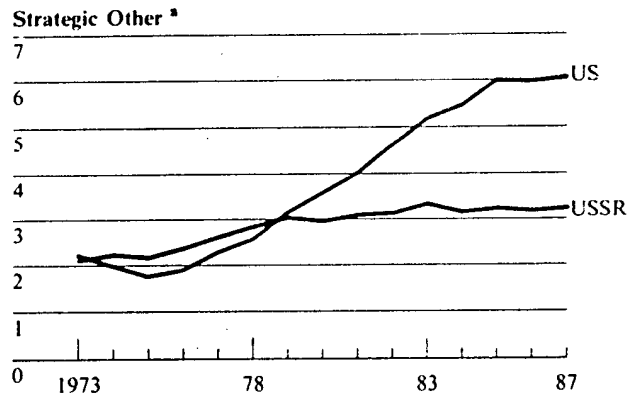
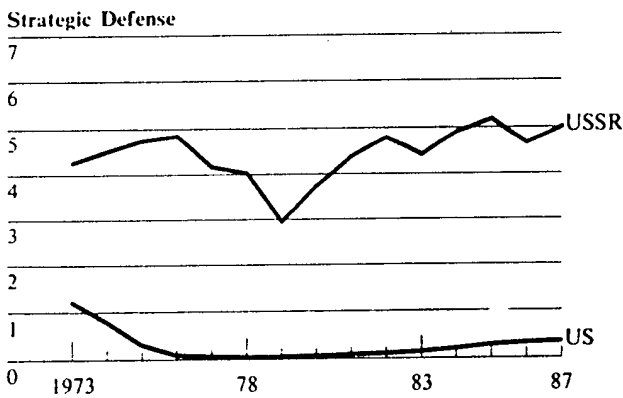
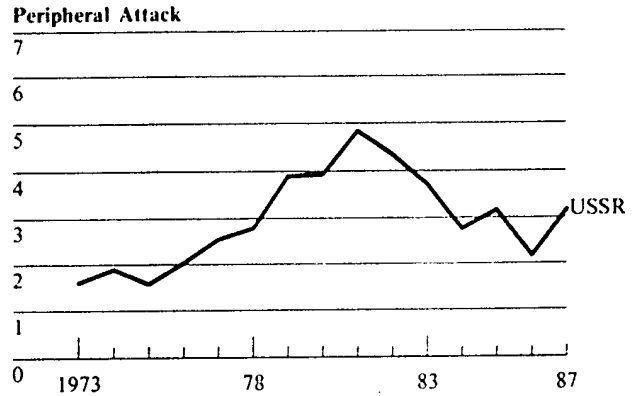
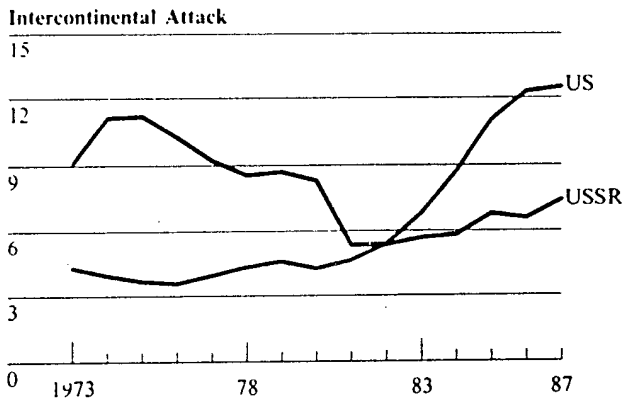
- The decline in the estimated dollar costs of Soviet investment reflects the completion of the SS-17, SS-18, and SS-19 ICBM modernization programs and a slowdown in SSBN deliveries—from five in 1977 to fewer than two per year in the late 1970s and early 1980s.
- US outlays grew on average almost 8 percent per year. Growth during the middle part of the period was largely a result of the ALCM and Trident SLBM programs. After 1980 outlays grew because of the B-1B bomber and Peacekeeper ICBM programs.

We estimate that during 1973-87 the cumulative dollar cost of Soviet strategic investment for *peripheral attack forces* was about \$45 billion. These forces, which we believe are primarily dedicated to strategic targets along the periphery of the Soviet Union, mainly in Western Europe and China, include the SS-20 intermediate-range ballistic missile (IRBM), the Backfire medium bomber, and about 70 percent of the Fencer light bomber force. The United States has no direct counterpart to this mission, although certain US missiles, tactical aircraft, and submarines could perform similar functions.

During 1973-87, the cumulative dollar value of Soviet investment in *strategic defense forces*—interceptor aircraft, strategic SAMs, ballistic missile defense, and warning and control systems—was more than \$65 billion. This total represents one-fourth of the estimated cumulative dollar value of Soviet strategic investment. In contrast, US investment outlays for strategic defenses over the same period were less than \$5 billion, or about 3 percent of total strategic investment.

Figure 7
Soviet and US Investment in
Strategic Forces, 1973-87

Billion 1986 US \$



^a Includes command and control systems and the production of nuclear materials.

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The disparity in levels of investment activity reflects significant differences in the two countries' approaches to strategic weapons. Since the early 1960s, US strategic doctrine has emphasized the use of offensive forces to deter an enemy attack rather than the deployment of defensive forces aimed at limiting the damage from an enemy strike. Moreover, after agreeing in the 1972 antiballistic-missile (ABM) treaty not to deploy a nationwide defense against the relatively

large Soviet ICBM and SLBM threats, the United States decided not to modernize its air defenses against the somewhat limited Soviet heavy bomber threat. In contrast, the Soviets historically have favored more balance between offensive and defensive forces. Although the Soviets also agreed not to deploy a nationwide ABM system, they have continued to

commit substantial resources to the modernization of their defenses against bombers. This emphasis was influenced by the threats posed by the US strategic bomber force—a force much larger than its Soviet counterpart—and by the threat from potentially hostile aircraft in the European and Pacific theaters and in China. In addition, the Soviets have continued to modernize their ABM defenses around Moscow within treaty limits.

General Purpose Forces

This mission includes all land, tactical air, general purpose naval, and mobility (airlift and sealift) forces. During 1973-87, the cumulative dollar value of Soviet investment in general purpose forces was about \$535 billion—roughly 10 percent more than comparable US outlays. The margin was considerably larger in 1973, when the dollar value of Soviet investment was more than one and one-half times US outlays. Over the 15-year period, Soviet investment in general purpose forces measured in US dollars grew at about 2 percent a year, as the USSR continued to modernize and expand its forces along the Sino-Soviet border and opposite NATO. Meanwhile, US investment outlays grew 8 percent per year—a reflection of growth in all categories of general purpose forces, particularly in land arms and tactical air forces (see figure 8). Thus, by 1982, US investment in general purpose forces surpassed our estimates for the USSR, and, by 1987, US outlays were almost 40 percent greater than the dollar value of Soviet investment.

During 1973-87 the cumulative dollar value of Soviet investment in *land forces*—primarily for ground forces combat divisions, ground attack helicopters, and certain elements of the Border Guards—was twice the US investment outlays for land forces. Estimated Soviet investment in this category was more than four times US investment outlays in 1973, but the margin of difference declined nearly every year, and in 1987 it was about equal.

Soviet cumulative investment costs, measured in dollars, were larger than US investment outlays mainly because the Soviets continued to expand and modernize land forces that in the mid-1970s were already

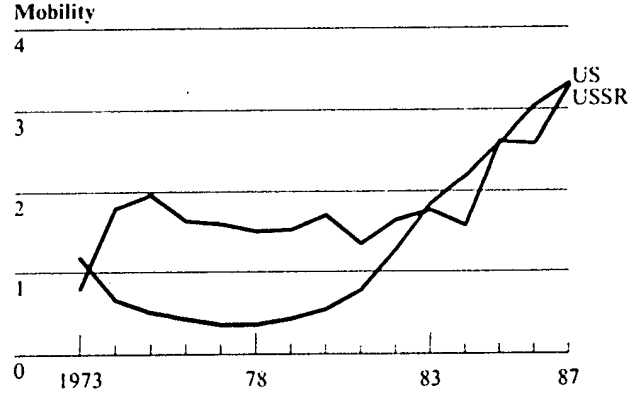
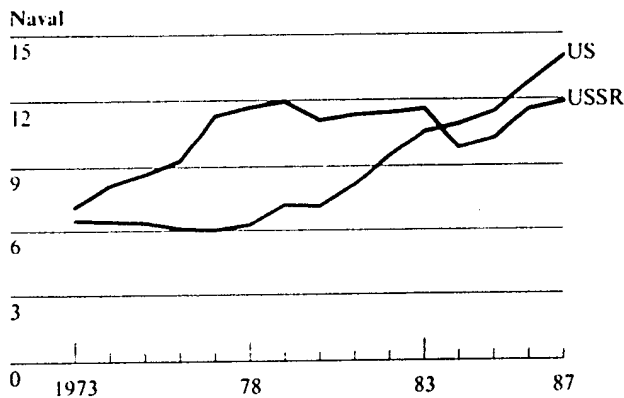
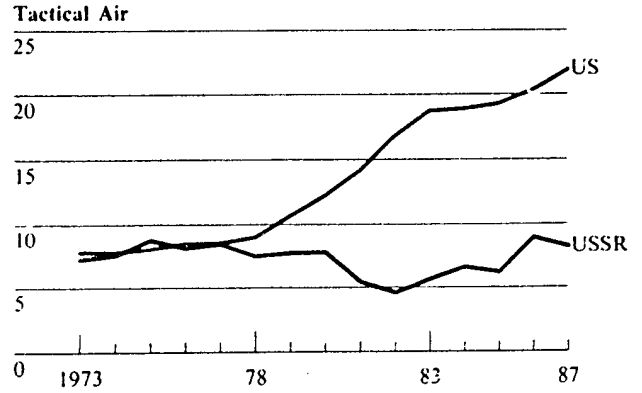
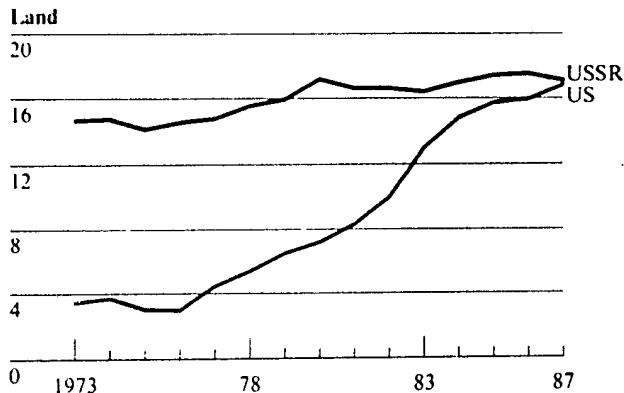
significantly larger than those of the United States. During the last decade, the USSR increased the size of its *ground forces* by 14 maneuver divisions, expanded two other divisions for two new army corps, and increased equipment holdings in each of its combat divisions. In 1986 the USSR had 20 percent more tanks, 125 percent more APCs and IFVs, and 90 percent more artillery pieces than it had at the start of the period. At the same time, the Soviets replaced large quantities of older equipment with newer, more capable systems. By 1986, for example, almost 40 percent of the Soviet tank force consisted of modern T-64, T-72, and T-80 models compared with less than 15 percent in 1977. This modernization was undertaken at a steady pace and, when measured in dollars, required an average growth in investment costs of almost 2 percent per year.

US investment outlays for land forces climbed dramatically throughout the period, averaging about 12 percent per year. By 1987, US outlays for land forces were nearly five times as high as at the start of the period. The United States, however, did not significantly increase the size of its land forces or produce as much new equipment as the USSR. The United States procured over the period, for example, only about 30 percent as many tanks as the Soviet Union. The United States, however, procured weapons—such as the M-1 tank and the M-2 IFV—that were more costly per unit than their closest Soviet counterparts (see appendix D). The United States also made a concerted effort in the early 1980s to improve both the combat effectiveness and sustainability of its land forces by accelerating its purchases of ammunition and major spare parts.

Both countries added sophisticated new fighter aircraft to the inventories of their *tactical air forces* (land- and sea-based fixed-wing aircraft that are used in a tactical role, as well as multipurpose aircraft carriers) during 1973-87. US cumulative investment costs were about twice as high as estimated Soviet investment measured in dollars, even though the

Figure 8
Soviet and US Investment in
General Purpose Forces, 1973-87

Billion 1986 US \$



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Soviets procured almost 50 percent more aircraft over the period. Moreover, the disparity widened; by 1987, US investment outlays for tactical aircraft were more than two and one-half times our estimate for Soviet outlays.

In part, the higher US figures reflect the costs associated with the construction of three Nimitz-class

carriers and efforts to increase stockpiles of ammunition and major spare parts during the last decade. The disparity in investment costs, however, resulted primarily from the US purchase of aircraft, such as the F-15 and the F-16, that are more sophisticated and considerably more expensive than comparable Soviet aircraft (see appendix D).

Soviet investment in tactical aircraft during the period followed an erratic but downward trend as the Flogger and Fitter production programs neared completion. In the early 1980s, the Soviets began series production of two new fighters—the Flanker and the Fulcrum—which we believe have capabilities approaching those of current US fighters. Production of these aircraft, however, has proceeded at a slower pace than past aircraft programs. We believe that production has actually been below the level the Soviets intended, perhaps as a result of manufacturing difficulties. Partly because of these factors, by 1987 the dollar value of Soviet investment in tactical aviation was about 10 percent greater than it had been at the start of the period. []

During 1973-87 the estimated cumulative dollar value of Soviet investment in *general purpose naval forces*⁶ was more than 20 percent larger than comparable US outlays. The difference in costs reflects the considerable modernization and expansion accomplished by the Soviets. Over the period 112 major surface combatants (ships with a displacement over 1,000 tons) and 94 submarines were built. []

The difference in investment was greatest during the late 1970s, when the dollar value of annual Soviet investment was about twice as high as US outlays. During the 1980s the disparity narrowed considerably as investment in the US Navy grew at an annual rate of nearly 10 percent. This spending growth reflected an acceleration in the pace of ship and submarine construction to achieve the goal of a 600-ship navy by the late 1980s. On the other hand, the growth of Soviet naval investment, measured in dollars, was slower during the late 1980s than at the beginning of the 1973-87 period. As a result, US outlays exceeded our estimates for the USSR by about 15 percent in 1987. []

Over the 1973-87 period cumulative Soviet investment in *mobility forces* (airlift and sealift activities and military port operations), measured in dollars,

⁶ Includes major and minor surface combatants, attack submarines, ASW aircraft and carriers, amphibious warfare ships, and naval auxiliaries directly supporting the fleet. []

was more than 40 percent higher than comparable US investment outlays. The Soviet costs reflect the modernization of the transport fleet with the new IL-76 Candid medium-range aircraft. Most US transport aircraft were procured before 1976, and investment was directed toward the modification of existing aircraft, primarily the C-141 and C-5A jet transports. []

Support Forces

The support mission includes those activities that are required to support US and Soviet combat forces. Because of the diverse nature of each country's support establishment, the dollar value is a particularly useful way to compare these activities in the aggregate. Some of the major elements of this mission are:

- The operation and maintenance of all military installations.
- Training conducted at other than the unit level, primarily recruit or conscript, officer, and skills training.
- Administrative activities, including those of centrally located command personnel; recruitment, conscription, and personnel management services; and the administrative costs of US participation in NATO and the USSR's administration of the Warsaw Pact alliance.
- Many other support services, such as satellite communications, hospitals and medical clinics, data-processing support, security, investigative and judicial activities, and the maintenance of emergency command posts.

In addition, the defense-related activities of the US Coast Guard and the administration of Soviet KGB border guards are included. []

Over the period as a whole, estimated Soviet investment in support forces measured in dollars was almost

60 percent greater than comparable US outlays. The Soviet margin reflects, in large part, the cost of supporting a much larger military establishment.



Comparison of Operating Activities

Operating activities are divided into two categories:

- O&M—the operation and maintenance of military equipment and facilities and the services provided by civilian personnel.
- Personnel—the goods and services provided to active and reserve military personnel, including pay, food, clothing, travel, retirement, and other allowances.



The dollar value of Soviet operating activities was about 20 percent greater than US outlays for such activities during the period (see figure 9). Both the dollar value of Soviet activities and comparable US outlays increased over the period, primarily because of the maintenance required by increasingly large numbers of more complex weapons. Through 1980 the trends in Soviet operating activities in dollar terms increased about two percent per year, while US activities declined slightly. After 1980, however, the growth in US operating expenditures accelerated to an average rate of 3 percent per year, while Soviet dollar operating costs showed continued steady growth at about the average rate of the previous five years.



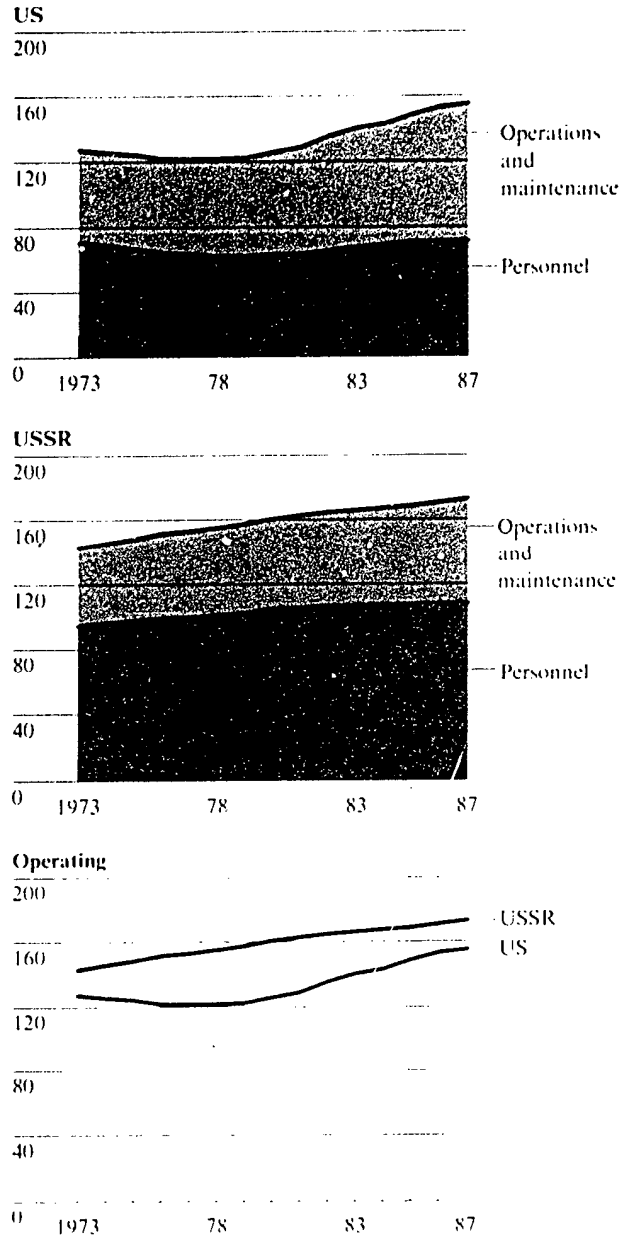
Operations and Maintenance

US outlays for operations and maintenance (O&M) during 1973-87 exceeded the estimated dollar value of Soviet O&M activities by about 20 percent, even though the weapons inventories of most US force components were smaller than their Soviet counterparts (see figure 10). This is mainly because the United States emphasizes high levels of operational training and has a more technologically complex inventory of weapons to maintain.



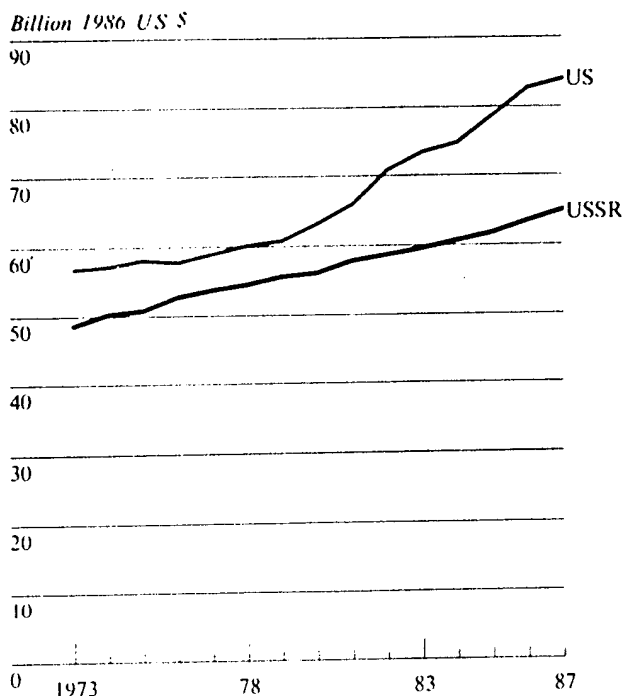
Figure 9
Soviet and US Operating Activities, 1973-87

Billion 1986 US \$



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Figure 10
Soviet and US Operations and
Maintenance, 1973-87



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The dollar value of O&M of Soviet *strategic forces* grew by 2 percent per year during 1973-87—a period of considerable force modernization. Although the newer systems are more technologically sophisticated than the ones they replaced, in some cases they are not as difficult to operate and maintain. For example, the SS-20 solid-fueled IRBM is considerably easier to operate and maintain than the older, liquid-fueled SS-4 and SS-5 missiles.

The estimated dollar costs of Soviet *general purpose forces* O&M grew steadily over the period by 3 percent a year. In each component of these forces,

inventories were expanded and more advanced equipment was introduced:

- The rise in the dollar value of Soviet land forces O&M—more than 2 percent annually on average—was the result of an increase in most major land arms, particularly tanks and armored vehicles. The technological sophistication of the equipment operated by the forces also increased as the T-64, T-72, and T-80 tanks, late-model BMPs, and self-propelled artillery accounted for growing shares of inventories.
- The estimated dollar O&M costs of Soviet tactical air forces increased an average of 5 percent annually during the period, as third-generation aircraft (Flogger and Fencer) were deployed and the total number of tactical aircraft rose. O&M costs measured in dollars stayed fairly level later in the period, as fourth-generation Flankers and Fulcrums began to be deployed, but at a relatively slow pace.
- The estimated dollar O&M costs of Soviet general purpose naval forces increased an average of about 4 percent annually with the increase in major surface combatants and general purpose submarines. The higher O&M costs also reflect the growing technological sophistication of the forces.

The dollar value of Soviet O&M for *support forces* grew on average about 2 percent a year, reflecting the additional requirements to support the expanding Soviet military establishment. After 1980, O&M costs accelerated as Soviet military space programs began to play a much larger support role, particularly in the areas of communications and intelligence collection.

The growth in US O&M requirements affected each of the major missions. US O&M costs for:

- The strategic mission increased on average about 2 percent a year during the period and grew even faster, at about 5 percent a year during 1977-80,

primarily as a result of maintaining the aging B-52 bombers. During 1981-87 there was negative growth as the number of B-52 bombers declined.

- General purpose forces rose by an average of 7 percent a year during the 1973-87 period, mainly reflecting increases in the weapon inventories of each of the major components. The growth also reflects the increasing complexity of US weapon systems such as the M-1 tank, F/A-18 aircraft, and Aegis-class cruiser, which make up an increasing share of the inventory.
- Support forces, accounting for about 60 percent of total O&M outlays, grew 2 percent a year during the period. In 1980 outlays began to increase at a rate of 4 percent, primarily because of higher pay and benefits to civilian personnel who operate bases and logistic establishments and serve in administrative capacities.

Personnel

For the Soviet Union, military personnel costs accounted for 65 percent of the estimated dollar operating costs for the 1973-87 period (see inset). They were about 55 percent greater than US outlays for military personnel. The USSR has more than twice as many personnel, but a higher percentage of them are at the lower end of the pay scale.

Since 1979, annual US costs have been increasing more than twice as fast as Soviet personnel costs. In part, the acceleration in US personnel costs after 1979 reflects increases in manpower levels. Primarily, however, it reflects increases in the rate of reenlistment among US servicemen. As the number of reenlistments increased, so did the number of officers and enlisted men at the higher end of the pay scales.

Research, Development, Testing, and Evaluation

During the period 1973-87 we did not detect any change in the Soviets' longstanding commitment to a large and growing military RDT&E establishment. We estimate, for example, that during the period

Estimating Soviet Personnel Costs in Dollars

The dollar values of pay for Soviet personnel are based on the pay of personnel the United States would assign to carry out similar functions. The concept is to match pay to positions or jobs, not ranks. Our estimates of the dollar pay for Soviet conscripts is based on the pay of US enlisted personnel with the same average time in service. To account for the fact that the United States uses enlisted men for many positions for which the Soviets use officers, dollar pay for some Soviet officers is an average of US noncommissioned officer and commissioned officer pay. Separate estimates are made for food and travel costs.

Unlike estimates of the dollar cost of weapons and military equipment, which take account of differences in technical and performance characteristics, the estimated dollar costs of military personnel assume that all personnel performing the same functions are of equal quality. This assumption is unlikely to be true even within a single country's military force, but in the absence of generally agreed upon "quality adjustment" factors there is no alternative to making this simplifying assumption.

Critics argue that this approach makes the disparity between the two defense establishments look greater than it is, because the Soviet military consists of numerous conscripts who are poorly paid, even when compared with the average ruble wage in the USSR. If, however, the dollar value methodology is to provide consistent comparisons that have validity and precision, US cost factors must be applied equally to all Soviet activities. Thus the same number of men doing the same activities should have the same dollar valuation.

floorspace devoted to Soviet military RDT&E increased at an average annual rate of 3 to 4 percent. In 1986 floorspace dedicated to this task totaled about 74 million square meters, and the Soviets employed about 3 million people to support their military RDT&E. Total manpower increased over the period at an average rate of about 3 percent per year, somewhat faster than during 1965-76.

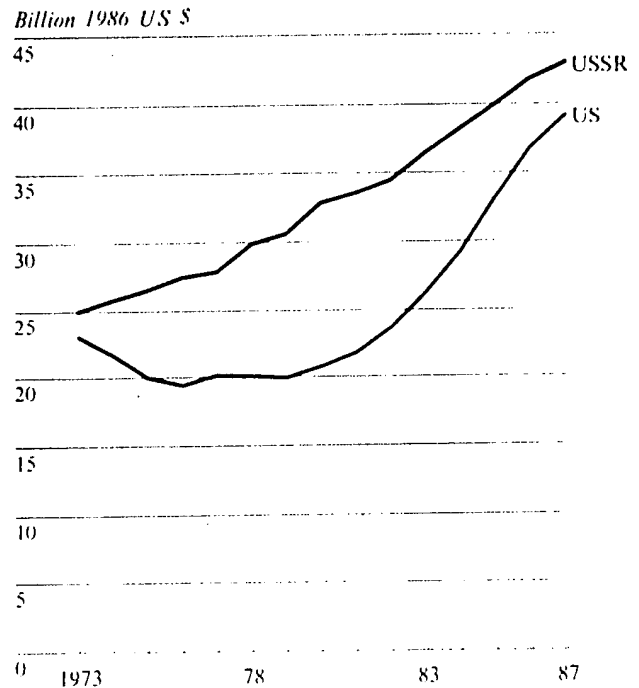
Studies of floorspace at RDT&E facilities show that growth in the allocation of military RDT&E resources has been greatest in newer technological areas, such as advanced electronics and lasers. The trend toward developing weapon systems that incorporate higher levels of technology is apparently requiring increasing support from the nondefense segment of the Soviet RDT&E establishment. We estimate that, together, the Academy of Sciences, the nondefense industrial ministries, and the higher educational institutes now supply about one-half of all the manpower supporting military RDT&E activities.

Resources committed to US RDT&E grew rapidly beginning in the early 1980s. This growth reflected:

- Efforts to improve strategic nuclear forces, including enhancements to associated command, control, and communications systems; development of the Peacekeeper ICBM and the B-1B bomber; and research on a small ICBM, the Advanced Technology Bomber (Stealth), an antisatellite system, and the new D-5 SLBM for the Trident submarine.
- Development of precision-guided conventional munitions and a conventional initiatives program, both of which rely on advanced microelectronics technology.
- The Strategic Defense Initiative—a research program to assess the potential for an effective defense against strategic ballistic missiles.

During 1973-87 the dollar value of Soviet military RDT&E grew steadily at 4 percent per year and in cumulative terms exceeded comparable US outlays by about 30 percent. The disparity was considerably larger during 1973-80, when Soviet costs grew while the rate of US outlays declined (see figure 11). Since

Figure 11
Soviet and US Military RDT&E, 1973-87



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1980, however, US RDT&E expenditures have accelerated sharply, increasing by an average annual rate of about 10 percent per year. As a result, the difference between the dollar value of Soviet military RDT&E and comparable US outlays decreased, and in 1987 the value of Soviet RDT&E was only about 10 percent greater than US outlays.

We have greater confidence in our new estimate of Soviet spending for military RDT&E based on resource costs than we had in our past estimates. First, this new estimate is based on a vast body of detailed information about Soviet military RDT&E organization and programs. Second, the resource-cost method

Methodology for Estimating the Cost of Soviet RDT&E

In 1986 we developed and adopted a new method of estimating the Soviet commitment of human, materiel, and financial resources to military research, development, testing, and evaluation (RDT&E).^a We had low confidence in our previous methods because they were based on a small number of intelligence reports on aggregate levels of RDT&E spending and the share devoted to the military. Our new method, the resource cost method, identifies, tracks, and costs specific RDT&E activities that support the Soviet military, encompassing the kinds of activities incorporated in the definition of US military RDT&E spending. The new method employs internal and external consistency checks and develops measures of uncertainty. []

The estimate is calculated in three stages. First, we build a file of all Soviet facilities identified as being involved in military RDT&E and use the data collected on these facilities to estimate the aggregate commitment of floorspace and manpower to military RDT&E. Second, these estimates are used with all-source data on resource costs to calculate total expenditures for resource inputs such as the wage bill, purchases of materials and equipment, training, travel expenditures, and other operating costs; capital repair; and new construction. The sum of the inputs

^a See DI Technical Intelligence Report SOV 86-10030 (Secret July 1986, Estimating Soviet Military RDT&E Expenditures. []

in these categories represents our ruble estimate of total military RDT&E expenditures. To account for uncertainties in our data and cost factors, we calculate a best estimate and a confidence interval. We first establish a range and probability distribution for each cost factor and then use an estimating technique known as Monte Carlo simulation. We believe it unlikely that this ruble estimate is in error by more than plus or minus 15 to 20 percent. Finally, we transform this ruble-based estimate into dollars. In estimating the value of Soviet military RDT&E in dollars, we are estimating what it would cost the United States to replicate, assuming US efficiencies, Soviet RDT&E services for researching and developing military technologies and weapons. We want the ruble-dollar ratio to reflect the comparative efficiencies implicit in moving from the Soviet resource commitment to RDT&E to the dollar cost of the services produced. This ratio would then be used to convert the estimates from one currency to the other. In actuality, we use the average of the ruble-dollar ratios for military procurement of major Soviet weapon systems; this ratio reflects relative Soviet and US efficiencies in producing Soviet weapon systems. We believe this ratio is the best available approximation of relative US and Soviet efficiencies in the later stages of weapon engineering development and prototype production, which, together, are the most costly stages of RDT&E. []

allows us to identify and quantify our uncertainties in each component of the new estimate and compute an overall confidence interval. Previous methods did not allow for an objective measure of uncertainty. Third, our new estimates meet several tests of reasonableness, including both the internal consistency of expenditure categories and the trends in related economic

and military data. Finally, we believe that the new methodology provides the basis for improving and extending our estimates by incorporating additional information on military RDT&E programs and cost factors. []

Table 4
Estimated Costs of Selected Soviet and
US National Security Activities, 1986

Billion 1986 US \$

	United States	Soviet Union	Soviet Union as a per- cent of United States
Total (defense plus other national security activities)	344.3	360.2-369.5	105-107
Traditional defense activities (baseline definition)	279.8	291.1	104
Other national security activities	64.5	69.1-78.4	107-122
Mobilization/wartime preparedness	13.6	26.9-30.6	198-225
Internal security troops	1.7	3.5	
Railroad and construction troops	2.8	7.1	
Civil defense	0.7	6.4	
Civil space	7.4	6.0	
Mobilization capacity	1.0	1.9-7.6	
Enhancement of global position	24.5	25.4	104
Foreign military and economic aid	20.9	20.3	
Conduct of foreign affairs	2.3	2.2	
Foreign information and exchanges	1.3	2.9	
Veterans' benefits	26.4	18.8-22.4	71-85

The resource method has limitations. It is based on observable indicators such as manpower and floor-space, and it is retrospective and cannot be used to forecast Soviet military RDT&E expenditures directly. Fewer collection opportunities and delays in collection and processing make it less likely that we will detect recent changes in the level of military RDT&E work. Without new information, we assume that organizations engaged in military RDT&E work continue the trend in the level of these activities. Finally, the crude measure used for converting our estimates from rubles to dollars imparts additional uncertainty.

national security-related activities that are not included in the baseline definition of defense (see appendix C for a description of these activities). We have estimated these costs for a single year, 1986—the most recent year for which we have reasonably complete information (see table 4). Under the expanded definition, the dollar value of Soviet defense and national security activities exceeded comparable US costs by a margin of 5 to 7 percent, compared with 4 percent when only traditional defense activities are measured.

Extended Comparisons

In addition to the traditional defense activities discussed above, both the Soviet Union and the United States engage in other activities that are intended to advance their national security objectives. This section examines the dollar costs of a wider set of

The additional activities included here are presented in three functionally related sets. The first set includes activities that bolster mobilization or wartime preparedness, such as civil defense and national mobilization capacity. The second set includes activities intended to enhance a nation's global position, such as foreign aid and the administration of a foreign policy

establishment. The final set includes the cost of veterans' benefits,⁷ which also are not usually included in baseline defense comparisons because they do not directly contribute to war-fighting potential.

Comparisons of this nature are somewhat arbitrary and, because of the disparity between the two socio-economic systems, cannot capture all defense-related activity. Readers are therefore cautioned that these activities probably do not constitute a complete accounting of all national security endeavors.

Mobilization and Wartime Preparedness

The dollar value of Soviet activities sustaining wartime preparedness in 1986 was roughly twice as great as comparable US outlays:

- Civil defense activities are more extensive in the USSR than in the United States.
- The number of personnel assigned to internal security duties is far greater in the USSR.
- Activities in support of national mobilization capacity are more extensive in the USSR; this is particularly true of those activities sustaining industrial and strategic reserves and industrial surge capacity, for which the dollar valuations were several times greater than comparable US outlays.

Enhancement of Global Position

The dollar values of Soviet and US activities in 1986 intended to enhance the respective global positions of the two countries were roughly equal:

- The greatest costs for both countries were incurred for economic and military aid, the combined dollar values of which were roughly equal, as were the respective dollar costs of conducting foreign affairs.

⁷ Readers should note that the present format differs from that of previous assessments. Several categories have been combined within the extended comparison and others have been included in the baseline figure or have been deleted. Appendix C provides definitions for these categories and outlines the basis for our reagggregations.

- On the other hand, Soviet dollar costs of supporting foreign information and exchange activities were over twice as high as comparable US outlays.

Veterans' Benefits

The dollar costs of Soviet veterans' benefits were less than US costs. Stricter Soviet eligibility rules and higher mortality rates limit the number of beneficiaries to a level below that in the United States. We estimate that the dollar value of Soviet veterans' benefits in 1986 was about four-fifths that of corresponding US outlays.

Outlook

The Soviet Union

Our estimate of future Soviet military spending is formulated largely from an analysis of ongoing military activities. This analysis suggests that recent trends in the dollar costs of Soviet defense activities are likely to continue through the remainder of the current five-year plan (1986-90), with outlays increasing by 2 to 3 percent a year. Any such forecast, however, is valid only to the extent that established patterns are not disrupted by major policy changes. The Soviets are talking about major changes in their military policy, but to date we have seen no indication that their professed adoption of a doctrine of "reasonable sufficiency" is affecting weapons development, procurement, or the size or structure of Soviet military forces. Given the difficulty of translating what we judge to be a still-ill-defined concept into specific prescriptions for equipping, manning, and operating military forces, we believe that, even if the Soviets are serious about their commitment to a new military doctrine, substantial changes in their defense activities would not be evident until the 1990s. Similarly, although they may be able to realize some resource savings from the INF Treaty and the withdrawal of their forces from Afghanistan, we do not anticipate that these measures will translate into big reductions in the overall level of Soviet defense activities in the next 10 years.

As far as future trends in Soviet military procurement are concerned, the military is likely to face increasing competition for resources in the years ahead. The Soviet leadership's ongoing efforts to modernize obsolescent industrial plant and equipment, for example, will require the allocation of scarce high-quality resources—once the near-exclusive preserve of the defense sector—to civilian economic uses. The overall modernization of the defense industries carried out during the late 1970s and early 1980s should allow the Soviets to manufacture most of the weapons we are projecting for the next few years without having to build new facilities or reequip existing factories. Competition for basic materials, intermediate goods, components, and skilled labor could cause production of some of these new systems to be somewhat slower and the date of introduction somewhat later than projected, but even reduced levels of procurement would permit substantial continuing military modernization.

While General Secretary Gorbachev appears to be encouraging the hope that arms control agreements will result in resource savings, the INF cuts probably will have only a limited impact on the level of defense spending measured in either dollars or rubles in the near term. More substantial savings could, however, accrue to the Soviets by the year 2000 as a result of the cancellation of follow-on programs eliminated by the INF Treaty. The direct savings from a START agreement that would reduce the number of warheads is much less certain and would depend heavily on the rate at which the Soviets modernize their forces both in the absence of an agreement and under such an accord.

The withdrawal of Soviet troops from Afghanistan will provide some savings. The direct additional cost of Soviet military involvement in Afghanistan rose steadily after 1980 because of the gradual buildup of personnel, increased expenditure of ammunition, and growing equipment—especially aircraft—losses. By 1988, expenditures in Afghanistan amounted to some 1 to 2 percent of total Soviet defense outlays measured in dollar terms. We believe, however, that the Soviet decision to withdraw probably was based largely on politico-military considerations rather than on economic factors.

In the strategic forces, new generations of modernized weapons, such as land- and sea-based ballistic and cruise missiles, already have entered or soon will enter production. A comprehensive modernization of the USSR's strategic offensive forces should be completed by the early-to-middle 1990s. This will include further deployment of road-mobile SS-25 and the rail-mobile SS-24 ICBMs, the Blackjack intercontinental bomber, and initial deployment of the silo-based SS-18 Mod 5. Strategic defense force improvements, although less substantial, also will permit sustained improvements in capabilities. The Soviets will improve their ability to defend against cruise missiles and low-altitude bombers with such systems as the SA-10 missile and the MIG-31 and SU-27.

Conventional forces will undergo a similar upgrade. The Ground Forces will be equipped with a new tank. Existing tanks will be upgraded with advanced armor and better fire-control systems. Modernized versions of infantry fighting vehicles and armored personnel carriers will be fielded. The USSR is expanding the number of artillery pieces in units and will be placing more emphasis on self-propelled systems. New tactical surface-to-air missiles, such as the SA-12, will give the Ground Forces much greater capabilities to engage enemy aircraft and cruise missiles.

The Air Forces are starting to receive two late-generation fighters, the MIG-29 and the SU-27. These aircraft, carrying advanced air-to-air missiles, are much more maneuverable than their predecessors and have improved fire-control systems. Two new combat helicopters, the Havoc and the Hokum, will be fielded by the end of the 1980s.

The Navy will receive more new attack submarines of the Akula and Sierra classes. These submarines are quiet, have improved sonar systems, and carry advanced weapon systems. New surface combatants, including the Soviet Union's first full-sized aircraft carrier, will join the fleet. These ships have enhanced capabilities to participate in a protracted conventional conflict.

For Soviet defense activities other than the procurement of weapons and military equipment, the prospects for growth are mixed. Soviet military manpower, and hence the estimated constant dollar cost of military pay and allowances, has not grown appreciably during the last 15 years and is unlikely to grow in the near future. As far as operating activities are concerned, the Soviet armed forces apparently are under intense leadership pressure to increase the efficiency of their operations. Still, with Soviet military operating rates already lower than those of the United States, there is not much room for cutbacks in the operating sphere in the absence of force reductions. Also, the growing Soviet emphasis on procuring more advanced weapons and equipment, which for the most part require more complex maintenance than older, simpler systems, will make it difficult to reduce maintenance costs. Continued growth in RDT&E activities is crucial to Soviet efforts to narrow the US lead in weapons technology. On balance, we believe Soviet overall defense activities, as measured in dollars, probably will grow at or near the recent slow rates for at least the next few years.

The United States

The United States is involved in a major program to modernize its forces, yet in the current fiscal climate has decided to scale back plans, reduce force levels,

and eliminate some programs. Programs outlined in the Secretary of Defense's *Annual Report to the Congress, Fiscal Year 1989* call for further improvements in all three services. The Army will reduce the size of its forces, but will continue to modernize them with M-1A1 Abrams tanks and additional Bradley armored fighting vehicles. Substantial numbers of the new AH-64 Apache attack helicopter will be introduced into the force. In the next several years the Navy plans to acquire two additional Nimitz-class aircraft carriers and complete the reactivation of four Iowa-class battleships. It will also introduce new cruisers, destroyers, and attack submarines. Navy air assets will be expanded with substantial numbers of F/A-18s, AV-8Bs, and additional F-14Ds. The Navy's strategic capabilities will be improved with the deployment of the Trident II D-5 missile. The Air Force will continue to receive modernized F-15s and F-16s, and its strategic nuclear forces will be improved with further deployments of the Peacekeeper missile and the B-1B bomber.

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Appendix A

Costing Methodologies for Soviet and US Military Programs

Dollar Cost Comparisons

Estimates of Soviet defense activities expressed in dollars measure the cost, using prevailing US prices and wages, to produce and man a military force of the same size, armed with the same weapons, and operated in the same manner as that of the Soviet Union.

Definitions

In this paper, defense activities are defined to include the following US activities and their counterparts in the Soviet Union:

- National security activities funded by the Department of Defense.
- Defense-related nuclear programs funded by the Department of Energy.
- Selective Service activities.
- Defense-related activities of the Coast Guard.
- Military pensions.

Also included are border security forces that have a wartime mission of border defense, premilitary training performed by civilian schools, and pay for reservists funded by civilian enterprises.

Excluded are:

- Civil space activities that in the United States would be performed by the National Aeronautics and Space Administration.
- Military assistance to foreign nations (except for the costs of uniformed personnel) and military sales.
- Civil defense programs.
- Internal security or uniformed labor troops who do not have wartime defense missions.
- The cost of increasing and maintaining stockpiles of reserves such as fuel, spare parts, and raw materials.
- Industrial mobilization preparations.
- Dual-use infrastructure (including communications lines, reinforced bridges, and wider roads).
- Veterans' programs.

Soviet Military Programs

We begin to develop the estimate of the dollar value of Soviet defense activities by identifying and listing Soviet forces and their support organizations. Our model contains a description of over 1,500 distinct defense components—for example, individual classes of surface ships; ground forces divisions, divided into categories on the basis of type and readiness level; and air regiments, categorized by aircraft type for each service. Our listing also contains for each component the latest estimate of the order of battle, manning levels, equipment inventories, and new equipment purchases.

To these detailed estimates of physical resources, we apply appropriate US prices and wage rates:

- For procurement, we estimate the cost to build the Soviet weapons and equipment at prevailing dollar prices for materials and labor (including overhead and profit), using US production technology. It is assumed the necessary manufacturing capacity, materials, and labor would be available.
- For operations and maintenance, we apply dollar prices to estimates of the labor, materials, spare parts, overhead, and utilities required to operate and maintain equipment the way the Soviets do.
- For military personnel, we estimate the military rank of the person in the United States who would be assigned the duties of each Soviet billet. We then apply the appropriate US pay and allowance rates to that billet.

The results are then aggregated by military mission and by resource category.

To estimate the dollar value of Soviet RDT&E activities, we use a "resource cost" method which assigns ruble expenditure values to the resources used in Soviet military RDT&E activities. These include wages, materials, equipment, capital repair, capital construction, travel, training, and other operating costs. To obtain dollar values, the ruble estimate is converted by using an average of our military procurement dollar-ruble ratios. The purpose of using this ratio is to reflect the different productivities of R&D resources in the two countries. In effect, we are assuming that the ratio of the dollar value of the R&D work performed in the Soviet Union to the ruble cost of these resources equals the ratio of the dollar value of military hardware produced in Soviet defense plants to the ruble cost of the resources employed in those plants. []

The resource-cost methodology defines military RDT&E according to the definition used by the US Department of Defense in its reporting of US outlays for military RDT&E. RDT&E consists of all phases of programs and activities from research through full-scale testing, both for new weapon systems and the improvement or modification of operational systems. []

US Military Programs

US data in this paper are expressed in terms of outlays derived from the *Five-Year Defense Program* (FYDP) of the Department of Defense as of August 1987 and from the US budget. Outlays for defense-related activities of the Department of Energy, the Coast Guard, and the Selective Service have been added to improve the comparison with Soviet programs. The data have been converted from fiscal to calendar year terms and indexed to 1986 dollars using detailed price indexes for each type of military expenditure. The US figures in this report, therefore, do not match actual budget authorizations and appropriations. []

The physical-quantity data for weapon systems contained in this paper are of two types: delivery data, which refer to the quantities of selected weapon systems acquired during a calendar year; and order-of-battle data, which refer to the existing inventory of weapon systems in active units at a given time (the

middle of the calendar year for the Soviet Union and the end of the fiscal year for the United States).¹ US order-of-battle data were derived from the FYDP; US production data were provided by the Department of Defense. []

Confidence in the Dollar Cost Estimates

Every year we revise the estimate of the dollar value of Soviet defense activities using updated data on costs, production quantities, order of battle, and operating rates. Presumably, our estimates for any one year (for example, 1976) would improve as time passes, because we should know more about the quantities and characteristics of the weapon systems and facilities produced in that year. []

The annual revisions to incorporate new information also provide a method of assessing how well we estimate the dollar costs of major portions of Soviet defense activities. If estimates for a given year changed sharply with every review—indicating that different analysts, improved data, and new methodologies produce very different results—we would have little confidence that we had an accurate estimate of military activities in that year. On the other hand, if the estimates fluctuated by only a small amount and no bias were detected, we could have greater confidence that the estimates were substantially correct. []

On the basis of past experience, we are reasonably confident of the accuracy of our estimates. Indeed, monitoring our annual revisions and other statistical techniques lead us to believe that our dollar cost estimate for total defense activities is unlikely to be in error by more than plus or minus 10 percent for any year from 1973 to 1987. The margin of error can be much wider for some individual items and categories than for the total because of the tendency of errors at lower levels of aggregation to be partially offsetting. We generally have more confidence in data that represent trends than in data for absolute levels, especially the levels for individual years. []

¹ In 1976 the US fiscal year was changed from a July-June to an October-September timespan. Therefore, the end of the fiscal year is 30 June through 1976 and 30 September thereafter. []

Ruble Comparisons

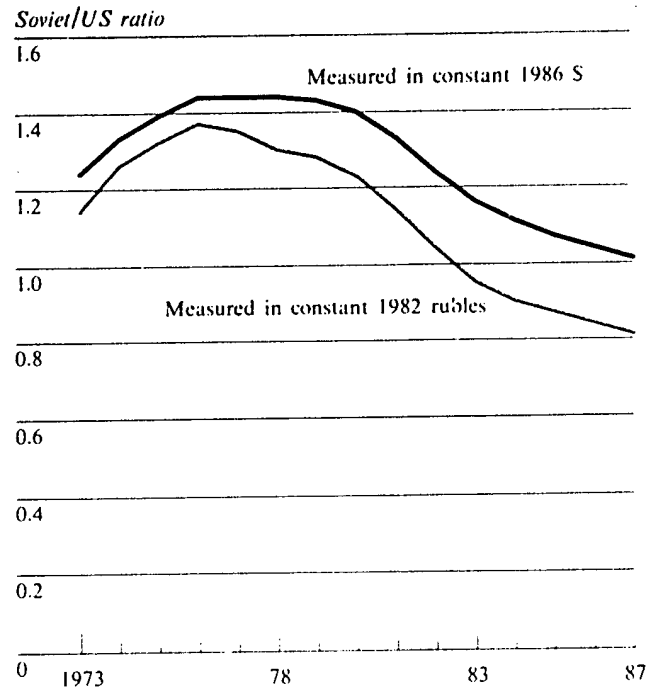
US dollars are not the only currency that can be used to compare US and Soviet defense activities. We have also estimated the ruble costs of US and Soviet defense activities for comparison with the dollar calculation. Because the price structures for goods and services differ for the United States and the Soviet Union, the relationship of US to Soviet defense activities measured in dollars differs somewhat from the relationship measured in rubles. The overall trends in defense activities, however, are about the same whether measured in rubles or dollars (see figure 12). Our confidence in the ruble cost comparison is much lower than our confidence in the dollar cost comparison because our access to ruble prices is not as extensive as our access to dollar prices. []

Our ruble estimate of US defense activities measures the cost, in constant 1982 rubles, for the Soviets to produce and man a military force of the same size and with the same weapons as that of the United States and to operate that force as this country does. To maintain consistency with our dollar estimates, we use the same definition of national security activities in the ruble-based comparisons as in the dollar-based comparisons. []

Ruble costs for US defense activities were calculated by major resource categories—construction, O&M, personnel, procurement, and RDT&E. Personnel costs were derived by a direct costing methodology because Soviet pay and allowance data were available. Ruble costs for the other four categories were derived by multiplying the US dollar resource accounts (called resource identification codes by the Department of Defense) by appropriate ruble-dollar ratios. []

Ruble-dollar ratios (developed originally to convert the value of Soviet defense activities from dollars to rubles in those cases where we do not derive ruble values directly) were used to convert US dollar outlays to rubles. The original ratios applied to specific Soviet product groups—aircraft, electronics, and missiles—that did not necessarily correspond to the US resource accounts. To mitigate this problem we constructed new composite ruble-dollar ratios. These are weighted

Figure 12
Ruble and Dollar Comparisons of
Soviet and US Defense Activities, 1973-87



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averages of the basic product group, the weights representing the share of total costs of each product group in the particular resource account. []

The ruble cost estimate of Soviet defense activities for the period 1973-87 exceeded that for similar US activities by about 7 percent. Measured in dollars, the cost of Soviet defense activities was about 25 percent greater. The estimates differ because of dissimilarities in US and Soviet price structures, primarily those for personnel and procurement, and the changing composition of US defense programs. Whereas personnel costs for the US military, with an all-volunteer force, are relatively high, personnel costs for the USSR with

its universal conscription policy are relatively inexpensive. Thus, military personnel are relatively more expensive when measured in dollars than in rubles. Similarly, capital goods are relatively expensive in the Soviet Union. For this reason, US military procurement is relatively more expensive when measured in rubles than in dollars. As procurement has become an increasingly large share of US defense programs since about 1980, it has had an even greater impact on the ruble valuation of US programs.

Appendix B
Statistical Tables

Table B-1
Estimated Dollar Value of Soviet Defense Activities and
US Defense Outlays by Resource Categories, 1965-87 ^a

Billion 1986 US \$

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Soviet total	177.3	181.7	190.0	199.0	205.5	215.0	220.8	224.9	233.1	242.0	247.2	252.5
Investment	49.8	49.4	53.3	58.1	59.4	61.5	61.4	61.3	65.0	70.2	72.1	73.2
Procurement	38.9	39.7	43.4	46.7	49.0	50.9	51.1	50.8	55.5	60.3	61.5	61.9
Construction	11.0	9.7	9.9	11.3	10.4	10.6	10.4	10.6	9.5	9.9	10.7	11.3
Operating	110.7	113.8	118.0	123.4	127.6	132.5	136.6	140.6	143.2	146.1	148.5	151.8
Personnel ^b	76.5	77.5	80.2	83.6	86.2	89.4	91.7	93.8	94.6	95.9	97.8	99.1
O&M	34.2	36.3	37.8	39.8	41.4	43.1	44.9	46.8	48.5	50.2	50.7	52.7
RDT&E	16.7	18.5	18.7	17.6	18.5	21.0	22.8	23.0	25.0	25.8	26.5	27.5
US total	204.7	231.2	259.1	267.2	254.1	232.3	213.0	196.8	187.4	182.4	178.0	174.8
Investment	44.7	53.8	64.3	68.4	62.2	52.1	44.2	39.2	36.7	34.7	33.3	33.2
Procurement	40.2	48.7	59.5	63.9	58.2	48.7	41.1	36.1	33.5	31.4	29.6	29.4
Construction	4.5	5.0	4.8	4.5	4.0	3.4	3.1	3.1	3.3	3.3	3.7	3.8
Operating	134.4	151.5	167.5	171.7	166.8	156.7	145.6	134.3	127.6	125.9	124.7	122.2
Personnel ^b	84.1	90.7	98.8	102.6	100.3	94.2	85.4	76.0	70.8	68.7	66.5	64.4
O&M	50.3	60.8	68.6	69.1	66.5	62.5	60.1	58.3	56.8	57.2	58.1	57.8
RDT&E	25.6	25.9	27.3	27.1	25.1	23.5	23.2	23.3	23.1	21.7	20.0	19.4

^a Because of rounding, data may not add to totals shown.

^b Includes retirement.

[Redacted]

Table B-1 (continued)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Soviet total	254.7	259.2	264.0	269.8	268.8	272.3	275.6	278.2	284.9	291.1	296.5
Investment	73.6	74.0	75.8	76.3	72.5	73.0	73.1	72.5	76.3	78.3	80.7
Procurement	62.7	62.3	63.6	63.9	61.7	62.0	62.5	61.5	65.4	68.1	70.2
Construction	11.0	11.8	12.2	12.3	10.8	11.0	10.6	11.0	10.8	10.2	10.5
Operating	153.2	155.3	157.7	160.7	162.8	164.9	166.1	167.4	168.7	171.0	172.9
Personnel ^b	99.6	100.8	102.1	104.7	105.1	106.2	106.6	106.8	107.0	107.6	108.0
O&M	53.7	54.4	55.6	56.1	57.8	58.6	59.5	60.6	61.7	63.4	64.9
RDT&E	27.9	29.8	30.6	32.8	33.5	34.4	36.4	38.2	39.9	41.8	42.9
US total	177.5	179.7	185.1	192.2	201.4	219.1	237.6	249.7	265.7	279.8	292.2
Investment	35.3	37.5	42.5	45.2	50.3	59.4	70.3	76.8	83.1	89.2	97.4
Procurement	31.8	34.5	39.5	42.1	47.4	55.8	66.2	72.4	78.3	83.9	91.9
Construction	3.6	3.0	2.9	3.1	3.0	3.6	4.2	4.4	4.8	5.3	5.5
Operating	122.0	122.2	122.7	126.3	129.3	136.1	141.0	143.6	149.4	153.9	155.7
Personnel ^b	63.1	62.1	62.0	63.1	63.4	65.3	67.6	69.0	70.8	71.1	71.6
O&M	59.0	60.2	60.8	63.2	65.9	70.8	73.4	74.7	78.7	82.7	84.0
RDT&E	20.1	20.1	19.9	20.7	21.8	23.6	26.3	29.3	33.1	36.7	39.1

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	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
US total investment	44.7	53.8	64.3	68.4	62.2	52.1	44.2	39.2	36.7	34.7	33.3	33.2	35.3	37.5	42.5	45.2	50.3	50.4	70.3	76.8	83.1	89.2	97.4
Strategic forces	10.9	9.4	8.5	8.7	9.1	8.8	8.3	8.1	7.7	6.7	5.8	5.6	6.3	7.0	7.8	7.9	8.8	10.1	12.1	14.4	17.3	18.6	18.9
Intercontinental attack	6.8	5.6	5.1	5.5	5.8	5.3	4.6	4.5	4.3	4.0	3.7	3.6	3.9	4.3	4.6	4.3	4.6	5.4	6.8	8.7	11.0	12.3	12.5
Intercontinental bombers	1.2	1.5	2.0	2.6	2.8	2.0	1.3	1.3	1.2	0.8	0.6	0.5	0.5	0.6	0.7	1.0	1.4	2.2	3.5	4.9	6.3	7.3	6.8
Intercontinental submarines	2.4	1.7	1.3	1.3	1.6	1.8	1.9	1.8	1.7	1.8	1.9	2.0	2.4	3.0	3.4	3.0	2.9	2.8	2.7	2.4	2.3	2.3	2.6
Intercontinental missiles	3.2	2.3	1.8	1.6	1.4	1.4	1.4	1.4	1.4	1.4	1.2	1.1	1.0	0.7	0.5	0.3	0.3	0.4	0.6	1.5	2.4	2.7	3.0
Strategic defense	0.7	0.7	0.8	1.0	1.1	1.3	1.6	1.5	1.2	0.8	0.3	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4
Strategic other	3.4	3.1	2.7	2.3	2.2	2.2	2.1	2.1	2.2	2.0	1.8	1.9	2.3	2.6	3.1	3.6	4.0	4.6	5.2	5.5	6.0	6.0	6.1
General purpose forces	22.8	30.5	39.3	42.6	38.0	30.6	24.4	20.2	18.7	18.4	17.8	17.8	19.2	20.8	24.6	26.9	31.2	37.3	44.0	46.6	48.9	51.9	55.8
Land	5.9	9.3	13.3	14.6	12.2	8.6	5.7	3.7	3.4	3.6	3.0	2.9	4.4	5.3	6.4	7.1	8.2	9.9	12.9	14.7	15.7	15.9	16.7
Tactical air	8.6	11.3	14.5	15.2	13.1	10.7	8.8	7.9	7.7	7.7	8.0	8.4	8.4	8.9	10.6	12.2	14.1	16.8	18.7	18.8	19.2	20.3	21.8
Naval	5.8	6.1	6.6	7.5	7.7	7.1	6.8	6.6	6.5	6.4	6.3	6.1	6.0	6.2	7.2	7.1	8.1	9.4	10.5	10.9	11.4	12.7	13.9
Mobility	2.5	3.8	4.9	5.4	5.1	4.2	3.1	2.0	1.2	0.6	0.5	0.4	0.3	0.3	0.4	0.5	0.8	1.3	1.8	2.2	2.6	3.0	3.3
Support	11.0	13.8	16.4	17.0	15.1	12.7	11.6	10.8	10.3	9.6	9.8	9.8	9.8	9.8	10.0	10.3	10.4	12.0	14.2	15.8	16.9	18.8	20.7
Soviet total investment	49.8	49.4	53.3	58.1	59.4	61.5	61.4	61.3	65.0	70.2	72.1	73.2	73.6	74.0	75.8	76.3	72.5	73.0	73.1	72.5	76.3	78.3	82.7
Strategic forces	13.3	14.5	17.9	17.3	17.4	18.5	15.5	14.1	17.1	19.7	19.7	19.5	18.5	18.2	18.6	18.9	17.6	17.6	17.1	16.6	18.3	16.5	18.8
Intercontinental attack	4.9	7.3	9.6	8.8	8.4	9.0	7.2	6.8	9.1	11.1	11.2	10.3	9.2	8.6	8.7	8.3	5.3	5.4	5.7	5.8	6.8	6.6	7.4
Intercontinental bombers	0.4	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.5	0.6	1.3	1.1	0.8
Intercontinental submarines	0.7	1.2	2.7	4.1	4.8	5.2	4.6	4.9	6.8	7.1	5.3	4.3	4.0	3.9	3.6	4.0	3.5	3.7	3.6	3.9	4.5	4.6	5.2
Intercontinental missiles	3.8	6.0	6.9	4.7	3.5	3.7	2.5	1.7	2.2	4.0	5.8	5.9	5.2	4.6	5.0	4.3	1.7	1.5	1.6	1.2	1.0	0.9	1.4
Peripheral attack	2.3	1.8	2.0	2.2	1.6	1.2	1.1	1.3	1.6	1.9	1.6	2.0	2.5	2.8	3.9	3.9	4.8	4.3	3.7	2.8	3.2	2.1	3.2
Strategic defense	4.5	3.8	4.5	4.5	5.5	6.3	5.5	4.2	4.3	4.5	4.7	4.8	4.2	4.0	3.0	3.7	4.4	4.8	4.4	4.9	5.2	4.7	5.0
Strategic other	1.5	1.6	1.7	1.8	1.8	2.0	1.8	1.9	2.1	2.2	2.2	2.4	2.6	2.8	3.0	2.9	3.1	3.1	3.3	3.1	3.2	3.2	3.2
General purpose forces	23.3	22.6	22.6	25.5	25.4	27.3	29.2	29.9	30.0	32.3	33.6	33.7	36.2	36.3	37.2	37.8	34.8	34.4	35.5	35.0	36.6	40.7	40.5
Land	8.0	8.8	9.7	11.6	11.9	12.7	13.2	13.5	14.7	14.8	14.2	14.6	14.8	15.6	16.0	17.2	16.7	16.7	16.4	17.0	17.4	17.5	17.1
Tactical air	4.4	3.5	2.3	2.1	2.7	3.9	6.2	7.2	7.3	7.6	8.8	8.1	8.4	7.5	7.7	7.8	5.5	4.6	5.6	6.6	6.2	8.9	8.2
Naval	9.6	9.3	9.6	10.6	9.7	9.4	8.7	8.0	7.2	8.2	8.7	9.3	11.3	11.7	12.0	11.1	11.4	11.4	11.6	9.8	10.3	11.6	11.9
Mobility	1.3	0.9	0.9	1.2	1.2	1.3	1.2	1.3	0.8	1.8	2.0	1.6	1.6	1.5	1.5	1.7	1.3	1.6	1.8	1.6	2.6	2.6	3.3
Support	13.3	12.2	12.8	15.3	16.6	15.7	16.6	17.3	18.0	18.1	18.8	20.1	18.9	19.5	19.9	19.5	20.0	21.0	20.5	20.9	21.4	21.1	21.4

^a Because of rounding, data may not add to totals shown.

Appendix C

Extended Dollar Cost Comparisons

The definition of "defense" used in our traditional comparisons of US and Soviet defense activities includes activities of the US Department of Defense and related activities of a few other Federal agencies as well as their Soviet counterparts (see appendix A for a more complete description). Because both countries engage in a broader set of activities to advance their national security interests, we have established an expanded definition of defense including three broad tiers of functionally related activities:

- The costs of activities that enhance a nation's mobilization and wartime preparedness capabilities.
- The costs of activities that enhance a nation's global position.
- The continuing costs of veterans' benefits.

We have changed the format in which we previously presented extended dollar cost comparisons. For example, figures for US and Soviet military and civilian pensions now appear in the baseline estimate. The cost of supporting government-funded foreign students is now included in the "Foreign Information and Exchange" category. We have also reaggregated five previous categories into one "Mobilization Capacity" category. Finally, we have deleted the "Cash Flow" and "Defense-Related Lawsuit" categories from the comparison. The former was deleted on the basis of our reassessment that debt servicing does not constitute a national security activity; we deleted the latter because both the US and Soviet figures were deemed negligible.

Mobilization and Wartime Preparedness

This category consists of measures that enhance national war-fighting capability or contribute to national security but are not included in our baseline activities. Soviet dollar costs for these activities in 1986 were about twice as high as comparable US outlays (see table 4 on page 26).

Internal Security Troops. Soviet Internal Security Troops (MVD) are not intended to fight enemy military forces, so they are not included in the baseline comparison. They do, however, assist in controlling Soviet borders and have a wartime role of maintaining order in rear areas and occupied territory. We estimate their cost in 1986 at \$3.5 billion.⁹ The United States does not have an exact counterpart, but we have included the costs of US border patrol and state costs for the National Guard and reserves as the nearest equivalents (\$1.7 billion).

Construction and Railroad Troops. We include the Soviet construction and railroad troops because their wartime mission is to build fortifications, repair battle damage, and maintain existing structures and rail lines, although in peacetime they also work on civilian projects. We count only the costs of those personnel who worked on civilian projects because labor on military projects is already part of the baseline estimate. The large number of personnel with civilian tasks accounted for the large costs (\$7.1 billion). Outlays for the closest US counterpart, the civilian Corps of Engineers, totaled \$2.8 billion in 1986.

Civil Defense. Civil defense activities are more extensive in the USSR than in the United States and include about 150,000 full-time personnel (military and civilian), urban and exurban blast shelters, and civil defense installations run by the military. Other programs, the details of which are largely unknown, include underground industrial plants, hospitals, power plants, and food and fuel storage, as well as individual protective gear and equipment and materiel reserves. Our estimate of Soviet civil defense costs is \$6.4 billion.

⁹ We exclude the estimated 280,000 internal troops who guard prisons and labor camps because they do not perform a national defense role.

Civil Space. While the prestige civilian space activities confer may to some degree enhance the USSR's global position, we have moved this account to the wartime preparedness category because of the wartime utility of the Soviet civil space infrastructure. We estimate that the dollar cost of the Soviet civil space program (\$6.0 billion) in 1986 was slightly less than outlays for NASA (\$7.4 billion).

Mobilization Capacity. This category includes activities that sustain the capacity to move the Soviet and US economies to a war footing and comprises the following categories listed individually in previous comparisons: industrial and strategic reserves, defense highways, industrial surge capacity, synthetic fuels, and merchant fleet operating and maintenance (O&M) costs. Because we have little information on the exact size and disposition of Soviet industrial and strategic reserves, our cost estimate for this subcategory is a range of \$0.4-1.7 billion; corresponding US outlays totaled \$0.6 billion in 1986. We estimate that the Soviets spent the equivalent of \$0.4 billion on the construction and maintenance of their defense highway network; corresponding US outlays were judged to be zero because civil needs have been sufficient to justify funding of major US highways. Our estimate of Soviet industrial surge capacity is based on fragmentary data and is expressed as a range of 0.5 to 5 percent of the machine-building sector's annual investment, or \$0.5-4.9 billion in 1986; comparable US costs were negligible. We estimate that the Soviets spent the equivalent of \$0.3 billion on synthetic fuel development programs; US costs reflect 1986 Department of Energy outlays for alternative fuels production (less than \$0.1 billion). Finally, we estimate that merchant fleet O&M costs for both the United States and the USSR in 1986 were roughly equal (\$0.3 billion).

Enhancement of Global Position

This category covers activities that serve foreign policy goals. The cost of these activities for the USSR and the United States were roughly equal in 1986.

Foreign Military and Economic Aid. We have combined estimates of military and economic aid as a

result of definitional problems associated with specifying where certain US programs should be included. For example, Economic Support Fund (ESF) outlays (which in 1986 totaled \$4.7 billion) may be construed as either military or economic aid, inasmuch as they are economic grants for nations of strategic significance to US interests (for example, Israel and Egypt) and, in a few cases, are intended to subsidize defense expenditures. Combined estimates for military and economic aid were roughly equal for the two countries in 1986. Readers are cautioned that economic aid figures reflect gross numbers, since we lack information on repayments to the USSR. The Soviet economic aid figure also includes the costs of price subsidies in trade with Eastern Europe and other Communist countries. Overall, we estimate that the USSR has provided the equivalent of \$4.4 billion¹⁰ in economic aid grants and \$6.5 billion in military aid grants in 1986. Corresponding US outlays were \$12.4 billion in economic aid and \$8.5 billion (figure includes ESF outlays) in military aid.

Conduct of Foreign Affairs. This category includes the costs of administering foreign policy and reflects annual outlays to the US Department of State and the dollar value of estimated outlays to the Soviet Ministry of Foreign Affairs. We estimate that these were roughly equal in 1986.

Foreign Information and Exchange Activities. This category represents the cost of official efforts to project a national image abroad. The US figure reflects annual outlays to the US Information Agency—including the Voice of America—Radio Free Europe, and Radio Liberty; the Soviet figure reflects the dollar costs of corresponding Soviet activities, which are performed by various agencies and ministries. Also included in this category are the dollar costs of supporting government-funded foreign students (cited as a separate category in previous assessments). We estimate that the dollar value of Soviet foreign information and exchange activities was over twice that of corresponding US outlays.

¹⁰ Includes \$4 billion in price subsidies. Because Western countries do not count subsidies in their aid totals, this sum must be removed to make the Soviet aid number comparable to the US data.

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Veterans' Benefits. Veterans' benefits in the USSR differ considerably from those in the United States because of stricter eligibility rules, and higher mortality rates limit the number of beneficiaries to a level below that in the United States.

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Appendix D

Comparisons of the Characteristics and Costs of Selected Soviet and US Weapon Systems

This appendix presents comparisons of the characteristics and dollar costs of selected Soviet and US tanks and tactical aircraft, identifying the key features contributing to the differences or similarities between the estimated dollar costs of the Soviet systems and US weapons costs. These comparisons illustrate that, in general, current US weapon systems are more complex and more costly than their most commonly procured Soviet counterparts. The estimated dollar cost of the Soviet weapons discussed are derived by the building-block methods discussed in appendix B. The costs of US weapons were obtained from US Department of Defense *Selected Acquisition Reports* (SAR). We adjusted the SAR data to make them comparable in coverage to our estimates of the dollar value of the Soviet weapons. In the case of aircraft, for example, we adjusted the SAR cost to reflect only the flyaway cost plus initial spare parts and to exclude any support equipment.

Readers should be aware that our confidence in estimates of the costs of an individual Soviet weapon system is lower than our confidence in cost estimates at a higher level of aggregation. The margin of error can be wider for some individual items than for the total because of the tendency of errors at high levels of aggregation to be partially offsetting.

Readers should also note that these comparisons do not by themselves indicate which weapon system is a "better buy," nor do they constitute a complete measure of weapon system capabilities. Such judgments would require a net technical assessment beyond the scope of this paper. We invite comments from our readership on how to improve these comparisons and how to make them more useful.

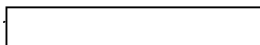
**Table D-1
Tank Comparisons**

	Soviet					US	
	T-64A	T-64B	T-72	T-72M1	T-80	M-1 Abrams	M-60A1
Weight (tons)	38	43	41	43	42-45	57	55
Engine							
Type	5-cylinder opposed diesel	5-cylinder opposed diesel	V-12 diesel	V-12 diesel	Turbine	Turbine	V-12 diesel
Horsepower	750	750	780	780	1,000	1,500	750
Transmission	Semiautomatic, 7 forward, 1 reverse	Semiautomatic, 7 forward, 1 reverse	Semiautomatic, 7 forward, 1 reverse	Semiautomatic, 7 forward, 1 reverse	Semiautomatic, with braking, 7 forward, 1 reverse	Automatic, 4 forward, 2 reverse	Automatic, 2 forward, 1 reverse
Suspension	Torsion bar	Torsion bar	Torsion bar	Torsion bar ^a	Torsion bar ^b	Torsion bar	Torsion bar
Main gun							
Bore type	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth	Rifled
Size	125 mm	125 mm	125 mm	125 mm	125 mm	120 mm	105 mm
ATGM	None	AT-8	None	None	AT-8	None	None
Fire-control rangefinder	Coincidence	Laser	Coincidence	Laser	Laser	Laser	Coincidence
Computer solution	Partial	Full	Partial	Full	Full	Full	Partial
Automatic loader	Yes	Yes	Yes	Yes	Yes	No	No
Night vision	Active infrared	Active infrared	Active infrared	Active infrared	Active infrared	Thermal imager	Active infrared
Electronic counter-measures	ECM against TOW, ATGM, laser-guided munitions	ECM against TOW, ATGM, laser-guided munitions	ECM against TOW, ATGM, laser-guided munitions	ECM against TOW, ATGM, laser-guided munitions	ECM against TOW, ATGM, laser-guided munitions	None	None
Estimated production	8,150	3,828	7,600	6,250	3,990	3,278	6,279
Cost (average unit cost of first 1,000 units, CY 1986 dollars)	\$0.9 million	\$1.2 million	\$1.1 million	\$1.1 million	\$1.2 million	\$1.6 million	\$0.8 million

Principal differences: In addition to being heavier than the Soviet tanks and having a more powerful engine and an automatic rather than a semiautomatic transmission, the US M-1 tank is equipped with a costly thermal imager and a sophisticated gun stabilization system with an advanced fire-on-the-move capability that the Soviet tanks do not have. In comparison with the US M-60A1 tank, on the other hand, the Soviet tanks have more advanced fire-control systems, electro-optics, gun-missile systems, and laminated armor.

^a May have variable height suspension.

^b Probably has variable height suspension.



**Table D-2
Aircraft Comparisons**

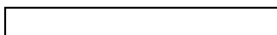
	Air-Superiority Fighters		Counterair Fighters		Ground Attack Fighters	
	Soviet SU-27 Flanker	US F-15 Eagle	Soviet MIG-23 Flogger	Soviet MIG-29 Fulcrum	US F/A-18 Hornet ^a	Soviet SU-22 Fitter
Maximum weight (kilograms)	25,470	25,450	19,600	17,900	23,540	17,900
Payload (kilograms)	1,320	10,705	3,000	3,500	7,710	4,409
Length (meters)	21.6	19.4	16.4	16.0	17.1	15.3
Wingspan (meters)	14.6	13.0	8.7	11.4	11.4	9.9
Range (kilometers)						
Ferry	3,710	4,800	3,000	2,270	3,700	2,900
Combat	1,260	1,530	550	720	740/1,065 ^b	400
Speed (Mach)	2.3	2.5	2.35	2.2	1.8	2.1
Armaments	6 AAMs, cannon	8 AAMs, cannon	4 AAMs, guns	6 AAMs	4 AAMs	2 ASMs, guns
Estimated production	311	850	4,364	575	404	1,934
Cost (average unit cost of first 250 units, CY 1986 US \$)	\$17 million	\$22 million	\$13 million	\$14 million	\$25 million	\$9 million

Principal differences: The US F-15 has greater range and can fly at greater speed than the Soviet SU-27 Flanker B. It also has a better engine, more advanced avionics, an airframe designed to last longer and operate under more stressful conditions.

The F/A 18, unlike the other aircraft, is designed for aircraft carrier operations. This requires special features for catapult-assisted takeoff, for landing with use of arresting devices, and for maintenance onboard ship; folding wings for space conservation; and corrosion resistance for operations at sea. The MIG-23 is less maneuverable than the F/A-18. The SU-22 is a ground attack aircraft with less advanced avionics, lighter payload, and less maneuverability than the F/A-18. The maneuverability of the MIG-29 is similar to that of the F/A-18.

^a The US F/A-18 is a dual-capable aircraft for both the counterair and ground attack missions.

^b 740 kilometers in the air-to-air mission; 1,065 kilometers in the ground attack mission.



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