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Foreword

By Caspar W. Weinberger, U.S. Secretary of Defense

To deter Soviet aggression, America's armed forces require command, control and communications (C^3) systems that are survivable and secure. Developing and properly employing these C^3 systems and related command and control strategies demand not only specific, classified threat intelligence for key people in the process, but also a broad understanding of C^3 by a broader audience. Such information serves to enhance public awareness of the potential threat we face and provides an understanding of our modernization efforts to counter it.

The education programs and publications of the Armed Forces Communications and Electronics Association have admirably supported this vital educational goal. In particular, since 1984, *SIGNAL* magazine's Soviet C^3 issues have provided a vital service in fostering better understanding of the current Soviet threat by the public and defense professionals.

A central tenet of Soviet strategy is the destruction, disruption or exploitation of our C^3. Coupled with this is the desire to possess highly survivable and redundant C^3 systems for Soviet and Warsaw Pact forces. To maintain superior C^3 military capabilities, the Soviet Union continues to research and develop advanced systems such as:

- A modern and highly survivable C^3 system to support Soviet intercontinental ballistic missiles
- C^3 to support an anti-ballistic missile (ABM) system
- A true look-down/shoot-down radar for the MiG-29/Fulcrum aircraft, an all weather, counter air fighter interceptor
- An extremely low frequency communications system to contact strategic nuclear powered submarines under most operating conditions
- Helicopters adapted for use as airborne command posts and electronic jamming platforms and as attack and transport platforms
- A vigorous research and development (R&D) program to produce new early warning and other air surveillance radars.

The Soviet Union long has recognized that deficiencies in high technology, especially in computers and microelectronics, hinder its ability to build advanced military systems. As a result, Soviet R&D programs have been targeted to overcome these difficulties. Western technology exploitation also has played a part. For example, the Soviets have invested in R&D projects to develop phased array and over-the-horizon radars, millimeter wave devices and high power radio frequency generators. Unfortunately, Western technology frequently also has been applied to Soviet military uses in computers, avionics and telecommunications.

This issue of *SIGNAL* magazine provides a broad picture of current Soviet C^3 capabilities, by which the reader can gain a better appreciation of their sophistication and pervasiveness. My congratulations to *SIGNAL* magazine for this helpful contribution to widespread understanding of the Soviet military threat.

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Soviet Power Today

Compiled by Daniel J. Marcus
Associate Editor

Power, in and of itself, cannot be measured. Yet just as heat can be identified and quantified with the calorie, military power can be measured in terms of the destructiveness and effectiveness of a country's military arsenal.

Soviet Military Power 1986, a comprehensive analysis of Soviet military capabilities published by the U.S. Department of Defense, measures Soviet strategic and tactical strength, substantiating the reality: The Soviet Union has a strong, dynamic military force—power that intimidates in the political arena and that can win on the battlefield.

Soviet Strategic Plans

Foremost in Soviet nuclear strategy is the ability to destroy enemy nuclear forces before they are launched or reach the Soviet Union. A successful Soviet preemptive attack would depend on effective coordination of Soviet strike capabilities and accurate intelligence of enemy intentions. In addition, effective command, control and communications (C^3) would be essential during a Soviet first strike.

If enemy missiles hit Soviet targets, Soviet strategy then calls for reconstitution of the war base and support and sustenance of combined arms combat in the military theaters. Attack warning systems and launch coordination would play vital roles in a launch-under-attack scenario. To fulfill this requirement, the Soviets have created an elaborate network of satellites, over-the-horizon radar and early warning systems to assess and respond quickly to any nuclear attack. In addition, the Soviets have developed mobile missiles and hardened operational silos to protect Soviet strategic weapons from attack.

Intercontinental Ballistic Missiles

The Soviet Union has an operational intercontinental ballistic missile (ICBM) force of approximately 1,400 silos and mobile launchers with missile ranges of approximately 10,000 kilometers (Figure 1). Since 1982, 818 silo launchers have been refurbished and hardened against attack by U.S. ICBMs.

The SS-18 (Mod 4) and the SS-19 (Mod 3) ICBMs, both in hardened silos, provide the most advanced capabilities in the Soviet strategic force. Since 1982, the Soviet Union has deployed 308 SS-18s, each carrying 10 multiple independently targetable reentry vehicles (MIRVs). Three-hundred sixty SS-19s, each carrying six MIRVs, have been deployed since 1982. The SS-18 force can destroy 65 to 80 percent of U.S. silos with only two nuclear warheads per silo. Presumably, more than 1,000 warheads would remain after the silo attack. The SS-19 can be used against targets in Eurasia.

Also in hardened silos are the SS-17 (Mod 3) ICBMs, each with four MIRVs. One-hundred fifty SS-17s have been deployed since 1979.

Next in the Soviet ICBM arsenal is the single warhead ICBM, the SS-16, which was developed in 1972. The number deployed is not known.

The older Soviet ICBMs consist of the SS-11s (Mods 1, 2 and 3), deployed in the late 1960s and early 1970s, and the SS-13 (Mod 2), deployed in 1973. They are housed in nonreinforced silos. Each system has a single warhead (the SS-13 [Mod 2] carries four multiple reentry vehicles). The Soviets have deployed 28 SS-11s (Mod 1), 420 SS-11s (Mods 2 and 3) and 60 SS-13s.

The Soviets are building mobile ICBMs that provide increased survivability against attack. The SS-25 is a small, road-mobile, single warhead ICBM. More than 70 SS-25s have been deployed since 1985 in launcher garages equipped with sliding roofs and several support buildings to house mobile support equipment. Under development is the SS-X-24, which will carry as many as 10 MIRVs (Figure

2). This medium sized ICBM primarily will be housed on a rail-mobile system to provide maximum survivability.

Submarine Launched Ballistic Missiles

The Soviet Union has the world's largest submarine ballistic missile force (Figure 3): 62 ballistic missile submarines and 983 submarine launched ballistic missiles (SLBMs). Two-thirds of the ballistic missile submarines carry long-range SLBMs while they patrol waters close to the Soviet Union. These submarines can protect themselves against NATO antisubmarine warfare operations and can fire from Soviet waters or even from home ports and still strike targets in the United States.

The Soviets have built four *Typhoon* ballistic missile submarines, the largest strategic submarines in the world (Figure 4). The *Typhoon* carries the SS-N-20, an SLBM with six to nine MIRVs and a target range of 8,300 kilometers. The *Typhoon* can operate under the Arctic Ocean icecap. Three or four additional *Typhoons* probably are under construction for deployment by the early 1990s.

The *Yankee I*, deployed in 1967, carries SS-N-6 (Mods 1 and 2) SLBMs, each with one reentry vehicle (RV), and SS-N-6 (Mod 3) SLBMs, with three RVs. The Soviets have removed 14 *Yankee I* submarines since 1978 in accordance with the Strategic Arms Limitations Talks (SALT) I Interim Agreement. The *Yankee II* carries single RV SS-N-17 SLBMs. The Soviets currently maintain 11 *Yankee* submarines (Figure 5).

The *Delta* class submarines, first deployed in the early 1970s, are larger submarines than the *Yankees*. *Delta I* and *Delta II* submarines carry SS-N-18 SLBMs, of which Mod 1 carries 3 MIRVs; Mod 2, one missile; and Mod 3, seven MIRVs. Thirty-eight *Delta* submarines currently are deployed. The *Delta IV* (Figure 4) will carry the SS-NX-23, a high accuracy 10 MIRV missile currently under development.

Furthermore, the Soviets are expected to deploy in the near future an extremely low frequency (ELF) communications system to maintain contact with strategic nuclear submarines under most wartime conditions.

Bomber Aircraft

Under Soviet military strategy, five air armies, each subordinate to the Supreme High Command, have Soviet strategic bombers and strike aircraft: Smolensk Air Army; Legnica Air Army; Venitza Air Army, Irkutsk Air Army; and Moscow Air Army.

The air armies' bomber forces include 180 Bear and M-type Bison bombers, 145 supersonic Backfire bombers, 397 medium range Tu-22 Blinder and Tu-16 Badger bombers and 450 shorter range Fencer strike aircraft. Soviet Naval Aviation assets include 125 Backfire and 230 Blinder and Badger bombers. In addition, the air armies and Soviet Naval Aviation together have in total approximately 530 tanker, reconnaissance and electronic warfare aircraft.

Thirty Backfires are produced per year. The aircraft can perform missions including nuclear strikes, conventional attack, antiship strikes and reconnaissance. The Backfire has low altitude capabilities for high speed operations, and it can be equipped with a probe for in-flight refueling to increase its range. Nuclear forces bombers are shown in Figure 6.

The Fencer is a supersonic, variable geometry wing, all weather fighter bomber. Four variations of the bomber have been produced since its introduction in 1974.

Furthermore, the Soviets are upgrading their long-range bomber force. Forty new Bear H bombers, carrying the subsonic AS-3 air-to-surface missile, have been produced since 1984. Older Bear aircraft are being reconfigured to carry the new supersonic AS-4 air-to-surface missile.

The Blackjack bomber, a new longer range aircraft due for operation in 1988, will be able to carry cruise missiles, bombs or a combination of both. It may be used first to replace the Bear A bomber and then the Bear G bomber.

Finally, the Soviets are developing the Midas, an aerial refueling tanker version of the Il-76/Candid aircraft. The tanker will be used to support tactical and strategic operations and will expand Soviet long-range mission capabilities.

Long-Range Cruise Missiles

The Soviet Union has accelerated cruise missile development. Since 1984, the primary Soviet cruise missile has been the AS-15, a small, air launched, subsonic, low altitude missile. It currently is deployed on the Bear H and will be placed on the Blackjack when operational. The AS-15 has a range of 3,000 kilometers.

The Soviets are developing additional cruise missiles based on the capabilities of the AS-15. A sea launched variant of the AS-15, the SS-NX-21, is small enough to be fired from standard Soviet torpedo tubes. The SS-NX-21 may be deployed on *Victor* class nuclear powered submarines, the reconfigured *Yankee* submarine and the new *Akula*, *Mike* and *Sierra* class submarines. When deployed in the near future, the SS-NX-21 will be placed off U.S. and allied coasts. A mobile ground launched cruise missile variant, the SSC-X-4, soon will be deployed to support operations in the Eurasian theater.

Moreover, a large cruise missile is under development. The SS-NX-24 is scheduled for operational use possibly by 1987 and will be flight tested from a specially converted *Yankee* class nuclear powered cruise missile attack submarine.

Nonstrategic Nuclear Forces

In 1977, the Soviets deployed SS-20 long-range intermediate nuclear forces (LRINF) west of the Urals and in the Soviet far east. Currently, 441 SS-20s have been deployed, each with three MIRVs and twice the range of older Soviet LRINFs, the SS-4s. The SS-20 is a highly survivable system because it can move both on and off the road. Launchers also can be reloaded and refired.

The Soviets still maintain 112 single warhead SS-4 LRINF missiles in the western Soviet Union targeted against Western Europe.

The SS-23 is a shorter range (500 kilometers) intermediate nuclear missile. In 1985, a brigade in the Belorussion Military District became the first operational unit with the SS-23. If this missile follows the same deployment pattern as the SS-1/Scud B surface-to-surface missile, the Western Military Districts first will receive the SS-23, followed by deployment to the Group of Soviet Forces, Germany.

Each front commander also may have a brigade of 12 to 18 Scaleboard short-range ballistic missiles. Currently, over 70 Scaleboard launchers are targeted at European NATO and 40 are stationed opposite the Sino-Soviet border. Scaleboard silos also can be used with nonnuclear warheads.

In sea based nonstrategic nuclear systems, the Soviets maintain and operate 13 *Golf II* class ballistic missile submarines, each equipped with three SS-N-5 SLBMs. Six *Golf*s are

based in the Baltic, and the remaining seven are employed against targets in the Far East.

For short-range nuclear conflict, Soviet division commanders have several nuclear assets at their disposal:

- *Scud short-range ballistic missiles*—Soviet armies and fronts have missile brigades equipped with 12 to 18 SS-1C Scuds. More than 500 Scud launchers have been deployed against European NATO, more than 100 on the Sino-Soviet border, and 75 opposite southwest Asia and eastern Turkey.
- *The unguided free rocket over ground (FROG)*, which is deployed in a battalion of four launchers—The Soviets have deployed 500 FROG and SS-21 launchers opposite NATO. Another 215 FROGs are deployed on the Sino-Soviet border and in the Far East, 100 opposite southwest Asia and eastern Turkey and about 75 in reserve.
- *Nuclear capable artillery tubes*—A 152 millimeter gun, a 203 millimeter self-propelled gun and a 240 millimeter self-propelled mortar are being added to the inventory. When fully deployed, more than 10,000 nuclear capable artillery tubes plus older 152 millimeter howitzers will be in the Soviet force.

Tactical Strategy

Soviet tactical warfare is divided into wartime theaters, allowing for proper deployment of resources to neutralize and overpower enemy forces in each region.

Soviet tactical strategy states that decisive NATO-Warsaw Pact conflict will occur in the western European theater. In battle, the Soviets would advance rapidly across West Germany and Denmark, ultimately to France, the North Sea coast and the Danish straits.

Central to the Soviet tactical strategy in the western theater are air capabilities to negate NATO aviation, air defenses, theater nuclear and C^3 capabilities. Air forces for the western tactical war zone comprise more than 37 percent of all Soviet tactical aviation assets.

In northwestern Europe, the Soviets would deploy land forces to seize vital air and naval facilities in northern Norway. Land attacks also would take place through Finland and possibly Swedish territory.

Soviet strategy for the southwestern theater postulates an attack through Austria into southern Germany and northern Italy. The Soviet Black Sea fleet and the Soviet Mediterranean squadron would prevent Allied forces from using the eastern Mediterranean to reinforce forces.

In an attempt to deny the West access to Middle Eastern oil supplies, the Soviets probably would conduct offensive operations from the Soviet Union and Afghanistan through Iran to the Persian Gulf.

Finally, Soviet tactical strategy calls for the deployment of the Soviet Pacific Ocean fleet into the Far Eastern, Pacific Ocean and Indian Ocean theaters. The Pacific Ocean fleet, the largest of the four Soviet fleets, would protect Soviet ballistic missile submarine assets, conduct operations against enemy sea based platforms and interdict enemy sea lines of communications. The naval fleet also would protect the Soviet Union from sea based attack.

The Soviet tactical command structure is integral to the effectiveness of Soviet tactical war fighting. The Soviets have constructed several hundred hardened, bunkered command posts and communications centers; created an extensive peacetime communications system; and established numerous, well-equipped mobile signal and headquarters support units. In 1985, the Soviets adapted their peacetime command structure to shift easily into wartime functions. Peacetime High Commands within the military operation theaters were activated with high ranking officers appointed as permanent commanders in chief.

Ground Forces

Soviet ground forces, the largest of the five armed forces branches, maintains a peacetime troop force of approximately 1.9 million soldiers. Combat power resides in 213 maneuver divisions, including 12 mobilization base divisions with two additional divisions expanded to corps type structures. Peacetime ground forces within the Soviet Union are subordinate to 16 military districts, except for seven airborne divisions that are directly subordinate to the airborne forces headquarters in Moscow.

Basic maneuver elements for Soviet ground forces have tank, motorized rifle and airborne divisions. A Soviet tank division consists of 11,000 personnel in three tank regiments and one motorized rifle regiment. The motorized rifle division has 13,000 personnel based in three motorized rifle regiments and one tank regiment. The tank and motorized rifle divisions have full support elements, including aviation, artillery, air defense, signal, engineering, chemical, reconnaissance, maintenance, motor transport and medical units. In addition, tank and motorized rifle divisions are being expanded and reorganized to create larger, higher speed combined arms operations.

Two corps type structures have been organized with more than 450 tanks, 600 infantry fighting vehicles and armored personnel carriers and 300 artillery pieces and multiple rocket launchers.

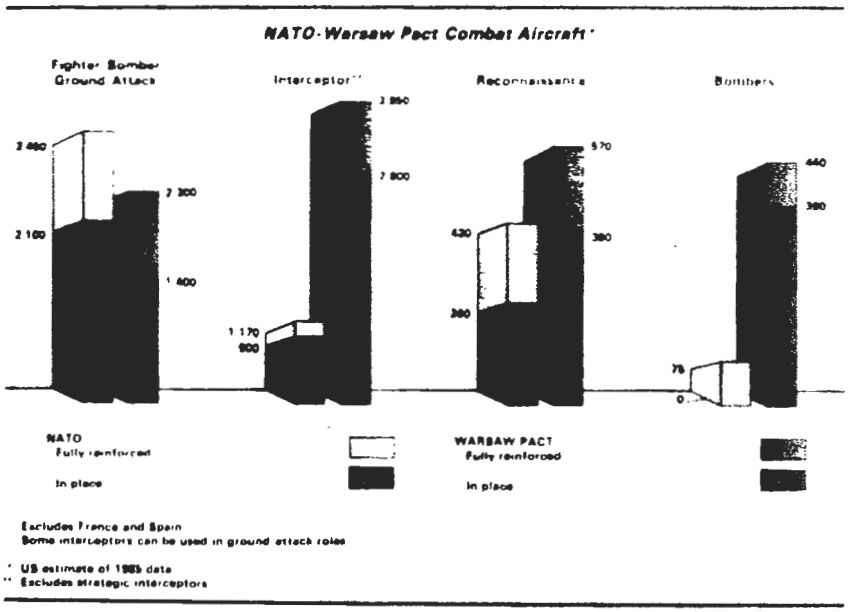

Figure 8. Combat aircraft comparison.

The Soviets maintain seven airborne divisions, consisting of three parachute regiments with airborne amphibious combat vehicles and combat support and service units. Air assault brigades at front level and air assault battalions at army level also have been created.

Nondivisional artillery support for maneuver forces also is being expanded. As a result, artillery pieces and the brigades are increasing by 40 percent, especially in units opposing NATO.

Soviet helicopters are an important element of Soviet ground forces. The Soviet army has formed about 20 attack helicopter regiments, each with as many as 60 Mi-8/Hip and Mi-24/Hind attack helicopters (Figure 7). The Mi-26/Halo, with an operational radius of 370 kilometers and a troop lift capability of more than 85 soldiers, is the world's largest production helicopter. The new attack helicopter, Mi-28/Havoc, currently is under production. It has an operational radius of 240 kilometers and a speed of 300 kilometers per hour. The new Hokum helicopter may give the Soviets significant rotary-wing air superiority. The Soviets are equipping their helicopters with infrared (IR) jammers and suppressors, IR decoy dispensers and additional armor to increase the helicopters' capabilities.

The sheer strength of Soviet ground forces is exemplified in the following statistics:

- 52,600 battle tanks in active inventory. These tanks have a 125-millimeter main gun and improved fire control systems, including a laser range finder on some versions.
- 59,000 armored personnel carriers and infantry fighting vehicles in active inventory and approximately 20,000 armored vehicles in reserve.
- 1,600 tactical and shorter range intermediate range nuclear force (SRINF) ballistic missile launchers. The SS-23, the newest SRINF missile system, has a range of 500 kilometers and will replace the SS-1 Scud B.
- More than 39,000 artillery pieces and multiple rocket launchers greater than 100 millimeters in caliber in active inventory.

Air Forces

The Soviet air forces consist of more than 700 bomber aircraft, 6,300 fighter and fighter bombers and about 600 transports. The forces are divided into Strategic Air Armies; Air Forces of Military Districts and Groups of Forces; and Soviet Military Transport Aviation.

The Strategic Air Armies are broken down into four armies to operate in continental theaters and one army for intercontinental and maritime strike missions. The four theater armies are equipped with medium bombers, fighter bombers and deep strike fighters. Seven-hundred fifty fighter and fighter bomber aircraft are allocated to the strategic armies, and approximately 180 Bear and Bison heavy bombers are assigned for intercontinental strikes.

Seventeen air forces comprise the Groups of Forces, the peripheral military districts in the Soviet Union, Mongolia and Afghanistan. These forces consist of combat fighters, reconnaissance aircraft, fighter bombers and helicopters. The air forces of the military districts and the Groups of Forces contain about 5,440 fighter interceptors, fighter bombers and reconnaissance and electronic countermeasures aircraft deployed in nearly 140 regiments and squadrons. Figure 8 compares Warsaw Pact combat aircraft with NATO combat aircraft.

Military Transport Aviation provides airlift for the Soviet airborne forces and air assault units. It gives air logistics support for deployed Soviet and Soviet satellite armed forces and supports Soviet political and economic activities especially in the Third World. In addition, to the current force of 600 medium- and long-range cargo transports, 55 An-22/Cock long-range turboprop transports can carry main battle tanks or large missiles. Another transport, the Soviet An-124 Condor, has 150 metric ton lift capability, which surpasses the heavy lift capability of the V.S. C-5B transport. (Figure 9 and Figure 10).

Soviet air forces are operationally subordinate to the military district, group or army commander. Reconnaissance regiments and squadrons are independent units. Helicopter units report either to the military districts and Groups of Forces or to armies or divisions. Tanks and combined arms armies are assigned their own aviation components, primarily helicopters. In wartime, the air forces of the military districts and Groups of Forces become air forces on the front.

Of the more than 500 bombers that constitute the Soviet air strike force, more than 50 percent are based west of the Urals. Therefore, they would serve primarily in operations in the western, southwestern, northwestern and southern tactical theaters. Non-Soviet Warsaw Pact countries add approximately 2,350 fixed wing combat aircraft to the Soviet-Warsaw Pact forces in the western and southwestern theaters.

In recent years, the Soviets have improved the capabilities of their tactical fighter aircraft. The Foxhound, Fulcrum (Figure 11) and Flanker aircraft, the new models of Soviet tactical fighters, each have true look-down/shoot-down radar capability to engage low flying aircraft or cruise missiles. Both the Fulcrum and Flanker carry beyond-visual-range AA-10 and short-range AA-11 air-to-air missiles.

The Soviet air combat force also includes approximately 800 Su-17/Fitters in Soviet air force regiments, military districts or Groups of Forces; 700 MiG-27/Floggers; almost 700 Su-24/Fencers (Figure 12), superior deep-interdiction aircraft; more than 200 Tu-16/Badger bombers (more than half of the Soviet medium bomber force); and 135 Tu-22/Blinder aircraft, completing the medium bomber force.

The Soviets have created a vital air defense force to disrupt enemy offensive air operations. Soviet air and ground assets, under the direction of the theater's High Command of Forces, attack enemy aircraft at their bases or in flight. More than 4,600 tactical surface-to-air (SAM) missiles and 12,000 antiaircraft pieces have been deployed with Air Defense Forces units at regimental through front levels. As many as 25,000 shoulder-fired SAM launchers are located at battalion and company level and with nondivisional units.

Naval Forces

The Soviet navy is divided into four major fleets—Arctic/North Atlantic, Baltic, Black Sea and Pacific Ocean fleets—plus the Caspian Sea flotilla. Soviet naval forces are deployed in the Mediterranean Sea, the Indian Ocean and off the coast of West Africa. A naval and air base also is being significantly improved at Cam Ranh Bay, Vietnam.

The four Soviet fleets each address a major maritime theater in the Soviet naval strategy. During wartime, the Soviet navy serves the traditional roles of protecting strategic submarines and defending Soviet-Warsaw Pact territory. From observations of Soviet continental theater exercises, it appears that the Soviet naval forces in wartime would prepare fleet units to protect the seaward flanks of the War-

saw Pact, seize key straits and islands and conduct amphibious assaults in support of Soviet land operations.

In the past 10 years, the Soviets have initiated a major program to upgrade their naval capabilities. Soviet naval capability previously was limited to that required for short-range combat over limited periods of time. The Soviets now are developing new classes of ships with sophisticated weapons systems, sensors, electronics and communications. In addition, capabilities to conduct sustained antiship, antisubmarine and antiair warfare in distant waters have been enhanced.

The Soviet navy currently has approximately 675 surface combatant ships. Within this force are included 280 principal surface combatants, three *Kiev* class aircraft carriers, 185 patrol combatants, 77 amphibious ships and 130 mine warfare ships. Furthermore, the Soviets have deployed 300 underwater replenishment and material and fleet support ships and 296 general purpose submarines. About 500 of these ships have ocean-going capabilities of greater than 1,000 ton displacement; the remaining number serves in coast defense and flank support roles.

The five *Kiev* class carriers in the Soviet fleet (four constructed, one being fitted) are the largest operational ships in the Soviet navy, each weighing 37,100 tons. They are the first modern Soviet ships to carry fixed wing aircraft.

The *Kirov* class guided missile cruiser is the first Soviet nuclear powered surface warship, providing antisurface, antisubmarine and antiair capabilities (Figure 13). Two *Kirovs* are in service; one should be launched this year; and a fourth will be completed soon.

The *Slava* is the leading ship in the new class of Soviet cruisers. It is active in the Black Sea and the Mediterranean, carrying 16 SS-N-12 launchers primarily for antisurface warfare. It also has a modern air defense system with eight SA-N-4 single launchers and two twin-armed SA-N-4 launchers.

The Soviets are constructing two new guided missile destroyers a total of 10 *Sovremennys* which have eight launchers for antiship cruise missiles; and seven *Udaloys*, which carry eight long-range cruise missile delivered antisubmarine warfare weapons. The Soviets also have 40 operational GISHA antisubmarine warfare corvettes.

Conclusion

In 1979, after a decade of Soviet defense modernization while the United States pursued détente, then Chief of the Soviet General Staff Marshal Nikolai V. Ogarkov stated, "The Soviet Union has military superiority over the United States. Henceforth, the United States will be threatened. It better get used to it."

As these measurements of Soviet military power demonstrate, General Staff Marshal Ogarkov's statement still holds true today.

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Illustrations courtesy of Soviet Military Power 1986.

References

1. *Can America Catch Up?* Washington, D.C.: Committee on the Present Danger, 1984.
2. Collins, John M. *U.S.-Soviet Military Balance*. New York: McGraw-Hill Publications Co., 1980.
3. *Soviet Military Power*. Washington, D.C.: U.S. Department of Defense, 1986.

Soviet Pacific-based Strike Forces

By Adm. Ronald J. Hays, USN

The Soviet Union's interest in the Pacific theater may have been slow to appear, but the Soviets' growing numbers compensate for their earlier indifference.

Already the Soviet Union has established itself militarily (Figure 1), and an all out economic, political and cultural offensive is currently developing. Party General Secretary Mikhail Gorbachev made the Soviet strategy for the Pacific quite clear in Vladivostok, the major Soviet east coast port, in late July, when he developed in detail a new Soviet thrust for the Pacific. This Soviet attention is yet another indicator of the region's growing importance to the world.

No longer can the United States dismiss Soviet diplomacy as bungling. Moscow's new approach integrates a sophisticated political, economic, military and cultural strategy designed to influence Pacific nations. The campaign has three prongs (Figure 2).

Northeast Asia

In Northeast Asia, the Soviet Union is establishing closer ties with North Korea and gaining favor with Japan and the People's Republic of China. Economic aid and, for the first time in a decade, modern military equipment, including MiG-23s and surface-to-air missiles (SAMs), are flowing into North Korea. In a show of friendship and support, a Soviet flotilla visited Wonsan on North Korea's east coast while a North Korean flotilla visited Vladivostok to mark the 25th anniversary of the Soviet-North Korea friendship treaty. In addition, both nations exchanged fighter squadron visits.

To improve relations with Japan, the Soviet Foreign Minister visited earlier this year, and Moscow has allowed Japanese citizens to visit ancestral graves in the disputed Northern Territories. In his Vladivostok speech, General Secretary Gorbachev hinted at concessions on the Soviet occupied Northern Territories if Japan would abandon its security relationship with the United States. Meanwhile, the Soviets have offered accommodations to China along the disputed border and initiated scientific and economic exchanges.

Southeast Asia

In Southeast Asia, the Soviet Union is providing economic and military aid for Vietnam, adequate for support of Vietnam's expansionist policies while ensuring support for any peaceful solution to the conflict in Cambodia.

This center prong focuses on Cam Ranh Bay, a former U.S. base in Vietnam. Cam Ranh Bay provides the Soviets with a first rate military operations and support base and a year-round warm water port located 2,200 miles south of Vladivostok. Cam Ranh Bay sits astride important sea lines of communication and provides a counterpoise to U.S. facilities at Clark Air Base and Subic Bay in the Philippines. It also serves usefully as a jumping off point for Indian Ocean operations and could serve the same purpose for South Pacific operations.

South Pacific

The southernmost Soviet prong, the South Pacific, is a recent development. Some economically disadvantaged independent nations are vulnerable targets. The Soviets offer attractive economic agreements that have the potential for conversion to economic dependence and then political and military advantage.

Soviet inroads in the South Pacific already have occurred with a fishing

agreement with Kiribati and subtle penetration of labor organizations. The next 12 months likely will result in additional fishing agreements, fish processing agreements, landing rights for the Soviet airline Aeroflot and ship repair and servicing contracts. All the while, Soviet diplomatic activity is increasing throughout the region.

The bedrock of this three pronged strategy is Soviet military power. Soviet forces in the region have grown from a home defense force as late as the mid-1970s to a formidable modern strike force in the mid-1980s. While the first phase of this growth was characterized by more of everything to build force structure, the introduction of increasingly sophisticated and capable weapons systems poses the greatest threat. New tanks, self-propelled artillery, helicopters, fighters, bombers, ships and missiles abound.

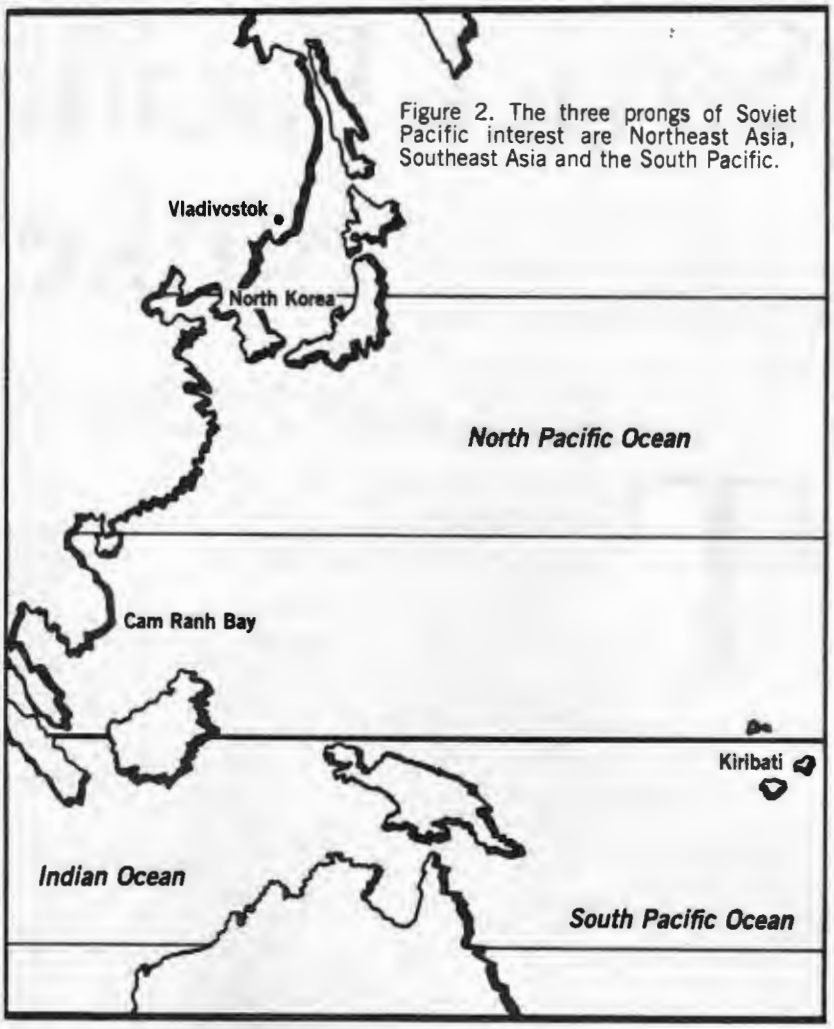


Figure 2. The three prongs of Soviet Pacific interest are Northeast Asia, Southeast Asia and the South Pacific.

Soviet Naval Forces

The Soviet navy's Pacific fleet exemplifies the substantial improvements made in Soviet strike forces. This fleet, the largest of the Soviet Union's four fleets, comprises more than 30 percent of the total Soviet navy ships and submarines. The fleet roams throughout the theater projecting naval power and, not infrequently, intimidation.

The Soviet Pacific fleet has 84 major surface combatants, including two of the Navy's three *Kiev* class aircraft carriers. The carriers are the largest operational ships in the Soviet inventory at 31,700 tons and are the first modern Soviet built ships to carry fixed wing jet aircraft (Figure 3). Also embarked are antisubmarine helicopters and long-range SS-N-12 antiship cruise missiles.

Other major surface combatants of note include the *Kirov* class nuclear powered guided missile cruiser grossing out at approximately 28,000 tons. This ship, which arrived in the Pacific in late 1985, is the most heavily armed Soviet combatant, carrying a variety of modern missiles. Complementing this cruiser are two new guided missile destroyers from two new classes of Soviet combatants: the *Sovremennyy* (Figure 4) and *Udaloy*. Altogether, three new classes of ships and their five new missile systems have considerably boosted Soviet Pacific fleet air defense, antisubmarine and surface warfare capabilities.

Soviet submarines comprise a potent strike force in the Pacific. More than 130 submarines are assigned, including three classes of ballistic missile submarines. Twelve different classes of cruise missile, attack and auxiliary submarines complete the remainder of the submarine fleet. A brand new arrival is a submarine called *Akula*. This attack submarine is state-of-the-art in submarine design technology and features reduced noise levels, high speeds and advanced weaponry and sensors. It compares well with the U.S. *Los Angeles* class submarines. The *Akula* is a candidate for the revolutionary SS-NX-21 long-range, undersea launched, land attack cruise missile. With such a missile, a submerged submarine can launch an attack against targets ashore while still hundreds of miles at sea.

From the strategic viewpoint, ballistic missile submarines are an important element of the Soviet Pacific fleet. Twenty-five of 62 ballistic missile submarines in the Soviet inventory are stationed in the Pacific. Sixteen of the 25 are fitted with long-range ballistic missiles that enable them to patrol in waters close to the Soviet Union and even to fire at U.S. mainland targets from the protected waters of home ports.

Soviet naval aviation (SNA) stations about one-third of its forces in the Far East. The supersonic, high performance Backfire carries gravity bombs, naval mines and long-range antiship missiles. The Backfire is replacing the older Badger as the navy's primary antiship strike aircraft. The Bear F has been around a long time but is still being produced and upgraded with modern electronic suites and weaponry. The Bear F, with spectacular range and endurance capabilities, is employed as an antisubmarine aircraft.

Another essential element of Soviet naval power is the amphibious force. Naval infantry in the Pacific consists of one 7,000 person division, similar in organization to the Soviet army's motorized rifle divisions. This force has dedicated transport, close air sup-

port and advanced weaponry, including new medium T-72 tanks, armored personnel carriers, the modern 122 millimeter self-propelled howitzers and 82 millimeter automatic mortars. Soviet naval infantry transport is built around the *Ivan Rogov* class (Figure 5), amphibious assault transport dock, amphibious vehicle landing ships and air cushion vehicles.

Soviet Air Force

The Soviet air force, like the Soviet navy, has made major technological advances in recent years (Figure 6). The Pacific Soviet air force, with more than 1,700 combat aircraft assigned, has its own version of the Backfire (Figure 7) and a strike variant of the venerable Bear, the Bear H, a newly manufactured aircraft designed to carry the AS-15 long-range, air launched cruise missile. The newest of the Soviet bombers is the supersonic Blackjack, with a huge payload and an unrefueled range of 7,300 kilometers.

The increased range and in-flight refueling capability give this stable of Pacific based Soviet air force aircraft a capability to strike targets throughout the theater, including those on the west coast of the United States.

In the Pacific, the United States now has to be concerned about the fourth generation fighter aircraft that the Soviet Union is producing. These aircraft, the SU-27 Flanker, MiG-29 Fulcrum and MiG-31 Foxhound, all feature ranges and performance double that of their predecessors and true look-down/shoot-down capability to counter low flying aircraft and cruise missiles. The fourth generation fighters incorporate the latest technology and provide a new dimension of air defense capability.

Strike aviation has shared in the technology upgrade as well. Soviet fighter-bomber forces—SU-24 Fencers, MiG-27 Floggers, SU-17 Fitters and the latest, SU-25 Frogfoots (Figure 8)—are high performers that carry large payloads extended distances for ground attack and deep interdiction missions.

Missile Forces

It surprises a lot of people, except those who live along the Asian-Pacific rim, to learn that one-third of the Soviet Union's SS-20 intermediate range ballistic missile (IRBM) inventory is poised to fire in the Pacific theater. The SS-20 has a short reaction time and, because of its mobility, is tough to target and therefore highly survivable. This missile, with three nuclear warheads and a 5,000 kilometer range, can target areas well into the Pacific basin, including Japan, Southeast Asia, the Philippines and parts of Alaska. Within army tactical echelons, shorter range nuclear strike forces in the Far East include more than 100 Scud and 215 FROG rocket launchers.

Add to these theater systems the more than 6,000 individual nuclear warheads comprising the Soviet intercontinental ballistic missile force, and you have the best argument for a strong U.S. deterrent posture.

Soviet Ground Forces

Soviet ground force strength in the far eastern military district has doubled in the last two decades to 53 divisions. The bulk of the divisions are poised along the Sino-Soviet border. This generates a concern within the People's Repulic of China that parallels U.S. concern about the Soviet threat. Thus, dialogue between the People's Republic of China and the United States is developing.

As with the other services, this expanded army has received new, more capable equipment. Maneuver forces within the divisions are being expanded and reequipped. New medium tanks and infantry armored personnel carriers improve mobility, while fire support forces receive new self-propelled howitzers. Army attack helicopters now include the heavily armed Hind and Hip, which simultaneously improve both mobility and firepower. Army improvements have resulted in modern ground units configured for swift, combined arms operations on either conventional or nuclear battlefields. Overall, Soviet ground forces, in concert with the navy and air forces, can threaten U.S. interests along the entire U.S. northern flank in the Pacific, including Alaska proper.

No credible army these days is without its extra tough forces, and the Soviets call theirs *Spetsnaz*. These forces are managed centrally from Moscow and trained to conduct sensitive missions, to include covert actions abroad. Their ruthlessness and aggressiveness already are well documented in Afghanistan. Fighting and infiltrating as small teams, these units could operate throughout the Pacific Command against a variety of targets.

Other Considerations

Soviet equipment modernization efforts would be meaningless if Moscow were not also making advances in other important areas. The Soviets have taken great strides in the areas of training and operations; command, control and communications (C^3); and logistics support. The most dramatic are the changes in the way the Soviets train and operate. For example:

- The tempo in the Pacific has increased
- Two large, complex naval exercises have been held recently
- Bear G and Bear H aircraft now fly simulated strategic strike and maritime attack missions against U.S. targets as a matter of routine
- Soviet aircraft overfly North Korea to collect intelligence and run simulated strike missions over the Yellow and East China Seas.

Meanwhile, C^3 has been reorganized and streamlined in the Far East military district, and the new system is exercised regularly. Logistically, the Soviets have continued to improve their support infrastructure and have stockpiled substantial quantities of supplies in the Far East. Soviet ground and naval forces now can sustain conventional wartime operations for more than 100 days. They have reduced substantially their dependence on vulnerable lines of communications from western Soviet industrial centers.

Surrogates

Soviet surrogates also are a factor in the power equation in the Far East, and North Korea is becoming increasingly prominent. North Korea's relationship with the Soviet Union has skyrocketed after languishing for more than a decade. Soviet participation in North Korean economic and military development can only contribute to the instability that already exists on the Korean peninsula.

The greatest single gain to Soviet military capability in the past decade in the Pacific is the superb operating base in Vietnam. The Soviet Union established the foothold in Vietnam in 1979 and since has developed Cam Ranh Bay into its largest forward deployment base outside of the Warsaw Pact.

The build-up, added to left-behind U.S. facilities, includes four additional piers for its ships, communications facilities and supply warehouses.

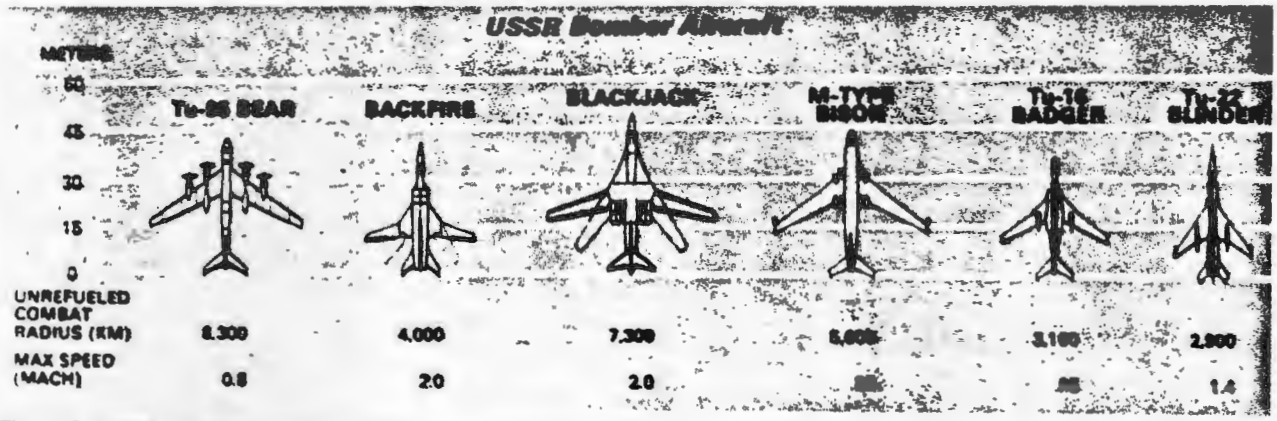
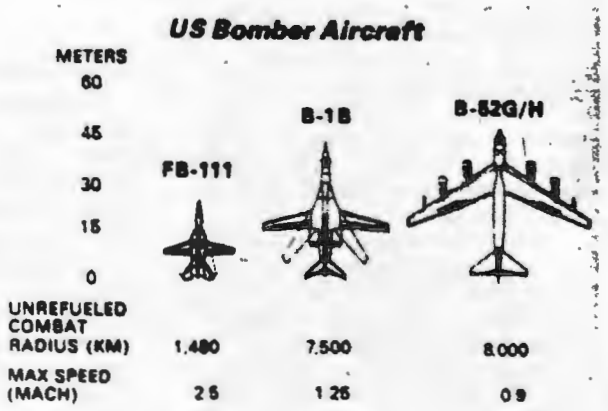


Figure 6. Soviet and U.S. bomber aircraft.



With TU-16 Badgers arriving in 1984 and MiG-23 Floggers in 1985, eight Bears, 16 Badgers and a full squadron of Floggers are deployed there now. The Bears and Badgers provide long-range naval reconnaissance and strike capability in the South China Sea, the Pacific Ocean as far east as Guam and the eastern Indian Ocean.

The Soviet navy has 25 to 30 ships and submarines deployed in the South China Sea and serviced routinely by facilities at Cam Ranh Bay. These naval forces, together with the aircraft, permit the Soviet Union to monitor U.S. and allied ships in peacetime and could threaten key sea lines of communication in wartime.

Conclusion

Even an observer unschooled in Pacific affairs can recognize the aggressive Soviet effort underway in the region. The Soviet Union's expansion in military capabilities has been impressive, but it has a tough battle on the economic and political side. Many people in the area have flirted with communism to find that it does not serve very well.

On the other hand, the United States too has made great strides in the Pacific from a nadir following the war in Vietnam. In the last five years especially, U.S. efforts among its friends and allies, coupled with its own military force improvements and modernization initiatives, have forged a very strong position in the Pacific. The U.S. Pacific Command has never had more highly trained, better equipped or higher quality forces. It enjoys excellent relations with the vast majority of nations in the Pacific, and with some tuning of policies in the region, the United States should be in even better shape in the future.

Ambassador to Japan Mike Mansfield's remark that the 21st century will be "the century of the Pacific" looks more on the mark all the time.

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Illustrations courtesy of Soviet Military Power 1986.

Adm. Ronald J. Hays, USN, is Commander in Chief, U.S. Pacific Command.

Soviet Nuclear Operations

By Stephen M. Meyer

Contemporary Soviet military doctrine, as reflected in both military and political writings, posits three primary nuclear war contingencies. The first involves escalation to global nuclear war from peacetime—a surprise strategic nuclear attack against the Soviet Union for which there would be few, if any, prior indications of impending war and little time to initiate military countermeasures. The second envisions global nuclear war arising from an extended superpower confrontation or crisis; the Soviet leadership has some opportunity to anticipate a possible attack. The third contingency is the well recognized possibility of nuclear escalation in the course of a major conventional war with the West. Soviet military specialists also have mentioned two other scenarios—an accident that precipitates nuclear war and escalation from local war—but these contingencies are apparently considered to be less likely. A sixth contingency, never mentioned specifically in Soviet military writings but certainly worthy of attention, is a surprise first strike attack by the Soviets intended to disarm the United States.[1]

Deterrence, retaliation, nuclear war fighting and damage limitation are fundamental dimensions of the Soviet strategic framework. In contrast to Western strategic theory, however, Soviet political and military leaders perceive these as complementary and not competitive notions. This synthesis went so far that, by the beginning of the 1970s, Soviet military strategists ceased distinguishing between strategic offense and strategic defense in general nuclear war.[2] Thus it is not surprising that Soviet strategy for nuclear operations makes Western observers nervous.

Soviet military strategy—the operational response to the requirements imposed by military doctrine—offers three alternatives for nuclear-use options: a preemptive strike (launch on strategic warning); launch on tactical warning, which for the purposes of this article will be considered synonymous with launch under attack (LUA); and second strike ride-out. A fourth option, the never mentioned Soviet disarming first strike, must be added. Each option involves use of Soviet active and passive strategic defenses as well as strategic offensive forces.

Yet, Soviet nuclear operations include much more than doctrine and strategy, or counts of missiles, bombers and nuclear warheads. In particular, command and control (C^2)—a primary determinant of how, when and where Soviet nuclear operations would unfold—has received little systematic attention. Too often, Soviet C^2 capabilities are taken as given or are equated with specific technical systems. In either case, they are not critically analyzed. Even when efforts are made to focus on Soviet C^2, U.S. notions and standards frequently are imposed on the analysis.

* * *

The Soviet Notion of C^2

Soviet military writers use the expression "command, control and communications (C^3)" only when discussing Western forces. In discussing their own strategic requirements, they use the terms "troop control" (*upravleniye voyskami*) and "strategic leadership" (*strategicheskoye rukovodstvo*).

The most recent Soviet works on troop control subsume the conventional Western understanding of C^3 within a broader framework including not only the standard functions related to directing forces and implementing war plans, but also the prior stages

of intelligence collection; warning and assessment; military staff work; political military and military decision making; preparation of officers, troops and forces for combat action; and, most notably, political control.[3]

Strategic leadership is concerned with decision making and political oversight by the highest political and military authorities. The roles of, and relationships among, the political, military, economic, governmental and industrial organs of national leadership are examined in the context of wartime activity.

* * *

C^2 During Peace, Crisis and War

Today, no modern military power can maintain its armed forces during peacetime at wartime readiness levels. Both the Soviets and the Americans understand this.[4] Even states on a continuous war alert, such as Israel, cannot indefinitely hold forces at wartime readiness and mobilization levels when war does not appear imminent. Although some elements of the U.S. and Soviet strategic nuclear forces—most notably, intercontinental ballistic missiles (ICBMs)—are kept close to wartime readiness states, the great bulk of the forces of both military establishments exists in day-to-day (peacetime) states far below war readiness. Crisistime readiness is a transition state during which the shift from peacetime to wartime readiness depends on many factors. These include the length and seriousness of the crisis, the goals and objectives of the Soviet political leadership, Soviet perceptions of the likelihood that the crisis will end in war, standard operating procedures of the armed services and the characteristics of the forces and force structures in place. With the one exception of the Soviet strategic rocket forces (RVSN), the nuclear and nonnuclear forces of the other four armed services of the Soviet Union—the ground forces, the air defense forces (VPVO), the air forces (VVS) and the navy (VMF)—would have to undergo significant shifts in readiness during a crisis to move to a near wartime posture.

* * *

Indeed, to prepare their C^2 system, the Soviets rely heavily on their ability to exploit a period of mounting tensions—much more heavily than does the United States. This may be due to their inability to maintain a robust peacetime posture (owing to concerns about political control, technical constraints and cost) as much as to some *a priori* confidence that they will have adequate strategic warning. Wartime readiness, then, reflects the maximum military capability of the state.

* * *

Students of Soviet military policy disagree on whether U.S. surprise attack has ever been an object of major Soviet concern. On the one hand, the threat of some form of U.S. surprise nuclear attack has been an ever-present specter in the Soviet political press and the political-military indoctrination literature. References to it also are scattered throughout Soviet military-technical publications. Certain Soviet strategic programs—most notably ICBM programs—were clearly influenced by a desire to cope with this threat.[5] On the other hand, Soviet military technical literature does not reveal a deep and widespread sense of urgency, and inspection of the overall Soviet military posture raises further doubts. With the exception of RVSN, the remainder of the Soviet strategic forces and all general-purpose forces have not been kept in readiness states consonant with the fear of a bolt-from-the-blue surprise attack. Figure 1 shows the location of Soviet military forces.

A careful examination of the evidence suggests that the Soviets have indeed been concerned about a surprise attack, but not the bolt-from-the-blue version that so dominates U.S. strategic discussions.[6] Surprise attack, in the Soviet historical experience, does not arise in a political vacuum but in an identifiable political-military context. The crux of the issue is the degree of strategic warning expected. According to Soviet analyses of the beginning period of war, a surprise attack would emerge from political events that accelerate so rapidly that little if any time would be available to move forces to generated alert. A key political element in Soviet notions of surprise attack is the absence of a declaration of war until after the first wave of the attack. The attacker, having seized the initiative, would have the advantage in the brief race to mobilize to higher states of readiness.

Because of the success of Soviet strategic programs of the late 1960s and 1970s, Soviet military and political leaders probably view the threat of surprise attack today as one of the least likely paths to nuclear war.

* * *

Tactical Warning

Initial tactical warning of a U.S. ICBM attack against the Soviet Union would come from two different sources: a satellite early warning system (SEWS) and a ground based system of over-the-horizon backscatter (OTH-B) radars. These two Soviet systems complement one another in trying to provide nearly instantaneous tactical warning—launch detection—of U.S. ICBM launches. In the future, SEWS may also provide some degree of warning when submarine launched ballistic missiles (SLBMs) are fired, but it does not today.

Soviet research on these satellites began in the mid-1960s, but concerted efforts to deploy a dedicated SEWS constellation did not begin until the late 1970s.[7] The constellation is supposed to consist of nine satellites in highly elliptical orbits (400 kilometer × 40,000 kilometers). When completed, it will offer continuous coverage of the U.S. missile fields.[8] This particular configuration allows SEWS to transmit data directly to the Soviet Union from its apogees over the Atlantic and Pacific oceans. It also provides the greatest warning time without the problems of reliability, security and delay incurred by a geostationary SEWS, which requires ground or space relay.

A drawback of these satellites is that their particular orbits require nine operational satellites to maintain full and continuous coverage. Data on Soviet SEWS constellation replenishment suggest that the Soviets are having reliability problems with these satellites (most likely with their sensors) and have not been able to maintain a full, working constellation to date.[9] This implies incomplete coverage of all relevant missile launch areas in the United States and China.

The satellites carry infrared telescopes that scan the horizon above U.S. missile launch points and are sufficiently sensitive to detect the heat of missile plumes against the background of the upper atmosphere.[10] Given the several minutes required for U.S. missiles to rise above the Earth's limb and the location of their targets in the Soviet Union, the Soviets' satellite early warning systems give about 25 minutes of tactical warning of U.S. ICBM launch. If later generations of these satellites acquire some limited ability to detect SLBM launches, warning would be between 10 and 15 minutes, depending on the

launch point and target location. (The ability of the Soviet SEWS to detect a single or small missile launch, characterizing an accidental or unauthorized launch, depends on the design and quality of the infrared sensors onboard the satellites.)

Three Soviet OTH-B radars provide redundant tactical warning of ICBM launches. Two of these radars (one southeast of Minsk and the other in the Soviet far east near Komsomolsk-na-Amur) appear to point at ICBM fields in the United States. The third, near Nikolayev, stares across Chinese launch sites.[11] Currently, no Soviet OTH radars are oriented for SLBM launch detection or bomber detection.[12]

OTH-B radars look over the horizon by refracting radar waves through the ionosphere, which then are scattered off missile and large aircraft bodies in flight and reflected back to receivers in the Soviet Union. In this way they provide warning time comparable to the SEWS—roughly 25 minutes for ICBMs. Since OTH-B radars have very low resolution, they are best at detecting large flights of enemy weapons. Again, single weapons in flight or a small launch resulting from an accident might not be detected by OTH-B radars at all. Problems with false echoes, ionospheric disturbances and other forms of physical and electromagnetic interference, however, produce a fairly high false alarm rate (and perhaps a missed detection rate). Thus the Soviets do not consider OTH-B radar to be a highly reliable source of tactical warning by itself.[13]

In the case of a U.S. ICBM attack, further confirmation of possible attack might not occur for some 10 to 15 minutes, when the approaching warheads would enter the field of view of Soviet line-of-sight, ballistic missile early warning (BMEW) radar systems.[14] In the case of an SLBM initiated attack, these line-of-sight radars might actually be the first source of early warning. This might also be true in the case of a small or accidental launch of U.S., French, British or Chinese nuclear weapons.

The combination of 11 older HEN HOUSE radars—at Sary Shagan, Murmansk, Skrudna (Latvia), Mishelevka (near Irkutsk), Sevastopol and Mukachevo—and six newer phased-array radars—at Penchora, Lyaki (near the Caspian Sea), Olenogorsk (Kola Peninsula), Sary Shagan, Mishelevka and Abalakova (north of Krasnoyarsk)—offer complete 360 degree coverage around the periphery of the Soviet Union.[15]

Attack Assessment

The service responsible for all early warning systems associated with missile or air attack on the Soviet Union is the *voyska protivovozduzhnaya oborona* (VPVO) or troops of the air defenses.[16] Launch detection data from SEWS and OTH radars are relayed first to the central command post of the VPVO located near Moscow and the VPVO's alternate command center, alleged to be in Kalinin.[17] A technical assessment of the warning indications then would be carried out and relayed to the General Staff, the top of the military chain of command. The General Staff may also receive direct feeds from the VPVO central command center and thus be in a position to assess warning data simultaneously with the VPVO command.[18]

Data provided by the line-of-sight radars, especially those of the newer Penchora design, enable the VPVO to determine the basic dimensions of the attack—tens, hundreds or thousands of warheads.[19] In this respect, an isolated launch resulting from an accident would be easily discriminated. The only capability for fine grained attack assessment—that is, for actually counting incoming warheads, predicting impact points and distinguishing among closely spaced targets, decoys and warheads—exists in the Moscow area as part of the Moscow anti-ballistic missile (ABM) system. The Moscow ABM system, however, is as much a test bed for ABM systems development and training as it is an operational weapons complex. Thus, some of its tracking and battle management radars may be down frequently in peacetime.

* * *

Soviet Strategic Missiles

Although the Soviet ICBM force grew from a half-dozen missiles in 1960 to more than 200 in 1966, most of those weapons were deployed in soft horizontal concrete coffins.[20] (Soviet intermediate range ballistic missiles [IRBMs] were deployed in a similar fashion.) Erecting these second generation ICBMs to vertical position and fueling them was dangerous and required an hour or more.[21] From 1960 to 1963, U.S. strategic bombers posed the primary threat to these missiles.

By 1964, however, the U.S. ICBM force began to present a serious counterforce threat. At the time, the Soviet BMEW system consisted of a few fledgling line-of-sight radars, providing at best 15 minutes of early warning of U.S. ICBM attack along selected axes. This meant less than 10 minutes for decision making and execution. Soviet second generation strategic missiles simply could not be readied and launched before U.S. ICBM warheads struck, regardless of whether or not they had been armed with warheads.[22] Consequently, a political requirement to deploy these strategic missiles without warheads and under KGB custody for purposes of control could not be countered by military or technical arguments. It follows that the Soviets could not have had a launch-under-attack capability during most of the 1960s.

A similar situation existed with respect to Soviet tactical nuclear forces.[23] The missiles and aircraft were held by the military, but the nuclear charges were held by the KGB. It is widely assumed that the Soviets' tactical nuclear delivery vehicles were housed in Eastern Europe but that their associated nuclear charges were kept on Soviet territory.[24]

In the latter part of the 1960s, however, a significant change occurred. Soviet ICBMs, IRBMs and SLBMs were armed with their nuclear charges. The KGB relinquished direct physical control over nuclear bombs and warheads.[25] Technological change may have forced political change. Between 1966 and 1967 soft site ICBM deployments became a minority in the Soviet strategic force, with more than 450 ICBMs placed in silos. Since these third generation weapons were deployed in vertical launch position, fuel could be stored in their tanks on a day-to-day basis. By eliminating the time required for vertical positioning and fueling, these missiles, if already armed, could be launched within several minutes of a launch command.[26] Consequently, combat readiness would be affected severely if warheads were not in place. In other words, an LUA capability was potentially attainable if the strategic missiles were armed. Soviet military and political sources report that an LUA capability was a high priority for the ICBM force.[27]

Also at this time, Soviet ballistic missile firing nuclear submarines (SSBNs) began to patrol within striking distances of the United States.[28] It is not clear whether these patrols were the consequence of a Politburo

decision to arm Soviet missiles with their nuclear charges or if the arming of these missiles was the consequence of a Politburo decision to begin these patrols. In either case, it was obvious that SLBMs would have to be armed with nuclear warheads because the missiles' short range meant that Soviet SSBNs would have to be stationed far from the Soviet Union.

Although the Soviet ground forces were given custody of the nuclear charges for their theater (operational and tactical) nuclear systems, the physical separation of delivery vehicles and charges was continued.

Political control is maintained over Soviet nuclear weapons through special control devices to prevent accidental or unauthorized launch installed on RVSN strategic missiles. Soviet ICBMs are launched via a multikey system.[29]

* * *

Of all Soviet strategic weapons, ICBMs are the least costly and most easily maintained and controlled on high day-to-day alert levels. The Soviet Union's new SS-18 ICBM, when deployed, is likely to carry at least 10 warheads (Figure 2). Today more than 80 percent of Soviet ICBMs, carrying more than 95 percent of Soviet ICBM based warheads, are ready to be launched in minutes from their day-to-day alert status. By comparison, about 30 percent to 40 percent of Soviet SSBNs are on day-to-day alert. Roughly 20 percent of Soviet SSBNs are on station at any given time and available for launching retaliatory strikes.[30] The other 10 percent to 20 percent of Soviet alert SSBNs are dockside but possess missiles capable of reaching the United States from port. They could participate in an LUA order, but their ability to survive a surprise attack and contribute to Soviet second strike retaliation would depend heavily on the design of their submarine pens. Since nuclear ballistic missile submarines require at least 10 to 12 hours to bring up their reactors before they can put to sea, even 25 minutes of tactical warning would not be sufficient for those in port to move out under surprise attack conditions.[31]

Soviet strategic bombers are even more vulnerable, with no aircraft on air or ground alert. Thus, about 90 percent of Soviet strategic warheads available on day-to-day alert are in the ICBM force.[32] (Soviet SSBNs at sea, but not on station, could be used as part of the follow-on series of salvos in the second strike—if communications still work. The same would hold true for any surviving strategic bombers, especially those armed with long-range cruise missiles.) Figure 3 shows a breakdown of Soviet intercontinental attack forces in 1985 and as expected in 1990.

Following a LUA directive, the General Staff would communicate the strike order to the Main Staff of RVSN for relay to ICBM command posts in the field. Alternatively, the General Staff could bypass the Main Staff by communicating directly with ICBM command posts.[33] Launch teams at RVSN launch control centers would receive release authorization and firing orders. According to Soviet sources, prelaunch check procedures and releasing of safety devices for liquid fueled ICBMs required about two to three minutes in the 1960s and early 1970s.[34] Marshal Tolubko asserts that systems today require even less time.[35] The final action by launch crews occurs during the last half-minute prior to launch, when final safety devices are released. Automation then takes over to complete the launch sequence.[36] It is clear that Soviet military officers, not computers, launch Soviet nuclear weapons.[37] Launch on warning in the Soviet Union would not be an automated process any more than it would be in the United States.[38]

* * *

The Crisistime Contingency

The relaxed day-to-day posture of most of the Soviet armed forces strongly suggests that the Soviet military is not preoccupied with the threat of surprise attack. A far more prominent contingency posits war arising from an extended U.S.-Soviet crisis that would evolve over many days, if not weeks or even months.[39] Thus ample time would exist for Soviet forces to move from day-to-day readiness to generated alert levels in accordance with political interpretations of unfolding events. Soviet military analysts observe that a U.S.-Soviet war arising out of a crisis could begin in three ways: with conventional engagements in the theater; with theater nuclear engagements; or with intercontinental attacks on respective homelands. Since this article concerns nuclear operations, the third scenario will be examined—direct escalation from crisis to nuclear strikes on the U.S. and Soviet homelands.

This contingency can be called the anticipated strategic nuclear attack because the Soviets assume that there would be substantial indications of U.S. intentions of, and preparations for, launching a nuclear war. Partial historical models might include the Berlin crisis of 1948 or the Cuban missile crisis of 1962.

* * *

Intelligence

U.S. strategic forces were put on alert during both the 1962 Cuban missile crisis and the 1973 Middle East crisis, yet only in the former instance did the Kremlin perceive that general nuclear war might erupt. Obviously, the Soviets look to other indicators beyond military activities for strategic warning.

Soviet military specialists have identified some basic indicators that they believe to be worth monitoring (Table 1).[40] A quick comparison of the Berlin and Middle East crises reveals the notable differences in the political and diplomatic milieu of the early 1960s and early 1970s.

* * *

National Command Authority (NCA) Survivability

Reportedly, about 75 hardened military command centers are in the Moscow area. Many of these blast shelters, some hardened to many hundred pounds per square inch, are equipped to accommodate national level leaders. But the probability that these facilities and associated communications systems could survive an extensive and accurate nuclear strike on the Moscow area is small.

Evacuation would offer a higher probability of survival. Consequently, the Soviets have invested heavily in hardened leadership facilities—not mere fallout shelters—outside of the Moscow area and away from populated areas.[41] There may be between 1,500 and 2,000 such shelters for government, Party and military officials. Some of them are hardened to several thousand pounds per square inch and are designed especially to house the relocated NCA and associated military support. [42] A few facilities combine above- and below-ground complexes with nice surface housing,[43] which presumably provides comfortable living for the highest political and military leadership during extended crises, while allowing them to move

quickly to safety should events escalate.

A special underground rail system linking the Kremlin to the metro is one method for moving NCA quickly and secretly out of Moscow.[44] A 15 minute ride delivers the Politburo to the central airfield (Khodinka) where the Soviet equivalent of the U.S. National Emergency Airborne Command Post (NEACAP) could transport the Politburo out of the Moscow area.[45] Other airports and air bases around Moscow also could serve this function. Thus, the Politburo could relocate in a matter of hours.

Not only is NCA protected, but every minister and ministry in the Soviet government is believed to have both a primary and an alternate shelter facility.[46] Special communications systems—satellite, above- and below-ground cable and radio (including extensive radio relay)—would be available to carry NCA directives to the network of hardened military command posts and ministerial shelter facilities.[47]

* * *

Military Decision Making and Implementation

Activation of some of the alternate military command facilities and their associated communications systems would be among the first directives issued by the General Staff, as authorized by the Politburo. The General Staff has a number of alternate command centers, including underground facilities, airborne command posts, ground mobile vans and train cars.[48] In addition to main headquarters in the Moscow area, each of the armed services also maintains alternate and reserve command facilities elsewhere, including rail mobile command trains.[49]

One of the most important peacetime responsibilities of the General Staff is organizing and preparing reliable and continuous communications systems connecting NCA and the General Staff with the fronts, fleets and armies in the field.[50] First among these is the General Staff's specialized and redundant communications circuits, many of which are not active in peacetime. Cable communications systems—both above and below ground—have always been a fundamental element of Soviet strategic communications networks, and they continue to be seen as such.[51] Radio communications systems operating in low, high, very high and ultra high frequency bands could be activated, while mobile radio relay and troposphere scatter systems (generally very high frequency) would be dispersed. Ground links to Molniya strategic communications satellites and constellations of tactical communications satellites (some for SSBN communications) would proliferate.

Type of indicator	Possible signs
Diplomatic	Instituting various types of diplomatic warnings and statements; exerting diplomatic pressure on certain countries; breaking relations; establishing or confirming treaty obligations.
Political	Introducing measures of moral-political preparation of the population for war; repressing public discussion and opinion; limiting radio, television, press, other media.
Economic	Partial shifting of industry to military production; accumulating additional stocks of raw materials and materiel; imposing blockade.
Military	Strengthening reconnaissance; upgrading readiness of armed forces; conducting concealed mobilization; introducing operational-strategic camouflage; increasing duty forces and means; strengthening deployment of groups of forces in likely theaters of military action.

Source: K. V. Tarakanov, *Matematika i vooruzhennaya bor'ba* (Voyenizdat, 1974), pp. 64–66.

Table 1. Soviet strategic warning indicators of impending war.

Strategic communications by the General Staff's Communications Directorate tie the General Staff to the main staffs of all of the services and directly to lower command levels of the nuclear forces. Skip echelon communication is a basic element of Soviet troop control; in other words, the General Staff could establish direct communications not only with the RVSN main staff, but also with RVSN army headquarters and subordinate launch control centers.[52] A similar setup ties the General Staff to the navy main staff, to the fleets' headquarters (and alternate command posts) and perhaps to SSBNs at sea. Thus destruction of any or all intermediate links should not prevent General Staff control of forces in the field.

Today, the communications systems of all of the five main staffs of the services—comprising cable, radio, radio-relay, troposphere and satellite networks—could serve the same purpose.[53]

Each of the services has its own communications systems linking service main staff headquarters, alternate command facilities and forces in the field, but compatibility and interoperability between the services are enforced by a number of factors. First, the commander in chief of the signal troops, who is also the chief of the Directorate of Communications for the General Staff, oversees the development of communications systems for the Ministry of Defense and the training of the communications troops. Second, all communications systems are produced by the Ministry of Communications Equipment Industry, and even though a number of production enterprises exist within the ministry, one of the hallmarks of Soviet weapons design practice is commonality of components. This should produce strong similarities in communications system designs even between services.[54]

The third factor supporting redundancy of strategic communications is the hierarchical structure of the Soviet command system linking the ground forces, the air forces, the air defense forces and the navy. At the top of the structure is the General Staff. Just below are the commands of the theaters of military operations (TVDs) and then the commands of the military districts and groups of Soviet forces (fronts in wartime). TVD inter-

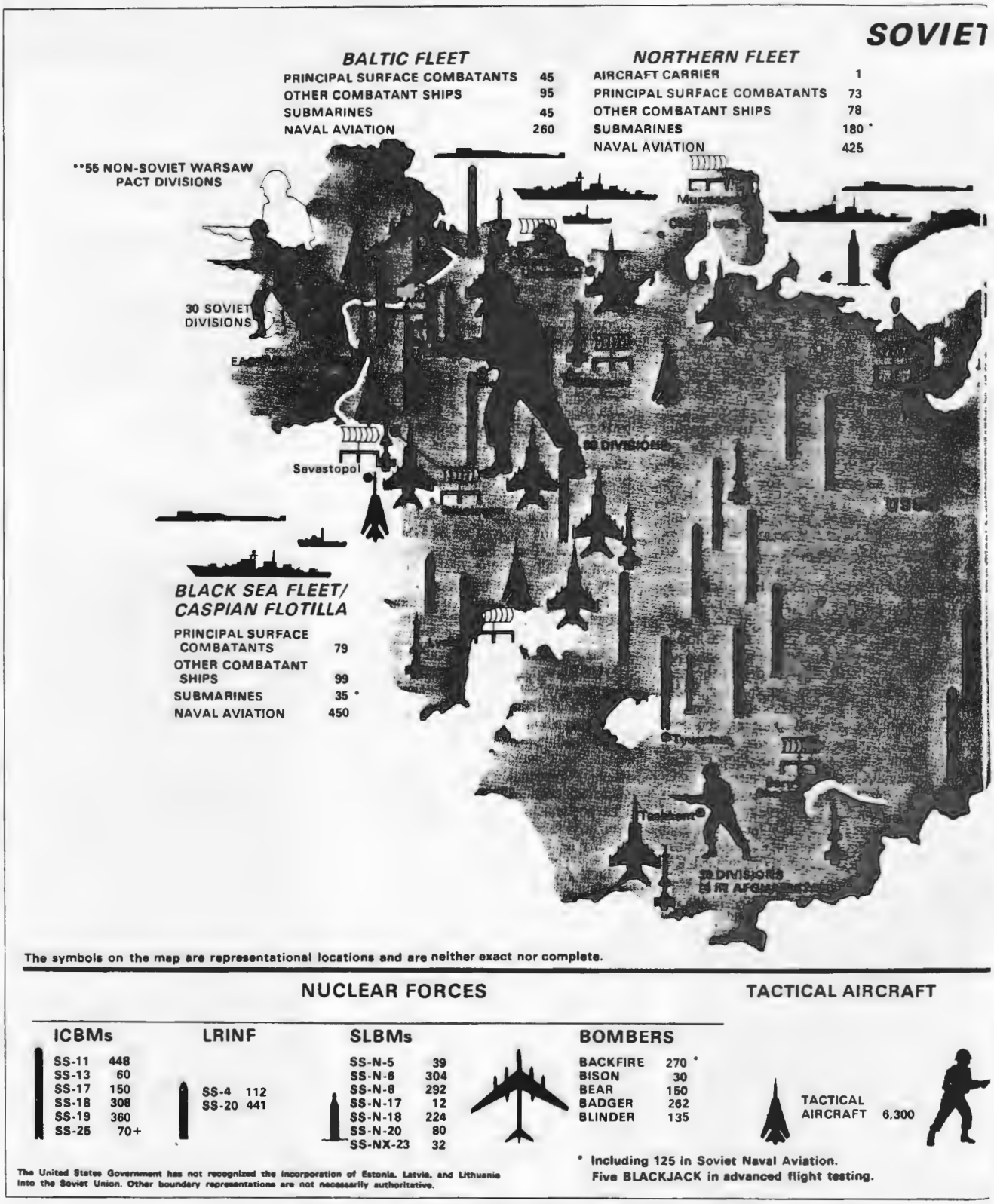


Figure 1. The different aspects of Soviet military forces.

MILITARY FORCES

PACIFIC OCEAN FLEET

AIRCRAFT CARRIERS	2
PRINCIPAL SURFACE COMBATANTS	83
OTHER COMBATANT SHIPS	120
SUBMARINES	115 *
NAVAL AVIATION	510

* Includes SSBNs and SSBs
** NSWP Air and Naval Forces not depicted

GROUND FORCES*

MOTORIZED RIFLE DIVISIONS	142
TANK DIVISIONS	51
AIRBORNE DIVISIONS	7
COASTAL DEFENSE DIVISIONS	1

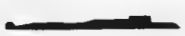
* Totals exclude 12 mobilization divisions and 2 new Army Corps

STRATEGIC DEFENSE FORCES

INTERCEPTORS 1,210

** In USSR only — does not include Soviet Strategic SAMs (SA-2/3/5) in Mongolia or with Groups of Forces.

NAVAL FORCES



AIRCRAFT CARRIERS	3
PRINCIPAL SURFACE COMBATANTS	280
OTHER COMBATANT SHIPS	392
COMBATANT CRAFT	745
AUXILIARIES	300
SUBMARINES	375
NAVAL AVIATION	1,645

mediate command is a main communications trunk between the General Staff and the forces in the field. It serves as the command node for subordinate forces of the ground forces, VPVO, air forces and navy.[55] Most of the service commands in the theater—the ground forces, tactical air forces, VPVO and navy—are directly subordinated to TVD, or military district headquarters where they are deployed and are often located in the command's main, alternate or reserve command post. Thus numerous common command and communications nodes link the various services at the strategic and operational levels.[56] Figure 4 illustrates the Soviet Western TVD.

As already noted, an independent avenue of strategic communications and control would be provided by the KGB. On order by the Politburo, it too could activate a vast network of cable, radio and satellite systems.

The Strategic Forces

A second General Staff directive, perhaps issued simultaneously with the first, might be to move some or all of Soviet forces to higher states of alert.[57] Although there would be little change in the readiness or survivability of Soviet ICBMs themselves, during crisistime RVSN troop control capabilities and survivability would increase.

RVSN forces are organized by armies, divisions, regiments, battalions and batteries—a form similar to that used by the missile and artillery troops of the ground forces.[58] The army is the highest command level and controls five to 10 divisions. Each army has an airborne command post that could be placed on strip or air alert.[59] These flying command posts allegedly can take over the missile launch duties of subordinate RVSN units, should lower level command posts be destroyed by enemy strikes.

The lowest level of launch control is the battalion, which consists of a launch control center and a complement of either six, nine or 10 ICBM launchers. A single launcher is considered a battery and therefore presumably can be fired individually. About 160 battalion launch control centers are associated with Soviet ICBM fields, each consisting of a hardened underground command post and a ground mobile command post.[60] In a crisis, cancellation of RVSN crew leaves would allow posting of double launch teams, and ground mobile command posts could then be dispersed.[61] Special missile checkout procedures would shorten ready-to-launch times.

A significant increase in Soviet SSBNs on station and on alert near base is possible, raising the preemptive and LUA striking power and survival potential (and hence, second strike possibility) of the fleet simultaneously. The number of unscheduled SSBNs that could put to sea would depend on their state of refit and repair and on the speed with which crews could be reassembled. It is not unreasonable to assume, however, that Soviet SSBNs could surge to on station rates exceeding 50 percent. Overall alert rates could approach 75 percent after several weeks, especially given the extended range of newer Soviet SLBMs.

Communications with Soviet SSBNs can be accomplished by a number of means. High frequency radio and direct satellite communications (ultra high frequency) are possible if SSBNs are near the surface.[62] Low frequency communications systems have been deployed at several locations in the Soviet Union. Completion of a new extra low frequency (ELF) SSBN communications system will allow the General Staff, the navy main staff and fleet headquarters to send flashes corresponding to predesignated operational directives, including signaling SSBNs to rise for high frequency and satellite messages.[63]

In a unique vein, Soviet naval planners assume that both SSBN survivability and C^2 can be enhanced by deploying SSBNs in Soviet controlled waters, so-called SSBN bastions. Encircled by surface ships, attack submarines and naval aircraft, Soviet SSBNs could be defended from U.S. antisubmarine warfare. Obviously, this approach stands in direct contrast to the U.S. practice of protecting SSBNs by losing them in the ocean.

Bastions for nuclear ballistic missile submarines greatly simplify the problem of SSBN C^3. These areas are within easy range of the large Soviet network of low frequency and very low frequency naval communications systems.[64] At the same time, the Soviets have deployed specially configured surface ships and submarines as intermediate command posts with extensive communications capabilities.[65] The other ships, submarines and aircraft that make up the shield covering the SSBN bastions can be used as relay stations. Thus communications from the General Staff, the naval main staff and fleet headquarters could be transmitted directly to the SSBNs by radio, or to intermediate navy assets for relay by radio or acoustic means.[66]

Soviet strategic bombers might be put on strip alert and dispersed to remote fields around the Soviet Union. The first stage would involve uploading bombs and cruise missiles. Tanker aircraft would be fueled to capacity to support dispersed and airborne activities. Some bombers and tankers would then be moved to staging bases along the northeast and northwest arctic areas of the Soviet Union. The remainder would be dispersed to interior airfields. But strategic bomber mobilization is likely to be most problematic since this arm of the Soviet strategic force was allowed to wither over the past 25 years. Only recently, with the advent of the Bear H cruise missile carrier (Figure 5) and the Blackjack bomber (Figure 6), has this trend been reversed. Consequently, an enormous array of standard operating procedures remains still to be worked out and implemented.[67]

VPVO radar units—more than 7,000 systems at 1,200 sites clustered to protect Soviet economic-industrial and military facilities—would be mobilized.[68] Surface-to-air missile units and interceptor squadrons could be brought to full strength by canceling leaves and calling up reservists. But the communications structure—linking radar units, missile units and interceptor bases and comprised of cable, line, radio and satellite links—is particularly complex and would require considerable time to bring to full alert status.

The decision to launch a preemptive strike is the sole prerogative of the political leadership. It also would establish the basic goals and objectives of the strike.[69] The General Staff then could draw up the corresponding strike plan based on the strike packages devised in peacetime as part of the Soviets' single integrated operational plan. Once the plan was approved by the Politburo, the General Staff would issue directives to the main staffs of RVSN, the navy and the air forces. Execution of the plan, on Politburo orders, would be relayed through the General Staff.

Targeting and Operations

A strong element in Soviet military thinking continues to be the belief that initial use of nuclear weapons can

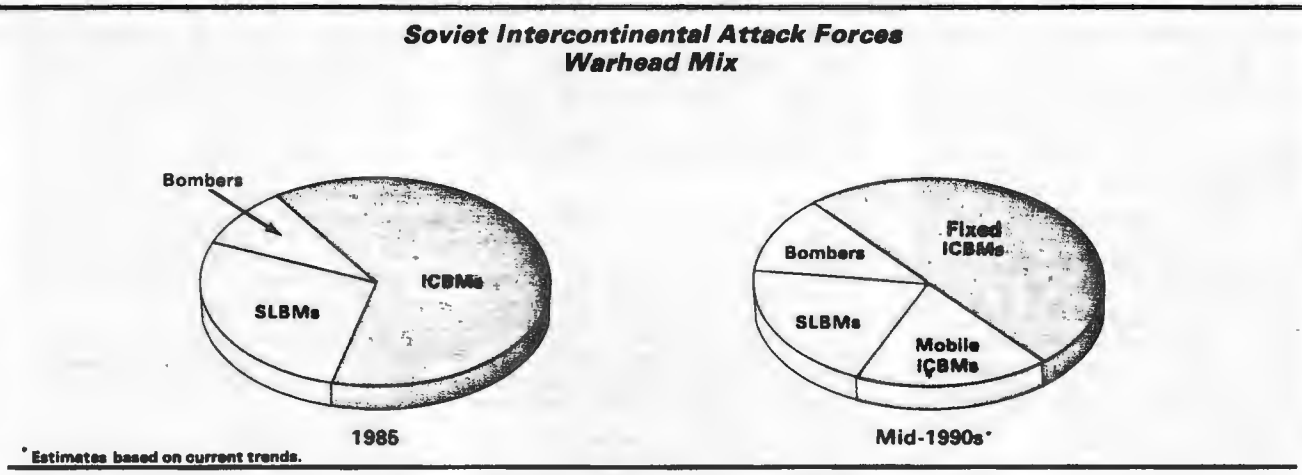


Figure 3. Soviet intercontinental attack forces in 1985 and as predicted in 1990.

decisively influence the course and outcome of a war.[70] The terms of nuclear war initiation, studies in historical allegory by the Soviets as the beginning period of war, is a special interest of military planners. They emphasize what is called the first massed nuclear strike—the initial large scale use of nuclear weapons (not to be confused with the Western notion of a first strike attack). As A. Veseyev notes, "The most important thing to conclude about this period is that the first massed nuclear strike can predetermine in large measure the subsequent course of the war, and with losses to the rear as well as troops, also place the nation and the country in a grave situation."[71]

In essence, this is a preemptive strike, which necessarily involves thousands of attacking warheads in the case of intercontinental nuclear war.[72] Such discussions lead many Western observers to attribute to the Soviets a predilection for a bolt-from-the-blue first strike. A more accurate view, however, is that the Soviet military simply recognizes that it is better to launch first than second—if a general nuclear war with the West appears imminent and unavoidable.

Soviet writings portray the first massed nuclear strike as a purposeful attack with specific military objectives, not as a spasm launch of every nuclear weapon in the arsenal. Soviet targeting for preemption assumes damage limitation as the objective. The Soviets fully recognize that the attack would not totally disarm the enemy. The purpose is to cut relative losses—relative to the enemy and relative to what would have occurred if the enemy had struck first. Thus the Soviets' inability to destroy the entire U.S. SSBN fleet is not necessarily a deterrent to a preemption decision should they become convinced that U.S. strategic attack is about to occur.

In contrast to Soviet targeting for response under surprise attack conditions, there is an unmistakable interest in first order destruction of U.S.

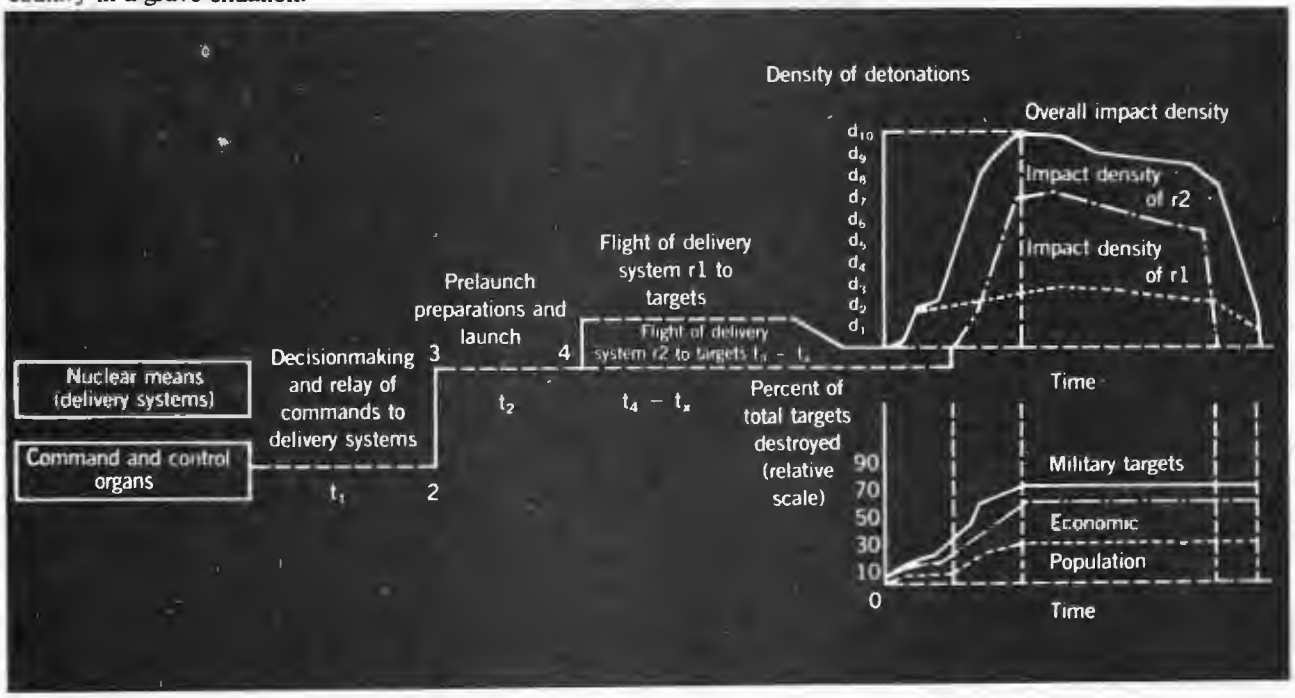


Figure 7. Soviet nuclear attack targeting diagram.

strategic forces and associated political and military C².[73] Figure 7, taken directly from a Soviet book on strategic analysis, provides some clues to Soviet military thinking on nuclear targeting. The diagram depicts a nuclear attack against population, economic and military targets by two types of delivery vehicles: R_1 and R_2. The nuclear charges of R_1 hit first, and almost all of this type of weapon are used before the charges of R_2 arrive at their targets. The time delay between arrivals strongly implies that R_1 is an SLBM. Being much more numerous than R_1 and arriving later, R_2 must be an ICBM.

Notice that about 10 percent of the population losses and almost 20 percent of the economic losses are incurred in the R_1 strike, but almost 30 percent of the military targets are hit. Exactly what is being struck? The author of the diagram, a leading Soviet military operations analyst, explains: "In as much as the first nuclear explosions can be used by the attacked side as an indication of more powerful strikes to come, it is logical to assume that the enemy will use nuclear warheads delivered [in the initial strike] . . . primarily against the means of detection and the points of control of the defending side."[74]

In short, the SLBM attack is aimed at C³ facilities and necessarily destroys nearby population and economic targets. The graph indicates that about 30 percent of the assigned military targets are destroyed in the SLBM attack. Besides C³ facilities, these include a range of unhardened military bases, airfields, naval bases and ports and logistic support systems.

As the SLBM attack reaches its peak, ICBM warheads begin to arrive. These weapons are targeted, first and foremost, on hardened facilities; in particular, on U.S. ICBM silos and launch control centers. Although Soviet political leaders could exclude U.S. military-industrial centers and political-administrative centers from intentional targeting in the preemptive strike, no evidence exists that Soviet military planners consider such limitations useful in intercontinental nuclear war. Of necessity, there would be thousands of nuclear detonations on the U.S. homeland, with subsequent group and individual nuclear strikes spaced out over hours and days.

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Notes

[1]The chapter builds on Stephen M. Meyer, "Soviet Perspectives on the Paths to Nuclear War," in *Hawks, Doves, and Owls: An Agenda for Avoiding Nuclear War* ed. Graham Allison, Albert Carnesale, and Joseph Nye (Norton, 1985), pp. 167–205. Ongoing research, however, has resulted in some notable revisions in argument and thesis.

[2]From the late 1950s to the late 1960s, Soviet military discussions of general nuclear war treated as independent missions strategic offense against an enemy and strategic defense of the homeland. This critical distinction reflected their expectations for the development and deployment of missile defense systems. S. S. Lotostkiy, *Istoriya voyn i voyennogo iskusstva* (Voyenizdat, 1970), pp. 498–501. This book was the product of a prestigious authors' collective at the Frunze Military Academy. According to a follow-up study published fourteen years later, the distinction was dropped in the late 1960s. B. V. Panov, *Istoriya voyennogo iskusstva* (Voyenizdat, 1984), p. 462. It is most probable that this change in Soviet thinking came about in the late 1960s and early 1970s. Today strategic offense and strategic defense are discussed separately in Soviet works on conventional warfare and theater nuclear warfare.

[3]Useful references on troop control include "Upravleniye voyskami," *Voyennyy entsiklopedicheskiy slovar'* (Voyenizdat, 1983), p. 766; P. K. Altukhov, ed., *Osnovy teorii upravleniya voyskami* (Voyenizdat, 1984); and D. A. Ivanov, V. P. Savel'yev, and P. V. Shemanskiy, *Osnovy upravleniya voyskami v boyu* (Voyenizdat, 1977). M. M. Kir'yan, *Problemy voyennoy teorii v Sovetskikh nauchno-spravochnykh izdaniyakh* (Voyenizdat, 1985) pp. 71–73, notes some confusion in Soviet usage. The *Voyenno-istoricheskiy zhurnal* extensively covers troop control and strategic leadership.

[4]N. V. Ogarkov, *Vsegda v gotovnosti k zashchite otechestva* (Voyenizdat, 1982), p. 58. Ogarkov was chief of the General Staff and is currently commander in chief of the western theater of military operations. M. Poviliy, "Military Strategy and Economics," *Military Thought*, no. 4, 1971, pp. 29–30. Poviliy was chief of the General Staff's Operations Directorate. The extensive treatment of the problem of mobilization in Soviet military materials highlights this issue. See Ogarkov, *Vsegda v gotovnosti*, pp. 58–60; and M. A. Gareyev, *M. V. Frunze: Voyennyy Teoretik* (Voyenizdat, 1985), pp. 192–95. Gareyev is a deputy chief of General Staff.

[5]Panov, *Istoriya*, p. 460; and N. Krylov, "The Nuclear Missile Shield of the Soviet State," *Military Thought*, no. 11, 1967, pp. 13–21.

[6]Stephen M. Meyer, "The Threat of Surprise Strategic Attack in Soviet Military Thinking," *Working Paper* (Soviet Security Studies Working Group, Center for International Studies, Massachusetts Institute of Technology, 1986).

[7]Serious problems with infrared detection technology delayed the initial operation capability (IOC) of the Soviet SEWS. U.S. Department of Defense, *Soviet Strategic Defense Program* (DOD, 1985), p. 13. For an extensive analysis of Soviet views on early warning technology and Soviet assessments of American early warning technology, see Matthew Partan, *Soviet Assessments of U.S. Early Warning Technology Programs* (Soviet Security Studies Working Group, Center for International studies, Massachusetts Institute of Technology, 1986).

[8]Nicholas L. Johnson, *The Soviet Year in Space: 1982* (Teledyne Brown Engineering, 1983), pp. 18–19.

[9]Nicholas L. Johnson, *The Soviet Year in Space: 1984* (Teledyne Brown Engineering, 1985), p. 30; Stephen M. Meyer, "Space and Soviet Military Planning," in *National Interests and the Military Use of Space*, ed. William Durch (Ballinger, 1984), pp. 76–80.

[10]For Soviet views on problems and prospects of infrared sensors for ballistic missile early warning, see I. I. Anureyev, *Oruzhiye protivoraketnoy i protivokosmicheskoy oborony* (Voyenizdat, 1971), pp. 202–10; and A. B. Krasnov, "The Early Warning System: Means and Prospects of Development," *Military Thought*, no. 4, 1969, pp. 86–90. See also Partan, "Soviet Assessments," pp. 102–119.

[11]U.S. Department of Defense, *Soviet Military Power* (DOD, 1985) p. 45; and W. M. Arkin and R. W. Fieldhouse, *Nuclear Battlefields* (Ballinger, 1985), p. 75.

[12]Recent Soviet interest in OTH-B bomber detection is revealed by K. Shelepov in "Zagorizontnyye RLS v PVO," *Tekhnika i vooruzhenniye*, no. 1, 1985, pp. 8–9. He notes that 3 to 3.5 hours of early warning is possible for subsonic targets and 1.2 to 1.5 hours for supersonic targets.

[13]Anureyev, *Oruzhiye protivoraketnoy i protivokosmicheskoy oborony*, p. 141; and Shelepov, "Zagorizontnyye RLS vs PVO," p. 9. See also Yu. Mishchenko, *Zagorizontnaya radiolokatsiya* (Voyenizdat, 1972).

[14]Ibid. Soviet signals and electronic intelligence systems might provide intermediate confirmation that a nuclear attack was under way. But this would depend heavily on the peacetime readiness of these intelligence systems to respond immediately. Moreover, data relay from naval and space signals intelligence collectors may be delayed by ten minutes or more.

[15]U.S. Department of Defense, *Soviet Strategic Defense Programs*, p. 9; U.S. Department of Defense, *Soviet Military Power—1986*, pp. 8–9; and Arkin and Fieldhouse, *Nuclear Battlefields*, p. 74–75.

[16]Ogarkov, *Vsegda v gotovnosti*, p. 50; and A. D. Verbitskiy, N. N. yefimov, and B. S. Ivanov, *Armii stran Varshavskogo Dogovora: Spravochnik* (Voyenizdat, 1985), p. 157.

[17]Arkin and Fieldhouse, *Nuclear Battlefields*, pp. 86, 225, 258; and *Congressional Record*, September 5, 1984, p. S10672.

[18]Early warning data would be passed to thirty military support bunkers of the national command authorities (NCA). Arkin and Fieldhouse, *Nuclear Battlefields*, p. 86.

[19]Anureyev, *Oruzhiye protivoraketnoy i protivokosmicheskoy oborony*, pp. 136–37; and V. Kulikov, "Dal'neye obnaruzheniye tseley," *Tekhnika i vooruzheniye*, no. 10, 1971, pp. 18–21; and U.S. Department of Defense, *Soviet Strategic Defense Programs*, p. 9.

[20]The Soviets give a figure of twenty-five pounds per square inch for these missile structures. Mikhaylov and Nazarov, *Razvitiye tekhnika puska raketa*, p. 97. The reference is to a U.S. Atlas-E coffin.

[21]Astashenkov, *Sovetskiye raketnyye voyska*, p. 75, and Mikhaylov and Nazarov, *Razvitiye tekhnika puska raketa*, p. 97, discuss U.S. liquid-fueled rockets of the same generation. They give figures of not less than 15 minutes for then-current, liquid-fueled ICBMs. For a discussion of the readiness and preparation of liquid-fueled ICBMs in general, see B. T. Surikov, *Boyevoye primeneniye raket* (Voyenizdat, 1965), pp.56,57. V. F. Tolubko, "Vesegda v boyevoy gotovnosti," *Krasnaya Zvezda*, April 25, 1985, p. 2, claims that early-generation Soviet ICBMs required several hours to prepare for launch. It is known that Soviet IRBMs of a similar generation also require several hours to ready for launch.

Although Soviet second-generation ballistic missiles —SS-4 IRBMs and SS-7 ICBMs—were designed for use with storable liquid fuels, they were deployed initially in a horizontal mode that did not allow fuel to be kept in on-board tanks. Environmental factors and

technology prevented the Soviets from maintaining these "soft-site" weapons in vertical position, exposed to the elements, for extended periods of time. Missile silos were considered important not only because they increased survivability from an American attack, but also because they protected missiles from the weather. Khrushchev, *Khrushchev Remembers*, pp. 48–50.

[32]Alternatively, a Soviet decision to strike first or an extended U.S.-Soviet crisis would have allowed more than enough time to prepare these weapons for launching, including emplacement of warheads.

[33]The Soviets distinguish among three types of nuclear forces for theater operations: tactical nuclear weapons (for example, SS-21 battlefield missiles and nuclear artillery) with ranges less than 150 kilometers; operational-tactical nuclear weapons (for example, SS-23 and SS-22 missiles and nuclear-capable frontal aircraft) with ranges of several hundred kilometers; and strategic weapons, which for theater use have ranges over 1,000 kilometers, the most obvious examples being the SS-20 IRBM and the Backfire bomber. Soviet terminology is used for the remainder of the chapter.

[34]Secretary of Defense Harold Brown contended that it was Soviet practice to retain tactical nuclear charges in the Soviet Union at least until 1978. U.S. Department of Defense, *Annual Report Fiscal Year 1979* (DOD, 1978), p. 69. In contrast, a former member of the Czech Communist party's Central Committee Department of Defense implies that the Soviets had deployed nuclear charges in the German Democratic Republic and Poland by the mid-1960s. Josef Hodic, "Military-Political Views Prevalent in the Czechoslovak Army 1948–1968," *Research Project 'The Experience of the Prague Spring 1968'* Working Study no. 5, (Austria), p. 18. I am indebted to Condi Rice for bringing the source to my attention.

Soviet intention may have been to prevent nuclear charges from falling in the hands of its Warsaw Pact allies, to whom the Soviets had given nuclear-capable tactical and operational-tactical missiles as early as 1960. The German Democratic Republic appears to have been the initial recipient, followed by Poland and Czechoslovakia. P. A. Zhilin, *Stroytel'stvo armiy evropeyskikh stran sotsialisticheskogo sodruzhestva 1949–1980* (Izdatel'stvo Nauka, 1984), pp. 146, 190, 270–78; and Thomas W. Wolfe, *Soviet Power in Europe* (Johns Hopkins University Press, 1970), p. 151. Penkovskiy, *The Penkovskiy Papers*, p. 331, recounts the concern of some members of the Soviet military leadership over providing the Eastern Europeans with nuclear-capable missiles.

[35]Barron, *KGB* (Reader's Digest Press, 1974), p. 10.

[36]Astashenkov, *Sovetskiye raketnyye voyska*, p. 75; and Anureyev, *Orudhiye protivoraketnoy i protivokosmicheskoy oborony*, p. 120.

[37]Mikhaylov and Nazarov, *Razvitiye tekhnika puska raketa*, p. 87, emphasize that the launch preparation time for ICBMs must be less than the flight time of enemy warheads. See also V. I. Vartokomeyev and M. Kopytov, *Proyektirovaniye i ispytaniya ballisticheskikh raket* (Voyenizdat, 1970), pp. 290–94; and Krylov, "The Nuclear Missile Shield of the Soviet State," pp. 13–31. The choice between two competing missile designs was based on shortest time to launch. Khrushchev, *Khrushchev Remembers*, pp. 50–51.

[38]These were Yankee-class SSBNs armed with SS-N-6 submarine-launched ballistic missiles.

[39] V. F. Tolubko, "Novoye peredovoye—v uchebyy protsess," *Krasnaya Zvezda*, January 26, 1984, pt. 2; and Yu. P. Maksimov, "Okhranaya trud Otchizny," *Pravda*, November 18, 1985, p. 3. Marshal Tolubko was the commander in chief of the RVSN until the fall of 1985, when General Maksimov replaced him. For a similar description of on-board systems on RVSN missiles for preventing unsanctioned operation, see P. Gorchakov, "Na strazhe mira i truda," *Krasnaya Zvezda*, November 19, 1985, p. 2. Gorchakov is the chief of the Political Directorate of the RVSN.

One is left to wonder whether there is some underlying motive for the frequency with which these statements about Soviet measures to prevent unauthorized launch are suddenly appearing. They might reflect a response to a Politburo-level admonition in 1982 to improve controls against unauthorized launches on Soviet nuclear forces. See D.F. Ustinov, "Otvesti ugrozu yadernoy voyni," *Pravda*, July 12, 1982, p. 4. On Soviet multiple-key launch systems, see N. Sutin, "Podzemnyy bastionnn," *Izvestia*, March 19, 1986, p. 6.

[40]These on-station rates for Soviet SSBNs are low by U.S. standards. The major constraint appears to be crew assignment. The United States "double crews" its missile submarines, but the Soviets use only a single crew. The Soviets recognize that they could almost double their SSBN day-to-day alert rates by switching to a double-crew system, but they have not. I. N. Potapov, *Nauchno-tekhicheskiy progress i flot* (Voyenizdat, 1977), p. 129. The recruitment and retention of submarines in the Soviet Union is likely to be the constraining factor in switching to double-crew manning. Maintenance and reliability problems may also prevent a more intensive use of Soviet SSBNs.

[41]Robert Bathurst, Michael Berger, and Alan Wolffe, *Soviet Sailor: Combat Readiness and Morale*, report KFR383–82 (Ketron Inc., 1982), p. 9.

[42]It is often noted that ICBMs constitute 75 percent of the Soviet strategic force loading. This number, however, includes ready and nonready forces.

[43]A. Yevseyev and O. Gurov, "Organizatsiya informatsionnoy raboty v General'nom shtabe, shtabakh frontov i armiy," *Voyenno-istoricheskiy zhurnal*, no. 3, 1981, p.14; Victor Suvorov, *Inside the Soviet Army* (Macmillan, 1982), p. 56; and U.S. Department of Defense, *Soviet Military Power—1981* (DOD, 1981), p. 55.

[44]Surikov, *Boyevoye primeneniye raket*, p. 57.

[45]V. F. Tolubko, "Vsegda v boyevoy gotovnosti," *Krasnaya Zvezda*, April 25, 1986, p. 2.

[46]Surikov, *Boyevoye primeneniye raket*, p. 57.

[47]All Soviet discussions of automated control systems (ASU) emphasize the preeminent role of the commander in all phases of decision and action. ASU are used to reduce the time of technical work by crews and staff, to assemble and move information, and to carry out human directives. Yu. Bogdanov, "Otobrzheniye informatsii na komanduiykh punktahkh," *Tekhnika i vooruzhenniye*, no. 4, 1985, pp. 14–15; Altukhov, *Osnovy teorii*, pp. 77–93; and Ogarkov, *Vsegda v gotovnosti*, p. 37.

[48]As in the United States, the Soviet organization responsible for early warning, the VPVO, has no operational control over nuclear strike forces.

[49]The Soviet VPVO, Air Forces, civil defense system, and navy require a minimum of a week to shift from peacetime to a "near-war" footing. Mobilization of the Soviet Ground Forces would require a month or more to increase substantially the number of battle-ready divisions, as well as to fill out logistics and troop control support. The reappearance of mobilization as a major theme in Soviet military and military-economic analyses further supports the view that the Soviets expect a substantial period of escalating political tensions to precede war. In particular, the Soviet General Staff now rejects the proposition, most strongly articulated in the early 1960s by former chief of the General Staff V.D. Sokolovskii, that future wars would be fought only with forces and means predeployed and prestocked in peacetime. V. D. Sokolovskii, *Voyennaya Strategiya* (Voyenizdat, 1963), p. 22. For the General Staff rejection, see Gareyev, *M.V. Frunze*, pp. 241–42.

[50]An exercise in this strategic intelligence appears to have taken place in 1981 (*Washington Post*, p. 1, "Defector Tells of Soviet Alert.")

[51]*Department of Defense Authorization for Appropriations for Fiscal Year 1983*, Hearings before Senate Committee on Armed Services, 97 Cong. 2 sess. (GPO, 1982), pt. 7, pp. 4673–74.

[52]Testimony by Donald Latham, Deputy Secretary of Defense for Command, Control and Communications, *Department of Defense Appropriations for Fiscal Year 1984*, Hearings before the House Committee on Appropriations, 98 Cong. 1 sess. (GPO, 1983), pt. 8, p. 316.

[53]Ibid. See also *Department of Defense Authorization for Appropriations for Fiscal Year 1983*, Senate hearings, pt. 9, p. 4673.

[54]Suvorov, *Inside the Soviet Army*, p. 153. A less discrete approach would be to station helicopters on alert near the Kremlin.

[55]Ibid.

[56]*Department of Defense Appropriations for Fiscal Year 1984*, House hearings, pt. 9, p. 316; and *Department of Defense Authorization for Appropriations for Fiscal Year 1983*, Senate hearings, pt. 7, pp. 4673, 4675. Overall, Soviet shelter capacity is estimated to be able to serve 5,000 key party and government officials, 63,000 lower level leaders, 2,000 industrial installation managers, and 40,000 civil defense staff workers. These shelters are hardened to withstand blast pressures of the order of hundreds of pounds per square inch. Warning to evacuate would come over radio and over a new cable communications system currently being installed in the Soviet Union. Radio Vilnius, "Civil Defense in Case of War," broadcast January 3, 1986, reported in *Radio Free Europe*.

[57]Altukhov, *Osnovy teorii*, pp. 73–76, discusses these communications technologies in the context of redundancy for troop-control survivability under contemporary (nuclear) conditions. Similarly, V. P. Zaytsev, P. M. Anisimov, and I. V. Borisov, *Voyennyye svyazisty v boyakh za Rodinu* (Voyenizdat, 1984), pp. 228–47, explain the importance of combining the various communications technologies for maintaining the continuity of strategic and operational troop control under nuclear conditions. See also U.S. Department of Defense, *Soviet Military Power—1981*, p. 18.

[58]For a discussion of these forms of command centers and the survivability of command and staff, see Altukhov, *Osnovy teorii*, p. 73. See also U.S. Department of Defense, *Soviet Military Power—1985*, p. 28.

[59]On the structure of primary, alternate and reserve command posts, see Altukhov, *Osnovy teorii*, pp. 72–74. M. Krylov, "Svyaz' VMF v velikoy otechestvenney voyne," *Morskoy Sbornik*, no. 5, 1985, p. 23, discusses the navy's use of a rail-mobile alternate command post (four cars) during World War II.

[60]N. Lomov and V. Golubvoich, "Ob organizatsii imetodakh raboty General'nogo shtaba," *Voyenno-istoricheskiy zhurnal*, no. 2, 1981, p. 13.

[61]Altukhov, *Osnovy teorii*, p. 76; and Zaytsev, Agisimov, and Borisov, *Voyennyye svyazisty*, pp. 231–32, 243. *Department of Defense Authorization for Appropriations for Fiscal Year 1983*, Senate hearings, pt. 7, p. 4673.

[62]Yevseyev and Gurov, "Organizatsiya informatsionnoy raboty," p. 14; Suvorov, *Inside the Soviet Army*, p. 56; and U.S. Department of Defense, *Soviet Military Power—1981*, p. 55.

[63]The main naval staff employed cable, radio and line communications during World War II to control the fleets. Krylov, "Svyaz' VMF," p. 23. Zaytsev, Anisimov and Borisov, *Voyennyye svyazisty*, pp. 230–46, discuss the full range of systems for operational control of the Soviet Ground Forces.

[64]Arthur Alexander, "Decision-Making in Soviet Weapons Procurement," *Adelphi Papers*, no. 147/148, Winter 1978/1979.

[65]I. M. Tret'yak, "Razgrom Kvantunskou armii na Dal'nemostoke," *Voyenno-istoricheskiy Zhurnal*, no. 8, 1985, pp. 9–20. U.S. Department of Defense, *Soviet Military Power—1986*, p. 59.

[66]Zaytsev, Anisimov and Borisov, *Voyennyye svyazisty*, p. 234, discuss the importance of communications between the Ground Forces, the VVS, the VPVO, the navy and strategic authorities. Yevseyev and Gurov, "Organizatsiya," p.12, point out that one of the reasons that the intermediate high commands of World War II were ineffective was because they lacked independent means of communications and intelligence collection. One can assume that this defect has been remedied in the contemporary reincarnation.

[67]A multistage alert system has been employed since the 1930s, although the number of levels have not been disclosed. Readiness level No. 1 is the highest. Krylov, "Svyaz VMF," p. 24. Soviet military activities during the past twenty years—for example,

readiness changes related to the invasions of Czechoslovakia and Afghanistan, preparations to invade Poland, mobilizations for the 1969 Ussuri River clashes and airborne alerts related to the 1973 Middle East crisis—reveal that alert levels can be differentiated by service, branch, unit and geographic deployment.

[58]Stephen M. Meyer, "RVSN Structural Organization," *Research Note* (Soviet Security Studies Working Group, Center for International Studies, Massachusetts Institute of Technology, 1986). The RVSN was created out of the Missile and Artillery Troops of the Ground Forces, and thus its service heritage is distinctly different from that of the U.S. Strategic Air Command.

[59]Suvorov, *Inside the Soviet Army*, p. 56, claims that RVSN army commands possess airborne command posts. This is confirmed by *Department of Defense Authorization for Appropriations for Fiscal Year 1983*, Senate hearings, pt. 7, p. 4675. See also U.S. Department of Defense, *Soviet Military Power—1983*.

[60]*The commonly cited number of 300 RVSN launch control centers appears to include command posts for the IRBM force as well. See Meyer, "RVSN Structural Organization," p. 3.*

[61]*Suvorov, Inside the Soviet Army*, p. 56. The existence of ground-mobile command posts is confirmed by *Department of Defense Authorization for Appropriations for Fiscal Year 1983*, Senate hearings, pt. 7, p. 4675.

[62]E. Mordvintsev, "Svyaz' s podlodnymi na sverkhizkikh chastotakh," *Morskoy Sbornik*, no. 8, 1985, p. 86.

[63]U.S. Department of Defense, *Soviet Military Power—1985*, p. 33, reports the Soviets' development of an ELF system. The system is being constructed on the Kola Peninsula, according to Arkin and Fieldhouse, *Nuclear Battlefields*, p. 81. Owing to the low data rate and extreme vulnerability of ELF communications to both nuclear and conventional strikes, the most that the system can be expected to do is alert SSBNs to the start of a conflict. Mordvintsev, "Svyaz' s podlodnymi," *Morskoy Sbornik*, pp. 87–88.

[64]Arkin and Fieldhouse, *Nuclear Battlefields*, pp. 252–63.

[65]*Department of Defense Authorization for Appropriations for Fiscal Year 1983*, Senate hearings, pt. 7, p. 4675.

[66]The Soviets allegedly had worked out methods for submarine-to-ship and submarine-to-aircraft communications during World War II. For a discussion of acoustic communications, see G. Afanas'yev and V. Solov'yev, "Svyaz' podvodnykh lodok," *Morskoy Sbornik*, no. 2, 1985, pp. 28–31; and Mordvintsev, "Svyaz' s podlodnymi lodkami," p. 86.

[67]The Soviets have recently begun mock intercontinental bombing missions against Alaska. "USAF F-15s Intercept Soviet TU-95 Bomber North of Alaska," *Aviation Week and Space Technology*, December 2, 1985, p. 19.

[68]U.S. Department of Defense, *Soviet Military Power—1985*, p. 45.

[69]Skirdo, *Narod, armiya, polkovodets*, pp. 121–24.

[70]Yevseyev, "O nekotorykh tendentsiyakh v izmenenii," pp. 16–17; and Kir'yan, *Problemy voyennoy theorii*, p. 124.

[71]Yevseyev, "O nekotorykh tendentsiyakh v izmenenii," p. 17. Yevseyev, a general lieutenant who recently became a prominent writer, refers here to general nuclear war, not theater warfare.

[72]Even a Soviet limited nuclear strike against U.S. military facilities would involve 1,800 targets at a minimum. See Robert Berman and John Baker, *Soviet Strategic Forces* (Brookings, 1982), p. 137. See also Yevseyev, "Onekotorykh tendentsiyakh v izmenenii," p. 17; and M. M. Kir'yan, *Voyenno-tekhnicheskiy progress i vooruzhennyye sily SSSR* (Voyenizdat, 1982), p. 314. Soviet military discussions distinguish three levels of nuclear strikes: massed, group and individual. When quantitative dimensions are appended to these categories, they usually are in terms of hundreds of weapons for a massed attack, tens of weapons for a group attack and single weapons for the individual attack. Such discussions, however, are invariably tied to theater nuclear war, not intercontinental war. When one considers the relative dimensions of the target arrays for theater versus intercontinental nuclear war, it is obvious that the massed nuclear attack in the latter instance must involve thousands of attacking charges. For a revealing analysis of nuclear strike effectiveness for individual and group nuclear strikes, see N. M. Fendrikov and V. I. Yakovlev, *Metody rascheton voyevoy effektivnosti vooruzheniya* (Voyenizdat, 1971), chap. 4.

[73]Kir'yan, *Voyenno-tekhnicheskiy progress*, p. 314; Panov, *Istoriya voyennogo iskusstva*, p. 462; Dimitriyev, *Raketnyy shchit Rodiny*, p. 32; and Anureyev, "Correlation of Nuclear Forces."

[74]K. V. Tarakanov, *Matematika i vooruzhennaya bor'ba* (Voyenizdat, 1974), p. 185. Of course, such discussions always specify that it is the enemy who attacks.

Color Illustrations courtesy of Soviet Military Power 86.

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Soviet Military Use of Space

By Gen. Robert T. Herres, USAF

The militarization of space has been an accomplished fact for a long time. The Soviet Union has been pressing ahead with a vigorous space program devoted in large part to military objectives. But neither the Soviet Union nor the United States was the first to militarize space. Significantly, both nations entered the space race at the end of World War II on an almost equal footing.

Germany was the first competitor nation to try to gain a military advantage using space. As early as 1934, German scientists, funded by the German army, worked to develop an eight ton rocket capable of delivering a one ton warhead nearly 200 miles. In 1944, the first V-2 crossed the threshold of space and came down on British soil.

This period in history was significant for several reasons. First, spurred by a life-or-death struggle, space—albeit the threshold of it—was first crossed for hostile military purposes. Next, almost all of the rocket and missile expertise in the world resided in the German contingent at Peenemünde. Third, both the Soviet Union and the United States captured or otherwise acquired the expertise of these German scientists. Next, as the World War II alliance between the Soviet Union and the West began to unravel, the alliance of a hot war unfortunately was displaced by the competition of a Cold War. And finally, and perhaps most importantly, the United States and the Soviet Union, with large and historical disparities between their land, naval and air forces, faced the medium of space from the same starting point. Never before in history had the Soviets entered any competition on nearly equal footing with the West.

As early as 1945, the Soviets likely judged that superiority in space could offset not only some of the disadvantages of their geography and their heterogeneous population held together by coercion, but also an inferior air force and navy. Control of space became a top Soviet military priority, and there is little evidence today that its priority has been displaced. On the contrary, all of the evidence argues that the basic Soviet objective in space remains the attainment of military superiority.

Misconceptions

Some of the ill-founded beliefs concerning space include claims that space is not militarized; that the U.S. initiative to conduct research of technologies that could lead to a decision to develop and deploy a strategic defensive system will violate the untrespassed sanctity of space; and that the United States is provoking a new arms race in space.

For nearly 30 years, space has been used for military purposes. Illustrations on pages 64 and 65 show some of the Soviet Union's applications. Even the intercontinental ballistic missile uses the properties of space. If a spacecraft is defined as an object that enters space and transits it for some given interval of time or distance, then the multiple independently targeted 10 warhead platform of the Soviet SS-18 intercontinental ballistic missile must be characterized as a spacecraft. Not only do these platforms travel more than 1,000 miles above the Earth; they also travel between 3,000 and 4,000 miles through space while maneuvering. In fact, they travel above the orbits of more than 40 percent of the satellites in low earth orbits, including most of the Soviet COSMOS satellites, and above U.S. orbiting TRANSIT naval navigation satellites and the METSTAR meteorological constellation.

Because the orbital properties of space are ideally suited for spacecraft performing functions such as communications relay, aids to navigation, surveillance, warning, meteorological observation and geodesy, the military forces of both the United States and the Soviet Union have employed satellites in those roles for more than two decades. If employment of a regime by military forces or the presence of military systems in a medium defines militarization, then space has been militarized for a long time.

However, a distinction should be drawn between nonhostile, nonthreatening military activities and those that are either hostile or threatening. U.S. spacecraft support the national policy of deterrence. The spacecraft of the Soviet Union may serve altogether different ends.

Soviet Intentions

As early as 1965, the Soviet Union's *Dictionary of Basic Military Terms* officially made reference to a mission described as antispace defense, which was defined as "A component part of air defense. The main purpose of antispace defense is to destroy space systems used by the enemy for military purposes in their orbits. The principal means of antispace defense are special spacecraft and vehicles, which may be controlled either from the ground or by special crews."

The Soviets also authoritatively defined military space systems as "systems used for military purposes in space, namely to carry nuclear weapons, to conduct reconnaissance, to organize radio countermeasures, to effect communication and control and to destroy space vehicles. Military space systems will include various types of artificial Earth satellites and space ships, such as missile armed satellite bombers, manned space bombers, etc."

The Soviets, firmly grounded in this doctrine by the late 1960s, were working to develop an orbiting bombardment system and had developed and deployed a fractional orbiting bomb system. This system featured an unmanned spacecraft that could be launched and could complete a partial orbit with a nuclear weapon onboard. After a fractional orbit, it could be returned to Earth and detonated on command.

The Soviets also developed the world's only operational satellite interceptor system, a system emerging from their doctrinal requirement to be able to control the medium of space (Figure 1). Although some have described the Soviet satellite interceptor, which has been deployed since 1971, as crude, most experts do not share that appraisal. No system capable of engaging all U.S. satellites in low earth orbit should be dismissed as crude.

Soviet declarations to the contrary, the Soviet space program is, and always has been, a military space program. Approximately 95 percent of Soviet space launches have military applications, with 80 percent having exclusively military missions. Of about 150 Soviet satellites currently on orbit, 95 percent have military or military related missions.

Space Budget

The Soviet Union's space program consumes a massive amount of resources. The Soviet space budget has been growing at the rate of more than 15 percent annually, exceeding the growth rate in the Soviet Union's already massive overall military budget. In U.S. dollars, it has been estimated that Soviet space activities cost between $20 billion and $25 billion a year, with some analysts estimating the cost as high as $30 billion a year. While comparing dollars and rubles is an exercise full of pitfalls, Soviet citizens have less and sacrifice more than U.S. citizens do to sustain their nation's space program.

The Soviets also operate a colossal research and development establishment. They graduate 300,000 engineers annually and continually employ 900,000 engineers and scientists in research and development roles. Of these, almost one-half million specialize in military or military related research. The best Soviet engineering and scientific talent is found in the Soviet space effort. Entire cities of scientists, such as the city of Akademgorodok, with a population of more than 50,000, are closed off from the rest of Soviet society and dedicated to research and development. The wartime scientific population of Los Alamos, New Mexico, the closed U.S. community that developed the atomic bomb, reached a peak of 5,000 in 1945. Akademgorodok is only one of many such closed Soviet communities concentrating on research.

The Soviet research and development budget accounts for 20 percent of the total military budget—a budget consuming approximately 16 percent of the Soviet gross national product (GNP), which is approximately half as large as the U.S. GNP. And this investment in research and development continues to grow. It has grown nearly 28 percent since 1975, with some space related technology sectors having an even more dramatic growth rate.

Results

The tangible paybacks on these investments have been many. The Soviets possess the largest space logistics base and infrastructure in the world. It includes launch pads, numerous mission control sites and an entire fleet of space event support ships providing worldwide spacecraft tracking and recovery capability. This system allows the Soviets to sustain a vigorous launch rate of approximately 100 launches a year and, when combined with the world's largest and most active production lines for boosters and satellites, gives the Soviet Union a superior space system replenishment capability. Figure 2 shows the different types of Soviet launch vehicles. When flexibility and responsiveness are used as yardsticks, Soviet space logistics capabilities are formidable.

The Soviets also have a clear lead in manned space operations. Soviet cosmonauts have logged more than 42,000 manned days in space—three times as many as U.S. astronauts—and the SALYUT 7 crew set a space endurance record of 237 consecutive days in space. Soviet cosmonauts also have demonstrated an impressive on orbit maintenance capacity, salvaging and restoring operations on a tumbling SALYUT space station after ground operators were no longer able to control it. Little notice was given to two other impressive Soviet achievements: the transfer of cosmonauts from the MIR to the restored SALYUT and back to the MIR and the short notice return to Earth of an ill cosmonaut.

The Soviets admit to using manned spacecraft for Earth observation and experiments, but it is significant that radio communications between the cosmonauts and their ground controllers occasionally are scrambled to defeat U.S. efforts to determine the cosmonauts' activities. A continual, manned presence in space is clearly a goal of the Soviets, and they appear to be on the threshold of meeting that objective.

The ability of military space systems to influence the outcome of terrestrial events, or to change the balance between terrestrial forces, can

be seen clearly in two Soviet systems, for which no other country in the world has a corresponding capability. A satellite using radar to locate naval vessels, called RORSAT, and a satellite detecting electronic emissions emanating from ocean vessels, called EORSAT, can operate together. Thus, any attempt by a ship to use electronic countermeasures against the radar satellite may serve only to allow the electronic satellite to detect the ship's position. One can find no functions for the RORSAT-EORSAT constellation other than to allow the Soviets to economize their own military forces and to enhance the Soviet terrestrial capability to locate and target opposing naval forces. Specifically, these systems were designed and would be employed in an attempt to diminish the critically important naval advantage of U.S. maritime forces.

The Soviet Union's space based capabilities already are well integrated into its ground, naval and air forces to support the needs of terrestrial military commanders. Soviet space systems are launched to function or participate in military exercises, just as ships, aircraft and troops train through exercise activity. The Soviets are able also to redirect their spacecraft as the terrestrial situation, either exercise or real world, dictates.

Additional Capabilities

And all of these—funding for operations, funding for research, their space logistics base, their lead in manned space operations, an operational satellite interceptor, the RORSAT-EORSAT satellites and the integration of space based systems into operational military formations—are present capabilities. If the current asymmetries in space capabilities are not worrisome enough, related and emerging systems are further evidence of Soviet intentions in space.

The Soviet capital is defended by the world's only operational anti-ballistic missile system. Key military installations are hardened, and facilities exist to protect Soviet political leadership all the way from national leaders down to the leaders of cities.

The Soviets employ more than 10,000 people in their laser program—a program that would cost approximately $1 billion annually to duplicate in the United States. Several of their laser sites can interfere with U.S. and NATO satellites in low earth orbit. The Soviet version of a multiple layer Strategic Defense Initiative has been

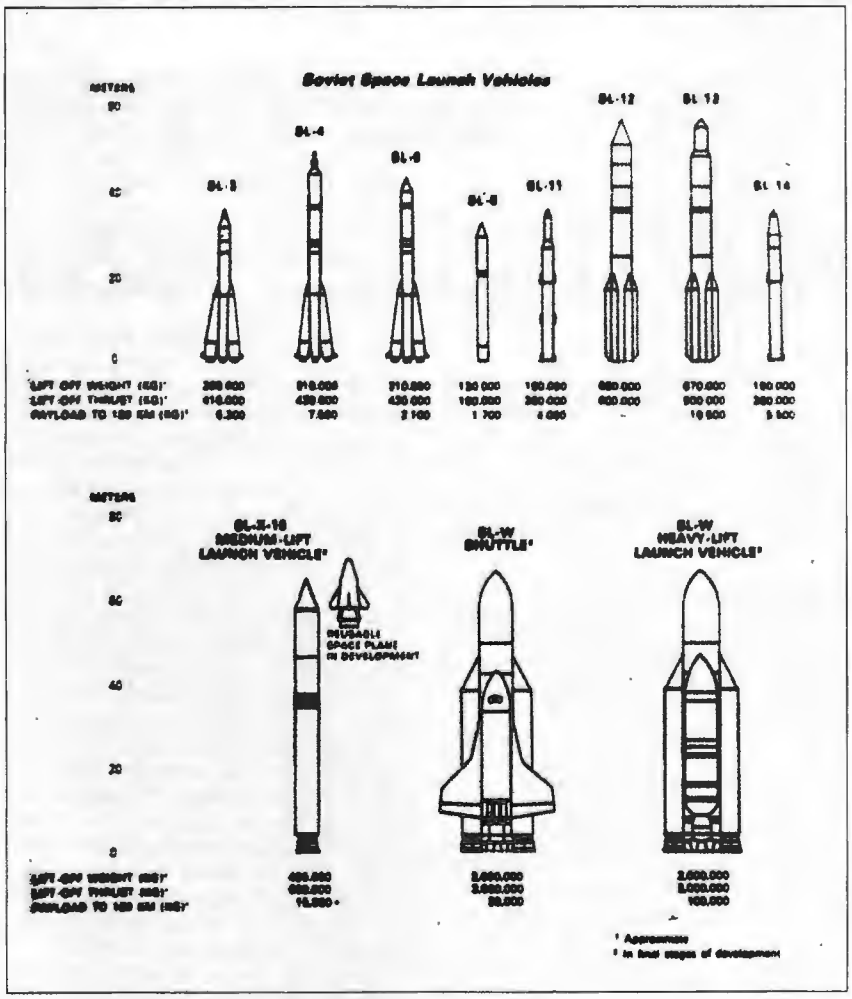

Figure 2. A representation of Soviet space launch vehicles

quietly under development for two decades, and elements of it already have been fielded. The Soviet penchants for mobility and for rapidly relocatable weapons systems are anticipated to emerge finally in a Soviet strategic defense system with some highly mobile elements.

The Soviets also are pressing ahead with a heavy lift space launch vehicle capable of lifting payloads in excess of 110 tons, a weight more than two-thirds heavier than the U.S. shuttle can carry; an aerospace plane; and a manned orbiter clearly based on the shuttle design but also having its own unique features. The potential military applications of these systems are legion. Taken together, already operational and future Soviet space capabilities are a cause for genuine concern. Not only do they provide the ability to alter the quantifiable attributes of national power, but they also are uniting the Soviet national will.

Pride in the Soviet space program is a key element in linking together bloc countries, their 15 separate republics and 104 ethnic nationalities. Cosmonaut selections obviously are sensitive to this need. Whatever other hardships Soviet citizens may bear, they believe their space program is superior and continue, whether joyfully or not, to make the sacrifices necessary to keep it that way.

U.S. Choices

Because national power is a relational phenomenon; because space based systems can enhance terrestrial capabilities to the point that they offset many of the disadvantages of terrestrial force structure or geography; because national pride can strengthen national will; because space is already

militarized; and because nations must compete to survive, the United States faces some very tough choices.

In the simplest terms, the United States must determine whether or not it will continue to compete. If not, it must rely on the good will of the other competitors to determine its destiny. Leaders do not derive much comfort from that thought.

If, on the other hand, the United States continues to compete, it must accept that military capabilities must be met with military capabilities. Nothing would be more dangerous or destabilizing than a situation in which the Soviets perceived a clear military advantage over the United States and its allies in any area—land, sea, air or space. Thus, the struggle must not be for superiority but to retain a balance between the respective forces. State-to-state agreements can be helpful in restraining the competition or channeling it into limited areas, but they can be helpful only if they are fair, are verifiable and do not delude anyone into thinking that someday military forces will no longer be needed to deter aggression. Nations have been known to violate treaties, in whole or in part, and the world has entered an era when aggression can be initiated not only on land, at sea or in the air, but also from space and in space.

Space will be as important to the future of the United States as the sea was to its past and is to its present. "Our future," wrote U.S. Secretary of Defense Caspar W. Weinberger, "is intimately tied to space." And remaining competitive in space is absolutely critical.

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Soviet Strategic Defense Initiatives

By RAdm. Thomas A. Brooks, USN

Since President Reagan announced the U.S. Strategic Defense Initiative (SDI) more than three and one-half years ago, the public has been assailed with a constant barrage of media sensationalism regarding the program. Misleading coverage of SDI often conjures up images of space stations, death rays and Buck Rogers and connects SDI with attacks on defense spending. This leads the public to believe that SDI is a pointless, gold-plated Pentagon plan, with limited utility and even less prospect of success.

The Soviet media and international propaganda machines play such themes back, adding to them the hysteria of the arms race. The Soviet Union claims that SDI endangers arms control, destabilizes the balance of power and brings the world closer to nuclear holocaust. All of this is disseminated by the Soviets with typical pontification, implying that they never would engage in such a destabilizing program.

But the Soviets already have a large, healthy and longstanding strategic defense program that began well before President Reagan's March 1983 speech introducing SDI. It is almost certainly a more expensive program than U.S. SDI, and in several areas, the Soviets have fielded operational systems that are still years away for the United States. If allowed to continue as a unilateral program, the Soviet effort could threaten world stability by giving the Soviet Union a major strategic advantage over the United States.

U.S. Strategic Defense Efforts

Although portions of SDI research appear as inconceivable as putting a man on the moon would have appeared in the 1940s, these projects form only a small part of the overall program. Much of the SDI effort represents the orderly development of already proven concepts or those that are well on their way to being proven—either by the United States or by the Soviet Union.

SDI researches the feasibility of a defense against ballistic missiles. Subordinate, but complementary, research programs now are underway to examine the feasibility of defenses against cruise missiles, bombers or space based weapons systems. Research and development (R&D) in the areas of ballistic missile defense and defense against bombers and cruise missiles is not new. In the 1950s and 1960s, ballistic missile defense research resulted in the deployment of the Safeguard anti-ballistic missile (ABM) systems (radars, exoatmospheric interceptors and endoatmospheric interceptors) approximately 15 years ago. The SDI ballistic missile defense concept takes several steps beyond the Safeguard program. Problems with Safeguard included the Soviet capability to overwhelm the system with a massive number of incoming warheads and the overarching problem of nuclear detonations over United States territory—either from incoming missiles or from nuclear warheads on the ABMs themselves. Today's SDI approach envisions a system with several tiers of defense wherein ballistic missiles can be detected and engaged during their boost phase, their mid-course phase or their terminal phase. Many of the systems could be space based: The capabilities the United States currently has in spaced based communications, strategic surveillance, weather reporting and Earth resources research indicate that U.S. technology will master the space aspects of strategic defense with relative ease.

Soviet Concerns

In a special June 1985 report, the U.S. State Department observed that

"Over the last two decades, the Soviet Union has invested as much overall in its strategic defenses as it has in its massive strategic offensive build-up. As a result, today it enjoys certain important advantages in the area of active and passive defenses. The Soviet Union will certainly attempt to protect this massive, long-term investment."[1]

SDI threatens not only the Soviets' strategic defense lead, but also their strategic offensive investment. A true U.S. commitment to strategic defense means that the Soviet strategic offensive missile arsenal, built at such great expense over the years, could lose its impact overnight. This loss would prevent the Soviets from achieving their goal of strategic superiority, which they have been striving hard to attain.

In view of the Soviet Union's historic preoccupation of defending itself from attack, it is not surprising that the Soviets are dedicated to developing defenses against nuclear attack, to include ballistic missile attack. Marshal V. D. Sokolovskiy detailed such Soviet doctrine almost 25 years ago in the first edition of his book *Military Strategy*: "They [the members of the Soviet military establishment] have the task of creating an invincible system for the defense of the entire country. . . . While in the last war it was sufficient to destroy 15 to 20 percent of the attacking air operations, now it is necessary to ensure, essentially, 100 percent destruction of all attacking airplanes and missiles."[2]

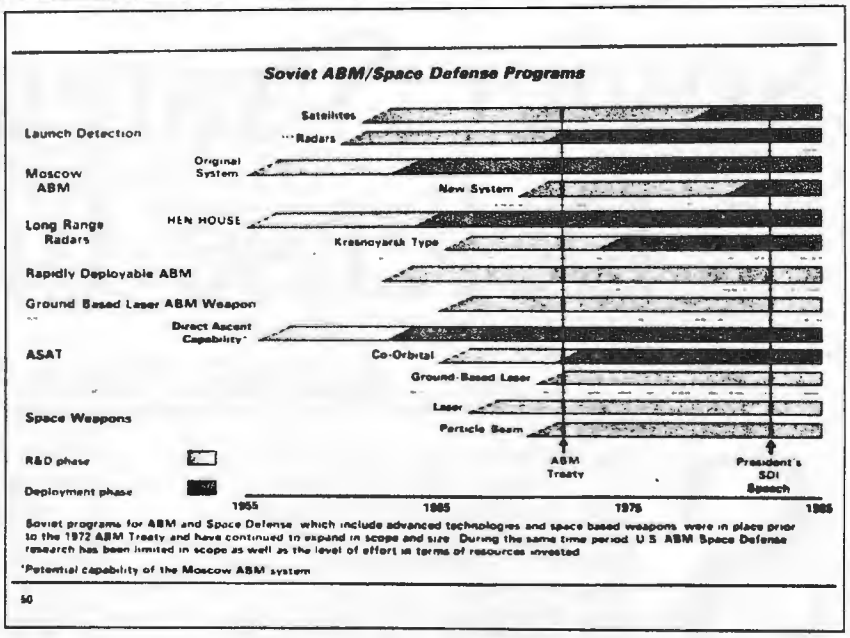

Figure 1. Various stages of research and development and deployment of the Soviet anti-ballistic missile/space defense programs.

Soviet Anti-ballistic Missiles

The Soviets first deployed an ABM system around Moscow in the 1960s. Figure 1 shows the stages that have been part of the Soviet ABM operation. They currently are in the process of expanding and upgrading this system to the 100 launcher limit allowed under the ABM Treaty. The new system will be a two tiered system composed of silo based long-range modified Galosh interceptors and silo based high acceleration Gazelle interceptors designed to engage targets within the atmosphere. It will be supported by engagement and guidance radars, to include a new large radar at Pushkino specifically designed to control ABM engagements. This new system could be operational as early as 1987.

Supporting this system is a sophisticated network of ballistic missile warning, target tracking and battle management radars. Most of these are located on the periphery of the Soviet Union and provide early warning of attack. One, however, is not. The radar at Krasnoyarsk is located well within the landmass of the Soviet Union and is thus in violation of the ABM accord, which limits this type of radar to the periphery of the Soviet Union. Those portions of the Soviet defensive radar arc currently occupied by older HEN HOUSE radars probably will be equipped with new generation radars providing 360 degree coverage with state-of-the-art large phased array radars.

In addition to land based radars, the Soviet ballistic missile defense system employs launch detection satellites capable of detecting and reporting a U.S. intercontinental ballistic missile (ICBM) as it is launched. These satellites, together with several over-the-horizon radars, which are boresighted on U.S. ICBM fields, probably would provide the first indication of a U.S. ICBM launch. The radars around the periphery of the Soviet Union would provide attack sizing and target tracking data in support of the ABM force. These missile warning systems and attack assessment/tracking radars are key elements in any ABM system. They are the long-lead time items required for an ABM capability of any scope—either within or beyond the numbers allowed by the ABM Treaty. Once the launch detection satellites and the sophisticated missile tracking radars are in place, they are capable of supporting an ABM system of any size—be it 100 launchers around Moscow or a total breakout of the ABM Treaty and large-scale deployment of ABMs throughout the Soviet Union. While it cannot be established that the Soviets intend to break out of the ABM Treaty, they are constructing, on a high priority basis, the critical elements that would be required to do so, such as the early warning systems, the attack assessments/missile tracking systems and the radars capable of ballistic missile battle management.

In addition to the Galosh and Gazelle, several other Soviet long-range surface-to-air missiles (SAM) have potential ABM capability, and the Soviets apparently are developing components of a new ABM system that would permit them to construct and configure sites rapidly throughout the Soviet Union. This too, of course, would be in violation of the ABM Treaty's prohibition of mobile land based ABM systems.[3]

In reporting Soviet noncompliance to Congress, the President concluded that the aggregate of the Soviet Union's ABM and related actions suggests that it may be preparing an ABM defense of its national territories.

Advanced Technologies

While proceeding on a traditional

approach to ballistic missile defense, the Soviets have not ignored R&D into potential advanced technologies. Electrooptical weapons application research has been a high priority area in the Soviet Union for years. In laser weapons, the Defense Intelligence Agency (DIA) estimates that more than 10,000 Soviet scientists and engineers and more than one-half dozen major R&D facilities and test ranges have been dedicated to applications of the laser as a weapons system. Several different applications are being experimented with, and the location of some of the laser research facilities indicates that they have an ABM and/or antispace application. DIA estimates that a laser weapons program of the magnitude of the Soviet effort would cost roughly $1 billion per year in the United States.[4] The U.S. intelligence community credits the Soviet Union with all of the technology required for this type of weapons application; in fact, the Soviets already may have some ground based lasers in place that could be used to interfere with U.S. satellites. They could have space based antisatellite laser weapons operational in the 1990s, and they could have prototypes for ground based ABM laser weapons by the late 1980s. Testing of components for large scale deployment of such a system could begin within a few years thereafter, although deployment of a full laser ABM system would not be likely until after the year 2000.

Particle beam weaponry also has received significant emphasis in Soviet R&D. Soviet technology is estimated to have progressed to the point where the Soviet Union could deploy a prototype particle beam weapon with a capability of disrupting satellite electronics in the 1990s. Sometime thereafter, a particle beam weapon that could destroy satellites will be possible. A weapon capable of destroying missile boosters in flight would undoubtedly take longer. In all likelihood, these weapons would be space based.

During the same time frame (that is, the mid-1990s through the early years of the 21st century) long-range space based kinetic energy systems for ballistic missile defense will be possible. The Soviets have conducted extensive research in this area as well, and deployment of kinetic energy weapons in space as antisatellite or satellite defense weapons could take place even earlier than deployment of a true antimissile weapon.

Figure 2. A significant trend can be seen in the number of U.S. space launches compared with the number of Soviet launches.

Antisatellite Weaponry

The Soviets fielded the world's only operational antisatellite satellite almost 15 years ago. The device is maneuvered into the same orbit as its target satellite, and when within range, it explodes a conventional warhead to destroy its target. While the system is rudimentary, it offers an effective capability against low orbiting satellites and provides the Soviets with valuable experience in antisatellite warfare. The United States has no similar capability.

Militarization of Space

While Soviet propagandists claim that SDI would militarize space, for years the Soviets have been engaged in a high priority program to do just that. In addition to the traditional use of space for reconnaissance and military communications satellites, the Soviets have supported the construction of a series of manned space stations and have used these stations for military R&D, reconnaissance and other less obvious military missions. It is estimated that at least 70 percent of Soviet space launches are purely military in nature and support both offensive and defensive operations. Figure 2 compares the number of space launches made by the United States to the number made by the Soviet Union over time. The Soviets are increasing their efforts to develop space systems to support military operations. These efforts include development of both a space shuttle (Figure 3) and a small manned craft to be used for real time reconnaissance missions, satellite repair and maintenance, space station defense and antisatellite inspection or destruction, essentially a space based fighter plane.

It is apparent from the SOYUZ/SALYUT/MIR effort that the Soviets are pursuing a modular space station program. They have demonstrated the ability to maintain crews in space

for extended periods of time and to rotate relief crews, indicating they are striving for a full-time manned space station, which will be capable of supporting military operations both in space and on the ground.

Also looming large in Soviet strategic defense calculus is the requirement for defense against the air breathing threat. Bombers always have comprised a significant portion of the U.S. strategic triad, but the increased penetration capability of new generation Strategic Air Command (SAC) bombers is even more threatening to the Soviets. Add to this the new dimension of air launched and sea launched cruise missiles, and the scope of the air breathing threat becomes impressive.

The Soviets have responded to this threat over the last 30 years with the deployment of extensive antiaircraft defenses. They now are in the process of upgrading their SAM defenses and their fighter interceptor forces with new generation radars, new generation SAMs and air-to-air missiles, new generation interceptors and the integration of airborne warning and control system (AWACS) aircraft and sophisticated command and control (C^2) systems for battle management. While the United States effectively has dismantled its continental United States (CONUS) SAM defenses, the Soviets have employed almost 10,000 strategic SAM launchers and almost 5,000 tactical SAM launchers. To round out their air defense, they have deployed more than 1,200 air defense interceptor aircraft. An additional 2,800 interceptors are assigned to the Soviet air force but could support the air defense forces if necessary.

The array of SAM systems that the Soviets have deployed is most impressive. They provide coverage from low to extra high altitudes and under all weather conditions. Several are mobile. Included among these are the venerable SA-5 missile system with its 300 kilometer range. Although an aging system, the SA-5 still provides a formidable threat to high altitude penetrators. The SA-10, with a 100 kilometer range and a capability to engage low altitude as well as high altitude targets, is a perfect example of a complementary system. The SA-X-12, a missile with similar range capability, is another case in point. The SA-10 and SA-X-12 missiles also may have the potential to intercept some types of strategic ballistic missiles. Thus, if widely deployed throughout the Soviet Union, they conceivably could augment the Soviet ballistic missile defense system as well as provide defense against intruding aircraft.[5]

Soviet Research and Development

The last element of the Soviet strategic defense equation is R&D. DIA estimates that the Soviet R&D program covering strategic defense associated research represents a much greater investment in space, capital and human resources than does its U.S. equivalent.[6] Beyond that, it is difficult to be specific with regard to Soviet R&D efforts. Funding for the Soviet Union's military associated R&D typically is hidden in the budgets of civilian research institutes, and it is difficult to determine which scientists are working on military versus nonmilitary applications. Analysis of observables, such as test ranges and known military associated research facilities, clearly indicates that the scope of Soviet strategic defense related R&D is substantial. The June 1985 State Department special report on SDI states, " . . . trends have shown steady improvement and expansion of Soviet defensive capability . . . current patterns of Soviet research and development, including longstanding and intensive research programs in many of the same basic technological areas which our SDI program will address, indicate that these trends will continue apace for the foreseeable future. If unanswered, continued Soviet defensive improvements will further erode the effectiveness of our own deterrent, based as it is now almost exclusively on the threat of nuclear retaliation by offensive forces."[7]

Conclusion

The Soviet strategic defense program is a longstanding program that enjoys the highest priority in Soviet defense funding. Although not referring to it as a strategic defense initiatives program, the Soviet effort has more components than the proposed U.S. SDI and has been active far longer and on a larger scale than the U.S. program. It has fielded strategic defense components, such as advanced radar networks, antisatellite satellites, ABM missiles and the world's most sophisticated air defense system. In all of these areas, research into military use of space and space based weaponry, such as particle beam and other directed energy weapons, has exceeded similar efforts by the United States.

Soviet propaganda against U.S. SDI is designed primarily to sustain the Soviet advantage in this strategic area and to prevent the United States from fielding a defensive system that could thwart the strategic advantage the Soviets seek in fielding new generation ICBMs, increasing the number of warheads, developing more accurate ICBMs and sea launched ballistic missiles (SLBMs) and deploying a generation of mobile ICBMs.

In an article in the *Armed Forces Journal*, March 1986, Dr. Felix Fenter points out that "The deployment of a limited strategic defense capability by all the major powers, including the Soviet Union, will eventually become necessary. So long as the world is capable of producing fanatical Third World leaders, the danger of a limited but devastating attack will hang over all civilized nations."[8] Nuclear weapons in the hands of Qadhafi, or similar fanatics who would not be deterred by the prospect of an avenging counterstrike, would leave even the superpowers open to nuclear blackmail. The only effective way to protect our populations is through strategic defense.

While some argue that SDI could be destabilizing, the most destabilizing choice would be to forego the SDI program. This effectively would leave the Soviets unchallenged and unimpeded in their efforts to achieve a meaningful strategic defense and thereby negate the effectiveness of our strategic deterrent. Beyond that, the prospect of unstable Third World nations acquiring nuclear weapons makes it morally imperative upon U.S. leadership to offer its people protection against nuclear weapons. In the words of Secretary of Defense Caspar W. Weinberger, "Defending people must be the goal of SDI. Our SDI goal must remain as the President first defined it: To save lives, not to avenge them."[9]

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References

1. "The Strategic Defense Initiative." State Department Special Report No. 129, June 1985.
2. Sokolovskiy, Marshal V. D., *Military Strategy*. Military Publishing ouse, Moscow, 1962.

3. "Soviet Strategic Defense Programs." Joint Department of Defense, Department of State pamphlet, October 1985, page 12.
4. Ibid, page 13.
5. *Soviet Military Power*. Department of Defense. March 1986, page 57.
6. Ibid, page 46.
7. "The Strategic Defense Initiative." State Department Special Report No. 129, June 1985.
8. Fenter, Dr. Felix W. "Yes, we can leave MAD." *Armed Forces Journal*, March 1986, page 78.
9. Secretary of Defense Caspar W. Weinberger speech to American Legion Convention, Sept. 2, 1986, as quoted in *Washington Times*, Sept. 3, 1986, page 5.

Illustrations courtesy of Soviet Military Power 1986.

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Problems and Prospects of the Soviet Union's Response to SDI

By James T. Westwood

Official Soviet military doctrine rejects the notion of passive defense against enemy capabilities and insists on Soviet capabilities to paralyze and destroy enemy military forces under any conditions of war. Moscow regards the Strategic Defense Initiative (SDI) as a wholly military capability.

Having evaluated the U.S. SDI prospects for three years, the Soviet scientific establishment believes that SDI capabilities are being developed in the United States and in Western Europe. In early 1984, the Soviet technical evaluation of SDI's progress was that "laboratory specimens" of SDI's components already were in existence but "technical development" either had not yet begun or was uneven. The present stage of SDI development is said by Soviet authorities to be a contravention of the 1972 Anti-ballistic Missile (ABM) Treaty. It is alleged that U.S. accusations of Soviet violation of that treaty are ploys to excuse the U.S. violations.

Collectively, senior Soviet political, military and scientific authorities take the position that SDI is offensive rather than defensive in the sense that it is intended to obviate Soviet retaliation to a U.S. first strike with strategic and theater missiles. SDI is regarded as resulting in a potentially more unstable balance of nuclear power.

In various ways, the Soviets have been unequivocal in stating that the Soviet Union must and will respond to SDI both defensively and offensively:

> *"How is . . . the Soviet Union supposed to behave . . . ? It is left with no choice: It will be forced to ensure the restoration of the strategic balance and build up its own strategic offensive forces, supplementing them with means of defense."*
>
> —MSU S. Akhromeyev
> Chief, General Staff
> *Pravda*, June 4, 1985

> *" . . . it is us and our countermeasures that will have to ensure guaranteed reduction in the effectiveness of the planned space defense."*
>
> —A. Bovin
> *Izvestiya*, December 5, 1985

Soviet Strategies and Options

Soviet political and scientific authorities believe the ballistic missile defense (BMD) and its SDI version are technologically and operationally feasible and ultimately practicable.

They believe the United States and Western Europe can and will field a workable SDI system. The Soviet Academy of Sciences already has studied the vulnerabilities and inefficiencies of the U.S. SDI systems, in particular the space based antimissile systems. This work was completed within a year of President Reagan's March 1983 speech announcing SDI.

The Soviet Union could respond to SDI in several ways. It could elect to attack before SDI systems are in place, halting its completion by force. Theoretically possible, this option is highly improbable because of unacceptably high risks, including retaliation.

The Soviet Union also could prepare itself to degrade SDI systems' effectiveness in time of war through military countermeasures. Soviet technical studies already have found the SDI as proposed is not leak-proof. Given Soviet predilections, this option is one of the most likely courses of action, regardless of cost and complications. Several applicable technologies, some dating back to the Soviet Union's Eighth Five Year Plan (1966–1970), are in research, development, testing and evaluation (RDT&E). Some of these will mature or be tested operationally during the current Five Year Plan (1986–1990), which emphasizes intensive technological and scientific progress above all other considerations. Moreover, an existing Soviet military organization and training program, begun during the Eighth Five Year Plan (1966–1970), for antispace systems defense would serve as the basis for expansion of an operating capability. Soviet discussions of SDI have intimated this existing capability.

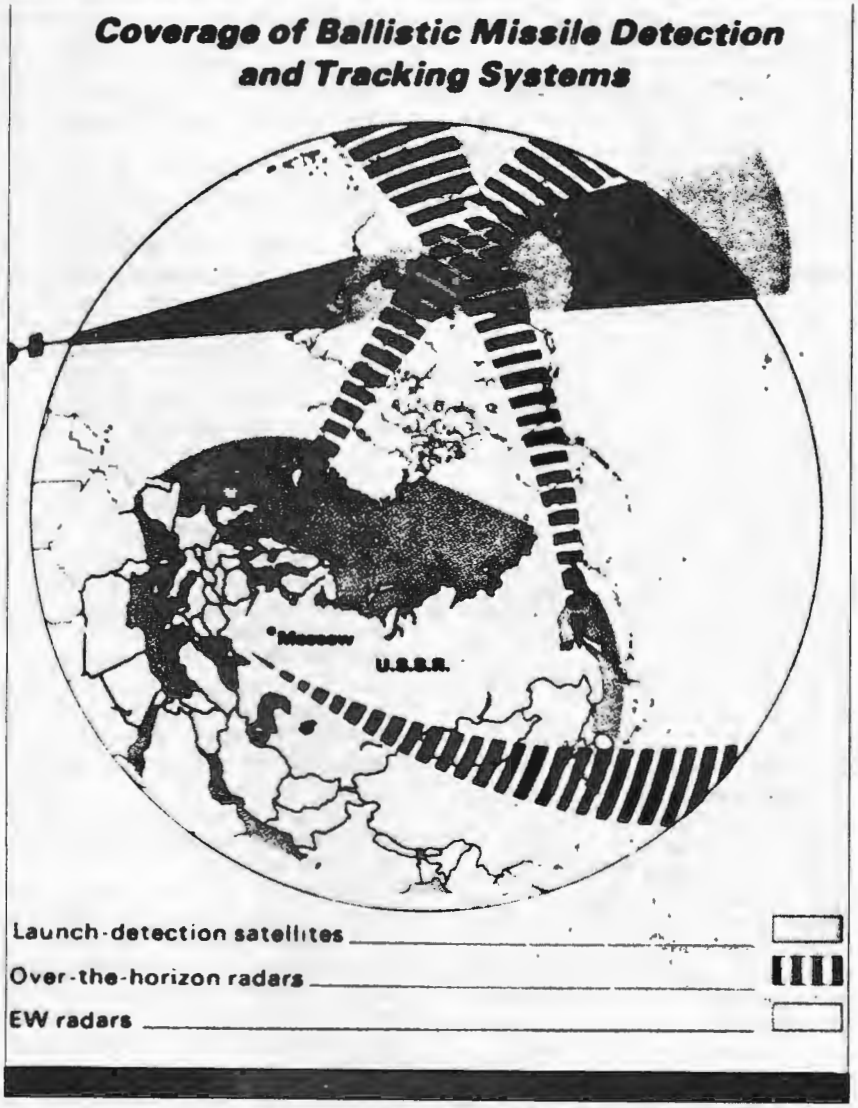

Figure 1. The coverage available from currently deployed launch detection satellites, over-the-horizon radars and electronic warfare radars.

Another Soviet option is to conceive, design, build and deploy a ballistic missile defense (BMD) system similar to SDI. The Soviets could time this development to occur before, during or after the SDI schedule. The logic of this preference is complex because it includes several variables in terms of the speed of progress and scope of the United States' SDI. Soviet studies have endeavored to calculate the timing and phased scope of SDI's future deployment. Along with the further development and preparation of countermeasures, the development of a Soviet version of SDI is highly probable. Figure 1 shows the coverage of ballistic missile detection and tracking systems.

The Soviet 1983–1984 technical assessment of SDI includes the prospect that the United States' initially deployed system would be limited to one capable of destroying only 15 missiles in 100 seconds. This would be a clear incentive for the Soviets to develop and deploy their own system as quickly as possible independent of the speed within which the United States proceeds. It is clear that the Soviets think they will have sufficient time to accomplish this.

The Soviets could opt to increase and improve their forces other than theater and intercontinental ballistic missiles forces. These forces include bombers and land attack cruise missiles, including ballistically delivered cruise missiles. This option is attractive because the original SDI did not include a capability against these weapons, though other U.S. programs do. Also, from the Soviet viewpoint, increasing unconventional forces and operations would seem a particularly attractive option. In fact, the Soviets already have initiated the option of improving all strategic and theater forces. The timing and scope of these improvements suggest that the decision to do so complements an independent decision circa 1980 to develop a Soviet space based BMD system similar to SDI. James C. McCrery, a specialist in Soviet strategic research and development (R&D) programs at the Defense Intelligence Agency (DIA), has observed that all R&D phases of currently operational Soviet strategic defense programs were begun before the 1972 ABM Treaty was signed.

The Soviets could also attempt to counteract SDI's progress and importance by selected means of propaganda, diplomacy and arms control activities. Clearly, this course of action is being integrated into the combination of strategies, which include military countermeasures and defensive system in kind.

Soviet Capabilities and Directions

The Soviet Union views ABM defense and SDI as serious enough to involve its Eastern European allies. In 1984, the Soviets made Czechoslovakia responsible for coordinating the Eastern European contribution to strategic defense systems weapons research. In 1983, Czechoslovakian scientists had begun working on a laser antimissile system.

The Soviets appear now to be in a quandary about their own future developments of measures and countermeasures relative to U.S. and West European SDI. Given the pace of the U.S. SDI and the nature of the U.S.S.R. State Planning Committee (GOSPLAN), they have, at best, just four years, 1987–1990, to resolve their purposes and directions. The annual Soviet space budget is variously estimated at $16 billion to $22 billion. It has grown as much as 15 percent per year through the 1980s. At some 660,000 pounds, the Soviet Union annually orbits about 10 times the annual U.S. total payload weight. From 70 to 75 percent of all Soviet launches into space have whole or partial military missions. In 1985, through an organizational move becoming usual in the 1980s, the Soviet Union established a new government supra-agency for space. Called Glavkosmos, its announced purpose is to coordinate all space technology and exploration activities.

Soviet Success Record

In the area of antispace systems operations, which consist of antisatellite (ASAT) operations, the Soviet record is not impressive. In 20 tests between 1968 and 1982, only one target actually was destroyed by the coorbital ASAT vehicle the Soviets developed and flew in two different versions. The second version was more sophisticated than the first; all six tests of this latter version failed.

The coorbital ASATs also are sharply limited operationally in terms of altitude, maneuver, launch opportunities and numbers of possible engagements. However, if these vehicles were delivered on a large booster from two pads at Tyuratam, they could reach altitudes of 3,000 miles rather than the 600 miles or less reached during the period of actual tests.

In theoretical work in almost all fields of study, the Soviet Union is equal or superior to any other nation. This includes the technologies required for space warfare. In design and practice, though, the Soviet Union is usually inferior or equal to the West. The laser was conceived in 1939–1940 by Soviet V. A. Fabrikant, whose doctoral studies proposed the use of a gas discharge to achieve inverted population of energy levels sufficient to amplify light. His work, finally patented in 1959, was based on Soviet scientific postulations of 1936 and on his own mercury vapor experiments in 1949. (The laser was perfected and first clearly demonstrated in the United States in 1960 by T. H. Maiman.) In mid-1977, reports of Soviet direct energy weapons (DEW) research appeared in U.S. defense technical literature. Over the same period, Soviet defense technical and operational literature has been given increasingly to treatises on space related weaponry and on space operations and warfare.

Regardless of shortcomings, the Soviet Union always has been extraordinarily persistent in continuing to work toward achievement of necessary military capabilities. In fact, most ABM programs were begun during the Eighth Five Year Plan, 1966–1970.

Given past achievements and the Soviets' nature, prowess and style, the Soviet Union should be expected to deploy ground and space based DEW before any other nation does so. The Soviet Union is better positioned to gain a marginal, near-term lead in space based BMD measures and countermeasures than is the United States. In the past, an operationally useful Soviet system typically has required 10 years, on average, to mature from a first unsophisticated prototype. Nevertheless, such quickly deployed prototypes produce large morale values, as in the case of the world's first artificial Earth satellite, intercontinental ballistic missile (ICBM), submarine launched ballistic missile (SLBM) and ABM.

As it pursues its own course of development in SDI-like systems and countersystems, the Soviet Union will try to take advantage of technology acquisition and transfers. One area of specific Soviet interest is the technology whereby laser reflectors are designed and built to minimize laser absorption. Apparently, the Soviets do not know how to do this.

A review of Soviet literature shows that, during 1983 and 1984, Soviet scientists carefully evaluated SDI's portent. The Soviets admit to having performed several cost/benefit studies on which they now rely in part for propaganda purposes. Not only was SDI found feasible and propitious, but it also was examined for its limitations and vulnerabilities, both technically and operationally.

Soviet Progress and Prospects in SDI Weaponry

Directed Energy Weapons (DEW). High-energy laser research in the Soviet Union dates from 1966. A rocket driven magnetohydrodynamics (MHD) generator delivering 15 megawatts (MW) of short-term power has been built. Three kinds of gas lasers are in advanced RDT&E: gas dynamic lasers, electrical discharge lasers and chemical lasers. X-ray and gamma lasers also are being developed. A space based laser with an ASAT capability should be deployed between 1991 and 1995. DEW will become increasingly important in the Soviet Union through 1995.

Particle Beam Weapons (PBW). Less than 10 percent of U.S. expense is for PBW. The Soviet program in PBW exceeds the U.S. program in scope and state-of-the-art development. PBW is more difficult than DEW, and the Soviet Union has a vigorous program deemed ready for testing against components of spacecraft between 1991 and 1995 and against spacecraft in 1997.

Kinetic Energy Weapons (KEW). A variety of Soviet research programs could lead to a short-range, space based system between 1991 and 1995 and to a long-range system between 1996 and 2000.

Radiofrequency Weapons (RFW). The Soviet Union has the technological capability to conduct electronic warfare against space systems. This capability would interfere with or destroy components of satellites, missiles and reentry vehicles. Tests of a ground based RFW could occur as early as 1991 and more certainly by 1995.

Ground Based System (GBS). Limited in operational effectiveness, GBS are relatively inexpensive and reusable. Prototyping and deployment of some terminal defenses has been conducted from 1981 to 1985 for point air defense. Operating, ground based laser prototypes may appear by 1989; two different systems are now in advanced RDT&E. Large-scale deployment of antispace systems defense could begin in 1991 or 1992 running through 1995, although this schedule would cause some testing to be skipped.

Airborne DEW (ADEW). An airborne laser is in R&D in the Soviet Union and could be deployed between 1991 and 1995.

ABM System. The existing Galosh ABM missile in a direct ascent mode is assessed as having an antispace system capability against vehicles in low earth orbit. Nearly 100 Galosh launchers at some six sites are being replaced by newer missiles, which are faster and have a higher ceiling than Galosh.

Spaceplane. One of the more invidious prospects is a Soviet transatmospheric vehicle (TAV) called *TPKA* (VKS). The Soviets are closely watching similar U.S. developments for what they call a reusable combat minispacecraft. The Soviet vehicle ultimately could be a quick reaction vehicle, maneuverable in space for which employment scenarios may already have been devised. In effect, *TPKA* is a space cruiser. A test version was flown four times between 1982 and 1984. Precursors were flown as pairs on two occasions in 1976 and 1978. DIA believes this vehicle will have an antispace system combat role.

Space Shuttle. The Soviet Union has built a space shuttle similar to the U.S. shuttle. Ground testing occurred in 1984; the earliest flight could be in 1987. The National Aeronautics and Space Administration (NASA) Administrator has observed that it could carry a preliminary BMD weapons system in its cargo bay. This compartment is about 15 × 50 feet and could orbit a 250,000 pound payload. The Soviets point to the capability of the U.S. shuttle cargo bay to house a five MW combat station with a four meter mirror.

Manned Orbital Station (MOS). The Soviets are prolific in man-in-space operations and probably will attempt a two year manned trip to Mars starting in 1992. A Soviet engineer stated that in 1984, the Soviet Union was designing a manned orbital station (MOS) larger than SALYUT to be used primarily for military purposes. The Soviet Union has eight different boosters and two more in R&D. The largest booster is assessed as being capable of lifting a 600,000 pound payload into orbit.

SDI Countermeasures

The Soviet military-scientific community considered at least the following active and passive countermeasures to SDI. Active countermeasures include:

- Use of small ballistic missiles with velocities of five to six kilometers/second (km/sec) against vehicles up to 2,000 km in altitude
- Use of high powered ground based lasers with a maximum response time of 10^3 seconds (Figure 2)
- Use of space mines containing shrapnel and missiles
- Orbiting obstacles such as heavy balls in the paths of target vehicles
- Offering SDI sensors false targets, referred to as false or dummy missile launchings
- Disabling the NAVSTAR global positioning satellite (GPS) upon which SDI's performance may depend.

Passive countermeasures include:

- Use of aerosol smoke around reentry vehicles to conceal them from radar
- Multilayer missile casings to resist DEW/PBW assault
- Ablative missile shields with the same effect as multilayer casings
- Reflective and retroreflective missile surfaces.

The following possibilities, not mentioned by Soviet sources, have been considered by Western specialists:

- Fast burn boosters to reduce the elapsed time of the boost phase
- Slow burn boosters to reduce the altitude and vulnerability of the midcourse phase
- Shielding boosters' exhausts to obviate plume detection
- Spinning boosters to dilute DEW/PBW impact over a larger skin surface
- Use of maneuvering reentry vehicles to avoid detection, tracking or strike
- Increased missile firing rates to overwhelm the defense systems
- Increased number of warheads to overwhelm the defense systems

- Deployment of all warheads on multiple independently targetable reentry vehicles (MIRV) missiles simultaneously to overwhelm the defense systems
- Use of nuclear explosions in space to blind or burn out the SDI sensors
- Change booster velocities and vectors in flight to avoid tracking and lock-on.

Of particular interest is the work of Gen-Maj. I. I. Anureev and his colleagues over the last 20 years. This work, all interrelated, extensively models C^3, force-on-force correlations and the dynamics of armed conflicts, particularly nuclear conflicts. In 1967, Gen. Anureev essentially invented C^3 countermeasures (CM) in its contemporary sense.

From 1968, the Gen. Anureev coterie began to apply its expertise to space operations and space warfare. In 1971, Gen. Anureev published a major work on ABM and space related weaponry. In 1972, his published work pointed specifically to DEW and PBW developments and prospects. In the following year, his work highlighted nuclear delivery systems, military spacecraft, antispace systems defense and ABM systems. By the mid-1970s, his theoretical and conceptual work had turned to investigations of space shuttles and transatmospheric vehicles. It appeared some six years before the United States first operated a space shuttle. Throughout his work, Gen. Anureev prognosticated a future wherein space based ABM defenses would be prominent.

The significance of Gen. Anureev's work is its long-term nature, its pronounced indications of Soviet military interest in space systems for BMD and, in particular, its remarkable integration of command, control and communication (C^3), C^3 countermeasures (C^3CM) and space based BMD into single, coherent Soviet thinking directly relevant to countermeasures against SDI. The work of Gen. Anureev and his colleagues at the Soviet General Staff Academy has shaped and guided Soviet policy on arms control, BMD, C^3 and nuclear conflict since before the 1972 ABM Treaty was signed.

Such a prospect as Soviet C^3CM against SDI should be viewed seriously by those who fund, program, conceive, design and test the critical C^3/battle management (BM) component of SDI. Whereas the Soviets have indicated they understand that increasing ballistic missile attack sizes could overwhelm SDI, they also have shown an equal interest in the strengths and weaknesses of SDI's C^3/BM. Much work remains to be done in understanding and simulating this kind of countermeasure, which combines techniques and operations against both the means and the methods of future SDI operations.

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Illustrations courtesy of Soviet Military Power 1986.

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C^3 and the New Soviet Nuclear Forces

By Daniel Gouré

Change may be taking place in the way the Soviet Union organizes and operates its strategic power. Over the past five or six years, the Soviet military press has made frequent references to the strategic nuclear forces, *strategicheskiye yaderniye sili* (SYS). Some analysts have concluded that references to SYS mean that the Soviet Union has organized its strategic nuclear forces into a single unified command resembling the U.S. Strategic Air Command but also including submarines carrying ballistic missiles. Others believe that these references do not reflect a change of organizational affiliation but one of strategy. Either conclusion would have profound implications for understanding the organization and command and control (C^2) of those branches of the Soviet armed forces concerned with the mission of conducting strategic strikes, the way the Soviet military views strategic nuclear war and the relationship between nuclear and nonnuclear warfare in Soviet military strategy.

Significance of SYS

For more than a quarter of a century, the long-range ballistic missile has been the key to the Soviet strategic arsenal, and its controlling service, the strategic rocket forces (SRF), has been dominant in the Soviet military hierarchy.[1] Ballistic missiles armed with nuclear weapons possessed a unique combination of range, speed, accuracy, flexibility and ability to penetrate to their target. The existence of these new weapons required a fundamental change in Soviet military art.[2]

Beginning in 1960, Soviet military doctrine asserted that a future world war would inevitably be fought with ballistic missiles. Marshal V.D. Sokolovskiy, in his classic 1962 work, *Voyennaya Strategiya (Military Strategy)*, declared that SRF had become the primary means of solving the main problems of modern warfare and that the other services would have to orient their strategic planning to reflect the actions of SRF.[3]

In the early 1960s, Soviet military writings began to assert that properly employed, long-range ballistic missiles could achieve decisive strategic results and even determine the outcome of a strategic nuclear war in the first moments after its initiation. Soviet nuclear strategy centered on the requirement to conduct strategic strikes against the entire enemy target set from the onset of hostilities. A fundamen-

tally new type of strategic action, described as nuclear strikes against targets throughout the enemy territory, was created. Such strikes would be the principal instrument by which the main objectives of a strategic nuclear war would be achieved. Due to the character of such a war and the limitations on Soviet strategic nuclear forces in the 1960s, the Soviets appeared to have intended to employ all of their strategic nuclear forces in a single salvo, according to a unified strike plan that centered on the actions of SRF.[4] Nuclear armed aircraft and naval forces were identified as components of any nuclear war but were assigned clearly subordinate roles.

SRF's claim to a leading role in achieving strategic objectives in the event of a world war began to change in the early 1970s. In this period, SRF's ability to determine the outcome of a future war was downgraded; its initial actions could decisively influence the course of the war but not the outcome.[5] Initial actions by SRF now would take the form of strategic operations, principally against counterforce targets, thereby achieving "partial strategic tasks."[6] Achieving the desired war outcome required additional operations by strategic nuclear forces, including ballistic missiles, but with more extensive participation by aircraft and sea based systems. The single integrated strike plan for Soviet strategic forces would have to give way in favor of a series of strike options.

Furthermore, SRF was no longer acknowledged to have a near monopoly on the conduct of strategic operations. The navy had begun to acquire long-range, relatively reliable and largely invulnerable submarine launched ballistic missiles (SLBMs) with which to conduct intercontinental strikes. As a result, ballistic missile firing nuclear submarines (SSBNs) were accorded the potential to influence the war's outcome.[7] In order to do so, SSBNs largely would be withheld from the initial strikes. Victory in a nuclear war was attainable through a strategy combining initial preemptive counterforce strikes, which determined the course of the war and the maintenance of a secure strategic reserve for intrawar bargaining and follow-on countervalue strikes.

The first authoritative indicator of another change in the Soviet Union's thinking about the structure and purposes of its strategic forces came in a 1981 article written by the then Chief of the Soviet General Staff, Marshal N. Ogarkov. In it he eschewed the traditional listing in rank order of the five branches of the Soviet armed forces, choosing instead to refer to the strategic nuclear forces.[8] This implied that the leading role of the SRF had further eroded and that Soviet military thought now viewed all Soviet strategic nuclear forces as contributing jointly to the pursuit of military objectives in wartime. In his 1982 monograph, Ogarkov elaborated on this theme, declaring that, with the creation of the strategic nuclear forces, the "supreme military leadership has acquired the potential for substantially influencing the achievement of the war's strategic and military political objectives."[9]

The strongest evidence of a change in the Soviet perspective on the mission of Soviet nuclear forces, and possibly their organization, was provided by Ogarkov's 1985 monograph, *Istoriya Uchit Bditelnost (History Teaches Vigilance)*. Ogarkov discussed at great length the changes in the nature of nuclear warfare over the past 30 years. In the 1950s and 1960s, he asserted, nuclear weapons were viewed merely as a means of increasing the firepower of the troops, implying that their employment was directed according to classical Soviet operational and tactical principles. Starting in the 1970s and continuing into the 1980s, however, the quantitative and qualitative development of Soviet nuclear forces led to "a basic review of the role of this weapon."[10]

In his discussions of current nuclear strategy, Ogarkov suggests that strategic nuclear forces should be viewed as a single organic force, SYS. He argues that the principal role of SYS is to deter escalation from a limited nuclear conflict.[11] As a political instrument, rather than a military asset, SYS would be a tool directed by the highest leadership echelons. This view is in keeping with another common thread in Ogarkov's writings: the paradox of the decline in an aggressor's ability to disarm an opponent precisely at the time the arsenals have been increasing.[12]

The various Ogarkov formulations over the past half decade strongly suggest that the use of the term "strategic nuclear forces" reflects an ongoing debate by the Soviet military regarding the roles and missions of its strategic nuclear arsenal. This conclusion is given further weight by the recent publication of Gen. Gareyev's book on Frunze. The author specifically criticizes Marshal Sokolovskiy's writings of the early 1960s for their excessive emphasis on the role of nuclear weapons in Soviet strategy and on the requirement for massive nuclear strikes during the initial period of a world war.[13] While neither theoretician rejects absolutely the concept of nuclear war fighting, they appear united on the point that the only militarily credible role for the great mass of Soviet strategic nuclear forces is as a coercive instrument to support Soviet conventional and theater nuclear war fighting strategies.

From these perspectives, references to SYS might be said to reflect the conclusion by the Soviet leadership that the prospects for successful nuclear war fighting have declined since the early 1970s and that, as a result, the individual nuclear armed branches of the Soviet armed forces increasingly are viewed as having a single political-strategic purpose: threatening unacceptable retaliation in the event of a strategic attack on the Soviet homeland.

Command, Control and Communications

Recognizing the destructive power embodied in its nuclear arsenals, the Soviet political leadership always has sought to control tightly the deployment and employment of such weapons. This is by no means new but rather reflects the tight centralization of C^2 that has characterized Soviet military affairs since before World War II. It is the responsibility of the Communist Party of the Soviet Union (CPSU) to develop the tenets of Soviet military doctrine, thereby defining for the military the expected character of future wars and the range of means available to it for prosecuting such conflicts. Thus, the Soviet Defense Council or its probable wartime counterpart, the State Committee of Defense (GKO), decides whether nuclear weapons shall be employed in wartime and how.

The role of political authority in determining nuclear use is reflected in Soviet writings on doctrine and strategy. According to one author, writing in the authoritative Soviet military journal *Voyennaya Mysl (Military Thought)*: "In the end, the resolution of the question on the use of nuclear weapons remained with the political leadership."[14] Another author, writing for the Soviet officers' library series, was even more direct: "The decision on the employment of such devastating weapons as nuclear weapons has become the exclusive prerogative of the political leadership. It is the political leadership, not the military leadership, who determines the necessity of the

employment of weapons of mass destruction, who selects the primary target and the moment of infliction of a strike on these targets."[15]

The centralized control over strategic nuclear forces by the Party as supreme military command echelon was reaffirmed by Ogarkov. The former Chief of the General Staff argued that the nature of modern weapons and methods of warfare required the creation of a new, larger type of strategic operation, which he described as a "strategic operation in a theater of military action."[16] C^2 of this operation was to be invested in a "command of fronts." More important, however, were Ogarkov's statements on the overall command of strategic operations. In 1982, Ogarkov had vouchsafed to the strategic nuclear forces and the supreme military leadership the ability for "substantially influencing" the pursuit of military and political objectives. In 1985, he strengthened his earlier statement, declaring that "the supreme military leadership has acquired a potential for directly and decisively influencing the course and outcome of a war."[17] This last formulation suggests that the supreme military leadership will make the key decision regarding both the initial use of Soviet nuclear forces and those subsequent operations necessary for the attainment of the State's military objectives.

C^2 for SRF, which has remained essentially unchanged over the past 25 years, reflects that service's roots within the Soviet postwar artillery.[18] SRF is divided into six armies, each of which contains a number of divisions formed out of regiments and, finally, missile batteries. Overall C^2 of the six rocket armies is exercised by SRF headquarters. Rocket armies, like their former counterparts in the artillery, apparently are assigned specific missions as part of an overall strategic plan organized and approved by the General Staff, or its wartime counterpart, the *Stavka*.[19] This structure provides not only flexibility but also the redundant command echelon typical of Soviet ground forces. Redundancy is important to ensure that units perform their assigned missions even under conditions of the breakdown of command.

The Soviet air force, by way of contrast, has undergone extensive C^2 and structural changes in the past few years. Originally, nuclear strike missions were divided between two branches of the air force: *Dalnaya Aviatsiya* (DA), or long-range aviation, and *Frontovaya Aviatsiya* (FA), or frontal aviation. There was a Deputy Commander in Chief of the Soviet air force for long-range aviation. More than 100 Bison and Bear intercontinental bombers were deployed with DA. In the late 1970s, the air force was reorganized, seemingly along functional lines. Long-range aviation was organized into a single air army, which was given responsibility for the intercontinental strike mission. Other air armies were organized to provide tactical and theater air support in potential wartime military theaters.[20]

C^2 for the Soviet SSBN force appears to be vested in the current fleet structure. The northern and Pacific fleets, by virtue of their responsibility for the majority of Soviet SSBNs, constitute the most important C^2 nodes for the Soviet naval nuclear strike forces. Overall C^2 for the SSBNs is probably vested in the navy general staff, headquartered in Moscow.

The communications means available to direct and coordinate the operations of the various elements that constitute the Soviet strategic nuclear forces have improved substantially since the first nuclear weapon entered the inventory. Each service has its own signal troops responsible for ensuring communications from the service main staffs down to the field units.[21] Communications redundancy is one of the characteristic features of Soviet military planning. This is nowhere more evident than in the communications network established for the control of strategic nuclear forces. The Soviets employ a series of parallel communications means including underground cables, microwave and short-wave fixed site and mobile radios and satellite platforms to ensure connectivity between the nuclear forces and command echelons. In addition, high level critical communications from the Ministry of Defense and General Staff is controlled by special signal units or, possibly by special KGB signal troops.[22] Some observers believe that control over nuclear warheads, particularly for field formations, rests with the KGB and that nuclear release authorization for certain types of nuclear forces would pass through KGB communications channels.[23] Another critical aspect of the command, control and communications (C^3) for Soviet strategic nuclear forces is early warning. Improvements in ground and space based sensors have permitted the Soviet leadership to consider a strategy of launch on tactical warning. Currently, the Soviets are completing a network of phased-array radars, one of which, at Krasnoyarsk in eastern Siberia, appears to be a clear violation of the Anti-ballistic Missile (ABM) Treaty. However, its location is critical to complete the circle of radar coverage of all possible threat corridors.[24] Receipt and processing of early warning intelligence probably rests with the Moscow Air Defense District headquarters of the troops of the air defense (VPVO).

It is not clear what consequences the creation of SYS might have for Soviet strategic nuclear forces C^3. High-level coordination of combined arms operations is not a new phenomenon in Soviet military planning. During World War II, multifront operations were planned by the *Stavka* and coordinated in the field by its representatives. However, the creation of new organizational structures and C^2 procedures usually has reflected a reassessment by the Soviet military of the combat capabilities of its armed forces. Soviet military theoreticians have consistently argued that the structure of military forces is critical to the character of their employment. According to Gen. M. M. Kir'yan, "the means of armed combat always exist in an intense and interactive relationship with the organizational forms of armed forces, influencing them and being changed by their influence."[25] The creation of SYS may reflect the Soviet leadership's changing perceptions of the capabilities of its strategic forces and the operational utility of existing C^2 procedures.

There always has been considerable overlapping of missions among the five services. Each is responsible for defining the manner by which it would carry out its assigned wartime missions. In peacetime, joint strategic planning is carried out within the operations directorate of the General Staff.[26] In wartime, strike planning and coordination probably would be carried out by the *Stavka* directly or, in some instances, by the service or theater commanders in consultation with representatives of the *Stavka*. Assets of SYS would be allocated to the theater commanders by the General Staff/*Stavka*. The decision to reallocate SYS assets between military theaters would undoubtedly rest with that same body. The conditions for nuclear release authority for theater commanders probably would be decided by the General Staff or *Stavka* based on

its own war plans and reviews of the situation estimates and nuclear strike plans prepared by the subordinate commands.

The Soviet Union undoubtedly will continue the modernization of its strategic nuclear arsenal. In particular, the deployment of more accurate, multiple independently targetable reentry vehicle (MIRV) SLBMs and air launched cruise missile (ALCM)-armed intercontinental bombers will reduce the preponderance of nuclear power concentrated in SRF. This may serve to increase the trend toward centralized planning and C^2 for strategic nuclear forces. It remains to be seen whether the references to SYS will result in the creation of the equivalent of a new service or a unified command.

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Notes

[1]The five Soviet armed services are: SRF; the ground forces; air force; navy; and troops of the national air defense.

[2]Marshal R. Yu. Malinvosky. *B'ditelno Stoyat na Strazhe Mira (Vigilantly Standing Guard over Peace)*. pp. 32–34. Voyenizdat, Moscow, 1962.

[3]Harriet F. Scott (ed). Marshal V.D. Sokolovskiy's, *Military Strategy*. p. 282. Crane Russak and Company, New York. 1975.

[4]V. Zemskov. "Characteristic Features of Modern Wars and Possible Means for Conducting Them." *Voyennaya Mysl*, No. 7, pp. 20–22. 1969; S. Tiushkevich. "The Modern Revolution in Military Affairs: Its Origins and Nature." *Kommunist Vooruzhennyk Sil*. No. 20. pp. 24–25. October 1966; Marshal N. Krylov. "The Nuclear Missile Shield of the Soviet State." *Voyennaya Mysl*, No. 11, translated in FPD No. 952. November 1967.

[5]James M. McConnell. *The Soviet Shift Toward and Away from Nuclear Warwaging*. Working Paper. pp. 112–114. Center for Naval Analyses. 84–0690.

[6]Marshal A. Grechko. *Vooruzhennye Sili Sovetskovo Gosudarstvo (The Armed Forces of the Soviet State)*. p. 353. Moscow, Voyenizdat. 1974.

[7]V. Savkin. *Osnovnye Printsipy Operativnovo Iskusstva i Taktika (Basic Principles of Operational Art and Tactics)*. pp. 121. Moscow, Voyenizdat. 1972.

[8]Marshal N. Ogarkov. "On Guard over Peaceful Labor." *Kommunist*, p. 83. No. 10. May 1981.

[9]Marshal N. Ogarkov. *Vsegda v Gotovnost k Zashchite Otechesva (Always in Readiness to Defend the Fatherland)*. pp.34–35. Moscow, Voyenizdat. 1982.

[10]Marshal N. Ogarkov. *Istoriya Uchit Bditelnost (History Teaches Vigilance)*. pp. 51–52. Moscow, Voyenizdat, 1985.

[11]Ibid, p. 68.

[12]Marshal N. Ogarkov. "The Defense of Socialism: History and the Present." *Krasnaya Zvezda*. p. 2. May 9, 1984.

[13]M. A. Gareyev. *M. V. Frunze-Voyenniy Teorik (M.V. Frunze-Military Theoretician)*. pp.237–241. Moscow, Voyenizdat, 1985.

[14]Colonel B. Samorukov. "Combat, Operations Involving Conventional Means of Destruction," *Voyennaya Mysl*. p. 30. No. 8, August 1967. Translated in FPD 0125/68.

[15]Col. M. Skirdo. *Narod, Armiya, Polkovodets (The People, the Army, the Commander)*. p. 121. Moscow, Voyenizdat. 1970.

[16]Ogarkov. *Always . . .* , op. cit., p. 34.

[17]Ogarkov. *History . . .* , op. cit., p.47.

[18]Robert P. Berman and John C. Baker. *Soviet Strategic Forces: Requirements and Responses*. pp. 14–16. The Brookings Institution, Washington, D.C., 1982.

[19]S. Tiushkevich. *Sovetskiye Vooruzhenniye Sili (The Soviet Armed Forces)*. pp. 387–389. Moscow, Voyenizdat, 1978.

[20]David C. Isby. "Soviet Air Forces Recast." *Defense Week*. pp. 4–5. July 25, 1983.

[21]William F. and Harriet Fast Scott. *The Armed Forces of the USSR*. Westview, Boulder, Colorado. 1982.

[22]John Hemsley. *Soviet Troop Control: The Role of Command Technology in the Soviet Military System*. pp. 63–64. Brassey's, New York. 1982.

[23]Scott and Scott. op. cit., p. 220.

[24]*Soviet Military Power*, U.S. Government Printing Office, Washington, D.C. 1986. pp. 42–45.

[25]General M. Kir'yan. *Voyenno-Tekhnicheskiy Progress i Vooruzhenniye Sili SSSR (Military-Technical Progress and the Armed Forces of the USSR)*. Voyenizat, Moscow, pp. 334. 1982.

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Communications and Computers in the Soviet Union

By Dr. Ivan Selin

The Soviet Union is moving to an integrated nationwide telephone system that AT&T at its peak would have envied, and the Soviets appear to be succeeding in their ambitious plan. At the same time, they are having serious problems in developing computer systems at a level comparable to those in the West.

Several years ago, the Soviets decided to end the proliferation of special-use local and long distance communications circuits, many of which were being developed independently by various ministries and institutions. Instead, they decided to develop a single, all-encompassing, centrally planned and managed telecommunications system.

When completed, this system will make extensive use of conventional cable, but most of the expansion will be based on satellite communication channels for all-digital, high data rate communications between cities and other major nodes, supplemented by fiber optics within cities and heavily built-up regions. The system will use major digital, computer controlled switching centers and, for the most part, will soften the distinction between military and civilian circuits. A high degree of encryption and security can be expected for a significant portion of the traffic.

Attempts will be made to standardize modulation techniques and devices. Eastern Europe is expected to be integrated fully into this system.

This is a massive project and a great consumer of resources. It is possible, given the hard choices facing the Soviet economy, that at some point Soviet planners will stretch out funding of the telecommunications system. But if they do not, progress to date suggests that it will be completed before the turn of the century.

Current Soviet Telecommunications

The current Soviet transmission network consists of cables carrying analog signals over long distances, heavily supplemented by microwaves carrying less secure digitized signals and by communications satellites. There is a trend toward digitized signals on the copper cable as well. Shorter haul communications also are primarily via copper cable carrying analog signals, but the systems make generous use of fiber optic cables for high capacity, short haul digital transmission. Soviet international communications rely heavily on microwave and communications satellites.

The architecture of the Soviet civilian system follows international standards. It has a single international gateway at Moscow and a standard hierarchy consisting of high level districts, each of which connects to a number of secondary centers, which are connected to many low level centers. There appear to be about 15 district centers, each of which is connected to the international gateway and to all of the other district centers by trunk lines. Each secondary center within a district is connected upward only to its own district center and can communicate only with other centers within the district.

Thus the Soviet telephone system is interconnected in a mesh network. The telephone systems of the Eastern European countries are integrated into this system, using the same types of equipment, the same architecture and basically the same numbering systems. The adherence to international architecture and signaling standards is a key feature of the Soviet system. It permits the Soviets to upgrade their telephone network via standard Western commercial equipment.

Most telephone systems outside of the United States use periodic pulse metering to monitor and determine charges for toll calls. Although this is inexpensive, it does not determine the called number, nor does it produce records of individual calls.

A more costly system is called centralized automatic message accounting (CAMA). CAMA identifies individual calls, including the calling and called numbers. The Soviets decided to invest in CAMA in the 1950s, perhaps to achieve the level of accountability and counterintelligence that CAMA provides.

The use of CAMA has a interesting side effect, relevant to the military use of the civilian system. Since calling subscribers are identified, they can be segregated into classes. This feature allows subscriber classes to be assigned discrete priorities. In particular, it enables military subscribers to be identified and given override privileges, a Soviet prerequisite for joint military/civilian use of a single integrated telecommunications network.

Military Implications

Not much is known about how the Soviet Ministry of Defense uses the Ministry of Communications public network, but an informed guess can be made based on technology and defense requirements.

The public network is well-deployed geographically to meet military needs. The high level district centers use relatively modern computer controlled electronic technology. The geography of these centers lines up well with the Soviet military districts and groups of forces and with Soviet intercontinental ballistic missile (ICBM) complexes. The automatic subscriber identification feature of the CAMA accounting system allows high priority users to be identified and facilitates military preemption of channels when required.

These features combine to make the first level of the public network an appropriate vehicle for long-haul military communications in the Soviet Union. The extensive use of cable for this network prevents intercepts of telecommunications traffic. The Ministry of Defense probably relies on the public network for long-haul nontactical communications. This common network most likely is supplemented by dedicated, survivable circuits for long-haul tactical use (for example, control for ICBM launches) and short-haul military communications within a district via dedicated military circuits.

Soviet Trends and Prospects

This overview of Soviet telecommunications shows a country with a clear idea of what it wishes to achieve in telephony. The Soviet Union has made a number of basic technical and managerial decisions consistent with its objectives and has chosen a technical approach taking advantage of its penchant for large projects of relatively straightforward technology (brute force approach).

The Soviets have not been as successful with their data communications. While the underlying telecommunications network will be digital, obliterating distinctions between voice and data as far as transmission is concerned, problems of local interconnections among processors remain to be solved. There is no provision for maintenance and multiple access to common data bases, and protocols for computer-to-computer communications are lacking.

The West has tried to set standards for local area networks and for teleprocessing. The efforts failed, in part because of the variety of users and applications to be served and in part because of the high rate of change in these areas. Instead, the West has learned to rely on market dictated standards. This will be difficult for the Soviet Union, with its rigidities; its propensity to centralize development as well as decision making; its abhorrence of the inefficiency of uncoordinated, competitive, small-team research; and its tradition of ignoring the wishes of the users.

In short, the Soviet Union probably will achieve its plan for an integrated, centralized, mostly digital telephone network by the end of the century. However, it is much less likely to achieve the other, potentially critical benefits of such a network, either in distributed processing for enterprises or in bringing computational and data capabilities to the many organizations and individuals who could benefit by them.

Soviet Computers

Soviet telecommunications indicates that the Soviets do well where they benefit from economies of scale and centralization, but they do poorly in areas requiring competition, decentralization, customer feedback and individual initiative. This pattern of strengths and weaknesses is observed in computers as well. Some computer aspects, such as very large batch oriented main frame computers, centralized storage and processing of information and megamodels, benefit from economies of scale and highly centralized management. These are the areas of computing in which the Soviets have done well. One example of a relatively successful effort is technical support to the State Planning Committee (GOSPLAN). The Soviets attempt not only to describe but also to plan and control their huge economy with a single set of centralized programs operated by GOSPLAN. For pure tenacity, it would be hard to find a set of programmers and programs anywhere in the world to match those of GOSPLAN. When the rulers of the Soviet Union change the guidance under which their planners are operating—as General Secretary Mikhail Gorbachev did at the beginning of 1986—the planners can produce a new plan in only a few weeks.

Even in GOSPLAN, however, the Soviets have succeeded only in single site computing. They have not been able to link the Moscow site to planning and reporting computers around the country for a single, all-union network.

Of course, the plan is notorious for its inaccuracy. When faced with this situation, top political and economics

figures in the Soviet Union seem to split into diametrically opposed camps. One side attributes the problem to the need for even bigger and faster computers, while the other places the blame on the intrinsic faults of the highly centralized planning process itself.

Other examples of moderately successful, large-scale computer projects include the centralized command post for controlling many of the municipal operations of the city of Moscow or the huge process control operations that occur in large refineries and petrochemical plants. But Soviet computing failures far outnumber the successes for many of these same reasons. Before examining the Soviet Union's computing problems in detail, consider what appear to be the Soviet objectives for informatics, the Soviet term for the combined fields of computer science and computer applications.

Apparent Soviet Computing Goals

Several major factors, different from those in the United States, affect Soviet computing goals. In Soviet society, information is power, and in direct contrast to United States society, it is a monopoly of the State. In a country in which copier machines are locked and relatively innocuous data, such as economic or morbidity statistics, are held secret, access to computers and information is a prize the State awards only to its most favored and trusted citizens.

Another aspect of Soviet informatics is its prestige. Many Soviet institutions attempt to automate, to start computer science projects or to obtain a charter for computer manufacture for reasons of prestige rather than for need. Thus an objective of many Soviet institutions is to participate in the informatics program, whether or not any practical goal is foreseen.

The closely held authority for computation, the prestige of informatics and the paucity of decentralized decision making lead to the following assumptions on Soviet computing goals.

- *Scientific*—The Soviet Union attempts to have state-of-the-art theoretical and experimental programs in all fields of science. In this respect, it is similar to the United States but different from every other country in the world. This objective includes all branches of computer sciences. Separately, there is a need for computational facilities to support Soviet programs in other sciences, ranging from astronomy to zoology.
- *Military*—Little unclassified information is available on the plans and the progress of Soviet military computer programs.
- *Central Planning*—The level of computational support required by Soviet central economic planning and monitoring is enormous.
- *Industrial*—The Soviets appear to put a very high priority on automation of factory operations. Soviet objectives for computing in this area are much more limited than their U.S. analogues. The Soviets are striving for productivity and quality control in their production process, but they have much less need than the United States does for the associated planning, ordering and inventory control functions—the Soviet Union has a supply-push system; the United States has a demand-pull system. The factory receives inputs according to the plan and has to do the best it can with them. Furthermore, few changes occur in what the factory is supposed to produce. Soviet industry does not have the frequent model changes, retooling or shifts to new product lines that characterize much of U.S. industry. Consumer goods are defined by the plan, not by rapid response to the latest market research or sales figures.
- *Business Applications*—Most computing applications in the United States fall in the area of business data processing, that is, the support of planning, management, accounting and general white collar business functions. Soviet computing problems and failures generally involve business applications. Yet it is clear that Soviet priorities for computing are lower in this area than in any other, largely because of the much lower status and independence of mid-level managers in Soviet bureaus and enterprises, compared to their U.S. counterparts.

Soviet Progress Against Computing Priorities

One source of trouble for the Soviets is their relative backwardness in the manufacture of miniaturized electronics, especially in microcircuits for computers. This problem, coupled with their weaknesses in quality control and the unavailability of advanced Western computers, affects all of the following application areas. Of course, their problems go beyond hardware into software, organization, economics and leadership.

The Soviets have made progress in the mathematics of computing, but when it comes to the nonmathematical aspects of computer sciences, they have had serious problems. One source of their problems is the scarcity of computer resources. One Soviet research institute visited was reminiscent of a U.S. computing facility of the 1960s—a great deal of pencil and paper analysis, the computer center operating as a closed shop with jobs submitted across a counter to the technician and machines so expensive that the researcher is able to use them only once per week.

Another problem is instructive. Last year the Soviets decided to invest widely in small computers for educational purposes. However, the program stalled because of the debate between those who want to buy Western machines quickly and those who see the opportunity to develop another Soviet machine. This is an example of the broader political problem that afflicts the field. Since informatics is a high prestige field, the Party is loathe to allow real control to the scientific community; within this community, access to choice assignments goes to senior people as rewards rather than to the junior specialists who could contribute the most.

The scientists are making some progress in controlling their program, but the shortage of computing equipment at all levels and the pervasiveness of Party and bureaucratic meddling will continue to haunt them.

Soviet progress in central planning is impressive, given the limitations in equipment, software and interactive development facilities. However, further progress appears to be blocked until the Soviets agree on the diagnosis of their problem.

A visit to an institute supporting GOSPLAN's economic planners showed the mismatch between the theoretical knowledge of the workers and their lack of practical opportunities. They were developing relational data bases, elegant computational models and some networking software, all of which were being implemented on obsolete PDP-9s and -11s. If the Soviets do decide upon even more highly centralized planning, they will come up short in the areas of software and interactive support for modeling and testing. Furthermore, if they opt for a more decentralized planning and control function, they will be almost completely without tools to implement the decision. But even before having to deal with computer problems, they would

have to face the economic implications of delegating real decision making to managers who currently are allowed to do no more than maximize the output of factory products against quotas handed down.

The Soviet press has discussed the need to measure profit and to build large-scale financial systems for large enterprises as part of a decentralized planning system. Such financial systems are useful only if managers have freedom to vary their inputs and outputs. In visits to Soviet computer institutes, none of the hosts appreciated the revolutionary changes implied by the widespread use of automated information systems.

Progress is slow even against the limited Soviet objectives of industrial automation. Productivity is low; quality control is poor; and the ability to change output is terrible. In a number of automated plants, shortage of good equipment and software is a problem, but confusion on objectives appears to be a greater problem. Generally, the Soviets have a bad copy of a Western production system rather than a clear idea of what should be accomplished in the Soviet context.

In the business applications area, there is little economic demand for good computing at the enterprise level, except to automate record keeping and to improve white collar productivity in carrying out preplanned tasks. Soviet enterprises are operations facilities, not planning and decision making units, so little would be gained by giving them planning and decision support tools.

On the other hand, all of the economic reforms that General Secretary Gorbachev is calling for would require a revolution in computing, one to which the Soviet political system would have difficulty responding.

Computing Prospects

Prospects depend on what path the Soviet Union chooses for its economy and for its information strategy. Although the state of informatics is poor in the Soviet Union, the only serious civilian performance shortfall is the inability to support the scientific and technical establishment adequately. A secondary shortfall is the lack of automation in current industrial processes.

Much of the problem can be attributed to the Soviet lack of good manufacturing technology for making main frame computers and related devices that are dependent on microelectronics. If the Soviet Union had abundant computer equipment, it eventually would overcome many of its scientific and engineering problems in the development of large computer systems. However, the Soviet Union would still face formidable problems in applying large-system technology and in extending technology to decentralized systems and decision making.

In the areas of central planning and business applications, the Soviet Union's computing weaknesses have not yet limited its performance. Economic theory, political control and organization seem to be much more limiting factors. But as the Soviets try to change their economic strategy, the situation changes.

Even the modest economic reforms that General Secretary Gorbachev has proposed will require additional information and computational tools. If the Soviets choose fundamental economic reform more along the Chinese model, where establishments have some freedom in deciding what to produce and where to obtain their supplies, the needs for business data processing will increase exponentially. If this happens, the Soviets will face crippling problems in computing. The problems fall into four main areas:

- *Hardware.*
- *Data*—Where will the managers obtain the needed economic and market data; prices and sources of supply; and transportation and distribution information? In addition to computational problems, the reforms would require direct communication between low level nodes in the telecommunication network, which would not be well supported by the telephone system that the Soviets are installing.
- *Software Development and Distribution*—Development of hardware and system software in the United States often is carried out by large organizations, which are roughly comparable to Soviet institutes plus a market research capability. But applications software is better produced by small suppliers developing many competitive offerings, with extensive marketing networks to distribute the software and to stay in close touch with the users.

Such a distribution network is practically unthinkable in the Soviet Union, where all of the prestige accrues to the remote, grand institutes that decide for themselves what the establishments need, and the establishments are left to cope with the products they receive. There is no customer support, no user groups, no configuration control, no maintenance and enhancement program. To understand what life is really like for the director of a Soviet establishment, imagine the head of a U.S. consumer products company being forced to obtain all the business software from either Harvard or the University of California.

- *Control*—The more important informatics becomes to the modern Soviet economy, the less amenable the Party will be to turning control over to the scientists and the new business leaders. It would be hard to imagine a group of people less qualified to manage informatics than the Party *apparatchiki*, who lack familiarity with computers and consider information as a resource to be guarded, rather than as something that can be spread out for a tenfold return.

Conclusions

The Soviet Union probably will achieve its plan for a massive, highly integrated telephone system, benefiting for once from its penchant for centralization. The system will look like a large version of a Western European post telephone and telegraph administration except for the lack of residential subscribers—that is, it will be relatively efficient if its functions do not change; however, it will be unresponsive, serving data users poorly, if the Soviet leaders decide to change the economy.

The state of Soviet computing is poor, but as disappointing as it must be to the Soviet leadership, the Soviet economy is not yet at the point where its computing limitations are a serious constraint. Currently, the computing limitations are more of a hindrance on scientific progress and probably on the military.

The military and scientific fields would benefit from a highly integrated computational system, featuring networked main frame computers and massive data bases. Such a system would not require the Soviets to change their centralizing ways, although they would face major problems in security. The lack of Western computers in significant numbers has been a major impediment to their achieving this large-scale system.

Currently, the Soviet economic system does not require much computing support, and the Soviets could not provide the needed support if they decided to move to a

reformed economic system. Business data processing requires the kind of decentralized computing that most severely would strain the Soviet system of centralized control, planned innovation centered at massive research institutes and highly classified data. Access to Western technology at the microcomputer end of the scale is probably also a prerequisite for this type of computing, to support a move away from the Stalinist and toward the Chinese model of economic and political control.

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The Changing Soviet System of Control for Theater War

By LTC John G. Hines, USA,
and Dr. Phillip A. Petersen

The Soviets think about control of forces during war in terms of the three types of strategic military action that the Soviet armed forces might execute: strikes by strategic nuclear forces against the enemy in adjacent theaters and on distant continents; strategic operations to repulse the enemy's aerospace attack and defend the homeland from strikes by enemy weapons of mass destruction; and offensive and defensive strategic operations in continental or oceanic theaters around the periphery of the Soviet homeland.[1] Everything else—how command systems are structured and specific control measures such as designation of strategic and operational directions—is developed around the kinds of strategic operations various Soviet forces would be expected to have to carry out in the event of war.

Soviet thinking about the relative importance of various forms of strategic military action and how they might be executed has been changing since the mid-1960s. In the standard Soviet scenario of the early 1960s, war was expected to be brief and violent. A future war was expected to begin with a global nuclear exchange, followed by theater nuclear strikes and subsequent exploitation and mopping up by ground and air forces.[2] By the late 1960s, however, the Soviets estimated that they had achieved approximate strategic nuclear parity with the United States, and they noted that this shift in the global strategic correlation of forces had led the United States to abandon its strategy of massive retaliation in favor of flexible response.[3] Their assessment of the significance of this and related changes led the Soviets to revise their estimate of the likely character of future war, especially with respect to how a major war would begin. Today, the dominant Soviet scenario centers on war in continental theaters peripheral to the Soviet Union. In such a war, advanced conventional, and possibly some nuclear, weapons would be used—but massive use of central nuclear weapons systems against transoceanic or even theater targets might be postponed indefinitely.[4]

This gradual but deliberate shift in focus to complex and perhaps prolonged theater warfare led Soviet military scientists to make a major reexamination of the command system for wartime control of forces. Forces designated to conduct strategic nuclear strikes seem to have moved toward an even greater degree of centralized control at the national level, probably to ensure further that any use of such

weapons would reflect pursuit of the objectives of the highest levels of Soviet leadership.[5] At the same time, protection of strategic nuclear weapon systems and control nodes through hardening, redundancy and mobility seems to have continued to increase in importance given the growing expectation that these systems would be exposed to enemy nonnuclear, and perhaps limited nuclear, attack for an indeterminate length of time while the war was being carried on in theaters around the Soviet periphery.[6]

Predictably, the possibility of prolonged exposure to strategic attack also has led to changes in control of forces that would conduct strategic operations to repulse the enemy's aerospace attack. The trend seems to be toward expanded centralized control over the aerospace defense assets of air defense and air and naval forces as well as toward greater interservice integration of the control systems for these defense assets and for offensive strategic nuclear forces. In these two areas, no new special commands seem to have been established. Instead, structural changes appear to be restricted to refinements of the preexisting functional control system under direction of the central leadership. Specifically, the national command authority almost certainly assigns responsibility for control of combined air defense assets to the air defense forces (*VPVO*), and strategic nuclear forces probably are directed by the General Staff on behalf of the national command authority through the established control mechanism of the strategic rocket forces, the navy and the air forces.

In contrast, new requirements for controlling the main form of strategic military action, strategic operations in peripheral theaters, have led Soviet planners to make what is probably one of the most significant changes in their command and control (C^2) system in more than two decades. Specifically, Soviet military leaders have added an intermediate level of strategic leadership, called High Commands, between the Supreme High Command (SHC) or, in Russian, *verkhovnoye glavnokomandovaniye* (VGK) in Moscow and Warsaw Pact fronts, which are large combined arms formations roughly equivalent to NATO army groups. These High Commands are being established in peacetime to control forces in what the Soviets call *teatr voyennykh destviy* (TVD), which is translated as theater of strategic military action (TSMA) (see "Translating a Concept," this page.)

As evidence of these C^2 changes began to appear in the Soviet military press and Western defense documents, such as *Soviet Military Power*, considerable speculation has attempted to explain their nature and significance. Much of this work has been found to be misleading or simply wrong for various reasons. The Soviet defector, Viktor Suvorov, for example, is normally correct on basic Soviet concepts but often wrong on important details. Some of the most significant changes the Soviets have made in theater C^2 have been devised and implemented since Suvorov left the Soviet Union. Others, in the apparent absence of accurate information, seem to be greatly distracted in their interpretation of Soviet command structure changes by events such as the reassignment of the outspoken former Chief of the General Staff Marshal Nikolai Ogarkov and his need for an appropriately important new job. Government analysts have indulged in creative and somewhat confusing speculation even when authoritative and definitive information is available to them.

Some of the most frequently repeated errors include: assertions that High Commands are being established at the level of theater of war as well as at the level of TSMA; that High Commands are being established in strategic directions instead of in TSMA; that the Soviet geographical descriptor strategic direction is now or soon will be identified as a formation of forces; that all of Europe is a single TSMA; and that all of this indicates an increase in Soviet preparation and proclivity for war.

Military Geography

The significance of the peacetime establishment of wartime High Commands of Forces (HCOFs) over sev-

Translating a Concept

Many Western specialists on the Soviet military have chosen to abandon use of the Russian acronym TVD as arcane and unhelpful in communicating to nonspecialists what the Soviet concept stands for. To the understandable confusion of nonspecialists, at least three different translations have been used over the past several years. Theater of military operations (TMO) is one of the most widely used, and some have used the more literal translation, theater of military action. The most accurate and useful translation of the Soviet military term, *teatr voyennykh deystviy*, is theater of strategic military action (TSMA).

In the 1983 Soviet *Military Encyclopedic Dictionary* and in a 1985 Soviet book devoted to clarifying military terminology (M. M. Kiryan), the term *voyennye deystviya* in the expression *teatr voyennykh deystviy* is defined as referring to military action on a strategic scale. The same sources point out that, for the smaller scale action at the operational and tactical levels, the Soviets use a different expression, *boyeviye deystviya*, which means combat action. The phrase military operations, in the widely used translation theater of military operations, therefore is a mistranslation of the term *voyenniye deystviya*. Moreover, TMO fails to communicate to the nonspecialist what Soviet military planners grasp immediately when they hear the expression TVD—that it is a region identified for military action on a strategic scale. The English term theater of military action accurately translates the individual Russian words but still fails to translate the specialized Soviet military meaning of the entire expression, which is theater of strategic military action.

The Soviets do not use the expression *teatr strategicheskikh deystviy* (theater of strategic action), most probably because *voyennye destviya* (military action) is a broader concept than strategic action. Strategic action tends to exclude smaller scale operations and tactics, whereas military action encompasses all levels of warfare, up to and including strategic, and is therefore more appropriate for describing the full range of military activity associated with theater conflict.

—LTC John G. Hines, USA, and Dr. Phillip A. Petersen

eral fronts often is misunderstood in the West, primarily because of confusion about how the recently established HCOFs are related to Soviet concepts of military geography. To help reduce the apparent confusion, Soviet concepts of military geography (*voyennaya geografiya*) and associated control measures are distinguished from Soviet concepts of strategic leadership (*strategicheskoye rukovodstvo*). It should then be easier to discuss how the Soviets relate the two in planning and controlling strategic military operations.

For purposes of planning for war, the Soviets divide the world into a number of hierarchically ordered military-geographical sections. Arranged in a descending order of scale, they are: theater of war, TSMA, strategic direction, operational direction and tactical direction (Figure 1). Starting at the top of the geographical hierarchy, the broadest concept in military geography seems to be that of the theater of war (TW), in Russian *teatr voiny* (TV). According to an article in the December 1981 *Polish Naval Review*, theater of war is defined as "the term given to vast areas of land, sea and air, prepared in a political, economic and military sense, on which bilateral hostilities are conducted between two states or coalitions." This article also noted, however, that although the boundaries of theaters of war are defined in a general sense in peacetime, during the course of hostilities "they may stretch to several continents or even over the whole globe—including into space."[7]

The country's military administrative system, which divides the Soviet Union into 16 military districts, is directly connected to the regional structure of the Soviet economy. These military districts may be visualized as comprising the following four regional groups (Figure 2) more or less analogous to the strategic rear and the rears of the potential theaters of war: regions of the center, Volga area and Ural in the middle of the European part of the country (the strategic rear of the country); regions of the northwest, west and southwest along the Soviet Union's western borders (the rear of the western theater of war); regions of the south and southeast along the southern borders of the country (the rear of the southern theater of war); and regions of the east (the rear of the far eastern theater of war).[8]

TSMA

While finding the concept of theater of war a useful way to identify general areas of potential conflict, the Soviets focus their operational planning at the TSMA level. The identities and sizes of TSMAs have changed over time. Europe, for example, was considered to be a single TSMA in the 1960s[9], but by the mid-1970s, the Soviets were teaching Voroshilov General Staff Academy students that Europe had been divided into three continental TSMAs. During the course of the mid- to late 1970s, the Soviets continued to work out their thoughts on the most appropriate geographical approach to strategic planning. Near Eastern, Middle Eastern, Northeastern and Northern TSMAs appeared and disappeared as strategic planning contingencies. Apparently, the first two eventually were subsumed in the present Southern TSMA, and the latter two were subsumed into the present Far Eastern TSMA.

Even the definition of TSMA has been an issue of bureaucratic contention within the Soviet armed forces. By arguing for independent sea (*morskoy*) in addition to oceanic (*okeanskiy*) TSMAs, the navy could hope to obtain additional resources and avoid subordinating some of its fleets or flotillas to the operational control of commanders in adjacent continental

Figure 1. Soviet military-geographical war planning hierarchies.

Figure 2. Four regional groups of Soviet military districts.

theaters. The authoritative 1983 *Military Encyclopedic Dictionary*, however, defined TSMA simply as "that part of the territory of a continent with the coastal waters of the oceans, internal seas and the air space above them (continental TSMA); or the water areas of an ocean, including its islands, the contiguous coastlines of continents and the air space above them (oceanic TSMA), within the boundaries of which are deployed strategic grouping of the armed forces and within which military operations are conducted." It appears, therefore, that while the term "sea TSMA" continues to appear in some Soviet military sources, such usage does not imply equality with continental and oceanic TSMAs. In most instances, an area that could be defined as a sea TSMA is an integral part of a continental TSMA.

By the Soviets' own assessment, the preparation of a TSMA is accomplished in advance, in peacetime, and continues in the course of war. In peacetime, construction of land transportation routes, airfields, naval bases, pipelines, fixed systems for detection of submarines and other kinds of infrastructure construction are planned, budgeted and conducted under the rubric of the preparation for war of the TSMA involved. If hostilities approach, troops and naval forces are to be mobilized and deployed on a TSMA basis. War plans setting out the strategic operations for each TSMA could then be executed with the onset of hostilities.[10]

The Soviets recognize five continental TSMAs around the Soviet periphery: the Northwestern, Western, Southwestern, Southern and Far Eastern. The Soviets also recognize North America, South America, Australia, Africa and Antarctica as individual continental TSMAs. The oceanic TSMAs include the Atlantic, Pacific, Indian and Arctic oceans. Figure 3 shows approximate Soviet TSMA boundaries.

Lines on a map can be misleading, however, in that "the boundaries of TSMAs can be fixed or variable; they can be adjacent or they can overlap."[11] Figure 4 indicates how the boundaries of TSMAs in Europe can overlap. Threats to Warsaw Pact forces operating in Denmark and the Danish Straits may require that combat actions be directed against southern Norway and Sweden by pact forces in the Western TSMA. On the other hand, forces operating among the common flank in the western and Southwestern TSMAs may find operational necessity driving either a resubordination of some forces or a shifting of boundary lines during the course of the conduct of strategic operations in each TSMA.

Voroshilov General Staff Academy lecture material from the mid-1970s specifies precisely what countries and bodies of water are included in each of the peripheral TSMAs. The North-

western TSMA includes Finland, Sweden, Norway, Iceland, the Barents Sea, the Norwegian Sea, the North Sea and the northern part of the Baltic Sea. The Western TSMA ncludes Denmark, West Germany, the Netherlands, Belgium, Luxembourg, France, Great Britain, Spain, Portugal, Switzerland, Ireland, northern Morocco, western Algeria, Poland, East Germany, Czechoslovakia, the southern part of the Baltic Sea and the western part of the Mediterranean Sea. The Southwestern TSMA includes Italy, Austria, Yugoslavia, Greece, the western part of Turkey, northern Egypt, Libya, Tunisia, northeastern Algeria, Hungary, Bulgaria, Romania, the western part of the Black Sea and the eastern part of the Mediterranean Sea. Based on the General Staff Academy and other materials, the Southern TSMA may include the eastern part of Turkey, Iran, Saudi Arabia, Syria, Iraq, Israel, Jordan, Lebanon, eastern Egypt, Afghanistan, Pakistan, India, Bangladesh, the eastern part of the Black Sea and the Caspian Sea. The Far Eastern TSMA includes People's Republic of China (PRC), Mongolia, the Republic of Korea, Burma, Indochina (excluding Indonesia), Japan, the Philippines, Alaska and northern and central Siberia.

The identity and nature of strategic objectives identified around the Soviet periphery constitute the key determinant of the nature and size of the various TSMAs as well as the number and location of directions within each TSMA. As explained in a mid-1980s Soviet military lecture, "TSMAs are organized and situated so that each TSMA has strategic and operational objectives." The lecture goes on to explain that because "each TSMA has several strategic objectives, it is necessary to organize and situate each TSMA along several strategic directions [the Russian term is *napravleniye*, which may be translated as direction, sector or axis]" aimed at those objectives. The exact location and scale of these strategic directions is determined by the objectives, but also by "natural features and the number and placement of existing lines of communication serving these objectives." For example, the Dutch and Belgian North Sea ports (grouped with the Baltic Straits and the Kiel Canal into a strategic region) probably would constitute strategic objectives in the northern sector of the Western TSMA. A strategic direction would be aimed at this set of objectives, but the location of the terrain over which forces would attack would be determined by the nature of opposing forces, the nature of the terrain (flat, mountainous or urban) and the loca-

SOVIET THEATERS OF STRATEGIC MILITARY ACTION

	CONTINENTAL TSMA		*OCEANIC TSMA*
1. STRATEGIC REAR	2. WESTERN	7. SOUTHWESTERN	12. ARCTIC
	3. NORTH AMERICAN	8. AFRICAN	13. ATLANTIC
	4. FAR EASTERN	9. SOUTH AMERICAN	14. PACIFIC
	5. SOUTHERN	10. AUSTRALIAN	15. INDIAN
	6. NORTHWESTERN	11. ANTARCTICA	

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Figure 3. Approximate Soviet theater of strategic military action boundaries.

tion of favorable road and rail networks.

Within each TSMA is one or more of these strategic directions. A strategic direction consists of a wide strip of land, including contiguous coastal waters and airspace, leading the armed forces of one warring party to the other's most important administrative-political and industrial-economic centers. Strategic directions involve operational-strategic scale operations, undertaken by combinations of fronts, fleets, independent armies and flotillas. Thus, a strategic direction usually permits operations by many strategic formations of various services.[12] The smallest size force likely to operate on a strategic direction would be a single front comprised of two or more armies. A strategic direction also might accommodate a group of two or more fronts, as was common toward the end of the Great Patriot War.[13]

Each strategic direction is, in turn, in the words of the same mid-1980s Soviet military lecture, "organized and situated along several operational directions." An operational direction is a zone of terrain, to include contiguous coastal waters and its airspace, within which an operational-strategic or operational formation conducts its operation.[14] Within the context of the continental TSMA in which they lie, operational directions may be internal or coastal. Normally, a Soviet army of two or more divisions would advance on an operational direction. These various strategic and operational directions might, depending on the conflict scenario, appear on the ground in the theaters around the Soviet periphery.

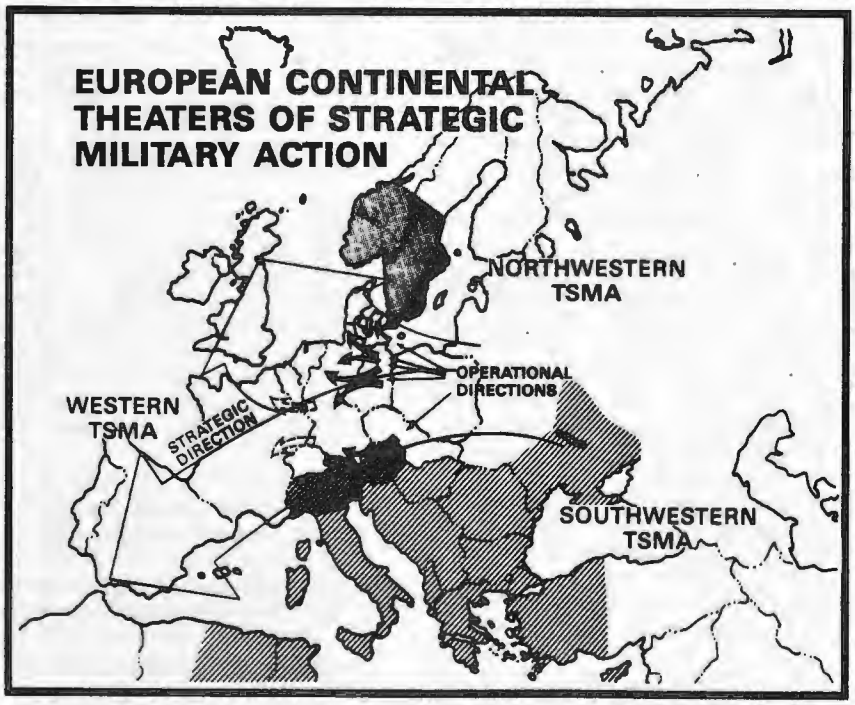

Figure 4. Overlapping European theater of strategic military action boundaries.

The Western TSMA

The Warsaw Pact considers the main TSMA to be the Western one in Central Europe (Figure 4).[15] According to lecture materials from the Soviet General Staff Academy, the Western TSMA may be envisioned as comprised of two strategic directions: north German and south German. The operational capacity of each of these strategic directions is said to be "sufficient for the deployment and military operations of up to two fronts."

The north German strategic direction would be directed against NATO's Northern Army Group (NORTHAG) and those Allied Forces North (AFNORTH) contingents located in Denmark and the West German state Schleswig-Holstein. The northern or coastal front on the north German strategic direction would probably have two initial operational directions: one directed against Schleswig-Holstein in AFNORTH and a second directed at the Dutch corps sector in NORTHAG. The operational axis directed against Schleswig-Holstein would be aimed at seizing the probable immediate front objective, the Kiel Canal, and subsequent seizure of Jutland. The southern front on the north German strategic direction would probably have at least two initial operational directions; one aimed at fixing the I German corps in the Intra-German Border (IGB) positions and the other at penetrating the British and Dutch corps sectors. Successful operations on these operational directions along the north German strategic direction would ensure achievement of initial strategic objectives in NORTHAG's rear, specifically the Dutch and Belgian ports and the French border. Operational tactical encirclement of the First German Corps probably would be the means by which the Soviets would hope to expedite achievement of these objectives.

The south German strategic direction probably would be aimed at holding the two German and two U.S. corps in Central Army Group (CENTAG) in their IGB and West German-Czechoslovakia border positions and attempting to encircle them on two major operational directions, one through the British and Belgian sectors and the other through Austria. In a protracted conflict, subsequent operational directions probably would be grouped along northern and southern strategic directions aimed through France at the United Kingdom and the Iberian peninsula. On the southern flank of the Western TSMA, any Warsaw Pact forces moving up the Danube Valley from Hungary probably would be initially subordinated to HCOF in the Southwestern TSMA, although upon operational success they could become resubordinated to HCOF in the Western TSMA.

The Southwestern TSMA

According to the previously mentioned Soviet military academy lecture presented in the mid-1980s, possible operational directions would include the following:

- *Alpine Direction*—frontage, 180 to 240 kilometers; depth, 550 kilometers; operational density, six to eight divisions
- *North Italian Direction*—frontage, 100 to 200 kilometers; depth, 600 to 750 kilometers; operational density, six to eight divisions

• *Adriatic Direction*—basically the territory of Yugoslavia. Frontage, 300 to 500 kilometers; depth, 500 to 700 kilometers. It allows control of the Adriatic coastline, prevents a major assault landing by NATO and thus creates favorable conditions for a grouping of forces operating on the north Italian direction. Besides this, by operating on this axis, the forces of the Warsaw Pact can cover the primary economic regions and industrial centers of Yugoslavia, Hungary and Romania and control the important lines of communication: Vienna-Belgrade-Athens. The Dinaric Alps stretch from the southern coast to the Adriatic Sea and ports and constitute a wide, mountainous obstacle having operational significance. The most impenetrable sector is the western sector of the Alps, where no forces exist and there are not sufficient sources of water. The most convenient places for crossing the Dinaric Alps are the valleys of the Bosna and Neretva rivers. The operational density of this axis is 10 to 15 divisions (toward the west from the Sava River it is four to five divisions).

• *Ionian Direction*—frontage, 180 to 400 kilometers; depth, 400 to 500 kilometers. This direction provides a grouping of forces an exit from the lower Danube plain to the coast of the Ionian Sea and the Strait of Otranto. The natural conditions of this direction are complicated; therefore, a wide use of combat equipment with high trafficability, airborne assaults, transport aviation and helicopters is advisable. The operational density is only five to six divisions.

• *Bosporus-Dardanelles Direction*—provides the creation of conditions for the breakout of a large grouping of Warsaw Pact forces in the straits. The terrain on this direction allows for the use of tank formations as part of combined arms groupings and for the rapid exploitation of success with the aim of establishing control over the straits. The operational density of this direction is five to six divisions, including two tank divisions.

The Alpine, North Italian and Adriatic operational directions probably would be grouped along a single strategic direction, and the Ionian and Bosporus-Dardanelles operational directions probably would be grouped into another strategic direction aimed at establishing control of access to the Black Sea.

The Northwestern TSMA

On the northern flank, an initial offensive strategic direction against the Nordic countries in the Northwestern TSMA undoubtedly would center on the operational direction aimed at northern Norway. Assault (amphibious or airborne/heliborne) tactical combat action might be undertaken in support of this coastal operational direction, or as a sequentially executed assault operation conducted on an independent maritime axis directed along the Norwegian coast. Obviously, the operational plan for the Northwestern TSMA takes into consideration contingencies for the conduct of combat actions against Sweden as well. As a result, this northern operational direction also could include an axis of advance directed across northern Sweden toward Narvik, Norway. A defensive operational direction aimed at southern Finland probably would be used to hold Finnish military forces in the south.

Iceland could be part of both the continental Northwestern TSMA and the Arctic Oceanic TSMA, depending upon the wartime scenario. If a conflict in the Western TSMA did not spread to the Scandinavian peninsula, combat action in the Northwestern continental TSMA could be limited to Iceland. In this case, the military-political significance of Iceland would be based on its importance to the conduct of strategic action in the Arctic and Atlantic Oceanic TSMAs.

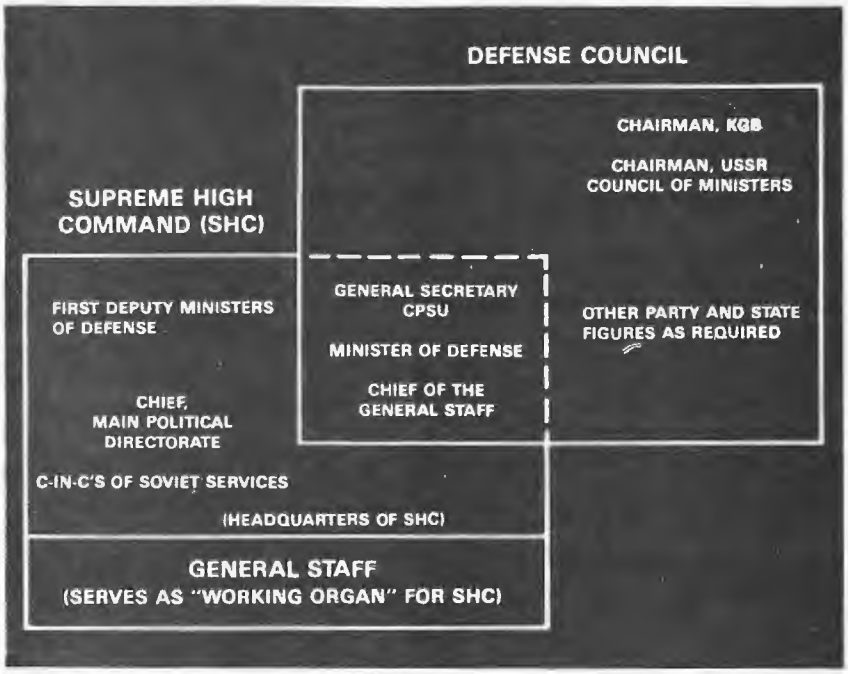

Figure 5. Interrelationship of the Defense Council and the Supreme High Commander.

The Far Eastern TSMA

At the opposite end of the Soviet Union in the Far Eastern TSMA, the Soviets apparently envision four strategic directions: against the Urumqi military region; against the Shenyang and Beijing military regions; against Japan, Korea and the Philippines; and against Alaska. Of these four strategic directions in the Far Eastern TSMA, the direction against the northeast PRC constitutes the keystone of any successful strategic operation involving PRC and is, by far, the most complex of the possible strategic directions. It is comprised of at least three initial operational directions, involving offensive operations by at least three fronts: the Transbaykal front against the Beijing military region; the second Far Eastern front against the northern Shenyang military region; and the first Far Eastern front against the eastern Shenyang military region.

The Southern TSMA

Finally, in the region between central Turkey and PRC lies the Southern TSMA. The Southern TSMA probably can be divided into two initial strategic directions, one directed toward the Middle East, the other toward Iran, Pakistan and India. Thus,

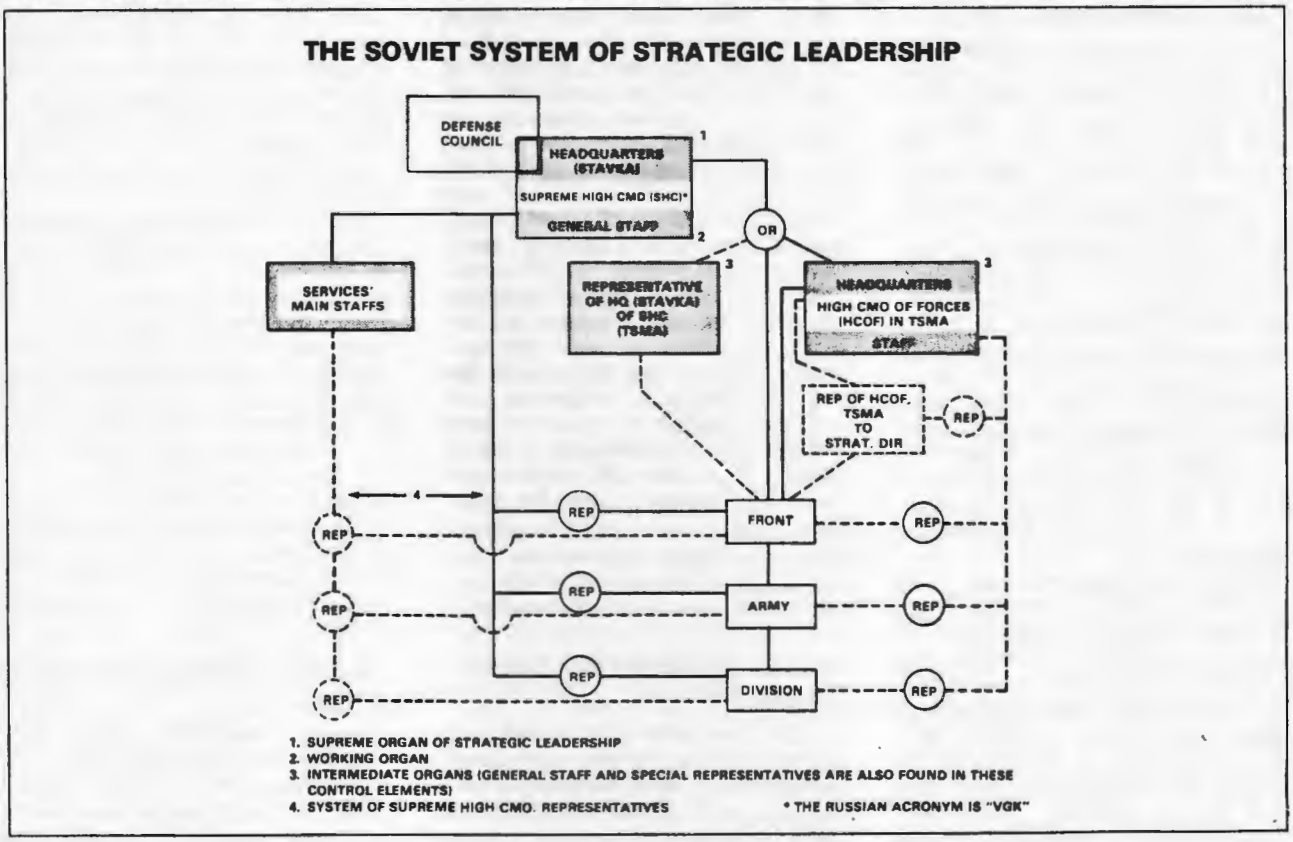

Figure 6. Soviet command structure.

the Turkish border with the Soviet Union is not considered by the Soviets to lie in the same TSMA as the Bosporus and Dardanelles but lies instead in the Southern TSMA. This apparently reflects at least two Soviet considerations: Any Soviet conflict with Pakistan and Iran could involve the United States and Turkey, but not necessarily NATO as an alliance, and in an operational sense, combat actions against the Bosporus and Dardanelles would not involve the coordination of front boundaries with combat action against eastern Turkey.

The System of Strategic Leadership

The Soviets have developed a comprehensive theory of strategic leadership that corresponds to their highly structured view of military geography. The Soviets explain the intersection of political and military authority at the very top of the command hierarchy as follows:

> "The general policy on strengthening national defense and developing the armed forces is determined by the Communist Party, its Central Committee and the Politburo. According to the constitution, the direction of all the armed forces of the U.S.S.R. is vested in the highest organ of State authority—the Supreme Soviet. The Presidium of the Supreme Soviet organizes the Defense Council. . . . "[16]

The Defense Council (*Sovet Oborony*) unifies the military and civilian leadership to ensure centralized political direction of military efforts.

The Defense Council controls the Soviet armed forces through the Supreme High Command (SHC) (in Russian, *Verkhovnoye Glavnokomandovaniye* [VGK]). SHC is responsible for "direct leadership of the armed forces both in peacetime and in war."[17] Figure 5 illustrates the interrelationship of the membership of the Defense Council and SHC. Soviet General Secretary Mikhail Gorbachev is both the Chairman of the Defense Council and the Supreme High Commander.

Four Elements of Strategic Command

SHC is the heart of what the Soviets call their system of strategic leadership, which is comprised of the elements shown in Figure 6. The two key components of this system are within SHC itself. The first and "supreme organ of strategic military leadership" is the Headquarters, SHC (in Russian *Stavka VGK*). The working organ of SHC, the General Staff, is the second component. The so-called "intermediate organs of strategic leadership," comprising the third element, consist either of formal High Commands of Forces or representatives of Headquarters (HQ) SHC and are intended to extend the operational control by the HQ SHC out to the forces actually engaged in combat. The fourth component is also a system of representatives, in this case an extension of the General Staff. These SHC staff representatives ensure strategic coordination of planning down to the level of division and flotilla.

The "intermediate organs of strategic leadership" bear a closer look because they are the source of much confusion and controversy in the West today. The major differences between an HCOF and an HQ SHC representative are the degree of their permanence and the size of their staffs. Existing HCOFs probably are supported by a sizable infrastructure and staff. In fact, each High Com-

mand, just like the SHC, would be comprised of its own headquarters and staff. The HQ SHC representative, on the other hand, is more of a crisis manager. He would be more likely to have only the staff support of a relatively small operations group that could move quickly to solve immediate but more temporary problems. Such a representative could, however, also draw upon the staffs of fronts and fleets who temporarily are under his control. HQ SHC representatives could even be dispatched to oversee wars of national liberation. For example, in the early 1980s, First Deputy Ministers of Defense Petrov and Sokolov (now Defense Minister) served as representatives of the HQ SHC to "progressive" forces fighting in Ethiopia and Afghanistan.

Both the Commander in Chief (CINC) of HCOF and a representative of HQ SHC would have the full authority of the HQ SHC and probably are themselves members of the headquarters. This conclusion is based on the Soviet assessment that a major weakness of World War II HCOFs on strategic directions was their lack of authority. They controlled no reserves and had to refer all important decisions to SHC. The Soviets eventually dissolved the High Commands and sent members of HQ SHC itself out to the troops to control operations by groups of fronts. This practice finally evolved into the reestablishment of an HCOF in the Far East, in which the authority of the CINC (Vasilevskiy) was ensured by his membership in the HQ SHC. The entire thrust of Soviet military literature regarding strategic leadership suggests that modern HCOFs are modeled on this World War II command, incorporating both the authority of an HQ SHC representative and the organization and permanence of a High Command.

The fourth component of Soviet strategic military leadership is the extensive system of SHC staff representatives. Their primary function is to monitor the operational situation to ensure that the overall plans of SHC are being respected. They also serve as a direct conduit for communications between lower level units and both the General Staff and the Main Staffs of the five services. This information can form the basis for refining planning and, ultimately, changing support priorities throughout the forces. The staff representatives either are officers of the General Staff with general coordination responsibilities or are officers from the main staffs of the services who assist, on behalf of the General Staff, in specialized areas such as air, artillery, engineer and naval support. While neither the General Staff nor the Main Staffs of the services formally command any forces, this entire staff representative system constitutes a shadow control system superimposed by SHC upon the formal organizational structure. Members of the Western military might be inclined to view this as a higher headquarters spy network that would demoralize mid-level commanders. The Soviets, however, have expressed great confidence in the effectiveness of the staff representative system in helping to keep the armed forces focused on the SHC's strategic objectives rather than on more narrowly defined objectives of the services or of lower level commanders.

Parallel Operational and Support Structures

The relationship in the Soviet command structure between operational subordination of forces and the military support infrastructure can be seen in Figure 7. Fronts (or independent armies) and fleets (or flotillas) constitute the operational components of the system. The Ministry of Defense, services and military districts constitute the support structure. Note that both the operational and support elements are responsive directly to HQ SHC. HQ SHC allocates strategic reserves (to include air and nuclear reserves) within the strategic leadership system, depending upon planned requirements and contingencies that arise during the course of conflict. The Soviets do not establish different command structures for conventional and nuclear war; a single system exists for conflict of any intensity under control of HQ SHC.

On the support side, the Ministry of Defense does not function as an organ of strategic leadership. It does, however, play a central role in the Soviet control structure through the services and military districts. Peacetime military districts do not turn into fronts and disappear in time of war.[18] The command and staff functions of fronts that are generated initially are likely to be already embedded in the headquarters of the military districts and, in Eastern Europe, in the headquarters of the various groups of forces (for example, Group of Soviet Forces Germany [GSFG]). Military districts exist, however, because they must generate additional forces—perhaps several armies or even another front. Moreover, the military districts are required to support homeland aerospace defense and, in the event of general nuclear war, post-nuclear strike reconstruction.

The five services also continue to function in wartime. While the units of the services are absorbed into the combined-arms command structure of the various fronts, fleets and SHC reserves, the services themselves continue to exist to help generate new units and sustain those that already exist. Moreover, the services continue to be indirectly involved in the wartime strategic leadership system. First, the service CINCs are members of HQ SHC. Second, the main staffs of the services participate in the operational planning process in direct support and response to the general staff of SHC. This is greatly facilitated by the membership of the five service CINCs in the headquarters (*Stavka*) element of SHC.

The operational side has considerable structural flexibility in the Soviet command system (Figure 7). Variants in the subordination of operational commands can be dictated by HQ SHC in response to planned or unanticipated wartime requirements. It is possible that a ground force division or army might be subordinated to a navy fleet and the fleet itself subordinated, in turn, to an HCOF or a representative of HQ SHC in a continental TSMA. Likewise, a ground forces army under command of a front might control a navy flotilla in the conduct of an operation.

The Soviets believe that this highly centralized system of strategic leadership, responding to developments of military technology, enables commanders to meet the requirements of warfare on a broader scale than previously experienced. They expect that the mobility of modern forces and the ranges of new and projected weapons are leading to the possibility of modern theater warfare. In such a war, success will require progressively greater centralization of control to enable commanders to make effective use of the full capabilities of the modern means of war. Historical and theoretical discussions in Soviet military literature strongly suggest that a highly centralized control structure greatly increases flexibility at the strategic and operational levels where, in the Soviet view, the outcome of conflict would be determined. The Soviets

recognize that, to avoid the systemic paralysis such centralization might induce, the entire centralized control process must be fully and effectively automated.[19] Thus, the way the Soviets define their own control requirements puts them under considerable pressure to stay abreast of the West in technologies in which they are traditionally weak.

The Soviets' estimation of the growing complexity and scale of strategic operations in the far flung theaters around the Soviet borders, each facing different conditions and, in some cases, different enemies, led them to anticipate the need to bring strategic leadership closer to the forces. In response, the Soviets have extended the control by HQ SHC to the forces that would operate in the most important peripheral TSMAs (Figure 7).

TSMA High Command Rationale

Belief that the beginning period of war probably will feature large conventional combat actions rather than global strategic nuclear missile strikes places a premium on Soviet readiness to be able to gain and maintain the strategic initiative in a conventional war. The critical feature of such readiness is a command system that would be adequate to control effectively the many hundreds of armored, artillery, missile, air and naval units in the conduct of large-scale offensive operations. There would not be sufficient time to repostur forces of such variety and size from peacetime to wartime organizational structure. Nor would there be time to establish and train special commands capable of directing such forces in wide-ranging, complex operations in large, sometimes continental-size TSMAs. Finally, wartime commands established in peacetime could facilitate covert mobilization and integration of reserves into active units during the prewar crisis and the beginning period of war.[20]

Soviet military statements calling for maintenance of a wartime command structure in peacetime have grown stronger since the mid-1970s. A May 1985 statement is most straightforward:

> "The course and outcome of the last war revealed the imperative need for the peacetime creation of suitable organs and a scientifically based system of strategic leadership. They need to be maintained in condition that would provide reliable and continuous control of troops and naval forces from the onset of military action *without substantive changes incidental to the transition from a peacetime to a wartime state*"[21] (emphasis in original).

Since the end of World War II, the Soviets have recognized that, if war began, some form of regional intermediate level command for control of strategic operations conducted by groups of fronts would be necessary in some regions.[22] Prior to the end of the 1970s, had war occurred, the strategic direction would have been the most likely level in the scale of military geography at which High Commands would have been established.[23] This would have been consistent with Soviet experience with HCOFs on strategic directions and the designation of representatives of HQ SHC to control groups of fronts on strategic directions in World War II.

By the mid-1970s, however, then Chief of the General Staff Marshal Kulikov indicated that the Soviet military leadership was rethinking the structure of wartime strategic leadership. Kulikov noted that the TSMA, rather than the strategic direction, had been the more effective level for establishment of HCOFs during World War II.[24] Upon Kulikov's appointment as CINC Warsaw Pact, his successor as Chief of the General Staff, Marshal Ogarkov, strongly reaffirmed and refined Kulikov's initiative. The authority of the authors and the forcefulness of their arguments strongly pointed toward establishing HCOFs in TSMAs, not in theaters of war, and normally, not in strategic directions.

HCOFs at the Level of TSMAs

Other indicators have served to reinforce these conclusions. First, the *Soviet Military Encyclopedia* states that a High Command can be established for forces operating "in either a theater of strategic military action or in a strategic direction.[25] In this and similar reference works, theater of war is not included as a candidate for HCOF.[26] Despite this and the total absence of indications that the Soviets are associating High Commands with theaters of war, speculation about the existence of such commands continues to appear in Western analytical discussions. This may be attributable, to some extent, to projection of Western thinking about command of geographical regions (for example, CINC Europe and CINC Pacific). A major reason, however, appears to be an inadequate appreciation of the importance TSMA holds in Soviet thinking about the planning and execution of war. This often is complicated by an even more basic lack of understanding that theater of war and TSMA are not one and the same. For analysts who do not read Russian, this confusion has been deepened by some well meaning translators who have taken the liberty of translating *teatr voyennykh deystviy* (TSMA) as theater of war, since the latter is a military term with which Westerners are familiar.

Secondly, based on Soviet sources such as the one cited, High Commands could be established either on strategic directions or in TSMAs. Most evidence indicates, however, that the TSMA has emerged as the level considered by the Soviets to be most appropriate. Arguments in the West that High Commands have been established for strategic directions instead of TSMAs have been based, in part, on a misunderstanding of the nature of strategic directions and how they relate to TSMA. Some have concluded that, unlike the geographical concept of TSMA, the strategic direction is an independent operational entity that passes over several TSMAs "like a chess piece over chessboard squares."[27] Furthermore, it is more likely, the argument goes, that the Soviets would establish High Commands for strategic directions representing forces conducting operations than for a geographical region such as a TSMA.

In fact, a strategic direction, like a TSMA, is a military geographical descriptor that represents terrain where operations may occur. It differs from TSMA in that it designates the general area of the objective as well as the location of potential operations. Furthermore, the Soviet *Military Encyclopedic Dictionary* explains that the strategic direction "is part of a TSMA," not an independent entity of forces or an equivalent expression for the same terrain. One might conclude, then, that the strategic direction does not move (since it is not a formation) and that, as a geographical control measure, it lies within the TSMA of which it is a component part. The *Soviet Military Encyclopedia* explains that "several strategic directions might be located within the boundaries of a single TSMA." To use the

Ogarkov's Role

In September 1984, Marshal of the Soviet Union (MSU) Nikolai Ogarkov was reassigned from the position of Chief of the General Staff to be Commander-in-Chief (CINC) of Forces in the Western theater of strategic military action (TSMA). This reassignment probably was a result of his resistance to resource allocation decisions that he believed failed to meet rapidly changing military requirements. Ogarkov's assessment that the threat was increasing, both in the short term and even more so in the long term, probably caused him to demand increases in military spending for the 1986–1990 Five Year Plan both for procurement and for the more intensive research and development. Ogarkov's apparently persistent resistance to Defense Council decisions (violating the Marxist-Leninist principle of democratic centralism, demonstrating thereby a deficiency in *partinost*) necessitated Ogarkov's reassignment to a position that would remove him from the resource allocation decision process but that would not waste his considerable talents.

Some Western defense analysts find it difficult to believe that a capable and prominent figure such as Ogarkov could be given such a lowly position as that of CINC of forces in a TSMA. Consequently, they have been inventing for him special commands of forces in entire theaters of war (to include all regions except the Far Eastern TSMA), or they have put him in charge of special secret preparations for global nuclear war. Speculation about such super commands and sinister assignments indicates an inadequate appreciation of the importance and nature of the High Command of Forces (HCOFs) in the Western TSMA.

Appointment to the position of CINC of forces in a TSMA does not constitute exile to the provinces. These commands are essentially forward deployed components of the Headquarters Supreme High Command (HQ SHC) itself. That Ogarkov is CINC of forces in the Western TSMA, the main TSMA in overall Soviet military strategy, indicates his importance. The Western TSMA holds the same significance for the Soviet Union on a political and military strategic scale that selection of the main direction holds for lower-level tactical combat actions.

One of the most interesting indications of Ogarkov's authority and possible future is found in a January 1985 article in the Soviet *Military Historical Journal* about the wartime career of MSU Vasilevskiy. We agree with our British colleague, Christopher Donnelly, who drew our attention to the article, that this discussion is probably the Soviet military's way of explaining to its officers, by way of historical analogy, the nature of Ogarkov's new assignment and his possible future. This interpretation is reinforced by the position of the author, General of the Army Gribkov, Chief of Staff to CINC of the Warsaw Pact Kulikov.

General Gribkov stresses that Vasilevskiy served simultaneously both as Chief of the General Staff (Ogarkov's former job) and as representative of the HQ SHC " . . . in fact as the leader . . . " of several fronts in especially important combat sectors of the Soviet-German front (equivalent to Ogarkov's present job). Gribkov notes that, in the crucial closing phase of the war in the West, MSU Vasilevskiy "turned over the function of Chief of the General Staff . . . " to the lower-ranking general of the army Antonov to free himself to do something that, presumably, was more important. MSU Vasilevskiy, former Chief of the General Staff of all the armed forces of the Soviet Union, took command of a single front, the 3rd Bylorussian, to carry out the liquidation of German forces in East Prussia. He then was sent to the Far East to be CINC of the HCOF organized to execute the Manchurian campaign against the Japanese. In the Far East, Vasilevskiy commanded two other Marshals of the Soviet Union (Malinovskiy and Meretskov), who are pictured in the Gribkov article standing at almost rigid attention listening to a clearly relaxed Vasilevskiy. The photograph was almost certainly included to illustrate that CINCs of HCOFs do indeed command a great deal of authority and that there is clearly rank even among marshals of the Soviet Union.

Gribkov also points out in his article that, after the war, Vasilevskiy occupied the highest leadership posts in the Soviet armed forces, including Minister of the Armed Forces (Defense Minister). If, indeed, this article reflects Soviet thinking about Ogarkov, then he retains a great deal of authority, and his essentially lateral reassignment may still leave him in contention for assignment as Defense Minister.

—LTC John G. Hines, USA, and Dr. Phillip A. Petersen

previously mentioned analogy, for any given strategic direction, the TSMA is the entire chessboard, not a square.

Ogarkov's Views

Marshal Ogarkov hinted very strongly at the nature and span of control of the reconstituted High Commands in his 1985 update *History Teaches Vigilance* of a 1982 book, *Always in Readiness to Defend the Fatherland*. Specifically, in the discussion in which he related higher military leadership (*vyshiye voyennoye rukovodstvo*) to the scale of warfare, Ogarkov explained, in both versions, that today the main operation is no longer the front operation but, instead, the operation in the TSMA.

In 1985 this sentence was amended to exclude from consideration as the main operation the operation of a group of fronts, traditionally carried out on a strategic direction. He made this addition almost certainly to clarify to those within the Soviet military who still did not understand that the scale of the modern operation, and the level at which it would be controlled, transcended the operation by a group of fronts on a strategic direction.

Ogarkov links higher military leadership, that is, strategic leadership as discussed earlier, directly to "the main form of military action," the strategic operation in the TSMA, not in the strategic direction. In addition, Soviet military literature and reference publications of recent issue refer to strategic operation in the TSMA.[28] Strategic direction is not even offered as a parenthetical alternative. This strategic operation is defined by the Soviet *Military Encyclopedic Dictionary* as " . . . the sum total of operations, strikes and combat actions of large units and formations of the various services of the armed forces, coordinated and interrelated by objective missions, terrain and time and carried out in accordance with a single concept and plan for the achievement of strategic objectives." HQ SHC has established High Commands around the Soviet periphery to control forces executing these strategic operations more effectively. Unity of command, as the Soviets practice it, would require that all forces executing the strategic operation would come under control of these High Commands. All this would suggest that forces executing the strategic operation within a TSMA would be controlled at that

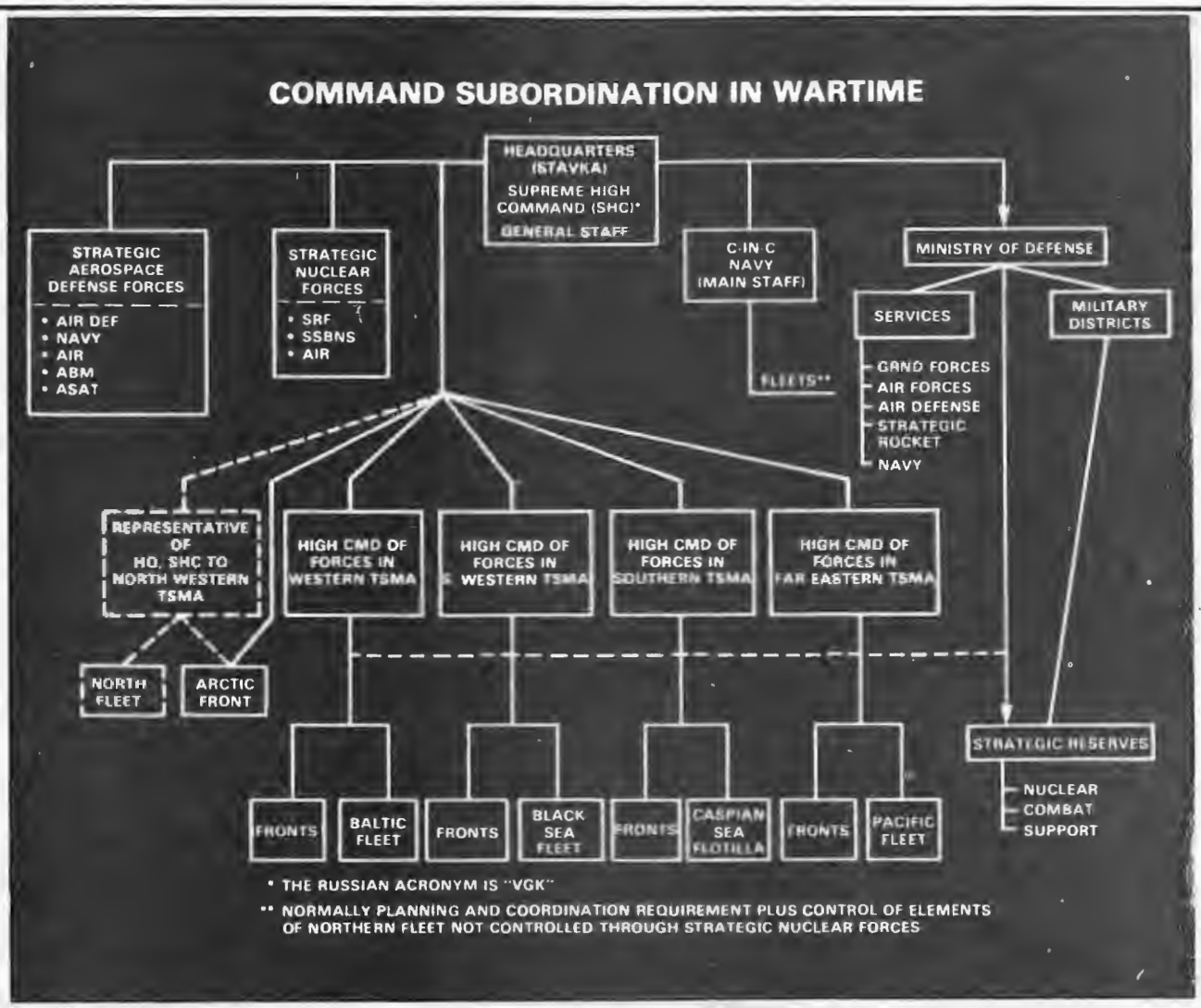

Figure 7. Elements of the wartime system of strategic leadership.

level rather than at the level of the strategic directions that lie within the TSMA. Figure 1 illustrates how the Soviets associate commands of forces in the execution of operations with the various military geographical areas over which those operations would be conducted.

Control on Strategic Directions

Some analysts, including those who acknowledge that the establishment of HCOF has been at the level of the TSMA, continue to wonder how forces on strategic directions within a TSMA would be controlled. Discussions in the Soviet military literature strongly suggest that, when required, the CINC of an HCOF in a given TSMA would designate his own high level representative to oversee operations by groups of fronts on diverging strategic directions within the TSMA. One Soviet military writer noted with approval that these High Command representatives could be officers from the CINC's own military council, his chief of staff, chiefs of the major directorates within his staff or officers of similar responsibility and position. The use of such High Command representatives was standard practice in World War II, and only rarely were subordinate commanders called to the CINC's headquarters to receive instructions.[29]

Variants of this practice continued when representatives of HQ SHC replaced High Commands later in the war. In some instances, an HQ SHC representative would leave one of his senior deputies to control one or two fronts for him while he took responsibility for the overall strategic operation.[30] In other instances, he would designate a front commander to be his deputy and give the deputy control of two or more fronts in order to free himself to attend to the overall operation.[31] A variant of these methods is expected in a future war, although the most likely approach would be designation by the CINC of an HCOF in a TSMA of his own special deputies for temporary control of forces on strategic directions within the TSMA.

Existing HCOFs

CINCs of HCOFs have been assigned to command forces in four of the five peripheral continental TSMAs. It appears that no HCOF is being established in the Northwestern TSMA. In the event of war, therefore, the Arctic front commander might be the senior combined-arms commander responsible for strategic operations in the Northwestern

TSMA. It is possible, however, that given the likely complexity of wartime military requirements in the northwest region (protection of ballistic missile nuclear submarines in the adjacent Barents Sea, strategic air defense of the European Soviet Union and the possibility of operations into Scandinavia), a representative of HQ SHC might be sent to the region. The absence of an HCOF in the Northwestern TSMA does not mean that the TSMA does not exist. Strategic leadership and military geography are separate concepts. There is probably no Soviet command of any kind for the Australian TSMA, for example, but the Australian TSMA continues to exist in Soviet military geography.

The High Command of the Warsaw Pact is not a wartime operational command. It appears that, with the possible exception of Romanian forces, the ground forces, navies and air forces of the Warsaw Pact allies are integrated directly into the Soviet wartime command structure shown in Figure 6.[32] This, of course, raises the question of the wartime role of Marshal of the Soviet Union Kulikov as CINC of the Warsaw Pact, especially as it might relate to Ogarkov (see "Ogarkov's Role," page 108). It is likely that Kulikov would function in a role not dissimilar to that of a wartime Soviet military district commander. While Ogarkov would have operational responsibility for the forces operating in the Western TSMA, Kulikov's primary wartime mission would be to ensure that non-Soviet Warsaw Pact forces and associated support are fed quickly and efficiently into the operations conducted in the western and southwestern theaters.

The dominance of land warfare in Soviet military thinking is expressed clearly by the absence of any HCOF in an oceanic TSMA and by the probable subordination of all but possibly one of the four Soviet fleets to HCOFs in continental TSMAs (Figure 7). The leadership of the Soviet armed forces is ground forces dominated, and the fleets still are considered to be primarily maritime support elements to continental operations and a means of extending homeland defense out to sea. The global role of the ballistic missile nuclear submarines places them in the strategic nuclear forces under control of SHC, leaving few naval forces under operational control of the navy in time of war. Remember that the CINC of the navy, Admiral Chernavin, is a member of HQ SHC and, in that capacity, can influence how naval forces are used in the various theaters. This influence is reinforced by the role of the navy main staff in preparing the naval sections of strategic plans prepared by the operations directorate of the General Staff for the various continental TSMAs.

Conclusion

This article might convey the impression that Soviet military thinking is systematic and structured in the extreme and is therefore very rigid. However, it is important to point out that, while Soviet views of military geography and strategic leadership are more specifically defined than are comparable Western concepts, the manner in which their ideas are applied to objective conditions can be quite flexible.

The identities, boundaries and associated command structures of forces in various TSMAs and strategic directions described reflect how the Soviet military thinks about organization and control of forces for war around the Soviet periphery. This does not mean that, in the event of war, the Soviets are committed to execute any or all of the operational scenarios implied by the previously identified strategic and operational directions. Even the command structure of forces and the boundaries of TSMA and internal strategic directions could be altered radically in response to unanticipated changes posing special problems or opportunities. In the early months of World War II, the Soviets made major adjustments in their strategic thinking and command structure as a result of unanticipated developments in initial operations against the Germans. Their concepts of command and operational control continued to change and mature throughout the war.

Increasingly numerous indications in Soviet military literature show that Soviet military leaders do not believe they will have the luxury of such a learning process in a future war. This drives them to try to make more accurate forecasts of the nature of future war and to adjust their operational planning, command structure and military geographical boundaries accordingly. A Soviet general recently warned his Soviet military readers that "there is absolutely no doubt that future war cannot avoid leading to the appearance of fundamentally new forms and methods of strategic leadership of the armed forces. Working out these developments in a profoundly scientific way is one of the most important tasks of Soviet military theory."[33]

The changes already seen in the postwar period are a clear manifestation of this Soviet requirement. Expect still further adjustments, given the Soviet military's commitment to keep systems of command abreast of demands created by new weapons technology and changes in political-military relations within and between opposing military alliances around the Soviet periphery.

Soviet development of strategic leadership and military geography—of strategic planning in general—is a continuous and vital process. Western defense analysts tend to plug into that process when it begins to manifest itself in a threatening way, such as in the peacetime creation of High Commands in TSMA. Predictably, the reaction tends to be surprise, alarm and misinterpretation. The United States is doomed to such a pattern of complacency interrupted by surprise so long as it is unable to attend to the long-term, systematic Soviet planning process rather than to its occasional outputs.

The basic concepts underlying the changes in Soviet command and organization today were being developed in the mid-1960s and were well on their way to implementation in the mid-1970s. This does not mean the United States should be any less disturbed by their implications. Warning time of a Warsaw Pact attack almost certainly will be reduced as a result of Soviet peacetime institution of wartime commands. There is greater reason to be disturbed, however, by the Soviets' demonstrated seriousness and vitality in long-range strategic planning and by the United States' demonstrated inability to comprehend the scale and continuity of this process.

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Notes

[1]M. M. Kir'yan, *Problem y Voyennoy teorii b sovetskikh navchno-spravochnykh usdaniyakh* [Problems of Military Theory in Soviet Scientific Reference Publications], Moskva: "Nauka" Publishing House, 1985, p. 61; and M. I. Cherenchenko, "Strategicheskaya Operatsiya" [Strategic Operation], *Sovetskaya voyennaya entsiklopediya* [Soviet Military Encyclopedia], hereafter *S.V.E.*, Volume 7, pp. 550, 551.

[2]V.D. Sokolovskiy, ed. *Voyennaya strategiya* [Military Strategy], Third Edition, Moskva: Voyenizdat, 1968, pp. 226, 234, 255–292 and 331.

[3]B.V. Panov, et. al., *Istoriya voyennogo iskusstva* [History of Military Art], Moskva: Voyenizdat, 1984, pp. 498–499.

[4]The source that most directly and explicitly revises Sokolovskiy's single-scenario view of war was written by Deputy to the Chief of the General Staff, Colonel-General M. A. Gareyev in his book, *M.V. Frunze-Voyennyy teoretik: vzglyady M.V. Frunze i sovremennaya voyennaya teoriya* [M.V. Frunze-Military Theoretician: The Views of M.V. Frunze and Modern Military Theory], Moskva: Voyenizdat, 1985, pp. 239–241, 380, 381.

[5]See, for example, Marshal of the Soviet Union I. Bagramyan and Colonel, Docent, I. Vyrodov, "Rol' predstaviteley stavki vgk v gody voyny: organizatsiya i metody ikh raboty" [The Role of Representatives of the headquarters, SHC in the War Years: Organization and Methods of Their Work], *Voyenno-istoricheskiy zhurnal* [Military Historical Journal, hereafter *Vizh*], No. 8, August, 1980, p. 33.

[6]Global war with highly capable conventional weapons is envisioned in an increasing number of Soviet military sources. See, for example, N. V. Ogarkov, "The Defense of Socialism: The Experience of History and the Present," *Kvasnaya zvezda* [Red Star], May 9, 1984, p.3; and L. I. Ol'shtynskiy, *Vzaimodeystviye armii i flota* [Interaction of the Army and Navy], Maskra: Voyenizdat, 1983, p. 132. The most responsible discussion of Soviet thinking about limited nuclear use can be found in Notra Trulock III, "Soviet Perspectives on Limited Nuclear War," in Fred Hoffman, Albert Wohlstetter, and David Yost, *The Sword and the Shield: Changing Offensive and Defensive Technologies*, Summer 1986. Trulock's research includes open sources and lecture materials from the Voroshilov General Staff Academy. Also see John G. Hines, Phillip A. Petersen, and Notra Trulock III, "Soviet Military Theory from 1945–2000: Implications for NATO," *The Washington Quarterly*, Fall 1986.

[7]Lt. Cdr. (Dpl) Zygumunt Binieda, "Ogolne pojecie teatru dzialan wojennych" [The General Concept of a Theater of Strategic Military Action], *Przeglad morski* Polish Naval Review],Number 12, 1981, p. 3.

[8]*Politicheskaya i voennaya geografiya* Political and Military Geography], Moskva: Voenizdat, 1980, pp. 92–93 and 116–117.

[9]Warsaw Pact defectors trained in the 1960s were so instructed. See, for example, Viktor Suvorov, "Strategic Command and Control: The Soviet Approach," *International Defense Review*, Volume 17, Number 12, 1984, p. 1815.

[10]"Podgotovka TVD" [Preparation of the TSMA], *S.V.E.*,Volume 6 Moscow: Voyenizdat, 1978, p.384.

[11]Binieda, p. 4.

[12]"Strategicheskoye napravleniye" Strategic Direction], *S.V.E.*, Vol. 7, 1979, p.555; and *Voyennyy entsiklopedicheskiy slovar'* [Military Encyclopedic Dictionary, hereafter *V.E.S.*], Moskva: Voyenizdat, 1983, p. 711. In our 10/83 *International Defense Review* article "The Soviet Strategic Offensive: The OMG in Context," the editors equated the Soviet concept of strategic direction to the theater of strategic military action.

[13]"Front," *V.E.S.*, p. 787.

[14]"Operatsionnoye napravleniye" [Operational Direction], *V.E.S.*, p. 516; and *S.V.E.*, Vol. 6, p. 64.

[15]Colonel (Diploma) Pilot Aleksander Musial, "Character i znaczenie operacji powietrznyc we wspolczesnych dzialaniach wojennych" [The Character and Importance of Air Operations in Modern Warfare], *Przeglad wojsk lotniczych i wojsk obrony powietrznej kraju* [Polish Air Forces and Air Defense Review], No. 3, 1982, p. 13.

[16]S.A. Tyushkevich, *The Soviet Armed Forces: A History of Their Organizational Development* (Moscow: 1978), translation by U.S. Air Force, Soviet Military Thought Series, No. 19, Washington: GPO, p. 459.

[17]Colonel M. P. Skirdo, *The People, the Army, the Commander*, (Moscow: 1970), translation by U.S. Air Force, Soviet Military Thought Series, No. 14, Washington: GPO, p. 109.

[18]John Erickson, Lynn Hansen, Amnon Sella, *etc. al.*, "College Station Paper 2—Organizing for War: The Soviet Military Establishment View Though the Prism of the Military District," College Station Papers Series, College Station, Texas, 1983, pp. xxxi, xxvii.

[19]General of the Army P. Lashchenko, "Sovershenstvovaniye sposobev okruzheniya i unichtozheniya krupnykh gruppirovok protivnika po opytu velikoy otechestvennoy voyny" [Perfection of Methods of Encircling and Destroying Large-scale Enemy Groupings Based on the Experience of the Great Patriotic War], *Vizh.*, No. 2, February, 1985, page 31.

[20]These themes are repeated and refined in a great volume of Soviet military literature on strategic leadership. For a discussion of the need to be able to mobilize quickly reserves while avoiding provocation of an enemy response see Gareyev, ibid, p. 241, 242.

[21]General of the Army A.M. Mayorov, First Deputy Commander of the Ground Forces, "Strategicheskoye rukovodstvo v velikoy otchestvennoy voyne" Strategic Leadership in the Great Patriotic War],*Vizh*, No. 5 (May), 1985, p. 39.

[22]Skirdo, *ibid*, pp. 117 and 118.

[23]Warsaw Pact defectors trained in the 1960s were so instructed. See, for example, Viktor Suvorov, "Strategic Command and Control: The Soviet Approach," *International Defense Review*, Volume 17, Number 12, 1984, pp. 1813–1820.

[24]V. Kulikov, "Strategicheskoe rukovodstvo vooruzhennymi silami" [Strategic Leadership of the Armed Forces], *Vizh.*, No. 6, June 1975, pp. 15–16.

[25]See "Glavnoe komandovaniye," *S.V.E.*, Volume 2, Moskva: Voyenizdat, 1976, p. 562.

[26]Brigadier John Hemsley, "The Influence of Technology upon Soviet Operational Doctrine." A lecture given at the RUSI on February 13, 1986. Hemsley incorrectly speculates that the three TSMAs in the west, (the northwestern, western and southwestern) have now been grouped together "to one large TVD" under the command of Ogarkov and that there are additional High Commands that have been established on the northwestern and southwestern strategic directions. He wrongly assessed that Marshal Kulikov held the High Command of forces of the western "strategic direction."

[27]This and numerous other factual and analytical errors can be found in Jack Sullivan and Tom Symonds, "Soviet Troop Control: Challenging Myths," U.S. Air Force Intelligence Research Division Special Research item, April 1985.

[28]"Strategiya voyennaya' [Strategy military], *S.V.E.*, Vol. 7, p. 564; *V.E.S.*, p. 712; and "Strategicheskaya operatsiya" [Strategic Operation], *V.E.S.*, p. 710.

[29]Col. I. Vyrodov, "O rukovodstve voyennymi deystviyami strategicheskikh gruppirovok voysk vo vtoroy mirovoy voyne" [On the Direction of Military Action of Strategic Groupings of Forces in the Second World War], *Vizh.*, Number 4, April, 1979, p. 19.

[30]Bagramyan and Vyrodov, p. 30.

[31]*ibid*. p. 29

[32]The most authoritative discussion of the current state of Warsaw Pact command structure can be found in John J. Yurechko, "Command and Control For Coalitional Warfare: The Soviet Approach," *SIGNAL*, December 1985, pp. 34–39. Yurechko's research includes both open sources and post-1973 *Military Thought*.

[33]General of the Army A.M. Mayorov, First Deputy Commander of the Ground Forces, "Strategicheskoye rukovodstro v velikoy otechestvennoy voyne" [Strategic Leadership in the Great Patriotic War], *Vizh.*, No. 5, May, 1985, p. 40.

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Contributions of Eastern European Countries to Soviet C³I

By James T. Westwood and W. Robert Klein

The Soviet armed forces could not have reached their current level and sophistication of command, control, communications and intelligence (C^3I) development without the significant and essential contributions of the communist countries in Eastern Europe, which, with the Soviet Union, are members of the 1949 Council of Economic Mutual Assistance (CEMA) and of the 1954 Warsaw Pact.

Each Soviet five year economic plan (FYP) and 15 year outlook (or forecast) has a large and distinctive element, or subplan, that may be regarded as a Five Year Defense Plan (FYDP), in the context of its 15 year forecast. The national economies and the defense establishments and military enterprises of CEMA/Warsaw Pact countries are tightly, inseparably and integrally interwoven within the Soviet Union's master FYPs across the entire gamut of all economic enterprises, which, in the case of armed forces, includes all military procurement, acquisition, modernization, operations, maintenance and replacement. The FYDPs extend throughout all military operation as planning mechanisms. Each FYDP has a main or operational flavor. In effect, the FYDPs schedule all Warsaw Pact military training events, including exercises.

Established in January 1949, CEMA is the foreign trade and economic organization of the principal communist nations, allegedly set up to accelerate post-war economic rehabilitation. CEMA is strongly dominated by the Soviet Union, which tightly integrates the national economies of the socialist bloc. CEMA's members are Bulgaria, the German Democratic Republic (GDR), Hungary, Czechoslovakia, Romania, Poland, Mongolia, Vietnam, Cuba and the Soviet Union. Poland, Romania and Hungary are also members of the worldwide, 91 member General Agreement and Tariffs and Trade (GATT). CEMA includes international banks, a scientific and technical information center, an institute for nuclear research, a common pool of rail cars, a railways cooperation organization, a postal union and central industrial metallurgical and chemical organizations.

Outline of the Development of Soviet C³ 1956–1990

6th FYDP (1956–1960)	Periods of basic research and development (R&D). Development of a uniform theory of command, control and communications (C³) based on military cybernetics.
7th FYDP (1961–1965) 8th FYDP (1966–1970) 9th FYDP (1971–1975)	Period of applied R&D and testing and evaluation (T&E). Research is guided and directed by the Academy of the General Staff; laboratory experiments in low probability of intercept (LPI) and antijam (A/J) communications occur; C³ countermeasures (C³CM) is invented and becomes part of military art in 1966; development of algorithms for automating C³; research in artificial intelligence (AI) begins in 1973; more than 30 investigations are conducted by the Academy of the General Staff.
10th FYDP (1976–1980) 11th FYDP (1981–1985) 12th FYDP (1986–1990)	Period of introduction into the forces of new automated C² systems (ASUVs). Major exercises test new systems. Systems are fully fielded in all forces by the end of 1985. The 12th FYDP is given to training and consolidation of gains introduced, 1986–1990. By the end of 1990, analog signals and processes will have been replaced in favor of all-digital systems.

Table 1.

Warsaw Pact

The Warsaw Pact, instituted in 1955 for 30 years, was renewed in 1985 for another 20 years. The members are the communist nations of Eastern Europe—less Yugoslavia and Albania—and the Soviet Union. The basis of security among the Warsaw Pact members is not so much the pact itself but the individual, bilateral security treaties in force between the Soviet Union and each non-Soviet Warsaw Pact (NSWP) nation. All of those predate the formation of the Warsaw Pact, formally called the Warsaw Treaty Organization. (The same condition pertains to CEMA in the economic sense.)

The Warsaw Pact is heavily dominated organizationally in training and planning by the Soviet Union. Professor John Erickson has characterized the Warsaw Pact as mainly an international crisis containment and crisis resolution organization with Soviet marshals and generals in all of its key positions. Says Erickson, "The Soviet Union does acquire considerable benefit from and through the Pact in its peacetime mode and also from its possible wartime configuration. . . . It pays heavily for this military asset, for 80 percent of the 'defense burden' within the Pact is carried by the Soviet Union."

Erickson describes how the command, control and communications (C³) of NSWP military forces is interlaced into Soviet C³ and examines how the integration of C³ and forces varies among the individual NSWP nations. He points out that C³ semiautonomy of individual members' forces in peacetime "would be overridden in time of war."[1]

In at least two publications, Dr. Jeffrey Simon of the U.S. Army War College has characterized and analyzed C³ issues, problems and potential of the Warsaw Pact.[2] In the early period of the bilateral defense treaties minus the pact (1949 to 1955), "each of the national armies of Eastern Europe had Soviet advisers assigned down to and including the regimental level."[3]

Air Defense

The most singular and exquisite case of Warsaw Pact C³ integration is air defense, an in-depth defense of the Soviet Union that has extraordinary present and future implications for any potential air war in Europe. Sejna and Douglass, in a recent work, provide a case study of the cooperative arrangement formed in the early 1960s between Czechoslovakian air defense and the Soviet Union. It is an impressive operation involving officials at the highest levels and referred to not as an ad hoc arrangement "but as part of the normal control regime."[4]

Implications of this one longstanding nationally integrated air defense C³ structure and its functions are considerable in terms of a single Soviet-run European theater of war air defense capability and C³ overlay, one that would be subdivided into theaters of military operations, zones and sectors. The air defense C³ should prove to be highly automated, digital, architecturally open-ended, mostly mobile, fault tolerant, distributed both electrically and geographically and reconstitutable. Essentially, this system would not have a multilevel security problem. It may be designed to present a particular and new problem to, for example, air defense suppression and theater air interdiction operations. This would be a single theaterwide system including Soviet and NSWP air defense assets, all very modern and redundant in the senses of C³ engineering and operation. This suprasystem is possible in terms of historical developments, technological abilities, new doctrines and new theater art. The basic theater C³ structures, conceived and implemented by the Soviet high command, are now in place and actually date from the late 1970s.[5]

Using the aforementioned instance of air defense C³, it is not difficult to show, in organizational and operational

terms, how the Eastern European countries vitally contribute to Soviet C³.

Soviet C³

Modern Soviet C³ is nowhere more fully researched and described than in Brigadier John Hemsley's *Soviet Troop Control: The Role of Command Technology in the Soviet Military System.*[6] This study is necessary background to understanding not only the structures and functions of Soviet C³ but also and importantly to understanding command and control (C²) technology in Soviet military forces, called *voennaya sistemoteknnika*. Absorbing this signal work allows the student of Soviet C³ to gain a rich appreciation of the technological aspects of Soviet C³ and thus of the technological (and operational) contributions of the nations of Eastern Europe to all Warsaw Pact C³.

Soviet C³, as it exists through 1990, is the result of a long and arduous development dating from 1956 (the first year of the Soviet Union's 6th FYDP) and running through the end of 1990 in accordance with the Soviet schema.[7] This 35 year period is composed of six successive FYDPs composing two successive 15 year outlooks and preceded by a five year basic research and development (R&D) period (1956–1960), which concentrated on developing modern C³ theory. The essence of the 35 year period is the automation of C³, producing what the Soviets call *avtomatizirovannya sistema upravlenie voiskami* (ASUV), which are automated C² systems. Table 1 summarizes modern C³ development over time.

Five distinct chains occur in Soviet C³: staff, administrative-technical, rear service (logistics and mobilization), political and operational. To some extent, NSWP forces contribute to all five, but most substantially in the staff and operational chains. If the NSWP C³ of air defense were not to be integrated and intermeshed, top to bottom, into Soviet C³, the Soviet Union would be highly vulnerable to wartime theater combat air operations (and to some strategic air operations) of the United States and NATO. The Soviet Union could not hope to hold NATO's air forces at risk without the integrated C³ contributions of the entire Warsaw Pact.

NSWP Contributions

A few representative examples of NSWP contribution to Soviet C³ from scientific, technological and economic planning standpoints follow. Further treatment is given in the December 1985 issue of *SIGNAL* magazine by Ross A. Stapelton and by Dr. John J. Yurechko.[8]

The 12th FYP (1986–1990) covers a crucial period in the political and economic furtherance of the Soviet Union. One of the most striking features of that plan is the scientific and technological acceleration and intensification. Soviet Chairman of the U.S.S.R. State Planning Committee (GOSPLAN) (and Deputy Chairman of the Council of Ministers) Dr. Nikolai V. Talyzin is the first high Soviet official to be an electrical engineer.[9] He was Soviet Minister of Communications in the late 1970s and subsequently the Soviet Union's chief representative to CEMA, 1980–1985.[10] In some measure, the GOSPLAN's chairman can be regarded as the second most powerful official in the Soviet Union. Because of Talyzin's background and qualifications, he is most certainly a personal hallmark of continuing and fruitful Eastern European contributions to Soviet C³.

The new (1986) U.S.S.R. State Committee for Computer Technology and Computerized Information Processing heads the Comprehensive Program of Scientific-Technical Progress of Member Countries of CEMA (SEV) with the goal of "electronification of the economy." This has the most important military C³ implications. East Germany and Czechoslovakia, which are the leading high technology contributors, are joined by Hungarian, Polish and Romanian electrical engineering and computer science enterprises in this amalgamated assault on electronification as part of the 12th FYP and 15 year outlook to the year 2000. The Comprehensive Program includes development of software, personal computer/trainer, user networks, algorithms, microminiaturization of integrated circuits (ICs), exchange of software products and a unified system of communications lines including 1,000 kilometer (km) optical fiber lines and optical fiber data transmission terminal equipment. The Soviet Chairman of the State Committee for Computers notes that 60 percent of SEV resources are to be spent on quality assurance.[11] As in the past, the armed forces will have priority call on these technologies.

A variety of Soviet and East European technical and media periodicals attest to the rapidly expanding development in CEMA of laser based technologies, including laser communications. Other literature points to the arduous development of microelectronic components, including the start up of a center to work on development of flexible automated facilities for producing microcircuits,[12] for example, robotic insertion and manufacture of ICs. Additional CEMA-wide developments for C³ are occurring in artificial intelligence, natural language processing, microprocessor avionics and personal computers.[13]

A recognizable division of effort exists among the East European countries (the silicon satellites) whose high technologies support the Soviet Union's electronification in general and its military C³ in particular.[14] For example, East Germany specializes in the R&D and manufacture of microelectronic components and computer hardware, including main frames and minicomputers. More than half of East Germany's output is exported to the Soviet Union according to bilateral agreements whereby the Soviet Union exports petroleum products to East Germany in payment for microelectronics. Czechoslovakian defense scientists and engineers appear to contribute primarily in the areas of systems analysis, systems architecture and battle management techniques, particularly in strategic defense programs. Hungary's role seems to be one concentrated on software development. Hungary also is the Eastern bloc's leader in the production of personal computers. Bulgaria is East Europe's primary producer of computer disks (and industrial robots). Romania has not been a contributor in any significant domain. Poland, once a main frame producer, has fallen off sharply in its ASUV contributions. (In the 1970s, Poland produced magnetic tape reader heads, which were superior to those produced in the Soviet Union.) Thus, East Germany, Czechoslovakia and Hungary really are the main Eastern European contributors to Soviet and Warsaw Pact-wide C³. Overall, civil and military, East Germany is involved in more than 600 CEMA projects of scientific and technical cooperation, 80 percent of which include the Soviet Union.[15]

During the period when the 12th FYP was being prepared, July 1984 through December 1985, one could begin to see the prospects for change and continuity in Eastern European contributions to Soviet C³. For example, a two day meeting of the CEMA Standing Committee for Cooperation in the Radio-Technical and Electronic Enterprises, held in Budapest, Hungary, in October 1984, gave primary attention to the development of a uniform

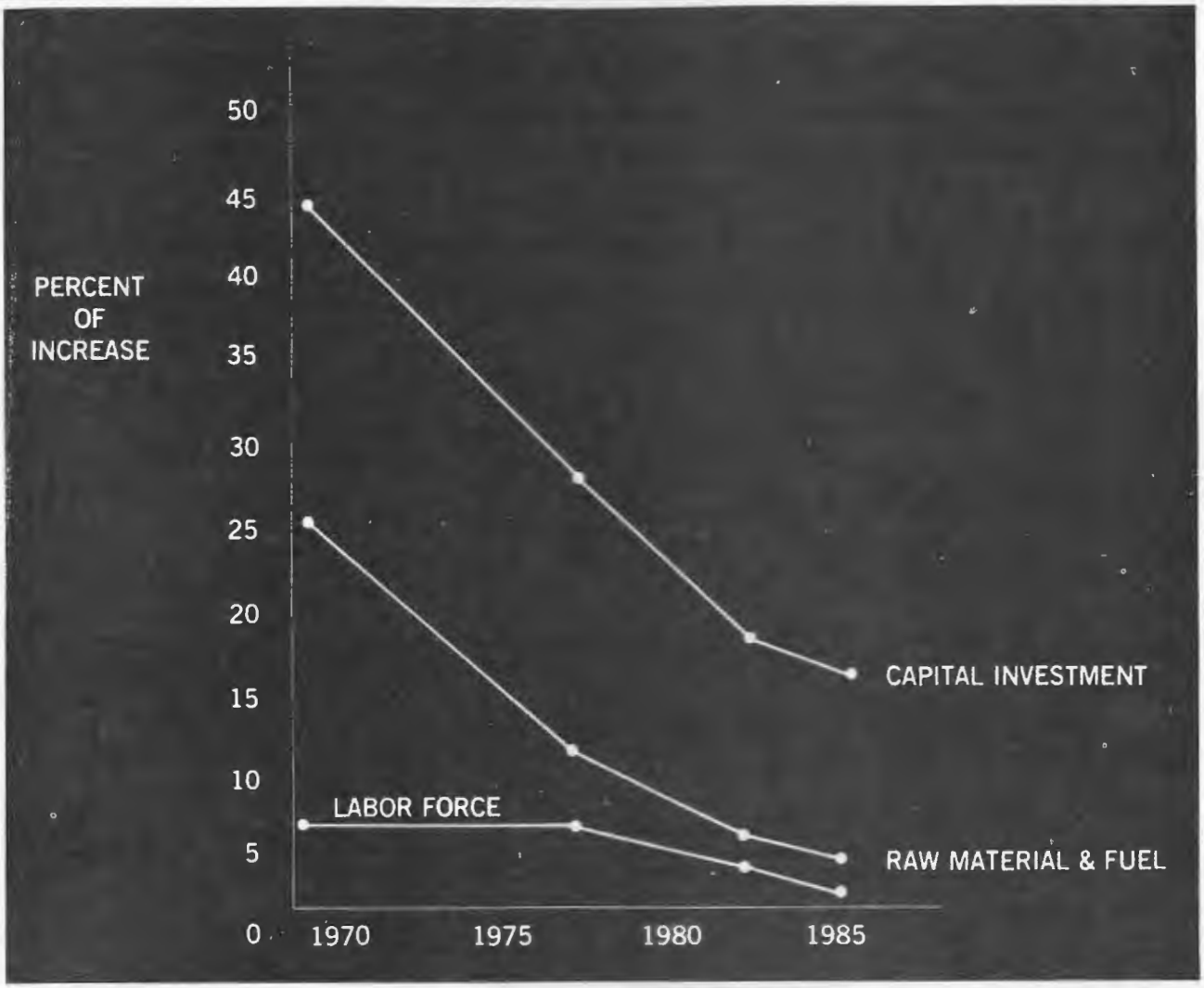

Figure 1. Rate of Soviet economic outputs 1970–1985.

switching system and digital transmission technology and the development and production of very high frequency (VHF) networks.[16] CEMA deliberations during that period show the criticality of the current FYP to further development, according to *Pravda*, the daily newspaper of the Communist Party of the Soviet Union (CPSU). "The next five year plan must be a turning point in this respect."[17] An August 1985 article in *Red Star*, the daily Soviet armed forces newspaper, said, "Today approximately 80 percent of microelectronics products are of constant exchanges on the CEMA market. In the next five year plan, electronic goods, computer technology and means of communication will account for 15 percent of the total volume of reciprocal deliveries of machines and equipment between the Soviet Union and the European CEMA countries."[18]

The advantages of Eastern European contributions to Soviet C^3 include the important factor of standardization and commonality of equipment operation, maintenance and training. Communist press reports of military command post exercises and field training exercises show this advantage. Another advantage is in the export of common C^3, security and weapons systems to Third World client states, an area where the Soviet Union dominates 90 percent of deliveries of systems whose sophistications owe much to Eastern European ingenuity.

Problems with Progress

All is not well, however. Very large problems plague the CEMA/Warsaw Pact cooperation of military C^3 development. Perhaps the basic question is: Can this tightly meshed international entity succeed technologically and operationally by the year 2000? In technological terms, Warsaw Pact C^3 trails Western developments by at least five years. CEMA, like the Soviet Union, espouses economic autarky, but its monetary and technological indebtedness is vast. (For example, a Soviet manpack radio, which is manufactured in GDR, is copied from RACAL's TRA-931 and contains Western made components.)[19] The long-lived monetary indebtedness became exceptional in the mid-1970s.[20]

Several months ago, LTGen. William Odom, USA, Director of the National Security Agency (NSA), and Dr. Dale Herspring of the State Department and Georgetown University's faculty, pointed to a "decline in the quality and reliability of . . . Warsaw Pact allies and a need to modernize equipment [that] is making it difficult to inte-

grate Soviet and Warsaw Pact forces. . . . "[21] Gen. Odom said that Soviet modernization problems seem to stem from an inability to match U.S. high technology systems and concepts in sensors, weaponry and strategic defense. He said that future Soviet military success may hinge more on arms control agreements than on besting the United States in the technological race. These experts suggest that the Soviets may now be so cautious about potential future warfare in Europe that they are preparing to fight independently of their Eastern European allies.

Soviet arms control demarches in 1986 imply that the Soviet leadership prefers a level of agreement over headlong, continued military competition. Several Soviet open statements strongly suggest that Soviet military scientists and senior staff appreciate the U.S. potential for technological superiority in the C^3 of strategic defense systems. A mid-1986 Soviet military statement called for limitations on the development of high technology conventional armaments in Europe.[22]

Over the past three years, some Soviet military writers have suggested that ASUV systems for C^3 are not catching on. These writers speak of frequent reluctance of Soviet commanders and their staffs to use, or to learn to use, the computer based systems for C^3 and planning. These numerous complaints suggest serious man-machine interface deficiencies in ASUV.[23]

In 1984, the Soviet armed forces finally replaced their primer on military strategy. It had been V.D. Sokolovskiy's *Military Strategy* (1968). The new work, Gen.-Col. M. A. Gareyev's *M.V. Frunze: Military Theorist*, is a more modest and scholarly book than was Sokolovskiy's. It emphasizes technology in general and training and automated C^3 in particular.

In line with this, the three dominant properties of the 12th FYDP appear to be emphasis on training, automation of C^3 and zero defense growth. It is difficult to ascertain which of these has the most extensive impact on the future.

Training

The Warsaw Pact military training theme for this FYDP (1986–1990) appears to be simply one of training to no particular end except that of general proficiency and readiness. For commanders, the emphasis appears to be on initiative, creativity and acceptance of and performance on ASUV. Spectacular themes of previous FYDPs, such as prolonged conventional warfare, theater nuclear warfare, wars of national literation and intercontinental nuclear war, appear to be missing from this current FYDP. Does this mean that the achievements of previous exercises can last for a decade, or does it mean that a new and quizzical period of retrenchment and consolidation has been entered?

Drawing from the Air Force Intelligence Service (AFIS/INOI) report, one can anticipate that C^3I training emphasis will be planning and directing conventional combat with the potential of nuclear war as a backdrop. In other words, one can expect a honing of existing architectures throughout the Warsaw Pact.

At the beginning of the 12th FYP, the commander in chief of the Soviet navy said that the theme of the 12th FYDP (as approved by the 27th Party Congress) is "questions of organization and training of people and the activation of the human factor. . . . " He said that the process of C^3 will be further automated, that commanders and staffs must learn to use ASUV and that Soviet fleet training will focus on operational-tactical perfection.[24]

As commanders and their staffs become more facile with the present level of automation imbedded in C^2 nodes through increased operational exercising and technical training, improved ability to focus resources, reconstitute forces and modify battle plans spontaneously is likely. The impact on Western forces will be that the historical indicators of a particular activity may not be as prevalent or may take a different form, confounding the intelligence process and bemuddling response selection.

In a July 9, 1986 interview, Gen. I. Shkadov, Soviet Deputy Defense Minister for Personnel, discussed the CPSU Central Committee draft, "Basic Guidelines for the Restructuring of Higher and Secondary Specialized Education in the Country." The essence of the discussion was that both military and civilian training are receiving very high attention, which is resulting in the restructuring of approach and content. Increased use of automation training will occur at all levels (enlisted, mid-grade officers and flag rank officers).[25]

Automation

If automation of ASUV is underway, one can conclude that, from the Soviets' perspective, the C^3I structure is stable. This could mean that roles and missions have been determined, resources identified, weapons systems assigned and command relationships established. This is certainly the case with the NSWP countries whose military resources have been fully integrated into all phases of planning and execution.[26]

One can conclude, based on Western experience, that automation of the Soviet C^3I process will create an environment conducive to rapid architectural changes. Automation seems to beget more automation. Increased flexibility enjoyed by commanders using automated C^2 systems invokes a need for more flexibility, data, performance and precision. The West is in a constant state of upgrading C^3I facilities to improve C^2 by some unquantifiable degree. The Warsaw Pact will probably have a similar experience. As it becomes aware of the data production potential of highly automated intelligence sensors, for example, there will be a corresponding need for increased processing in order to reduce the data to information and move the information to appropriate decision nodes. Moving the data will, of course, impose a requirement for more efficient communications systems. Once the new-found information is at the decision node, improved processing and decision aid techniques will be needed to manage the increased flow and to meet the timeliness requirements of a dynamic battle environment (for example, real time targeting). It is questionable whether any true improvement in C^2 capability will be achieved.

Zero Growth

Soviet statements, as of mid-1986, have begun to suggest that the 12th Soviet FYP is one of zero growth (or even negative growth) in the Soviet defense budget. Evidence indicates that the Soviets intend to invest only in R&D and operations and maintenance (O&M).[27] Soviet statements about defense decisions and directions for this FYP are lacking singularly in mention of quantitative growth. They are characterized by conditions of maintaining parity (rather than material improvements) and of holding the line and preserving the gains of the past. For example, "The policy of our Party and the Soviet State in

the area of national defense is . . . absolutely clear . . . everything necessary for an effective defense and nothing more than that."[28] If the theme of the 12th FYDP is one of proficiency and readiness training (rather than mission training), it implies drawing only on O&M resources, not on force structure improvement resources, which may have been fixed therefore at the same or a lesser level than those of the 11th FYDP (1981–1985). Rebecca Strode has examined this less-than-obvious phenomenon, showing overall flat procurement and absolute reductions in the budgets for strategic offensive and air defense forces.[29] A zero growth Soviet defense budget through 1990 corresponds with the themes of the Soviet Union's national economic plan through 1990. If a separate account exists for C³ in the Soviet defense budget, as evidence suggests, it may also have been flattened.

Soviet budget constraints are a result of severe decline in the rate of growth of human resources, raw materials, fuel and capital investment (Figure 1). These resource constraints have forced the Soviets to achieve their planned objectives through a policy of intensification. Improvements in training and training techniques are one way to intensify with minimal capital investment. A more strategic approach in intensification can be seen in the increase in production of robotics (1,400 units in 1980 to 15,000 units in 1985). Assuming constant R&D levels and successful automation of defense industry, it is conceivable that, within the next FYP (1991–1995), the Soviets will be able to field newly developed weapons and their supporting systems at a higher level and at an improved resource expenditure rate.

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Notes

[1]The interesting details cannot be treated fairly in such a short article. Among Erickson's analyses on Warsaw Pact C³ is his "Some Observations on the Warsaw Pact," NATO Workshop on Political-Military Decision Making in the Alliance, June 14–17, 1986, Winston House, Steyning, Sussex, United Kingdom.

[2]Jeffrey Simon, "Evaluation and Integration of Non-Soviet Warsaw Pact Forces into the Combined Armed Forces," *SIGNAL*, December 1985, pp. 45–65, and *Warsaw Pact Forces: Problems of Command and Control* (Boulder: Westview Press, 1985) 246 pp.

[3]Simon, *Warsaw Pact Forces*, p. 2.

[4]Jan Sejna and Joseph D. Douglass, Jr., *Decision-Making in Communist Countries: An Inside View* (Oxford: Pergamon-Brassey's, 1986), p. 70.

[5]Among the several treatments of the new Soviet theater and supreme high command is the U.S. Air Force publication (AFIS/INOI—Intelligence Research Division, "Soviet Theaters High Commands and Commanders," March 14, 1986.

[6]John Hemsley, *Soviet Troop Control* (Oxford: Brassey's, 1982), 276 pp. See review by J. T. Westwood, *Journal of Electronic Defense*, November 1983, pp.60–61.

[7]This material is adopted from an earlier research study (1984) by J.T. Westwood of naval command, control and communications countermeasures and is printed in an E-Systems, Inc., document.

[8]Ross A. Stapleton, "Soviet and East European Microcomputer Systems,"*SIGNAL*, December 1985, pp. 69–76, and John J. Yurechko, "Command and Control for Coalition Warfare: The Soviet Approach," pp. 31–41.

[9]The majority of all senior U.S.S.R. officials, party and government, are formally trained and qualified engineers. This includes the military leadership. For example, MSU N. V. Ogarkov, former Chief of the General Staff and now the Deputy Supreme High Commander, is a C³ engineer in cybernetics.

[10]"Gorbachev to the Year 2000," *Soviet Analyst*, October 23, 1985, pp. 1–2.

[11]"Officials View Bloc Cooperation in Computers, Communications Equipment," *Socialist Industry*, May 21, 1986, p. 3.

[12]"Microelectronics Center at Electrical Engineering Institute," *Leningrad Pravda*, June 6, 1986, p. 3.

[13]*Soviet Belorussia*, May 8, 1986; *Economics Gazette*, April 1986; *Problems of Research*, April 22, 1986; *Air Transportation*, May 27, 1986.

[14]Frederick Kempie, "Silicon Satellites," *Wall Street Journal*, September 16, 1985, p. 76C. Tom Diaz, "Czechs Provide Brains, ICBM Sites for Soviets," *Washington Times*, November 11, 1985, p. 2A; John Krammer, "Soviet-CEMA Energy Ties," *Problems of Communism*, July-August 1985; David Harvey, "Is the U.S.S.R. Missing the Real Revolution?" *Journal of Defense and Foreign Affairs*, March 1985, p. 31.

[15]Guenter Mittag, "Thirty-five Years of the GDR Fraternal Alliance with the USSR," *Economics Gazette*, October 1984, p. 20.

[16]Radio Budapest, October 9, 1984, 1712 GMT.

[17]"Internationalism in Action," *Pravda*, June 15, 1985, p. 4 (editorial).

[18]Yu. Sinyakov, "Horizons of Integration," *Red Star*, August 27, 1985, p. 3.

[19]"Warsaw Pact Arms Agreement Nearly Doubled Value in 1983," *Aviation Week and Space Technology*, April 29, 1985, p. 213.

[20]For example, see Dan Morgan, "Russia, Allies Deepening Debt to West," *Washington Post*, October 15, 1977, p. A7, and Richard Portes,"East Europe's Debt to the West," *Foreign Affairs*, July 1977, pp. 751–782. More recently, see "Soviets, 9 Allies Seek to Up-grade Economics," *Washington Times*, December 19, 1985, p. 6A; Jackson Diel, "Bulgaria Beset by Economic Woes," *Washington Post*, November 8, 1985, pp. A1, A42; Roger Fontaine, "Cuban Debt Woes Show Island Sinking," *Washington Times*, July 9, 1986, p. A1.

[21]Walter Pincus, "Experts Tell of Soviet Arms Woes," *Washington Post*, February 14, 1985, p. A23.

[22]Gen.-Maj. V. Makarevskiy, "A Military Scientist's Opinion: In the Interests of Europe and the World," *Red Star*, June 24, 1986, p. 3.

[23]An example is "Tasks for Extending Computer Skills in the Military," *Red Star*, May 13, 1986, p. 1.

[24]Adm. N. V. Cheravin, "The Navy: The 27th Party Congress," *Naval Digest*, January, 1986. This reference to "operational-tactical" fleet training is very significant because it means ranges from bases not greater than 500 kilometers.

[25]"Military Education: Paths of Restructuring," *Red Star*, July 9, 1986, p. 2.

[26]Op. cit., "Evaluation and Integration of Non-Soviet Warsaw Pact Forces into the Combined Armed Forces," Dr. Jeffrey Simon, *SIGNAL*, December 1985, p. 45.

[27]"Realities of Gorbachev's Economic Program," Boris Rumer, *Problems of Communism*, May-June, 1986, p. 20.

[28]Gen.-Maj. S. Tyushkevich, "One of the Most Important Functions of the Popular State," *Political Self-Education*, January 1986, p. 36.

[29]Rebecca Strode, "The Soviet Armed Forces: Adaptation to Resource Scarcity," *The Washington Quarterly*, Spring, 1986, p. 55.

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Speculations on Soviet Responses to SDI

By Dr. Sayre Stevens

The anticipation of Soviet responses to a U.S. decision to deploy defenses generated by the Strategic Defense Initiative (SDI) in the 2000 to 2010 time period is speculative and subject to a wide range of uncertainties: political initiatives and decisions, technological progress and the world environment at the time of deployment. Moreover, there are substantial gaps in the United States' understanding of Soviet attitudes and reactions to SDI, despite extensive press coverage of a defensive program within the Soviet Union.

SDI program reviews and funding decisions will occur frequently, therefore SDI effectively will be held at continuous risk. As long as the Reagan Administration maintains its commitment to the program as shown during the Reykjavik summit, SDI will survive. But each presidential election between the years 1988 and 2000 offers a real possibility of basic policy change.

For their part, the Soviets will watch all of these milestones and tailor their responses accordingly. The formulation and execution of Five Year Plans drive the Soviet weapons acquisition decision and implementation process. Thus, Soviet decisions will be constrained to the planning windows associated with this five year cycle. Moreover, Soviet programs are subject to review and revision as well, though in a substantially different sense than U.S. programs because of their limited technological reach. Nevertheless, economic pressures will complicate Soviet program delineation and heighten internal competition for resources. These complications make charting a course through the turn of the century extraordinarily difficult.

Assumptions

In these circumstances, some explicit assumptions must be made about the setting in which SDI deployment will occur and Soviet responses will emerge.

- U.S. SDI research and development will lead to initial deployment of an operational system in the 2000 to 2010 time period. At least some space based ballistic missile defense (BMD) components will be involved. The deployment decision is likely to be made in the belief that the criteria articulated by U.S. arms negotiator Paul Nitze—effectiveness, survivability and defensive economic advantage at the margin—ultimately will be met, even though not at the time of deployment. The decision almost surely will be accompanied by a public debate with no conclusive results. In short, the deployment decision, even if soundly made, will not establish the long-term efficacy of SDI, or the feasibility of achieving its visionary goals.

- Neither accommodation through an arms control agreement on BMD development based on other physical principles nor the resolution of differing interpretations of development prohibitions in the Anti-ballistic Missile (ABM) Treaty will have occurred prior to deployment. Efforts to persuade the Soviets to join in a cooperative effort will have failed. There will be no mutually accepted road map for a transition to the preeminence of the defense. Other more hopeful scenarios are possible but less likely.

• The Soviets will have made every effort to halt, delay or constrain significantly SDI with little success while simultaneously exploring military responses.

• The United States will find it appropriate to retain strategic offensive weapons through this period.

• U.S. allies will have become participants in the program in varying degrees, motivated largely by the possibilities of technology transfer rather than the commitment to the millenarian appeals of SDI. They will be anxious about the failure of arms control efforts and the dangers of actual U.S. deployment.

These assumptions do not portray an altogether appealing situation. They do not promise an easy transition to a world of defensive deterrence and are not without dangers. But they are not inevitable either. These assumptions are the likely outcome of the current course of events given the early deployment of SDI, an assumption that basically defines the projection being made.

Determinants of Soviet Response

A number of factors are likely to shape the ways in which the Soviets will react to the challenge of SDI. A key determinant will be the Soviet conception of SDI and its implications to the national interests of the Soviet Union and to the institutional interests of the policy makers involved.

Political doctrine and foreign policy lines are particularly important because they affect Soviet appraisals of the utility of political attempts to stop, delay or constrain significantly SDI. Policy options are developed in the Soviet system by a political leadership responsible for charting a course that avoids the outbreak of nuclear war and exerts Soviet influence in key situations and areas throughout the world. SDI significantly affects both tasks.

A further determinant is military doctrine, which serves as the calculus by which the cost and benefits of an array of specific military responses will be appraised. These doctrinal guidelines are particularly important in defining those military missions that are key to enable the military to cope with general nuclear war, should it occur.

The ultimate determinant is the Soviets' own appraisal of their ability to support various response options. Particular areas of concern involve military, economic, technological and weapons acquisition capabilities as the Soviets face up to the specific requirements of coping with SDI.

Soviet Perceptions of SDI

The Soviets indicate that SDI threatens important political objectives. They fear a direct challenge to the Soviet Union in an area that has been key to their international growth: The Soviet Union's image as an unquestioned superpower, largely based upon its growing military strength. SDI threatens the credibility of this military accomplishment. These military achievements represent the means whereby key political objectives can be pursued around the world. At the worst, SDI threatens a form of international humiliation, something about which the Soviets are extremely sensitive.

Military perceptions are pragmatic and more directly deal with the military effects of a successful SDI on the balance of Soviet and U.S. forces. Unquestionably, the Soviets have serious concerns about the reemergence of U.S. strategic superiority based on revolutionary defenses and the offensive force improvements now underway. Soviet press commentary equates this superiority with the U.S. ability to carry out with impunity a first strike against the Soviet Union.

The change of ground rules embodied in SDI vastly complicates the Soviet problem. For the Soviet military, uncertain U.S. defensive developments confuse and complicate developing and maintaining the capacity to deal with the contingency of nuclear war. This is particularly troublesome in the Soviet system, where long-range planning is the rule, and relatively long times are required to make changes in the acquisition of forces and new weapon systems.

Moreover, the implications of attaining SDI threaten an end to the currently successful Soviet approach to the acquisition of military forces: the accretion of capability over time with low technical risk and the maintenance of formidable forces. One of the greatest appeals of SDI is its potential to leap-frog the current state of weapons development, making it possible to deal with the strategic confrontation in totally different ways. To meet this challenge, the Soviets must be prepared to pursue the rapid incorporation of advanced technology weapons systems and to abandon older systems rendered ineffective by SDI.

Persuasive evidence exists that the current Soviet regime is sensitive to current economic difficulties and the need to find remedies. If so, this suggests a strong Soviet interest in reducing military expenditures and reallocating the resources to other economic objectives. There are some indications that the Soviet Union has made such cuts starting with the 10th or 11th Five Year Plan. Responding to SDI in a vigorous way surely will have great consequences in the allocation of scarce resources. To economic planners, SDI would be a substantial threat to efforts toward economic repair.

Doctrinal Imperatives

Soviet national security policy is bifurcated: The military must prepare for war and maintain a capability to fight and survive should it occur, while the political leadership must create policies intended to prevent war and limit the threat to Soviet national security through political means. The trick is to accomplish these objectives while pursuing other Soviet political objectives that tend to draw the Soviets into confrontation with the West. Historically, an image of military power has been an important means to these political ends.

The task for Soviet political leadership is to find the political means to eliminate the threat posed by SDI, or should that fail, restore the foundations of power that are threatened by successful U.S. SDI development. Apparent Soviet readiness at Reykjavik to accept deep reductions—and possible elimination—of key offensive systems reveals the high importance of halting SDI through political means. But dimensions for pursuing the latter other than through military accommodation appear to offer little promise. Weapons that might be sacrificed to eliminate SDI are apt to become more important in its presence.

Military doctrine becomes an important factor in guiding military responses to the development of SDI. President Reagan's SDI undertaking challenges a Soviet doctrinal belief in the dominance of the offense in confronting the defense. Soviet doctrine is not dogmatic in taking this position but generally finds that in the circumstances of nuclear war, the offense is likely to dominate. SDI achievements in the next 20 years are not likely to reverse this view. Moreover, Soviet doctrine gives particular importance to disrupting the ability of the enemy to function and respond during those phases. It is a mission peculiarly suit-

Ballistic Missile Early Warning, Target-Tracking, and Battle Management Radars

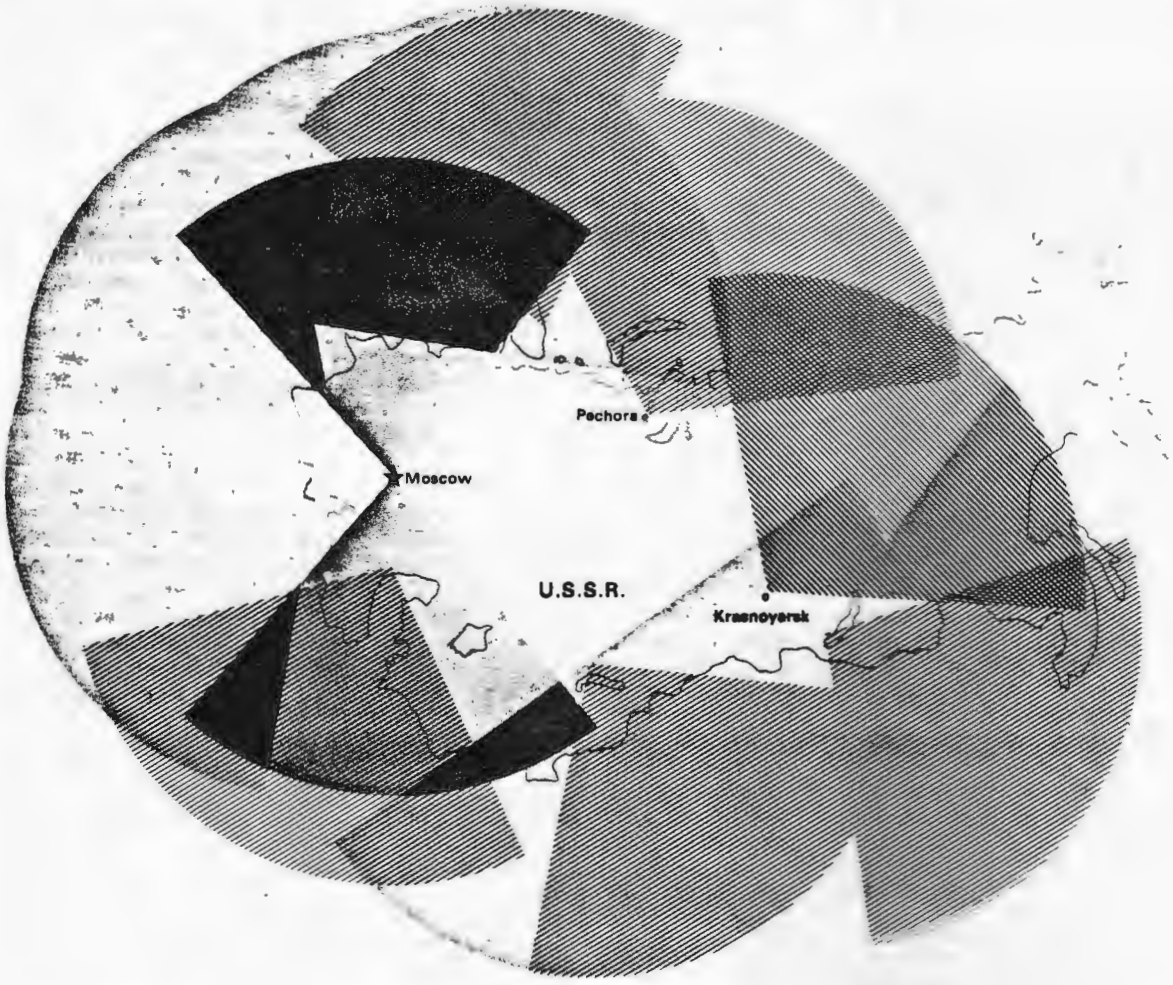

Figure 1. Overview of Soviet radar coverage.

ed for ballistic missiles. Thus, Soviet doctrine is apt to generate an immediate urge to strengthen those forces and to augment them with realizable countermeasures and accommodations to the technical military challenge of SDI.

Soviet doctrine calls for the coordinated use of all forces. Thus, as the United States has relied on the nuclear triad to make its strategic offensive forces richer and more robust, the Soviets have relied on the interactive use of a whole range of weapon systems to carry out their critical missions. This doctrinal stance suggests that the Soviet response to SDI will encompass the spectrum of all relevant weapons systems. Consequently, it appears unlikely that the Soviets will put full reliance on changes made to one particular type of weapon system.

The extension and improvement of Soviet strategic defenses will almost certainly be included as a part of the Soviet response to SDI. Despite a doctrine of offensive dominance, strategic defenses are seen as necessary during nuclear war. The Soviets, through their sustained investment in both active and passive strategic defenses, have been faithful to this precept and have shown appreciation for even partially limiting nuclear damage. Thus, the Soviets have relied on active defenses to provide protection against aerodynamic threats. They have deployed an ABM system to provide a limited defense against limited ballistic missile attack; they have established passive defenses to protect selected elements of the system; and they have developed the capability to undertake counterforce strikes against U.S. strategic nuclear weapons. Figure 1 shows the radar facilities used in Soviet efforts. Damage control will be a likely attribute to the overall Soviet SDI response.

Soviet Ability to Respond

Though the Soviets will have failed to halt SDI if first deployment occurs

in the 2000 to 2010 time frame, they still can take action to constrain SDI to more acceptable levels and to delay the process of system deployment. Arms control imperatives will have wide appeal throughout this period.

The Soviets have been insistent that arms control agreements are key to the preservation of peace. This line has had strong appeal in the West. Pressures for reestablishing mutually agreed constraints on military forces can be expected from Western populations and organizations as well as from other states and international organizations. The Soviets have succeeded in manipulating desires for arms control agreements to pursue broader objectives, such as weakening NATO's cohesiveness.

Under some circumstances, the Soviet political leadership might prefer to join the United States in a bilateral SDI rather than to pursue a competitive unilateral program. Such an arrangement would avoid much of the harsher technological challenge, would resolve many of the uncertainties about SDI and would provide the Soviets with some ability to affect the pace and direction of the program. But this is a difficult and unlikely step to take when the long-term pay-offs of SDI remain uncertain; when U.S. purposes and intentions are viewed as innately hostile; and when the patronizing offer to share technology is made to a political leadership preoccupied with maintaining a world image based on military technology and power.

Despite apparent Soviet desires to reduce or at least contain military expenditures, it is difficult to identify specific economic constraints that will affect Soviet responses to SDI. Real economic problems do exist, and the pressures to reduce military resources must be strong, but they will not prevent the Soviets from responding to SDI. The Soviets probably will do what they have done in the past: spend money and allocate scarce resources to meet their military requirements. The costs will be borne through the use of funds that might have been spent on other investments and economic sectors, but there is a long history of such behavior.

Although the Soviets have experienced difficulties in meeting the technological challenges associated with SDI, efforts are underway to improve the process of applying advanced technology to weapons systems. On the one hand, the defense technology of the Soviet Union is a model for other parts of the Soviet economy to emulate. On the other hand, there remains dissatisfaction with the exploitation of research and development (R&D) and its introduction into the weapons acquisition process. In general, Soviet acquisition policy limits technological risk through evolutionary weapons systems development that accretively enhances Soviet capabilities. But success in countering SDI poses a serious technological challenge: The transfer of R&D into technology for weapon systems must be successful. For many years, the Soviets have attempted to deal with this problem but with limited success. Systematic exploitation of technology transfer has helped but does not relieve the need to solve basic problems.

This situation suggests that the Soviet Union may follow the United States in SDI but at some distant time. However, programs pursued with characteristic intensity and persistence may introduce elements of a system significant to the strategic balance. The technology needed to deal with initial SDI deployment certainly is within reach of Soviet scientists and engineers.

The Soviet Union has a vigorous, persistent and low risk weapons acquisition capability to incorporate advanced technology. Weapons development is based on a planning process that tends to be rigid and hierarchical, and it involves the interaction of customers, developers, producers, suppliers and other infrastructural elements. But the process more than makes up for this shortcoming by generating a persistent program of force extension and enhancement. These peculiarities of the Soviet acquisition process have some disadvantages in rapidly fielding high technology responses to SDI, but give the Soviet Union significant advantages in pursuing distant and uncertain goals, such as SDI.

Specific Responses

A formidable set of Soviet military forces capable of coordinated use now exists to make a military response to SDI. However, this configuration also would create inertia and would have its own institutional imperatives in competition with responding to SDI. Thus, it will not be easy for the Soviets to make substantial changes quickly.

A single, grand counter to SDI is not likely to constitute Soviet response. It lacks the reliability and certainty of effect that the Soviets traditionally seek through their use of coordinated forces, and it would be difficult to define in this early time period. As a result, moderate responses in the form of gradual modifications of the current force structure are the most likely scenario.

Land based intercontinental ballistic missiles (ICBMs) have long constituted the heart of Soviet strategic offensive forces; the Soviets will be reluctant to abandon them. Overwhelming an early SDI system with offensive missile forces will be an attractive approach for some time; moreover, uncertainties about SDI will make it a prudent course to follow, particularly when the United States maintains its own offensive missile forces. Thus, in the period of first U.S. deployment of SDI elements, it is likely that the United States will face more rather than fewer ICBMs. New ICBMs are likely to be deployed that stress mobility to deal with improved U.S. capabilities to attack hard targets, but older systems are likely to be retained and improved as well.

If the Soviets are going to pursue this strategy, they must take the steps needed to add ICBM countermeasures to halt penetration by SDI systems. This task will be made difficult by the lack of the system's early definition. Fine tuning to ultimate architectural design and choice of sensor systems will not be possible much before the year 2000; broad experimentation and general approaches to develop a wide range of countermeasures will be required for some time.

The Soviets almost certainly will retain their commitment to submarine launched ballistic missiles (SLBMs) with follow-on systems to those currently deployed. The use of depressed trajectories by ballistic missile submarines may be a promising ploy for use against an eventual SDI system because of the limited amount of time it allows for decision making and the shortened period of vulnerability of the SLBMs to defensive action. These weapons will benefit from the development of ICBM countermeasures.

The Soviets already have an energetic program of cruise missile development to employ cruise missiles to cover a larger number of strategic missions. The Soviet cruise missile program represents the newest stage in the steady and gradual improvement of a particular class of weapon systems over many years. Though an SDI counter to the cruise missile

threat is promised, it has not yet become the focus of significant effort in the program. The absence of conventional air defenses in the United States argues for stockpiling cruise missiles.

Peripheral attack forces surely will continue to receive a good deal of attention, particularly those forces committed to confronting NATO. Some improvements are likely to be made in response to promised SDI NATO defense; mobile intermediate range ballistic missile forces are likely to follow the course of the ICBMs and SLBMs.

Since the signing of the ABM Treaty, the Soviets have maintained a steady R&D program for new ballistic missile defenses within the constraints of the treaty. Soviet R&D activities have succeeded to the point that deployment of a BMD system (after the conclusion of the ABM Treaty) now appears possible. The Moscow ABM system, which became operational shortly after the signing of the ABM Treaty, now is undergoing major modification and improvement. Insofar as conventional BMD development is concerned, the Soviets appear to be able to begin the substantially broader deployment of defenses whenever they choose to do so.

There is no evidence, however, that they are ready at this time to take such a step. Indeed, SDI appears to have made them more stalwart proponents of preserving the treaty and gaining the protection of its provisions. Should erosion of the treaty continue, it is likely that the Soviets will move to capitalize on their advantage of being able to put systems into the field more quickly. A Soviet BMD employment probably would first involve the strengthening of defenses in the Moscow area and the deployment of interceptors in larger numbers than currently allowed by the treaty, followed by the deployment of systems to provide protection of military and industrial centers in the western Soviet Union. Ultimately, a nationwide system of terminal defenses could be established. Work on conventional BMD systems has been accompanied by the investigation of weapons based on other physical principles. Both ground based and space based weapons reportedly are under investigation. The new systems include laser and particle beam weapons systems, advanced kinetic energy weapons and weapons using radiofrequencies at high power as the kill mechanism. Substantial work has been done to develop space systems suitable for robust orbital operations. In short, the Soviets have been conducting a low profile but vigorous investigation of the technologies needed to move their own strategic defenses to a new level of capability.

The Soviets enjoy some significant advantages over the United States in undertaking an SDI-type program. Their doctrine of damage limitation makes it possible to develop and deploy elements that are more easily achievable and to justify those developments in terms of their contribution to a much larger coordinated system. The momentum of the Soviet SDI program is likely to carry it well into the Soviet acquisitions process, and the features of that process will maintain program viability in circumstances that might lead to its abandonment in the United States. It is a worrisome possibility that the Soviets alone might possess deployed SDI defenses while the United States had abandoned its effort.

Current Soviet strategic defenses include antisatellite (ASAT) capabilities, but ASAT offers little promise in dealing with SDI. A substantially different system than the Soviet Union's current orbital interceptor must be developed. Because serious questions about the survivability of SDI exist, it is likely that the Soviets seriously will investigate ways to attack such a defense. They will look for attack scenarios affecting the neutralization of selected system elements, such as battle management and command, control, communications and intelligence (C^3I) platforms, and selected sensor elements that will cripple the use of the overall system.

Finally, consider some more specific political initiatives the Soviets might take. Despite the failure of early efforts to stop SDI, opportunities will arise to slow or constrain the U.S. effort. The Soviets will take advantage of U.S. feelings of culpability for eroding or breaking the ABM Treaty as a result of SDI efforts. The Soviets surely will endeavor to exploit any disagreements among the NATO Allies about the deployment decision.

Thus, a vision of the world in the 21st century emerges in which both the United States and the Soviet Union are engaged actively in upgrading both offensive and defensive weapon systems. In the case of the Soviet Union, the full range of force elements appears to be involved with little constraint on the improvements being made. This is the point of transition if SDI proves to be a success, and it may be one of the more dangerous periods during the shift to defensive systems.

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Technology Transfer: A Personal Perspective

By John W. Kiser III and Susan Helm

Competitive wisdom that the best defense is a good offense appears not to have penetrated yet into the mind set of U.S. technology guardians. If one quarter of the effort invested in protecting technology was expended on reforming the procurement system and exploiting Soviet brain power, the United States might be surprised by the Soviets less frequently. A more accurate assessment of the Soviets' capabilities would advance U.S. security interests.

In the past, the assumption of U.S. technological superiority over the Soviets has placed the United States in some vulnerable situations. A dramatic example was reported in *The Washington Post* on September 21, 1986, in a story on the decade-long underestimation of the state of Soviet submarine technology. Superior Soviet submarine technology came to light in a 1968 undersea encounter when a supposedly obsolete *November* class Soviet submarine kept pace (submerged) with the then newest U.S. Navy aircraft carrier—the *Enterprise*. This alarming discovery of superior power plant technology in older Soviet submarines and potential U.S. carrier vulnerability prompted Adm. Hyman Rickover to pursue aggressively the development of U.S. high speed nuclear submarine technology.

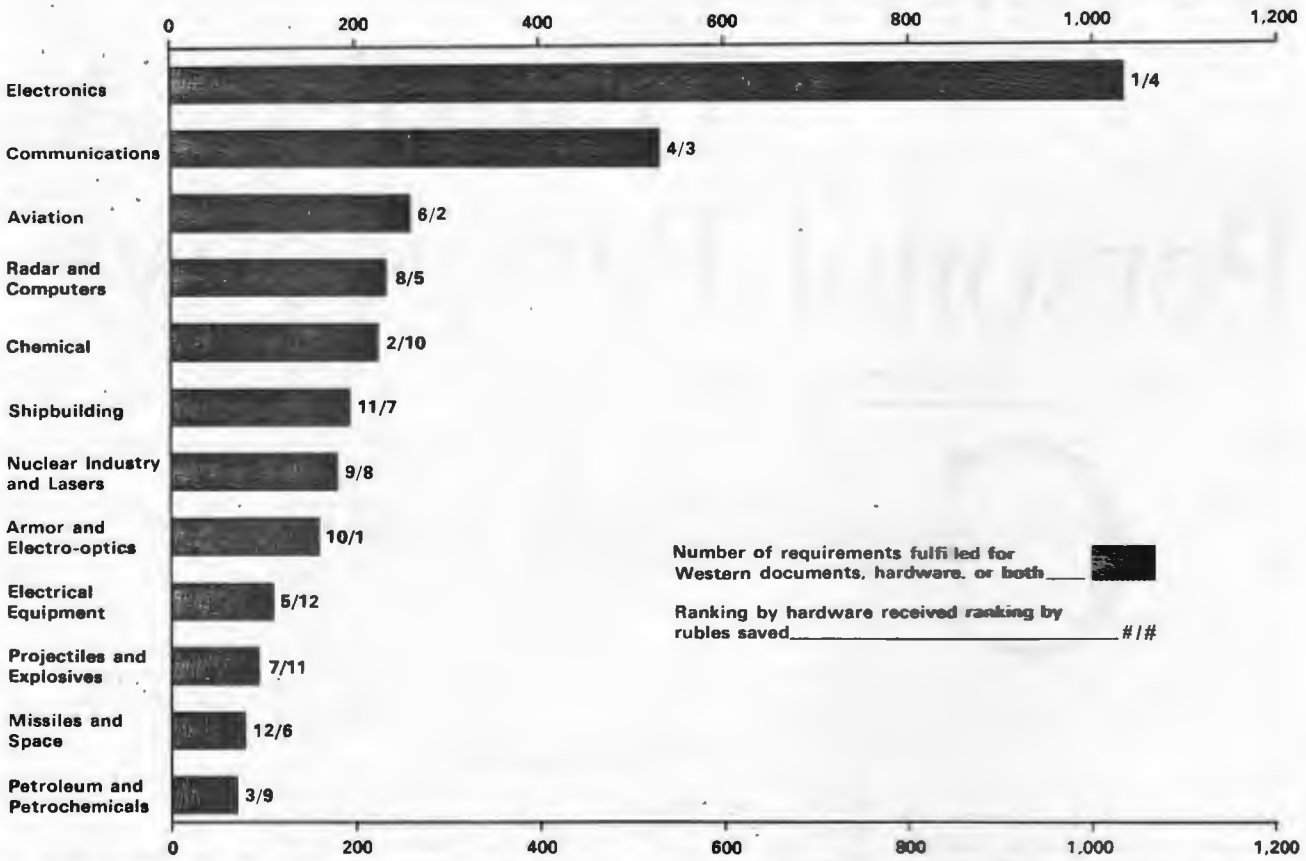
"Rickover . . . reminded the leadership of the Sputnik surprise and warned members [of Congress] about the dangers of complacency in national defense," the newspaper article stated. Does the United States need a Sputnik every 10 years to jolt it out of its complacency?

Underestimations

There is a history of U.S. experts underrating Soviet capabilities. After the United States built its A-bomb, Gen. Leslie Groves, head of the U.S. A-bomb program, said the Soviets would take 20 years to build their own. They built one in five years. They have matched the United States in nuclear submarine technology, multiple independently targetable reentry vehicle (MIRV) warheads and cruise missiles. The easy explanation is that these accomplishments are the result of espionage and copying. Espionage may play a role, but only technologically sophisticated thieves can benefit from high technology secrets.

The U.S. obsession with espionage and theft as a source of, and an explanation for, Soviet technological advances obscures some facts now long forgotten or never widely known. For example, the Soviets were the first to put diesel engines in tanks during World War II; the first to install gas turbine engines in their surface ships; and the

Rank Ordering of Soviet Industries by Military Industrial Commission (VPK) Requirements Fulfilled, by Hardware Received, and by Rubles Saved, 1976-80



About 50 percent of the VPK requirements that were fulfilled during the 10th Five-Year Plan for Western hardware and documents were satisfied on behalf of two defense industries — electronics and communications. These are key areas where the Soviets' need for militarily significant technology and the West's need for better controls are greatest.

The four industries receiving the most Western military hardware and dual-use products were electronics (over 6,000 pieces of equipment, a large percentage involving microelectronics), chemical (almost 4,000 pieces), petroleum/petrochemicals, (over 1,500), and communications (over 1,500) ranked in that order.

The top four industries saving the most rubles in research project development costs in terms of manpower and other resources were the armor and electro-optics industry (almost 20 percent of the 1.4 billion rubles saved in research project costs) and the aviation, communications, and electonics industries. These four industries consistently appear to be the Soviet leaders in requesting, absorbing, and generally getting the most use out of Western hardware and documents. In some cases, such as in the armor area, the Soviets are using Western technology not to catch up, but to enhance a capability that already is equal to or better than that of the West.

SOVIET MILITARY POWER

first to build an all titanium submarine. The ship-launched Soviet Styx missile, which sank the Israeli warship *Elath* in 1968, galvanized the Pentagon's cruise missile development program when it was still mired in bureaucratic infighting.

It is common knowledge, in the directed energy community, that Soviet publications on radiofrequency quadrupole (RFQ) encouraged a major breakthrough in the design of neutral particle beam weapons. RFQ produces a beam of neutral atoms that can travel long distances in space without being deflected by the Earth's magnetic field. The manufacturer of the Grumman EA-6B Prowler used Soviet radio electronic concepts taken out of open publications to improve the aircraft's electronic countermeasures equipment. According to Richard Wohl in the September 1983 issue of *Defense Science & Electronics*, the technology proved highly effective during simulated combat exercises against the airborne warning and control system (AWACS). By transmitting a sophisticated jamming signal, the enemy forces, with EA-6Bs, neutralized the computerized AWACS radar system.

Even in semiconductor technology, where the Soviets are supposedly in the Dark Ages, there is reason for caution. The East Germans have made steady progress in the development of advanced electron beam lithographic equipment. As early as the late 1970s, the East Germans had developed an advanced electron beam lithographic system that could print microcircuit linewidths to 0.5 micrometers (microns). By the early 1980s, the East Germans were capable of producing devices to print lines as fine as 0.1 microns and edgewidths to the order of 0.05 microns. The East Germans also are developing a process to combine the use of electron beam and X-ray beam lithographic techniques. This equipment would enable the Soviets to make microcircuit chips with 1,000,000 gates and a storage density of [illegible],000 bits per square centimeter. The East Germans, then, have approximated the state of the art in the United States.

In the area of laser pulse annealing, the Soviets were the first to publish information on the use of Q-switch lasers for annealing ion implanted silicon chips. The Soviet work subsequently led to an increase in research in laser annealing technology in the United States.

Currently, the Soviets have a strong lead in the area of thin diamond film technology. They have developed a process to deposit an ultra thin film of diamonds on the surface of materials to harden them and impart other qualities. This film deposited on semiconductor chips allows the generated heat to be dissipated by conducting it through the diamond layer underneath the working part of the chip. Vladimir Deryagin began research on thin diamond film technology in the 1970s and published his first report 10 years ago. Unlike Japan, the United States has been slow to pursue civilian uses of the technology.

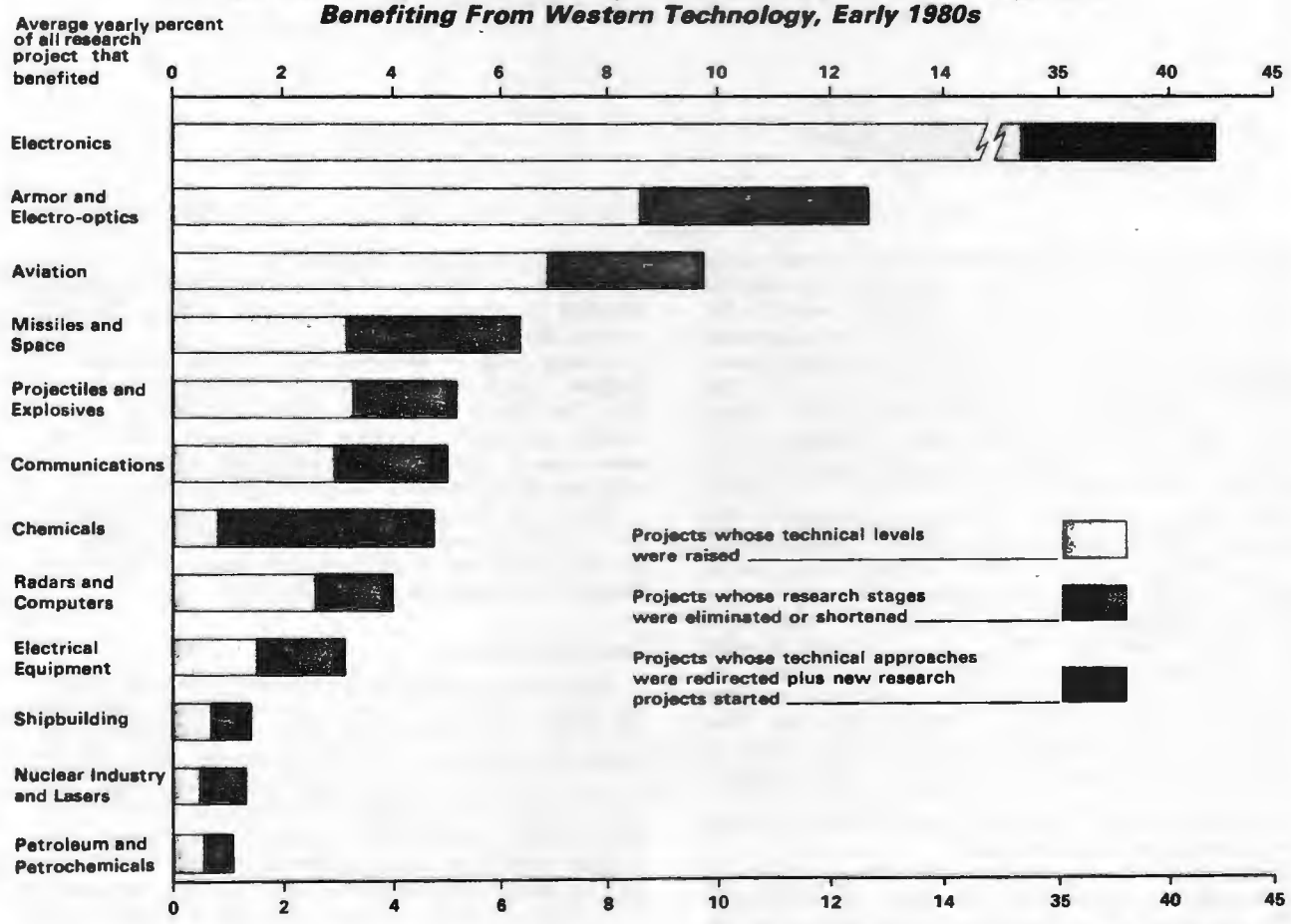
These examples illustrate two points, which some in U.S. industry have already learned. Not only may in-place industrial technology be purchased, copied or obtained otherwise in the Soviet Union, but also the untranslated open literature contains much valuable technological information.

U.S. Benefits From Soviet Efforts

Soviet work also has helped advance the art in the United States in other areas. The first "cold" laser was built by Nobel Prize winner Prokorov as part of a National Institute of Health (NIH) intergovernmental exchange program. YAG lasers are used for treating cataracts and glaucoma. Production technology for vinyl acetate using less expensive intermediates was used by the Dupont Corporation thanks to Soviet open literature leads. Development of ultrasound surgical devices in the United States has been strongly influenced by Soviet work. Electroslag remelting technology for producing high purity alloys used in critical parts is widely acknowledged as benefiting from Soviet art. Lastly, characterization of bismuth telluride as an optimum material for thermo- and photoelectric generators was first described by Russian A. F. Joffe in Leningrad as early as 1942. The U.S. Navy spent millions in vain trying to come up with a better material in the 1950s.

Would the U.S. military have the gyrotron (an efficient high power energy source of millimeter wavelength) without the help of the Soviets? Even though the original work had been supported by the U.S. military, this ceased in

Rank Ordering of Industries by Soviet Military Research Projects Benefiting From Western Technology, Early 1980s



The assimilation of Western technology into Soviet industries conducting military research is considerable. The greatest beneficiaries were the electronics and armor and electro-optics industries, which accounted for over 50 percent (equaling thousands) of all military research projects benefiting from Western technology in the early 1980s.

The general distribution points out the rather broad effect that Western documents and hardware have just on raising the technical levels of Soviet military research. This is particularly true for the top three industries, where advanced technology and innovative design concepts play a significant role in weapons developments.

SOVIET MILITARY POWER

Some Licenses Sold by Soviet Bloc Countries to Non-Bloc Firms

Technology	Buyer
Process for making polycarbonates (USSR)	Montedison (Italy)
In situ coal gasification (USSR)	Texas Utilities Services, Inc. (USA)
Drilling motors (USSR)	Drilex (France)
Methods for treating effluent from production of ion exchange resins (USSR)	Zerolit Ltd. (UK)
Magnetic impact bonding (USSR)	Maxwell Laboratories (USA)
Continuous flash butt welding of large diameter pipe (USSR)	J. R. McDermott (USA)
Electroslag welding (USSR)	Alsthom Atlantique (France)
Air plasma cutting (USSR)	Esab (Sweden)
Electrohydraulic cleaning of castings (USSR)	Mitsubishi Motors (Japan) Tellus Maskin (Sweden)
Moulds for automated investment casting (USSR)	Rolls Royce (UK)
Graphite moulds for titanium casting (USSR)	Fratelli Arsenigo (Italy)
Electromagnetic casting of aluminum (USSR)	Kaiser Aluminum (USA) Reynolds Aluminum (USA) Alcoa (USA) Mitsubishi Chemicals (Japan) Alusiusse (FRG) Pechiney (France)
Ethnozin, cardiovascular agent (USSR)	Dupont (USA)
Biodegradable polymer implant (USSR)	Diversified Technology (USA)
Surgical stapling devices (USSR)	U.S. Surgical Corp 3M (USA)

Table 1.

about 1965 as both the government and the private sector failed to recognize the gyrotron concept as an effective source of millimeter wavelengths. However, work by the Soviets continued under A. B. Gapanov, who reported achieving kilowatt levels of pulsed and continuous wave millimeter wavelength power from the gyrotron. The Soviets' published information included a drawing, which was subsequently scaled by Department of Defense (DOD) contractor Varian Associates and provided insight into the formation of the appropriate electron beam. The Soviet report eliminated 90 percent of the uncertainty for the engineers at Varian; the rest of the work was straightforward.

U.S. companies also buy Soviet know-how and patent rights. It seems to be a well-kept secret, but the Soviets and East Europeans are in the business of selling their proprietary technology (Table 1). Technological benefits obtained through purchased information also include:

- *Cabot Corporation* (superalloy manufacturer)—Production of hollow ingots by electroslag remelting. This process is used in a variety of applications, such as starting stock for rocket engine casings and shafts for gas turbines.
- *J. R. McDermott* (major offshore construction)—Continuous flash butt welding of large 56 inch diameter pipe, saving manpower and time.
- *Kaiser Aluminum*—Casting of aluminum ingots by electromagnetic pulsing to produce sheet, plate forgings and extrusions. This cost saving technology eliminates the use of molds and is of great interest to the DOD Mantech program.
- *Maxwell Laboratories* (high technology energy systems)—Magnetic impact bonding used for sealing ends of nuclear fuel rods and bonding and forming high strength metals such as zircalloy and titanium.
- *Multi Arc Vacuum* (special tool coatings)—Titanium nitrating for coating high cutting speed tools to enhance service life.

A large body of published work is freely available, in English, which represents potential licensing opportunities. The Soviet bloc is the home of one-third of the world's scientific community. In the Soviet Union alone, more than 60,000 patents are published each year along with tens of thousands of technical publications.

Why is the Eastern Bloc technology made available to the West? Bloc nations need to obtain foreign currency, to ensure prestige and to improve their return on the investment in developing these technologies.

Leakage Concerns

DOD's preoccupation with technology leaks has several side effects. First, it diverts attention to a problem over which the United States has little control. Many of the sensitive technologies DOD is concerned about can be purchased on the street and slipped in one's pocket. Theft and copying are international phenomena not limited to the Soviet Union. The Soviet Union has blatantly copied U.S. product technology, such as IBM computers. The Mostek chip, a special circuit design by that U.S. firm, was found in a listening buoy a few years ago. What is not usually mentioned is that the rest of the world also copied Mostek circuit designs and continues to copy IBM.

Second, stricter export controls are hampering industry's ability to compete in foreign markets. As the United States becomes less competitive in international markets,

its industrial base will continue to shrink. Already sensitive areas of technology are dominated completely by the Japanese. Growing market share is essential to keeping productivity high and unit cost low. Export controls undermine industry's ability to stay competitive in an increasingly international business environment.

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Scientific Communication Between the United States and the Soviet Union

By Catherine P. Ailes and
Arthur E. Pardee, Jr.

Last August, the United States and the Soviet Union announced an agreement on a number of exchanges covering a broad range of activities not only in cultural areas, but also in expanded contacts between scientists of the two countries. These proposed initiatives follow the general understanding on exchanges reached by President Reagan and General Secretary Gorbachev at the November 1985 summit meeting in Geneva.

Although cooperation in science and technology has been an important part of exchanges between the United States and the Soviet Union since the early 1950s, little activity has occurred in this area since December 1981, when the United States announced economic and political sanctions against the Soviet Union. In reaction to Soviet involvement in political and security events in Poland, President Reagan stated that the U.S.-Soviet cooperative agreements due to be renewed in 1982 would be permitted to expire. This resulted in the termination of the Agreement for Cooperation in the Fields of Science and Technology (S&T Agreement), which covered activities in the basic sciences, as well as other agreements in the areas of space and energy.

In light of the possible resumption of scientific cooperation in the near future, the experience of Soviet-U S cooperative science and technology activities between 1972 and 1982 invites careful analysis. As noted by Dr John P. McTague, then Acting Director of the White House Office of Science and Technology Policy, in hearings before the House Committee on Science, Technology and Foreign Affairs, a major question that needs to be answered by the United States in the renewal of scientific

cooperation with the Soviet Union is how to structure and manage U.S.-Soviet cooperation in order to achieve national security interests without repeating the mistakes of the 1970s.

Reaction to the proposed resumption of scientific cooperation with the Soviet Union has not been enthusiastic. This is perhaps due to a continuing concern over the problem of the potential leaking of militarily sensitive technology, as well as human rights and scientific freedom issues that have plagued scientific cooperation and communication between the two countries. Perhaps more importantly, critics of such exchanges often have asserted that, because the Soviet Union lags well behind the United States in most areas of scientific research, Moscow is inevitably the main beneficiary.

The S&T Agreement

While the S&T Agreement was in effect, the National Science Foundation (NSF) served as the source of support for 11 of the 14 working groups established under the agreement. These 11 working groups were the principal focus of an extensive review and evaluation of the S&T Agreement, conducted by SRI International for NSF. To evaluate the agreement, this review used surveys of U.S. participants in the program; evaluations by panels of experts with substantive knowledge in the various fields addressed in, but not formally associated with, the programs; and information contained in joint protocols, annual and semiannual reports, publications and other reports of working groups' activities found in files maintained by NSF and the U.S. Department of State.

The review found that all of the working group programs significantly broadened the knowledge of U.S. scientists about Soviet scientific capabilities. In many cases, U.S. participants learned not only about the directions in research and the specific procedures followed by Soviet scientists but also about the organization and direction of Soviet activities. Such knowledge is significant to the U.S. assessment of the plans, trends and prospective accomplishments of the Soviet Union, which in turn can be used to formulate the general policy of the United States toward the Soviet Union.

In terms of the impact of the exchanges on increasing U.S. scientific capabilities, varying results were produced in different fields. In general, the United States increased its scientific knowledge substantially when Soviet expertise was equivalent to that of the United States, or when Soviet resources were concentrated in specific areas or methods of research de-emphasized by U.S. scientists. When Soviet expertise lagged well behind that of the United States, there was little increase in U.S. scientific capabilities. In some cases, however, the impact on U.S. scientific knowledge was limited not because of wide discrepancies in the state of the art in the respective countries, but because of political sensitivities that inhibited the full cooperation of the Soviets. The predominant forms of cooperation used by the working groups were more important than relative levels of scientific expertise in the two countries. Benefits of this type concentrated on areas that emphasized intensive joint project work and extensive contact between scientists of the two countries.

Application of Computers to Management

Cooperation under the computer applications working group consisted primarily of joint project level meetings and a number of seminar series supplemented by several long-term joint projects. A primary benefit of the program was its usefulness in acquainting U.S. computer scientists with the status and quality of Soviet work. The exchange provided a better understanding of Soviet economic planning and management and of Soviet approaches to the trade negotiation process. Soviet interest and theoretical competence in algorithmic theory and statistical techniques and in automated programming and development of natural languages proved especially valuable. In addition, access to certain Soviet institutions, such as the U.S.S.R. State Planning Committee (GOSPLAN), was considered an important result of the exchange.

Cooperation in some of the project areas was impeded by a lack of full Soviet cooperation. U.S. project participants experienced some difficulties in obtaining required data from their Soviet counterparts and in allowing certain specialists to contribute. These problems were most frequent in politically sensitive projects, such as those involving training and forecasting of future specialists. Overall, however, the information exchanged under the computer applications working group appeared to be of considerable value to the United States in acquainting its participants with Soviet work in the field.

Electrometallurgy Materials

Cooperative activities under the electrometallurgy and materials working group provided a number of clear scientific benefits to the United States. A large volume of materials was exchanged for test and evaluation in the other country. The program provided an opportunity for U.S. scientists to observe advanced technologies in the Soviet Union in areas to which Soviet scientists had devoted more attention than U.S. scientists and to use and evaluate specialized equipment unavailable in the United States. This included electroslag remelting technology, which was developed by Soviet scientists but is now being used in the United States also, and plasma arc remelting technology, an area in which the Soviet Union had 10 plasma arc furnaces and the United States none, thus enabling U.S. researchers to test the advantages of this technology without requiring the purchase of large, expensive melting equipment. The cooperative program also provided an opportunity for U.S. scientists to conduct in-depth evaluation of structural material used in Soviet industry: it was discovered, for example, that Soviet scientists were coating high-speed tool steels to provide an improvement in tool life by a factor of three to eight. The program also provided a vehicle for industrial-commercial exchange.

Some problems were experienced in the program in terms of gaining access to specific Soviet laboratories, institutes and especially production facilities performing applied metallurgical work. This eventually led to a U.S. imposed suspension in the exchange of personnel under two of the project areas, although exchanges of experimental data continued to take place. Overall, however, the exchange in electrometallurgy appears to have benefited the United States substantially.

Chemical Catalysis

The joint program in chemical catalysis, although it provided an opportunity for U.S. scientists to learn more of Soviet capabilities in this area, offered few strictly

scientific benefits to the United States, primarily because the Soviet Union lags well behind the United States in research facilities and expertise in the chemical catalysis field.

The predominant form of activity under this working group was the exchange of research fellows to work for extended periods in research centers in the other country. The U.S. project coordinators were generally recognized authorities in the field, and the project protocols described programs of long-range importance in the fields to which they were addressed. However, U.S. project coordinators and principal investigators experienced difficulty in convincing U.S. scientists to participate in extended research visits to the Soviet Union, as post-doctoral programs in either the United States or other foreign countries where the state of the art is more advanced than in the Soviet Union represented more desirable professional paths for young U.S. scientists. The U.S. fellows who made extended research visits to the Soviet Union under this program complained of difficulties in obtaining access to advanced data, equipment and scientific information. This severely inhibited significant scientific achievement. Because of such problems, the joint program in chemical catalysis was terminated on recommendation of the United States in 1980.

Microbiology

Despite a large number of activities and a high level of funding relative to other working groups under the S&T Agreement, the scientific results from the cooperative exchange in microbiology appear to have been minimal. The primary factors behind the relative lack of success of this program seem to be a serious mismatch between the U.S. and Soviet participants, with the United States primarily oriented toward basic research and the Soviet Union interested in applied research; a heavy reliance on joint conferences and symposia as opposed to collaborative research work as the principal form of cooperation; and a lack of focus and concise objectives in many of the project areas.

Significant improvements were noted in the program after 1978, as the direction of several of the project areas began to be redefined. Progress was made in obtaining access to Soviet basic researchers in 1981 with the active participation of the Soviet Academy of Sciences in a joint conference. However, as the S&T Agreement terminated shortly thereafter, the achievement of notable benefits under the program was limited to the project in microbiological control of insect pests.

Physics

After initial delays, activities under the physics working group resulted in some significant benefits to the United States. The program led to increased U.S. scientific knowledge of the various theoretical fields involved through insight into Soviet activities, approaches and accomplishments, which often differed from and complemented U.S. methods and expertise. Cooperation in each of the specific project areas ranged from approximately equal in benefit to the United States and the Soviet Union to slightly favorable to the United States.

The principal problem was the disruption in planned project activities brought about by the curtailment and suspension of exchanges. A primary factor in the success of the program was the number of first-rate Soviet scientists in this field and the organization of the program to obtain access to Soviet experts who were outstanding in areas of mutual interest.

Science Policy

A primary benefit to the United States from the cooperative science policy program was that U.S. participants were able to obtain a more detailed and clearer understanding of Soviet science policy procedures and practices. Although only a modest amount of new information was learned, the program led to a clarification and confirmation of existing perceptions. In addition, the ability of U.S. Soviet specialists to clarify available data increased the reliability of the Soviet data base and provided a foundation for more intensive analysis of Soviet science policy.

Problems in receiving agreed upon materials were most evident in financing and manpower—the two projects most sensitive politically to the Soviet Union. On the U.S. side, members of the different subgroups experienced some problems in communication and interaction. On the whole, however, the United States obtained expanded insights, knowledge and information that probably would not have been possible otherwise.

Conclusions

The U.S.-Soviet S&T Agreement provided the framework for a broad program of cooperation between scientists of the two countries. Activities were programmatically organized, with teams of scientists collaborating over extended periods on specified project areas. The subjects selected for joint exploration under the S&T Agreement covered a broad spectrum of basic and applied sciences. The topically focused working group programs provided an opportunity for intensive joint project activity, exchange of test data and samples and sharing of facilities and equipment of teams of scientists in the two countries. Given the highly centralized Soviet system, these opportunities could not have been initiated effectively by the academic or industrial sectors and would not have been feasible under individualized exchanges.

A large number of scientists, representing a diverse set of institutions, participated from each country. U.S. participants included academic scientists from most of the major research universities and a broad representation of scientists from industry, government and research institutes. Although the organizational representation was less broad than in the case of the United States, many top Soviet scientists were directly involved from key technical institutes and ministries, the State Committee for Science and Technology, the U.S.S.R. Academy of Sciences and its research institutes. During the 10 years in which the agreement was in effect, more than 1,000 scientists from the United States participated in more than 400 organized activities, which included joint meetings, long-term visits, conferences and symposia. More than $22 million was provided by the U.S. government to support these activities, and some 3,000 publications resulted from these exchanges.

The principal motivation underlying the initiation of the S&T Agreement in 1972 differed significantly for the two countries. Economic motives were particularly strong for the Soviet Union, whereas political factors were predominant for the United States. In the years after the agreement was signed, however, neither of these expectations was being met, and both sides began to shift in their objectives for the cooperative science exchanges.

As the exchanges progressed, both sides realized that the programs provided only for the exchange of information and the development of joint research projects, and the United States intended to keep them that way. The Soviet leadership thus began to shift the level of its

expectations for acquiring U.S. technology through Soviet participation in the exchanges and to appreciate the advantages of cooperation in scientific research with the United States.

In the United States, high expectations of the early period of de'tente were succeeded also by a disillusionment that altered the original objectives of the exchange. With this shift, the notion of the United States as superior to the Soviet Union in many areas of science and technology increased concern that the United States must be relinquishing more than it was receiving in return. This concern resulted in a closer scrutiny of individual projects under the agreement to ensure that the principle of mutual benefit and reciprocity was being applied in the exchange of scientific and technical information and capabilities.

Nevertheless, the S&T Agreement never totally escaped its original linkage with political objectives; scientific and technical exchanges always remained a hostage to U.S. foreign policy interests. Although closer attention was given to selecting and implementing individual projects to maximize the scientific outcomes, the worsening political relationship between the two countries (exemplified by the periodic interruption in cooperative programs for political purposes) led to a "yo-yo" fluctuation in program continuity, the willingness of U.S. scientists to continue to participate, U.S. funding support and, ultimately, the scientific quality of the exchanges.

In the end, the final series of U.S. budget reductions in the program was the result of the sequence of national events evolving from the treatment of Soviet dissidents, human rights issues, restrictions on Jewish emigration, the Soviet invasion of Afghanistan and the application of martial law in Poland. It is probably neither feasible nor totally desirable to insulate Soviet-U.S. scientific exchanges from changes in the political climate between the two countries. Unlike the farming community, the U.S. scientific community cannot bring much political clout to bear to preserve its programs. Consequently, when the U.S. government wants to make a dramatic political statement to protest some Soviet action, reducing scientific exchanges is a way of doing so with relatively limited domestic political damage. Second, given the political environment and the growing concern over Soviet efforts to steal advanced Western technology, these programs likely would have become vulnerable to reductions whether or not they had been politically motivated at first, since many people believed that Moscow was the main beneficiary.

Nevertheless, the experiences of 1972 to 1982 show that cooperation with the Soviet Union in the basic sciences can work—when it is carefully conceived and properly managed. While it is neither likely nor desirable that such exchanges will be reestablished in precisely their old form, the experience of Soviet-U.S. cooperative science activities in the earlier period provides a number of lessons for maximizing the effectiveness of any programmatically organized scientific exchange that might be negotiated in the future. Significant among these are careful selection of areas for cooperative research; demand for access to key Soviet institutions and scientists; appropriate institutional linkages; agreement on concise and concrete project objectives; advanced preparation for meetings and exchanges; and early and regular evaluation of project results, with timely termination of those in which the level of cooperation demonstrated by the Soviet Union is less than satisfactory.

As noted by Allen H. Kassof, Executive Director of the International Research and Exchange Board, "Some level of Soviet-American cooperation in science and technology is both essential and inevitable despite difficulties and setbacks. There is plenty of room for joint, mutually advantageous work that does not impinge on sensitive areas of technology transfer and where both sides can bring something of value to field and laboratory. In the long run, the question is not whether there should be Soviet-American exchanges—the internationalization of scientific knowledge simply demands some contact—but what forms it should take."

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Soviet Blitzkrieg in Europe: The Abiding Nuclear Dimension

By Dr. Stephen J. Cimbala

Over the past several years, a growing number of Western analysts have begun to stress the possibility of the Soviet Union developing a "conventional-only option" for conflict in Europe, without due regard to its substantial capability for theater nuclear warfare.[1] Most recently, this thesis has received additional impetus from projections—prominently by West German Defense Minister Manfred Woerner—that the increasing accuracy of Soviet short- and medium-range missiles (SS-21s, SS-22s and SS-23s) permits those weapons to be armed with conventional warheads and to be used in a devastating attack against targets in NATO's depth in the critical, initial phase of battle.[2]

It is certainly both logical and plausible to assume that the Soviet planners would prefer to avoid the risks entailed in using nuclear weapons, if those weapons proved unnecessary in the accomplishment of Soviet war aims. Yet, there are equally plausible reasons to question whether the Soviet Union would rely on the probability of a quick and decisive victory in Europe without resort to nuclear arms. Moreover, it is not entirely clear that the Soviet Union's capabilities for conventional blitzkrieg warfare match the demands made upon that strategy under contemporary conditions. It may well be the case that the Soviet Union, rather than NATO, would face the requirement to introduce nuclear weapons in the early stages of conflict.

NATO's Objectives

NATO objectives are to deter Soviet aggression in Europe and to defeat that aggression if deterrence fails. If war occurs, NATO will not, presumably, have started it. Thus, one important consideration is why the Soviet Union would have initiated the war. Among the motivations that must be considered is the possible Soviet uncertainty attendant to upheaval within the "contiguous empire" in Eastern Europe.[3] Revolts in Eastern Europe could threaten to erupt into East-West conflict before politicians could collaborate to dampen the fires.[4] There are more scenarios for the failure of deterrence than there are plausible reasons for the relationship between the blocs to deteriorate to the point of war. Nevertheless, wars do not always break out for "rational" reasons; nor are they fought according to cost-benefit calculations alone.[5]

NATO's strategy of flexible response emerged essentially from a compromise in 1967 between U.S. policy makers, who desired a broader array of options short of the use of nuclear weapons, and Europeans, who feared that too many options would weaken rather than strengthen deterrence.[6] This compromise is still in force, although the interpretations of flexible response vary throughout the Alliance and, in democratic societies, are subject to the whims of domestic politics. Thus NATO's strategy is political not only in the Clausewitzian sense that war should

be related to policy, but also in the less sublime sense that logical strategies may be the casualties of domestic parliamentary compromises. The most difficult of these compromises is that NATO must, as Michael Howard has suggested, somehow reassure its publics and deter war at the same time.[7]

The deterrence needs of the Alliance are the focus here, and they depend upon credible war fighting strategies to deter the Soviet Union. Whether NATO correctly understands Soviet strategy, operational art and tactics will determine the likely success or failure of deterrence, assuming that the various countries of NATO have a sufficiently consensual understanding of their own strategy.[8] Figure 1 shows a comparison of the capabilities of the Warsaw Pact and NATO.

Soviet Operational Art and Tactics

Recent policy pronouncements and numerous studies have focused attention on the Soviet understanding of operational art and tactics. The Soviets believe in closely coupled political and military objectives. They acknowledge that a conflict between NATO and the Warsaw Pact might easily become a decisive conflict between East and West, between capitalism and socialism. According to MGen. V. Zemskov: "Any type of war on the part of the imperialist powers will constitute a continuation of their policy directed at establishing complete supremacy in the world, eliminating the socialist system and increasing capitalist exploitation."[9]

Even before the comprehensive expansion and modernization of Warsaw Pact conventional forces during the past decade, Soviet military writers included conventional war into their typology of potential conflict. Thus Marshal of the Soviet Union V. D. Sokolovskiy and MGen. M. Cherednichenko wrote: " . . . The possibility is not excluded of wars occurring with the use of conventional weapons, as well as the limited use of nuclear means in one or several theaters of military operations, or of a relatively protracted nuclear war using the capabilities of all types of armed forces."[10]

Soviet military strategists have paid close attention to Western concepts. Army Gen. S. Ivanov notes that the United States and its allies have planned for regional or local wars under the doctrine of flexible response "in accordance with which, along with a general nuclear war, there is also envisaged the conduct of other types of wars—with the use of only conventional means of destruction or with the limited employment of nuclear weapons."[11] Gen. Zemskov also was attentive to NATO's flexible response doctrine: "The NATO strategists are also able to conduct a so-called war by stages, in which the means of armed conflict are to be put into operation in sequence."[12]

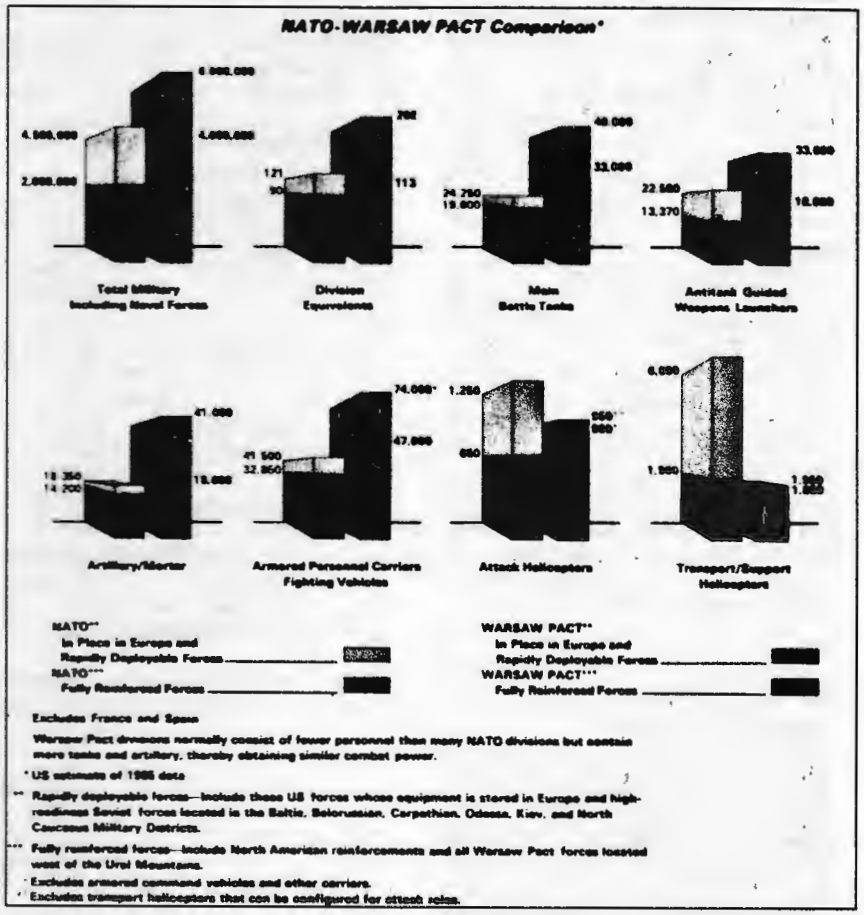


Figure 1. A comparison of NATO versus Warsaw Pact capabilities.

Incentives for Soviet Nuclear Use

Conventional wisdom about conventional war in Europe holds that the NATO Alliance would have the prerogative to introduce nuclear weapons into theater conflict. NATO conventional forces are supposed to meet and delay a conventional attack by the Warsaw Pact. If necessary, NATO will, according to doctrine, escalate to the use of battlefield, theater and U.S. strategic nuclear weapons. The Soviet Union is supposed to appreciate the determination by NATO to control and dominate the process of escalation at any stage and to condition the Warsaw Pact's attack accordingly.

NATO's strategy thus presumes a willingness on the part of Soviet planners to cooperate with the desire of the West to preserve the conventional-nuclear firebreak or "threshold." Yet this threshold may not be as important in Soviet eyes as it is to the West. Soviet expert Benjamin S.

Lambeth has noted that the decision to go to war is the more important threshold for Soviet leaders, compared to the decision to use nuclear weapons to achieve war aims.[13] Moreover, it is at least doubtful that the Soviets would believe in NATO's willingness and ability to exercise strict escalation control once war had begun.

Of course, one must ask: What is the war about? If it is about unrest in Eastern Europe and the possible dissolution of the Soviet empire, a Soviet willingness to accept stalemate or defeat in conventional war—assuming that either could be imposed by NATO—seems improbable. Thus the most likely reason for Soviet avoidance of nuclear use, either in retaliation or preemption, is the possibility that NATO conventional forces will be defeated so rapidly that a nuclear option would be in effect preempted.

Essential Assumptions for a Conventional Option

For the Soviets to initiate war in Europe with the expectation of avoiding nuclear conflict, they would have to assume several things. They would have to defeat NATO conventional forces within days rather than weeks, whatever their objectives were, and deter Western escalation while doing so. The Soviets' formidable chemical warfare capabilities might provide a force multiplier that, coupled to their other assets, could encourage their belief in such a rapid advance.[14] Still, in the final analysis, the Soviets would have to disbelieve NATO doctrine, which calls for first nuclear use if NATO conventional forces are about to be defeated.

The third thing that the Soviets would have to believe, assuming that their conventional attack objectives were limited to West Germany and/or the low countries, is that France and Great Britain would not use their nuclear forces in response to Warsaw Pact aggression. For this to happen, especially in the French case, the Soviets would have to overcome NATO conventional forces in West Germany while somehow persuading France and Great Britain of the Soviet Union's limited objectives.

Current trends would suggest to the Soviet Union an increasing collaboration between the French and West German defense establishments. The French Rapid Action Force (FAR) is ideally constituted for rapid deploy-

Command Level/ Forces	United States	Soviet Union
THEATER		
Long-range theater nuclear force (TNF) (More than 1,000 Miles)		
Missiles[1]	Pershing II GLCM	SS-4 Sandal SS-20
Bombers[2]	F-111	TU-16 Badger TU-22 Blinder TU-22M Backfire
U.S. CORPS SOVIET FRONT, ARMY		
Medium-range TNF (100–1,000 Miles)		
Missiles[3]	Pershing I	Scud-B SS-12 Scaleboard SS-22 SS-23
Attack Aircraft[4]	F-4 Phantom II F-16 Fighting Falcon	MiG-21 Fishbed J-N MiG-23/27 Flogger SU-7 Fitter A SU-17 Fitter C/D/H
	A-4 Skyhawk A-6 Intruder A-7 Corsair II F/A-18 Hornet	SU-24 Fencer
DIVISION[5]		
Short-range TNF (Less Than 100 Miles)		
Missiles	Lance	FROG SS-21
Artillery	8 inch Howitzer 155 mm Howitzer	240 mm Mortar 203 mm Gun 152 mm Gun
ADM	Yes	Yes

[1]Soviet LRTNF missiles are assigned to strategic rocket forces. SS-N-6 submarine launched ballistic missiles (SLBMs) on *Golf IV* and *Yankee I* submarines probably have TNF roles. So do some intercontinental ballistic missiles, (ICBMs), submarine launched cruise missiles (SLCMs) and 40 U.S. Poseidon SLBMs.

[2]FB-111s assigned to U.S. Strategic Air Command are similar to F-111 attack aircraft. Navy bombers could supplement Soviet TNF bombers.

[3]Soviet SS-N-5 SLBMs on *Golf II* and *Hotel II* submarines probably have TNF roles.

[4]Nuclear capable U.S. Navy/Marine A-4, A-6, A-7 and Navy F/A-18 aircraft may receive TNF missions. A nuclear capability is planned for Marine AV-8Bs.

[5]Medium-range TNF aircraft fly missions in support of divisions.

From: John M. Collins, with Patrick M. Cronin. *U.S.-Soviet Military Balance 1980–85.* 1985. Pergamon-Brassey, New York.

Figure 2. Theater nuclear forces related to command levels.

ment into the Federal Republic to join the French forces already stationed there.[15] Decoupling the French from a conventional war against West Germany would be as necessary for Soviet escalation control as it would be difficult to accomplish in the event.

It is true that the magnitude of Soviet theater and strategic nuclear forces would appear to be a powerful deterrent to a French initiation of much more modest nuclear forces. Still, French policy states very clearly the actions to be undertaken as Soviet forces approach the Rhine, and the Soviets cannot assume that the French will not remain faithful to their doctrine, especially in the heat of an enveloping conflict.

The fourth assumption that Soviet planners of a rapid and decisive conventional victory must make is that NATO would be unable or unwilling to use battlefield and theater range nuclear weapons while its conventional forces were being overrun. Undoubtedly some tactical nuclear weapons (short-range nuclear forces in current jargon) might be overrun before nuclear release was authorized. It is also conceivable that the Soviets could hope to preempt mobile Pershing 2 ballistic missiles and ground launched cruise missiles (GLCMs), along with NATO dual-capable aircraft, with conventional attacks alone, before NATO could react to prevent their destruction.[16] This could be accomplished only, however, if NATO responded with extreme incompetence to strategic, as opposed to tactical, warning of pact mobilization. Strategic warning would come in the form of the accumulation of indicators regarded by NATO as suggestive of a pact build-up beyond normal exercises or troop rotations.[17] Tactical warning as to the exact time and place of any attack would be more difficult to predict, but not necessarily decisive. Nor has it been proved that NATO conventional forces would be helpless in resisting a Warsaw Pact offensive on the central front, even granting the pact a plausible degree of tactical surprise. Figure 2 shows U.S. and Soviet theater nuclear forces related to command levels.

Even under the unlikely assumption of strategic surprise by the Pact against NATO defenders, the Pershing 2 and GLCM missile forces and dual-capable aircraft—together with the Poseidon submarine launched ballistic missile (SLBM) warheads assigned to Supreme Allied Commander, Europe (SACEUR) and U.S. strategic forces presumably targeted on Soviet conventional forces—present daunting obstacles to Soviet expectations of rapid victory without resorting to nuclear weapons. As the Soviets have defined it, the nuclear threshold is more concerned with what targets are hit and where they are located than it is with the declaratory intentions of the targeteers. If, for example, U.S. Pershing 2 missiles have flight times of from six to 10 minutes to significant command targets in the western Soviet Union, then they must be attacked and negated in the early moments of war. Whether this is done with nuclear or conventional weapons will depend upon Soviet expectations about Western propensities to escalate, but also upon the convictions of operational commanders about the most efficient way to accomplish the mission. If the effort to take out Pershing 2s and GLCMs by nonnuclear means —including chemical and *Spetsnaz* attacks—fell short, the political logic of inducing NATO not to escalate would conflict with the military logic of accomplishing the job in the most efficient way. Figure 3 shows NATO theater nuclear release channels.

If Soviet nuclear weapons were used against NATO's nuclear weapons and storage sites, the risks of escalation to the use of strategic forces would not be inconsiderable. Yet it seems improbable that the Politburo would take on the risks of war in Europe without considering all of the rungs of the escalation ladder, in and out of the theater.[18] This conservative calculus of Soviet expectations would include worst-case estimates about what could go wrong. The importance of both sides' perceptions as events gradually slipped from control would be decisive; whether either U.S. or Soviet intelligence could provide high-confidence assessments that the other side was not preparing for nuclear first use is moot. Each would anticipate the other's efforts to deceive the opponent or intimidate him if he is not deceived. In the confusion of the early stages of war marked by fluid "meeting engagements," military assets destroyed or depreciated, and high attrition rates for people and equipment in the ground forces, restraints, however desirable, would be difficult to enforce.[19]

Blitzkrieg in its Historical Meaning

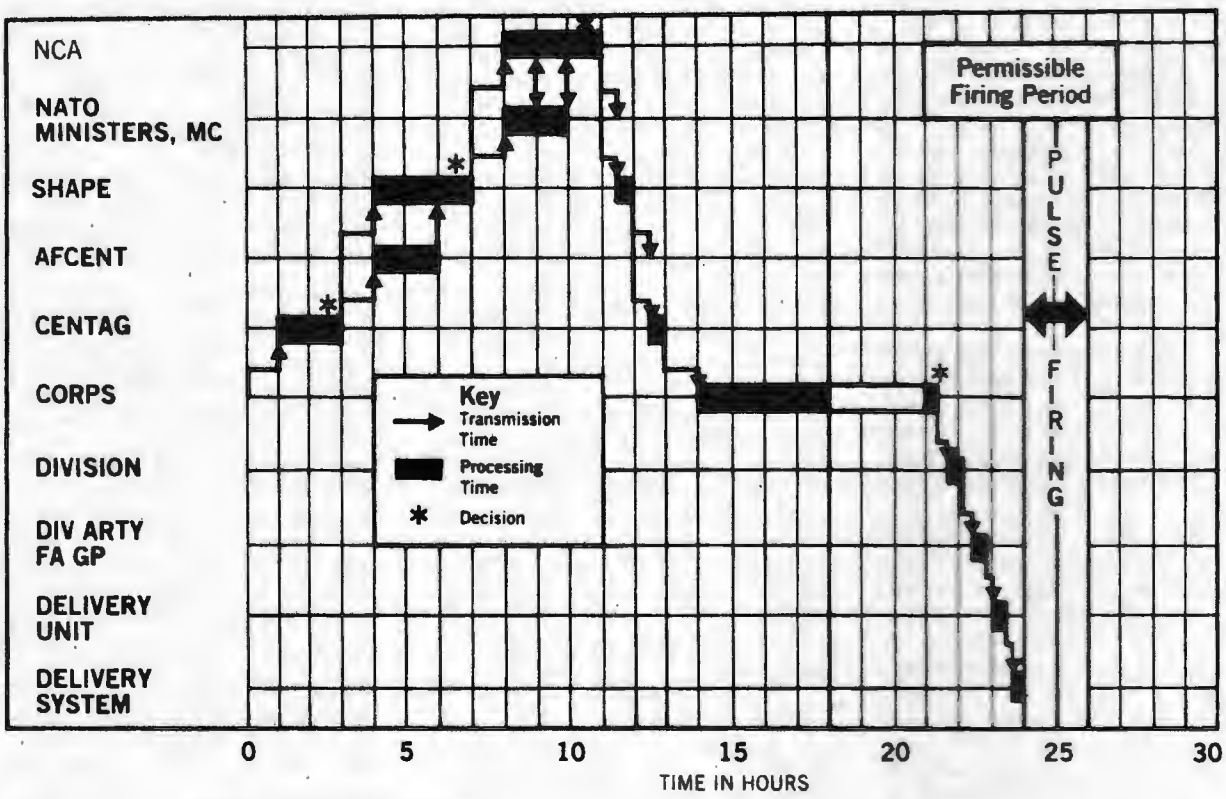
Soviet conventional strategy in Europe could take various forms, depending upon Soviet objectives, NATO defenses and improvisations by both sides under the stress of crisis and war. Western experts nonetheless assume certain constancies about Soviet operations against NATO, drawing upon assumptions about U.S.S.R. strengths and weaknesses and from what can be gleaned from Soviet writings and historical experience.

Undoubtedly the Soviets would prefer to maximize tactical surprise, throw NATO off balance and penetrate to the rear of Alliance defenses before NATO can regroup. This preferred approach has sometimes been described as a blitzkrieg. The generic term of "lightning war" may apply to some aspects of the Soviet operational plan as it is likely to unfold. Speed is certainly an important *desideratum* for Soviet commanders—indeed, it may be the most important under certain circumstances.[20]

Would the Soviet game plan constitute a blitzkrieg in anything more than the most general sense of the term? The German blitzkrieg through the Ardennes in 1940 bears little resemblance to the tactical and operational approaches used by Soviet commanders as they began to turn the tide against the Wehrmacht.[21] The 1940 blitzkrieg (essentially the "Manstein plan") substituted German speed, deception and maneuver for direct assault and attrition. This is not, by the reading of some historians, what the Russians did on the eastern front. Instead, they wore down and exhausted German units inferior in manpower and resources.

Consider, for example, the Soviet preparations for the decisive multi-front operation known as the Belorussian offensive. This campaign began on a 450 mile front, which became even larger as time progressed. Four fronts, including an estimated 166 Soviet divisions (including reserves), 5,200 tanks and SP guns, at least 6,000 planes and 31,000 guns and mortars, faced the German defenders. Density of artillery in the breakthrough sectors was frequently as high as 320 guns per mile.[22]

It might be objected that this amassing of overwhelming firepower and equipment against exhausted German forces was possible at that stage of the war only because more imaginative and daring operations had brought the Soviets through the earlier stages of conflict. It is true that Stalingrad provides an example of Soviet success with very different odds, as does Kursk, but in both cases German operational defeats



NCA	National Command Authorities[1]
MINISTERS, MC	NATO Foreign Ministers, Military Committee[2]
SHAPE	Supreme Headquarters, Allied Powers Europe
AFCENT	Allied Forces Central Europe
CENTAG	Central Army Group
DIV ARTY	Division Artillery
FA GP	Field Artillery Group

[1] U.S. and British NCA authorize release of nuclear weapons to using units after:
[2] NATO Ministers, consulting Military Committee, approve their use. French release procedures are separate. Strictly U.S. channels from corps to theater to JCS to NCA and back, then same as above [illegible] very system in any theater except Europe.
SOURCE: Adapted from Army FM 100-5, *Operations*, July 1, 1976, p. 10-9.

Figure 3. NATO theater nuclear release channels.

were brought about in part by strategical blunders at the top, for example, Hitler's insistence upon operationally self-defeating measures for self-serving reasons.[23] Nor were the Russians' operations based on blitzkrieg as the Germans had applied it to the war in France in 1940. The Soviets ground down their opponents through the combination of a frontal steamroller and selective encirclement operations at division, army and army group (front) levels.[24]

Perhaps the elasticity of the term blitzkrieg is itself responsible for some NATO confusion about probable Soviet operations. The essence of a blitzkrieg is to prevent the opponent from trading space for time by disrupting his ability to reinforce threatened sectors and, ultimately, disorganizing his command and control. This was never the preferred strategy of the Germans or the Russians. The blitzkrieg against France was improvised after earlier German plans had fallen into hostile hands. The German General Staff was skeptical about whether it would work; only the perceived need to construct an alternative that would satisfy Hitler's desire for rapid victory, and the advocacy of Erich von Manstein and Heinz Guderian, finally persuaded the highest echelons to take the gamble.

Qualitative Requirements for Blitzkrieg

There are, after all, substantial risks in the blitzkrieg approach, correctly understood. Much depends upon the willingness of lower level commanders to take risks and to understand orders in other than literal terms. The combat effectiveness of fighting battalions and regiments under such conditions depends as much on qualitative factors as it does on quantitative variables: The qualities include small group cohesion, morale, leadership and willingness to improvise.[25]

It is well known that the Germans, through their General Staff system, inculcated precisely those traits among their officers that were conducive to success in daring operations of this type. Trevor N. Dupuy's assessment of the Wehrmacht speaks for its effectiveness under all combat conditions compared to its adversaries. The Germans "consistently outfought" the Allied armies that eventually defeated them.[26] Germans outfought Russians even more decisively than they outbattled the Western Allies: German superiority in combat effectiveness over the Russians was close to 200 percent at the outset of Operation Barbarossa and remained at nearly 100 percent in 1944.[27]

These are the qualities some writers have found lacking in the modern Soviet ground forces. Of paramount importance for the success of daring operational strategies is the respect of troops for their officers—especially their perception of the officers' willingness to share the risks of combat with their enlisted men. This was a hallmark of the German officer corps before and during World War II, according to Martin van Creveld. The World War II figures are especially striking with respect to the vulnerability of German officers in combat compared to the vulnerability of their men. A German officer's chances of being killed early in the war were twice as high as those of all military personnel; by 1944, with a smaller proportion of officers, it was still 150 percent.[28] The implications for the loyalty and commitment of subordinates are all too clear. The German system of giving orders emphasized mission tactics in which the "what" rather than the "how" was specified. German regulations did not emphasize details and "school" solutions. The result was that "the German army, in other words, was built around the needs, social and psychological, of the individual fighting man. The crucial, indeed decisive, importance of the latter was fully recognized; and the army's doctrine, command technique, organization and administration were shaped accordingly."[29]

If this description of the German army in World War II applies to the Soviet army of today, it is probably news to Soviet commanders, who write frequently in their journals about the inability of their troops to take the initiative. Nor do Soviet conscripts have apparent high regard for the skills and commitment of their officers. Richard A. Gabriel's survey of Soviet army veterans revealed that about two-thirds believed their officers and noncommissioned officers (NCOs) did not have the kind of judgment they would trust in combat; the same percentage expressed doubt that Soviet officers "would make good men to go into combat with"; and more than 70 percent of Soviet officers were perceived as "overly ambitious at the expense of [their] subordinates and [their] unit."[30] Most significantly, when asked whether officers shared hardships with their men, twice the proportion of respondents said no compared to yes.[31] The conditions under which Soviet conscripts are trained do not encourage initiative, small-group cohesion or respect for officers, according to other accounts consistent with the survey data.[32]

Not only may Soviet manpower and organization be unsuited for the style of blitzkrieg that Germany launched against France, but apparently the Soviet Union will have sufficient difficulty mobilizing its reserves for a more drawn-out conflict. Whether it can mobilize enough manpower and equipment and sustain logistically a protracted conflict in Europe probably is unknown even to Soviet commanders, but they hardly can be optimistic. It is known that their efforts to mobilize reserves during three major operations (Czechoslovakia, Afghanistan and Poland) were plagued with problems of command incompetence and/or troop noncompliance, including desertion.[33]

These problems may not be insurmountable, but they occurred in situations far less stressing of Soviet capabilities than the outbreak of war against NATO. Moreover, the Soviets must resolve the problem of efficient mobilization to effect either a rapid or a protracted victory over NATO without using nuclear weapons. They face an inevitable trade-off between launching a war with little mobilization in the hope of attaining greater surprise and speed, versus taking more time for mobilization to create forces better equipped and with greater sustainability.[34]

Alternative Approaches to Theater Operations

Evaluations of Soviet operational capabilities and doctrine may require some reconsideration of customary terminology. There are essentially three generic approaches to theater-scale operations such as those that might take place in Europe. The generic approaches are defined by the estimate of how we expect the war to end—that is, expectations of war termination. In general, three abstract possibilities are: by exhaustion of one or more combatants; by creation of a decisive battle in which one side is crushed and unable to continue meaningful fighting; or, third, by disruption of the ability of one side to make decisions and control its forces.[35] Of course, aspects of these can be combined in larger operations, but the categories as genotypes are useful in avoiding confusion. For example, any of these approaches admits of both attrition and maneuver tactics as they are practiced on the battlefield, however misdescribed they might be in U.S. public policy debates. Attrition is in actuality a combination of firepower and sustainability, and maneuver is a combination of penetration and encirclement. Experienced commanders will recognize that both components of attrition and of maneuver can be applied selectively as the situation dictates, especially in rapidly changing environments.[36]

If we take the perspective recommended in the preceding paragraph, we are more likely to envision Soviet tactics that resemble the "steamroller," as Steven Canby has termed it, with some components of speed, daring thrust and maneuver at the tactical and operational levels. Canby also refers to Soviet doctrinal interest in blitzkrieg but indicates that it differs from the German model. His description of Soviet tactics at the divisional level is indicative:

> Steamroller tactics, at the divisional level, are characterized by a relatively inflexible command

system and a rigid system of echeloned forces with a few intermediate reserves (except for antitank). As formations are exhausted by fighting, they are replaced by other echelons behind them, instead of being replenished and reinforced by fresh men or units as is Western practice.[37]

The Soviets do attack with a high percentage of divisional platoons in immediate contact with defending forces to maximize shockpower in order to break through defenses and to minimize vulnerability to nuclear weapons.[38] This illustrates the combination of penetration and firepower tactics to bring about a decisive operational result, based upon combined arms operations that provide encirclement of bypassed and penetrated forces when necessary. Soviet preparedness for such operations has improved considerably in recent decades, and there is evidence, according to John Erickson, that the fourth tactical component of operational success, sustainability, is now receiving long-deserved attention.[39]

Implications

If this discussion of operations generally, and of Soviet operations specifically, has been reasonable, some disturbing conclusions relevant to NATO strategy are apparent. NATO conventional forces may be adequate for deterrence under most normal peacetime conditions, but if deterrence fails, they will be subjected to unprecedented stress. NATO has no apparent experience at having gone on full alert; this may be testimony to the durability of deterrence, but it also implies lack of experience in crisis management as applicable to a conflict in Europe.[40]

Although the Soviet Union might prefer to fight a purely conventional war, if this were more than a war of "limited aims," the prospects for keeping nuclear weapons out of the picture are not encouraging.[41] The Soviet Union intends to be prepared for the transition from conventional to theater nuclear warfare and will fight temporarily without nuclear weapons if it is advantageous to do so. But the Soviets also might use short- and long-range theater nuclear weapons preemptively in the expectation that the West is preparing to do so, or in reaction to imminent defeat or stalemate on the central front before either side has gone nuclear.[42]

Conventional and theater nuclear operations are complementary in Soviet doctrine and practice. What has come to be identified as Soviet operational blitzkrieg doctrine is really an emphasis upon disruption as a generic form. Time will not permit an exhaustion approach; at the same time, a single, decisive battle that will determine everything at stake seems improbable. Soviet disruption intends to throw off balance the opponent with a combination of penetration and encirclement (maneuver) and intense firepower (attrition), drawing upon conventional, chemical and—if perceived necessary—nuclear forces of theater or lesser range.

Obviously, the Soviet Union would prefer to avoid a strategic nuclear exchange with the United States. Its planners could reckon in a crisis that the "least worst" alternative was to count on having deterred U.S. strategic preemption by the "correlation of forces," including the obvious discrepancies in force capabilities and in more intangible factors. Soviet theater capabilities for nuclear warfare are being improved, and new doctrinal and tactical concepts are as suited to nuclear as to conventional warfare.[43]

If Soviet strategy (in the sense of operational art and tactics) depends upon blitzkrieg as the Germans practiced it, it is a very qualified dependence. The Soviet Union has neither the "mission tactics" philosophy nor the personnel to carry such a philosophy into combat practice under the conditions of modern war in Europe. Yet the Soviet history shows that the Soviets are astonishingly adaptable when need be. Evidence is provided by their successes in the Great Patriotic War and in their innovative uses of equipment of all sorts.

Soviet operational art does borrow from the classical blitzkrieg the elements of surprise, emphasis on disruption of the opponent's game plan, confusing his command and communications and striking deep while maintaining a high tempo of operations. The Soviet version is much more diversified in its pertinent equipment, force structures and tactics. Airborne and heliborne forces, *Spetsnaz* units, raiding detachments, operational maneuver groups and flexibly echeloned forces show the versatility that the Soviet version of mobile warfare has added to the classical version of blitzkrieg.[44]

NATO cannot contend with the Soviet model of operational art by assuming that only conventional force improvements are needed. Those improvements are welcome but insufficient by themselves. Both the modernization of NATO theater nuclear forces and the replacement of obsolete systems are imperative. Many valuable arguments can be made about the kinds of nuclear weapons that NATO members now deploy in Europe; some are more defensible politically and less vulnerable militarily than are others. The point of the foregoing is that conventional war in Europe on any appreciable scale presupposes a war capable of quickly going nuclear. The side better disposed to appreciate that fact, and to exploit it, may deter its opponent more successfully and defeat him if it comes to that.

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Notes

[1]*Strengthening Conventional Deterrence in Europe: Proposals for the 1980s.* Report of the European Security Study (New York: St. Martin's Press, 1983).

[2]Manfred Woerner. "A Missile Defense for NATO Europe," *Strategic Review*, Winter 1986.

[3]The phrase is Samuel Huntington's. See his "The Renewal of Strategy," in Samuel P. Huntington, ed., *The Strategic Imperative: New Policies for National Security* (Cambridge, Massachusetts: Ballinger Publishing Co., 1982), pp. 1–52, esp. 12–13.

[4]For scenarios based on compound crises affecting East-West conflict in Europe, see Richard K. Betts, *Surprise Attack: Lessons for Defense Planning* (Washington: Brookings Institution, 1982), pp. 159–160.

[5]Barbara W. Tuchman. *The March of Folly: From Troy to Vietnam* (New York: Alfred A. Knopf, 1984).

[6]David M. Schwartz. *NATO's Nuclear Dilemmas* (Washington: Brookings Institution, 1983) pp. 136–192.

[7]Michael Howard. *The Causes of Wars* (Cambridge, Massachusetts: Harvard University Press, 1984), pp. 246–264.

[8]The issue was of sufficient concern to inspire Gen. Bernard W. Rogers, USA, SACEUR, to address it publicly. See, for example, his "Follow-on Forces Attack (FOFA): Myths and Realities," *NATO Review*, Vol. 32, no. 6, December 1984, pp. 1–8.

[9]MGen. V. Zemskov. "Characteristic Features of Modern Wars and Possible Methods of Conducting Them," in Joseph D. Douglass, Jr., and Amoretta Hoeber, eds., *Selected Readings from Military Thought, 1963–1973*, vol. 5, Part 2, published under the auspices of the U.S. Air Force (Washington, D.C.: U.S. Government Printing Office), p. 48.

[10]Marshal of the Soviet Union V. D. Sokolovskiy and MGen. M. Cherednichenko. "Military Strategy and its Problems," in Douglass and Hoeber, ibid., p. 9.

[11]Army Gen. S. Ivanov. "Soviet Military Doctrine and Strategy," in Douglass and Hoeber, ibid., p. 29.

[12]Zemskov, op. cit., p. 51.

[13]Benjamin S. Lambeth. "On Thresholds in Soviet Military Thought," in William J. Taylor, Jr., Steven A. Maaranen and Gerrit W. Gong, eds., *Strategic Responses to Conflict in the 1980s* (Washington: Center for Strategic and International Studies/Lexington Books, 1984), pp. 173–182.

[14]Soviet and Warsaw Pact armies have a potentially very capable chemical warfare capability, but NATO retaliatory capabilities are being improved. Soviet chemical use may be circumscribed by environmental uncertainties, command and control problems and the

possibility of NATO nuclear retaliation. See John M. Weinstein and Henry G. Gole, "Chemical Weapons Rearmament and the Security of Europe: Can Support Be Mustered?" in Robert Kennedy and John M. Weinstein, eds., *The Defense of the West* (Boulder, Colorado: Westview Press, 1984), pp. 299–347.

[15]See Louis Wiznitzer, "Star Wars Brings West Germany and France Closer Together," *Christian Science Monitor*, October 1, 1985, p. 10.

[16]See Christopher N. Donnelly, "Soviet Operational Concepts in the 1980s," in *Strengthening Conventional Deterrence in Europe*,, op. cit., pp. 105–136; John G. Hines and Phillip A. Petersen, "The Warsaw Pact Strategic Offensive: The OMG in Context," *International Defense Review*, October 1983, pp. 1391–1395; Charles J. Dick, "Soviet Operational Concepts: Part I," *Military Review*, Vol. LXV, No. 9, September 1985, pp. 29–45.

[17]Betts, op. cit., pp. 190–191.

[18]This is put into perspective very well by John Erickson, "The Soviet View of Deterrence: A General Survey," in John B. Harris and Eric Markusen, eds., *Nuclear Weapons and the Threat of Nuclear War* (New York: Harcourt Brace Jovanovich, 1986), pp. 170–179. The Soviets are not very optimistic that nuclear war could be limited and are skeptical that strategic nuclear war could be a rational instrument of policy. Nevertheless they anticipate that war in Europe might well go nuclear and plan to be prepared.

[19]Walter Laqueur. *A World of Secrets* (New York: Basic Books, 1985).

[20]Dick, op. cit., p. 34.

[21]For a discussion of the German blitzkrieg in historical perspective, see Larry H. Addington, *The Blitzkrieg Era and the German General Staff* (New Brunswick, New Jersey: Rutgers University Press, 1971).

[22]Alexander Werth. *Russia at War* (New York: E. P. Dutton and Co., 1964), p. 861.

[23]Ibid., p. 504 (on Stalingrad), pp. 680–681 (on Kursk).

[24]Note that the Soviet Union was not fully prepared to conduct truly "combined arms" operations in the early stages of World War II due to shortages of pertinent equipment, including (until 1944) SP artillery in appropriate amounts. The Soviets' analyses of their own World War II experience cast some doubt on their capabilities to conduct meeting engagements of the kind that might be anticipated in Europe today. For discussion and pertinent data on Soviet World War II experience, see John Hemsley, *Soviet Troop Control: The Role of Command Technology in the Soviet Military System* (New York: Brassey's Publishers Ltd., 1982), pp. 92–94. Soviet writers consider the Battle of Moscow a crucible for developing their operational art in the "Great Combat Tactics." *Voyenno-Istoricheskiy Zhurnal*, December 1981, pp. 30–38 (translated by Combat Studies Institute, U.S. Army Command and General Staff College).

[25]Martin van Creveld. *Fighting Power: German and U.S. Army Performance, 1939–1945* (Westport, Connecticut: Greenwood Press, 1982).

[26]Trevor N. Dupuy. *A Genius for War: The German Army and General Staff, 1807–1945* (Englewood Cliffs, New Jersey: Prentice Hall, 1977), pp. 253–254.

[27]Ibid., p. 254.

[28]Van Creveld, op. cit., p. 156.

[29]Ibid., p. 165.

[30]Richard A. Gabriel. *The Mind of the Soviet Fighting Man* (Westport, Connecticut: Greenwood Press, 1984), pp. 17–18.

[31]Ibid., p. 21.

[32]Andrew Cockburn. *The Threat: Inside the Soviet War Machine* (New York: Random House, 1983), p. 56.

[33]Ibid., pp. 112–114.

[34]William W. Kaufmann. "Nonnuclear Deterrence," in John D. Steinbruner and Leon V. Sigal, eds., *Alliance Security and the No-First-Use Question* (Washington: Brookings Institution, 1983), pp. 43–90.

[35]The strategy of exhaustion is described in LTC Paul Tiberi, USA, "German versus Soviet blitzkrieg," *Military Review*, vol. LXV, No. 9, September 1985, pp. 63–71, esp. p. 64.

[36]For a contrasting but suggestive view, see Richard Simpkin, *Race to the Swift: Thoughts on Twenty-First Century Warfare* (New York: Pergamon-Brassey's, 1985), pp. 304–308.

[37]Steven Canby. "The Alliance and Europe: Part IV, Military Doctrine and Technology," *Adelphi Papers*, No. 109 (London: International Institute of Strategic Studies, Winter 1974–1975), p. 10.

[38]Ibid.

[39]John Erickson. "The Ground Forces in Soviet Military Policy," *Strategic Review*, Spring 1976, pp. 64–79.

[40]A point emphasized in Betts, op. cit. Paul Bracken argues that this is a blessing in disguise: "The NATO strategy of relying on nuclear weapons is politically and militarily credible because the governing command structure is so unstable and accident-prone that national leaders would exercise little practical control over it in wartime." Paul Bracken, *The Command and Control of Nuclear Forces* (New Haven: Yale University Press, 1983), p. 164. One hopes that this expectation of deterrence through command disintegration deters the Russians as much as it does NATO.

[41]On limited aims strategy, see John J. Mearsheimer, *Conventional Deterrence* (Ithaca, New York: Cornell University Press, 1983), pp. 53–57.

[42]Charles J. Dick. "Soviet Operational Concepts: Part II," *Military Review*, Vol. LXV, No. 10, October 1985, p. 9.

[43]Ibid.

[44]MGen. S. Shtrik. "The Encirclement and Destruction of the Enemy during Combat Operations Not Involving the Use of Nuclear Weapons," *Voyennaya Mysl*, No. 1, January 1968, pp. 279–292 (translated and compiled by Combat Studies Institute, U.S. Army Command and General Staff College, January 1984).

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