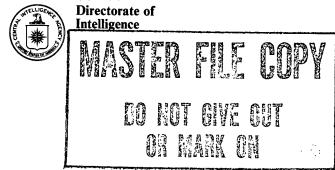
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**USSR Monthly Review** 

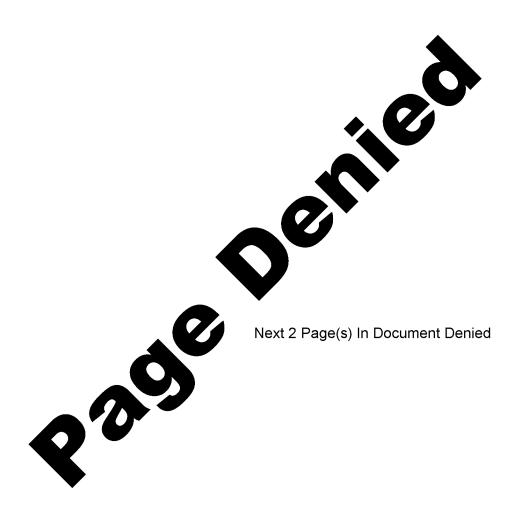
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Errata	Notice to recipients of USSR Monthly Review, SOV UR 83-012JX.
	Please make the following changes to the USSR Monthly Review for December 1983:
	Page 10, figures 2 and 3. The gold lines in both graphs represent total aircraft, not just third-generation aircraft as the labeling implies.
	Page 11, figure 4. The red line in this graph represents total helicopters, not just attack helicopters as the labeling implies.
	Page 11, final paragraph. The designator for the Flanker aircraft is SU-27, not SU-17.

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**USSR Monthly Review** 

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December 1983

The USSR Monthly Review is published by the Office of Soviet Analysis. Comments and queries regarding the articles are welcome. They may be directed to the authors, whose names are listed in the table of contents.

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rospects for Soviet	Perspective	Page	<del></del>
Iilitary Modernization	During the past two decades the Soviet military has undergone a dramatic modernization that has firmly established the USSR as a superpower. Most widely noted has been the accumulation of strategic nuclear systems, but this issue of the USSR Monthly Review surveys Soviet military growth in a variety of dimensions—in the military forces, in industry, and in resource management. Though the pace of weapons procurement has slowed during the last few years, the pace of military research and development has not. We expect military modernization to continue at least as fast as in recent years, and, if the Soviets surmount the economic and technical constraints currently facing them, weapons procurement could return to the dynamic growth rates of the past.		

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-		25 <b>X</b> 1
	Modernization Trends in Soviet Theater Ground and Air Forces 7	25 <b>X</b> 1
	A major modernization of Soviet general purpose theater forces begun in the mid-1960s continues today. This program has equipped the bulk of the theater air forces with late-model aircraft but, though massive by Western standards, has been well short of what would be needed to fully modernize the Ground Forces. We expect the Soviets to continue efforts to modernize their theater forces, although economic problems, demographic constraints, and short-comings in their defense industries may prompt increasingly difficult force development choices.	QEV4
	cuit force development enoices.	25X1
		25 <b>X</b> 1
	Modernization in the Soviet Aircraft Industry 13	
	Since the mid-1960s the Soviet aircraft industry has been modernizing its manufacturing plant and equipment. The Soviets now have under development several new aircraft that we believe incorporate technology advances permitted, at least in part, by this modernization program. The pace and scope of the program, however, do not appear sufficient to enable the Soviets to acquire soon a manufacturing capability equivalent to that of Western countries.	25X1
		25X1
	Fielding High-Technology Weapons in the 1980s: The Challenge to the VPK	 25X1
,	The Soviets have a powerful executive management structure for the expeditious development and production of weapon systems. While this structure and its methods of operation are effective for fielding weapons using the technologies of the past, the Soviets had serious difficulties in the 1970s with bringing more advanced technology to the battlefield in a timely manner. These difficulties may be overcome in the 1980s if current technologies can be redesigned and	
	repackaged in increasingly capable weapons.	25 <b>X</b> 1
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	Soviet Force Modernization in the 1980s: Resource Implications	1 25
	Soviet resources devoted to weapons procurement grew rapidly from the early 1960s through the mid-1970s. Although we believe weapons procurement showed little or no growth from 1976 through 1982, the level was such that substantial modernization continued. Our uncertainty about why weapons procurement did not grow during this period clouds our assessment of future resource trends, but not our perception that modernization of key strategic and general purpose forces will continue.	25 25
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Other Topics		23

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# Prospects for Soviet Military Modernization

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Since the mid-1960s the Soviets have produced 8,000 strategic offensive missiles, 15,000 combat aircraft, almost 50,000 tanks, and about 400 major warships and submarines for their forces in a continuous modernization process that has solidified their superpower status. During this period, the qualitative and quantitative improvements provided by these programs have shifted both the strategic and theater military balances toward the Soviets. To support this buildup, the Soviets have developed a powerful executive management structure for developing and producing weapon systems. The weapon acquisition process:

- Has expedited major weapon program decisions through early consideration by the highest levels of leadership and used special procedures to cut through the normally inefficient state economic apparatus.
- Has emphasized evolutionary development and early deployment resulting in incremental improvements in technical capability and a steady stream of new systems.
- Has employed a vast network of facilities to develop and produce a wide range of weapons in large quantities.

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Soviet expenditures for weapons procurement have not grown since the mid-1970s, but the high absolute levels have underwritten substantial modernization. (See article on resource considerations.) A review of weapons research and development and production indicates that during the 1980s the Soviets plan to:

 Continue the broad modernization of strategic offensive forces with major production programs for each of the primary strategic force elements. These programs will increase the number of warheads while reducing overall force vulnerability. In addition, the long-range cruise missiles now in the late stages of development will add a new dimension to the Soviet strategic threat.

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The number of military programs planned for the 1980s for which we have direct evidence indicates that modernization will continue at least as fast as in recent years. Depending on how the Soviets cope with current economic and technical constraints, weapons procurement could return to the dynamic growth rates of the past.

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# Modernization Trends in Soviet Theater Ground and Air Forces

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In the mid-1960s the USSR began a major modernization of its general purpose theater forces. Initially, this effort may have been a response to the years of neglect under Khrushchev, who had emphasized the development of strategic forces to the detriment of conventional war-fighting capabilities. It probably was further influenced by an evolving Soviet doctrine that began to recognize the possibility of a large-scale conventional conflict and to stress the use of mobility and massed nonnuclear firepower to overcome the opposition.

Soviet modernization efforts show few signs of faltering in the short term, despite chronic problems in the economy and systemic shortcomings in defense industry. Although the total outpouring of military production has been massive by Western standards, we believe it will remain well short of what would be needed to fully modernize the theater forces. Only about 40 percent of the ground forces, the "active" divisions, are reasonably modern; the low-strength reserve forces have benefited only modestly from the modernization program. The theater air forces, on the other hand, are largely equipped with late-model aircraft.

The technological sophistication of the new systems coming into the forces varies. Some, such as tanks and artillery pieces, are as technically advanced as any the United States has fielded. In other areas, such as tactical aircraft, the Soviets are only on the threshold of introducing systems comparable to those widely deployed with US and Allied forces

#### **Ground Forces**

The Soviet Ground Forces consist of 212 divisions with a peacetime manning of 1.8 million men. We consider 83 of these divisions to be "active" (NATO Category A and B divisions). These divisions are manned at more than 50 percent of their authorized wartime strength in peacetime, are well equipped and trained, and are considered fit for combat on or soon after mobilization. The "reserve" force comprises the other 129 divisions. These are manned at low strength or unmanned in peacetime, are poorly equipped, and are unfit for combat without substantial postmobilization training.

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Equipment modernization has been limited primarily to the active force (see figure 1), but there are 28 reserve (NATO Category C) divisions located in the western USSR that also receive some new equipment—especially tanks—on a priority basis. The bulk of this force modernization, therefore, has been ori-

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ented against NATO's Central Region.

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Weapon Inventories. The quality of new equipment has improved substantially during the past several years. Nonetheless, most of the equipment now in the hands of troops was first introduced before or during the 1960s, and some was developed during the 1940s and 1950s. Equipment fielded since 1970 is in short supply, even for forces in Eastern Europe.

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The testing, production, and eventual introduction of new weapon systems into the force is a long process. Developing and testing a new ground forces system usually takes from seven to 12 years. Even when new systems are fielded, technical problems sometimes delay widespread introduction. Moreover, the ground forces have not enjoyed the priority for modernization that has evidently been accorded the missile and air forces. Finally, while procurement of major combat vehicles has been at high levels by Western standards, it has been inadequate to achieve forcewide modernization.

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Tanks. Soviet tank modernization programs began to make an impact on the force by the late 1960s. Today,

tanks fielded since 1960 make up about 65 percent of the total inventory. Tanks fielded since 1970 (the T-64, T-72, and several recently introduced variants) are still in short supply, however, and constitute only

about 35 percent of the force.

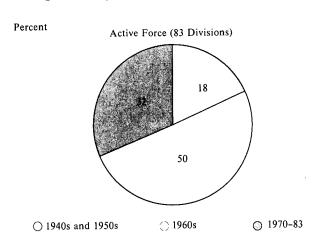
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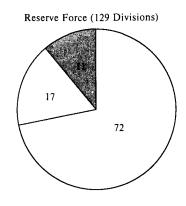
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Figure 1 Vintage of Weapons in Soviet Ground Forces, 1983





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Given the size of the current tank inventory and current rates for the acquisition of new tanks—about 1,800 enter combat units each year—large numbers of older tanks will remain in the force for the rest of this decade. The Soviets probably will rebuild and improve most of these older tanks, however. By 1990 we expect models introduced since 1970 to constitute about 90 percent of the tanks opposite NATO's Central Region but only half of the overall inventory.

Fire Support. Modernization of Soviet fire-support weapons is reflected in the growth of the variety, number, and capability of rockets and missiles, a modest increase in self-propelled artillery, and improvements in ammunition. The total number of artillery tubes (howitzers, gun-howitzers, and guns) throughout the force has risen substantially because of increases in the number of units, incorporation of artillery in maneuver units, and an increase in the size of many artillery batteries from six to eight tubes. This rapid growth has necessitated the return to service of old artillery pieces and, in some cases, the reactivation of old antitank guns in lieu of field artillery pieces. The age of the tube artillery force of nearly 30,000 tubes may be offset somewhat by Soviet

improvements in munitions. Modern improved conventional munitions have been tested, and at least the newer 152-mm tubes are capable of firing nuclear artillery shells.

There also has been a movement toward self-propelled artillery, but less than 10 percent of tube artillery currently is self-propelled. With an expected increase in the rate of introduction of self-propelled artillery, we estimate that by the end of the decade about 40 percent of the artillery in Soviet forces opposite NATO's Central Region will be self-propelled (compared with about 20 percent in 1982).

Ground Forces short-range missile and rocket inventories have risen from fewer than 250 launchers in 1960 to nearly 1,500 in 1982. The major divisional system today, and probably for the remainder of this decade, is the FROG-7. A new missile—probably an improved version of the SS-21—was first fielded in 1981 in the Group of Soviet Forces, Germany (GSFG), and 10 of 19 divisions there now have this system. We also expect the SS-23 missile system to be introduced soon in nondivisional missile units.

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Soviet forces have also received new multiple rocket launchers and mortars. The BM-27 multiple rocket launcher is entering service in nondivisional units, and a truck-mounted 122-mm system (called the Grad-1) is being fielded in maneuver regiments along the Sino-Soviet border. A nondivisional weapon, the 240-mm self-propelled nuclear-capable mortar, was introduced in the mid-1970s in special nuclear artillery units (heavy artillery brigades). Two new 82-mm mortar systems have entered service in motorized rifle units, and we anticipate the introduction of newer models of self-propelled mortars over the next few years.

Troop Carriers. The number of troop carriers—armored personnel carriers and infantry fighting vehicles—increased from 7,300 in 1960 to nearly 53,000 in 1983 as a result of a continuing Soviet program to mechanize infantry forces. There are still many units, however, that are short of troop carriers or that use trucks as troop carriers, and over 20 divisions have no means of troop transport. We believe the Soviets place a high value on infantry fighting vehicles and will continue to field them on a priority basis.

A new version of the BMP infantry fighting vehicle—the BMP-2 (with a 30-mm gun)—began to enter service in motorized rifle regiments and motorized rifle battalions of reorganized tank regiments in 1981. The BTR-70 armored personnel carrier entered service in 1979. Both of these newer systems remain in short supply, however.

Antitank Systems. The Soviets still depend heavily on guns for antitank defense but introduced two new antitank guided missile (ATGM) systems—the manpack AT-4 and the vehicle-mounted AT-5—in 1975. Most low-strength units, however, still use antitank guns in lieu of ATGMs. We expect the Ground Forces to retain their old antitank guns while continuing to field new ATGM systems.

Air Defense. Since the mid-1970s the Soviets have gradually replaced the 1950s-era S-60 57-mm AA gun in divisional air defense regiments with SA-6 or SA-8 surface-to-air missiles (SAMs). Maneuver regiments have retained AA guns, including the self-propelled ZSU-23-4, and added SAMs—the SA-9 or SA-13. Nondivisional units have switched from old AAA guns to the SA-4 SAM (introduced in the late 1960s).

Currently, 90 percent of the 83 active divisions and 85 percent of the maneuver regiments for these divisions have SAMs. Virtually none of the lower category units now have SAMs. The SA-11 SAM system entered into troop testing during 1983 in the western USSR, and we expect that it will be introduced in another year or two as a replacement for the SA-6. We also expect that the Soviets will introduce followons to the SA-8 and the aging SA-4 during the latter part of this decade.

#### Theater Air Forces

The Soviets also have taken steps over the past decade to improve the capabilities of their air forces by reorganizing, expanding, and reequipping them. Unlike the situation in the ground forces, where improvements have been concentrated against NATO's Central Region, the modernization of theater air units has occurred throughout the force

Reorganization. A major restructuring of the air and air defense forces took place in 1980 as part of the larger reorganization of Soviet military forces. During this restructuring, theater air forces were augmented by large numbers of fighter-interceptors formerly belonging to the national air defense forces. The Soviets also created Army Aviation to give combined-arms commanders greater control of the helicopter forces intended to support them. The separate Long-Range Aviation component was replaced by five strategic air armies, which were given, in addition to the medium and heavy bomber force, about 20 percent of the aircraft that formerly were part of Frontal Aviation.

Fighters. Fighter forces subordinate to the air forces of the military districts increased from about 1,550 aircraft in 1970 to almost 3,100 in 1980, despite a shift of 225 fighters to the strategic air armies. There were some gains in the size of the force through the 1970s, but most of the growth reflected the transfer of some 1,200 national air defense fighters to the control of the air forces of the military districts during the reorganization. Since 1980 the size of the counterair

Despite their transfer to the air forces of the military districts, we believe that most of these aircraft retain their primary role of territorial air defense.

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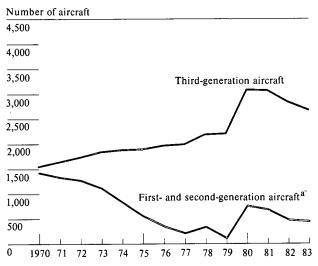
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Figure 2
Fighters in Military District Air Forces



<sup>&</sup>lt;sup>a</sup> The transfer of older air defense interceptors to the air forces of the military districts in 1980 caused the abrupt rise in the number of first- and second-generation fighters.

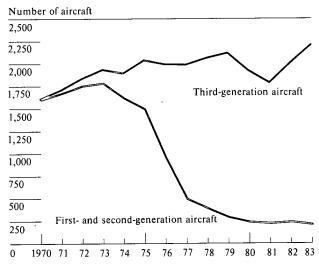
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fighter force has declined by about 10 percent through the conversion and reequipping of regiments throughout the USSR to perform ground attack missions.

Maintaining the capabilities of the fighter force through modernization has been an important consideration for the Soviets. By 1979, for example, the force had been almost completely reequipped with third-generation aircraft, primarily late-model Fishbeds and Floggers (see figure 2).

Ground Attack Aircraft. The ground attack force (light bombers and fighter-bombers) subordinate to the air forces of the military districts has grown from about 1,600 aircraft in 1970 to over 2,200 in 1983 (see figure 3). Increases through the early 1970s reflected the activation of units that were equipped with first-generation Fresco aircraft for duty along the Sino-Soviet border. The transfer of several ground attack units to the strategic air armies caused a decline in the size of the force in 1980 and 1981. The Soviets





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more than made up for these losses, however, by activating several new units and subsequently converting fighter regiments to the ground attack mission.

Although some growth in the ground attack force continued after the major buildup on the Sino-Soviet border was completed in 1973, most of the emphasis has been on force modernization. This modernization has been marked by the advent of Fencer, late-model Fitter, and ground attack Flogger aircraft as replacements for older Brewers, Fitters, and Frescos. Thirdgeneration ground attack aircraft currently make up about 90 percent of the force, compared with only 10 percent in 1973.

Helicopters. The Soviet helicopter force has grown more rapidly than any other element of the Air Force—from about 900 in 1970 to almost 4,400 today (see figure 4). Through about 1975 increases in the

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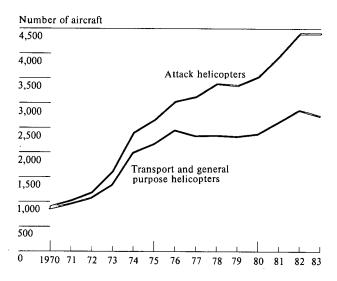
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# Figure 4 The Soviet Helicopter Inventory



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helicopter order of battle reflected additional transport and general purpose helicopters. Thereafter, deployments of new models of attack helicopters accounted for most of the gain.

Our analysis of Soviet plans for conventional air operations indicates that the rapid growth in the size of the helicopter force probably was driven by at least two developments. The first was a growing Soviet perception that during the first days of a war few fixed-wing aircraft would be available for direct support of the Ground Forces because most would be committed to theater-level air and air defense operations. The second development was an increased emphasis on airmobile and air assault missions in front operations.

#### Outlook

Despite various economic problems, adverse demographic trends, and shortcomings in the defense industries, we estimate that the growth and modernization of Soviet theater forces will continue. In the ground forces, for example, continued reliance on the tank to dominate the battlefield will impel ground force planners to develop means to counter NATO's increasingly lethal antitank weapons. Soviet solutions seem oriented toward increasingly heavy divisions, substantial increases in firepower, closer integration of combined-arms operations by tactical units, and a continuation of emphasis on modernizing forces opposite NATO's Central Region.

The Soviet Air Forces are beginning to deploy the next generation of fixed-wing aircraft. Of the three major fighter programs we expect over the next 10 years, the MIG-31 Foxhound is now being deployed, the MIG-29 Fulcrum is in series production and should be deployed soon, and the SU-17 Flanker should be available in the next year or two. We expect these fourth-generation aircraft to make up nearly half of the Soviet fighter inventory by the end of the decade. We also expect to see a new family of fighter-bombers fielded in the mid-to-late 1980s. The helicopter force almost certainly will continue to grow over the next several years to flesh out remaining division-

and army-level aviation units and to meet the demands of air assault forces.

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Madamination in the		
Modernization in the		
Soviet Aircraft Industry		25 <b>X</b> 1
Since the mid-1960s the Soviet aircraft industry has	known production techniques. Probably the most sig-	
been modernizing its manufacturing plant and equip-	nificant impact of the traditional Soviet design ap-	
ment. Evidence on the program is sparse	proach is that it results in most cases in heavier	0EV4
and program is sparse	structures, which results in most cases in neavier	25X1
but it apparently has been initiated at a control of	structures, which usually translate to lower perform-	
but it apparently has been initiated at most, if not all,	ance levels.	25X1
of the industry's major facilities. The program should		
enable the Soviets to produce the more advanced	it	25X1
aircraft that have been developed by the Ministry of	is the inadequate manufacturing technology in the	
Aviation Industry since the mid-1970s.	production sector that has been the primary factor	25X1
	inhibiting Soviet adoption of more complex aircraft	20/(1
Evolution of Manufacturing Requirements	technologies.	0EV4
Soviet aircraft designed and built in the 1950s and	teenhologies.	25X1
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into the 1960s had simple, conservative designs. They		
could be manufactured largely by labor-intensive		
techniques using basic machine tools. There was	Soviet designers have complained	
minimal use of machined parts, and all machining	that they frequently must "design down" to accom-	
was reduced to the extent possible. For example, a	modate the weaknesses in the manufacturing sector.	
manufacturing analysis of the engine for the MIG-21,	Visitors to Soviet aircraft plants during the 1960s and	
which was designed during the 1950s and entered	into the 1970s described some of the plants as resem-	
production in the early 1960s, indicated that, except	bling US aircraft plants of the 1930s.	25X1
for one or two parts, the engine could have been	omig OS anciait plants of the 1930s.	23/1
	The	-
produced with machine tools found in a typical 1930s-	The penalty for failing to adequately modernize pro-	
era US aircraft plant. Even the MIG-23, which was	duction capabilities has been a slow rate of incorpora-	
designed in the mid-1960s, has very few compound	tion of new technology in Soviet aircraft designs.	
curved sections compared with Western aircraft,	Previous Soviet attempts to depart from the deliberate	
greatly simplifying structural design and manufactur-	evolutionary approach and to base designs on technol-	
ing requirements. The manufacturing requirements	ogy that is not well understood or assimilated by the	
for these systems were consistent with the capabilities	production sector has resulted in lengthened, expen-	
of the Soviet aircraft plants in the early 1960s.	sive, high-risk development programs. A prime exam-	25 <b>X</b> 1
or the soviet another plants in the early 1700s.	pla is the TII 144 which incompanied and	23/1
This design approach has formed the Conjete to made	ple is the TU-144, which incorporated a number of	
This design approach has forced the Soviets to make	new technologies. Its development program involved	
compromises in mission requirements to ease manu-	concurrent technology and design efforts because it 25	5X1
facturing problems. For example, the military re-	was in competition with the Concorde. Although the	
quirement for the Foxbat interceptor called for a	development program continued for 23 years, the 25	<b>X</b> 1
speed capability higher than what could be achieved	Soviets were unable to solve the technological prob-	· X I
with an all-aluminum structure.	lems, and the TU-144 was never placed in regular	
	operational service.	25X1
the Soviets, rather than meeting the	•	20/ I
thermal design problems associated with these speeds,	Modernization Requirement	
S. L		

Modernization Requirement

More modern aircraft require much higher quantities of machined parts, are made of special steel alloys and other materials that have higher strengths and are

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limited the amount of time the aircraft could stay at

elevated speeds to a few minutes, just long enough to

intercept a target. This compromise enabled the Mi-

koyan Design Bureau to meet the mission requirement with a simplified structure that could be built using

therefore harder to machine and fabricate, make more extensive use of nonmetallic materials, and require much more careful control of manufacturing processes. Most of these new processes require specialized types of machine tools and other manufacturing equipment. Modernization of the Soviet aircraft industry will depend on the USSR's ability to produce modern machine tools, to adopt new investment policies that will encourage the installation of the tools in aircraft factories, to provide plants with the technical advice (and trained personnel) to support the continued use of the new equipment and technologies, and to eliminate within the industry the resistance to change.

Some of the modernization has been keyed to the introduction of new production programs to a plant. For instance, when the TU-144 supersonic transport was being introduced into production at the aircraft plant in Voronezh, substantial quantities of new machine tools had to be installed at the plant, especially to handle the large number of titanium parts on the aircraft. Although these tools, which were probably installed in the late 1960s and early 1970s, were not as capable as Western machine tools of that vintage, visitors to the plant in 1973 and 1974 noted that they were fairly modern. The equipment in the titanium machine shop contained single-spindle, three-axis milling machines that were apparently similar to early US-built automated milling equipment in the aluminum machine shop; US visitors noted numerically controlled machines that were "essentially equivalent to ours." Although none of this equipment incorporated features usually seen in US aircraft plants of the time, such as five-axis milling machines operating with all axes under simultaneous computer control, for the Soviets these tools represented significant advances.

A number of articles in the Soviet press have mentioned aircraft industry modernization programs:

- In 1976 an article noted that aircraft engine Plant 19 in Perm' "would be completely reequipped with program-controlled and other sophisticated machinery to replace the present lathes. The reequipment is expected to treble the output of plane and helicopter engines."
- An article appearing in 1978 indicated that the airframe plant in Kuybyshev which manufactures the TU-154 civil transport was being retooled and modernized. According to the article, the modernization program would increase the productivity of the plant 2.5 times.
- An article published in 1982 described the reequipment of the aircraft engine plant in Zaporozhye.
- A Pravda article in February 1983 discussed the modernization of the aircraft engine plant in Rybinsk, which it said would greatly expand the plant's productive capacity.

## Characteristics of the Modernization Effort

The pace and scope of the modernization effort are uneven and do not appear to be sufficient for the Soviets to achieve soon a manufacturing capability similar to that of Western countries. For example, the effort does not seem to be a continuous process. In an interview with a French journalist, the director of the plant in Voronezh indicated that his plant would not be receiving new tools for the current IL-86 production program that was introduced there in about 1980. According to the director, the plant would continue to use the tools and equipment installed at the plant for the TU-144 program. This equipment is now at least 10 years old. One US manufacturer has estimated that the machinery required to produce state-of-the-art technologies becomes obsolete in about 10 years.

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The capital investment policies generally followed by the production plants have tended to favor the construction of new plant floorspace at the expense of purchasing more modern equipment. According to the recent Pravda article discussing the modernization of the aircraft engine plant in Rybinsk, throughout the entire industry only 39 percent of total capital investment for industrial purposes was used to acquire new machine tools and other manufacturing equipment. The plant managers and other administrative personnel have usually opted to spend the funds on the construction of new buildings rather than the purchase of new manufacturing tools and equipment. Installation of new equipment interrupts the production flow and adversely affects bonuses tied to quantity rather than quality.

Even when funds are available, the machine tools produced in the Soviet Union are less capable than those available in the West. Soviet numerically controlled equipment, for instance, consists mostly of single-spindle, two-axis machines that in the United States are considered first-generation equipment. It appears that most, if not all, of the most capable Soviet machine tools are developed by the aircraft industry itself. The civilian machine tool industry is estimated to be even further behind the West in the ability to produce modern machine tools.

the numerical controls are especially poor. As a result, the Soviets install large quantities of imported controls on these tools.

while many of their basic machine tools are good, their bearings wear rapidly, causing frequent breakdowns and loss of accuracy.

Although the Soviet Union is estimated to be the world's largest importer of machine tools, the aircraft industry uses little Western equipment.

only 5 percent of the equipment stock

of the Soviet aircraft industry is imported.

Some

examples of the types of Western equipment installed

## Soviet New-Generation Aircraft

Name	First Flight	Туре	
Flanker	1977	F-15-type fighter	
Fulcrum	1977	F-16/18-type fighter	
Blackjack	1981	B-1-type strategic bomber	
Condor	1982	C-5A-type heavy airlifter	
RAM M	1982	U-2-type high-altitude reconnaissance	
RAM Q	1982	Possible tactical bomber	
IL-96	1985/86 (est.)	Long-range wide-bodied transport	
TU-204	1985/86 (est.)	Possible B-767-type transport	

in aircraft plants are numerically controlled presses from Sweden, milling machines from West Germany and Japan, and automated rivet-making equipment from the United States. The rivet-making equipment was installed in the airframe plant in Gor'kiy that manufactured the Foxbat and is now producing the Foxhound, the newest Soviet fighter to enter operational service.

One reason for the resistance to modernization is the lack of technical support available to the production plants to assist in solving problems associated with the introduction of new manufacturing methods and machinery. Modern aerospace manufacturing technology is complex and requires carefully controlled conditions. Often the ability to make new processes work comes only after extensive experimentation in the manufacturing environment. Equipment associated with new technological processes is often itself new and, thus, temperamental and difficult to operate correctly. In the Soviet system the separation of the manufacturing research and engineering personnel from the personnel of the manufacturing plants is a strong barrier to the improvement of manufacturing processes.

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Outlook  The Soviets now have under development several new	
aircraft that we believe incorporate technology ad-	
vances permitted, at least in part, by the moderniza- tion program. A partial list of these aircraft is shown	
in the table.	25X1
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they will be more complex aircraft. They will proba-	
bly contain more compound curvatures on wings and fuselages, may utilize lighter weight construction	
practice, and incorporate more complex features, such as high-lift devices, that will make them more	
adaptive to a wider range of operating conditions.	•
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Thus, the gains the Soviets have made in recent years	
will permit the Soviets to produce aircraft roughly equivalent to those the West developed in the late	
1960s to mid-1970s. The West, however, now has under development aircraft that will incorporate even	•
more complex structures and technologies. Serious	
shortcomings in the Soviet aircraft industry may limit Soviet responses to these systems. Key advances to be	
incorporated in the next generation of Soviet aircraft	
will depend on a continuation of the modernization program and on technology acquired from the West.	
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Fielding High-Technology Weapons in the 1980s: The Challenge to the VPK

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The Soviets have a powerful executive management structure for the expeditious development and production of weapon systems. While this structure and its methods of operation are effective for fielding weapons using the technologies of the past, the Soviets had serious difficulties in the 1970s with bringing more advanced technology to the battlefield in a timely manner. These difficulties may be overcome in the 1980s if current technologies can be redesigned and repackaged in increasingly capable weapons. But if ever newer technologies are required for new systems and evolutionary design proves ineffective, the management structure will exacerbate the predictable difficulties that will accompany this effort.

Priorities. To facilitate rapid development and ensure fairly predictable supplies, planning documents for development, production, and construction organizations place military projects at the head of the list of projects to be completed. If unforeseen shortages of materials and components arise, the VPK and the party Defense Industrial Department stand ready to enforce these priorities. Special bonuses are authorized so that labor can be obtained quickly to overcome unforeseen changes or disruptions that would otherwise undermine schedules.

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## Executive Management

The Soviet weapon acquisition process is characterized by early and complete presentation of weapon program decisions to the highest levels of the leadership. Major programs are launched by the signatures of the Chairman of the Council of Ministers and General Secretary of the Communist Party. The Military Industrial Commission (VPK), as a working body of the Presidium of the Council of Ministers, functions as the leadership's expediter. As such, the VPK epitomizes the command-economy approach to weapons acquisition. This approach employs special procedures and practices to cut through a normally inefficient state economic apparatus.

These systemic priorities enjoyed by the defense industries should be distinguished from the leadership decisions that determine the overall level of defense spending. The former are essentially privileged positions in the queue for the delivery of resources after the allocations have been made.

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Decisionmaking Process. The VPK oversees the drafting and coordination of decision documentation, reducing the time that is lost in the decisionmaking process. The VPK-directed coordination and approval of program decisions reportedly requires as little as two to six months, in contrast to the two to four years that civilian customers can spend obtaining approvals for the development of new products and securing contractual obligations from developers. This process also establishes clear lines of accountability and firm commitments to deadlines.

Momentum. Many of the resources in weapon program decisions are not the object of discretionary leadership choice, but are simply the result of inertia inherited from past programs. Weapon program decisions involve complicated trade-offs between resources, technical objectives, development goals, and timing. In a Soviet-style economy, program resource allocation decisions are more difficult than in a market economy because of the need to integrate such decisions with resource allocation in economywide planning. Major physical resources are explicitly allocated by planners and not distributed by a market auctioning process. To make the process manageable,

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of current production.

capital investment is chosen as the main instrument in five-year plans for resource allocations among major sectors of the economy. This limits leadership discretion on resource allocation largely to the changes affecting capital investment and facility staffing, rather than to those affecting the detailed reallocation

In this way, physical capital and manpower come to be dedicated over the long run to product specializations that are institutionalized in the defense industrial ministry structure. Like their civilian counterparts, defense industrial ministries divide responsibilities among functionally standardized subordinate organizations. The dedication of such support functions as construction, materials development, and manufacturing technology to one product specialization limits the flexibility of the system to shift resources between products. This creates a momentum for the continued use of resources for weapon programs that is difficult to reverse.

#### Impact of Program Practices

Program practices ensure that early choices of basic materials and manufacturing technologies will not change over the course of development. In its quest to focus on the most easily controlled elements of a program, the VPK-driven apparatus emphasizes concurrent development of subsystems and an early and strict commitment to a final schedule of deployment. As a result, developers make a very early commitment to the materials, component, and manufacturing technologies to be employed. Furthermore, the early commitment to a deadline motivates them to choose weapons technologies that are well within the prevailing capabilities of Soviet production plants. Little adjustment is made for new developments afterward because of the threat this would pose to schedules. Where development of subsystems employing advanced technology is undertaken concurrently with system development, more conventional subsystems are developed in parallel as a form of insurance.

The early selection of low-risk technology is reinforced by the chief designer's lack of options to accelerate technological development. Any materials or production processes that have to be developed for a system must be explicitly identified by chief designers in the initial VPK decree. However, the number of

individual components and parts in a complex weapon system is extremely large relative to the ability of small executive staffs such as the VPK to monitor the performance of the many subcontractors involved. Such staffs cannot evaluate esoteric engineering excuses over a wide range of product developments, and the proliferation of VPK orders would diffuse its authority and undermine its credibility.

As a result of these low-risk program practices, Soviet weapon technologies, with some exceptions, lag those of the West. The first Soviet onboard digital guidance computer was flown on a ballistic missile in 1972, 11 years after the first such computer was introduced in the United States, and it embodied a less advanced level of component technology than the US computer. Similarly, the first Soviet phased-array radar—the Flat Twin—was initially installed at Saryshagan in 1972, 13 years after the first US phased-array radar was deployed aboard ships.

Compensating Design and Production Practices

The Soviets have employed a variety of design and
manufacturing practices to compensate for technology
lag:

- Considerable ingenuity is spent in clever packaging and application where available technology does not readily produce advanced performance. For example, the SA-6 radar uses dated tube technology to perform the functions of more advanced electronic circuits to give the SA-6 greater target acquisition and tracking capabilities than previous Soviet SAM systems.
- In other cases, designers employ brute force techniques to compensate for limitations in underlying technology. Soviet over-the-horizon radars use very-high-power transmitter tubes to emit a strong signal rather than advanced computer processing techniques to extract targeting information from weak signals.

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• Finally, designers employ straightforward techniques to circumvent difficulties with high technology at the expense of other, less pressing military requirements. For example, in the SA-10 system, rather than using a complicated signal processor to screen out ground clutter, the Soviets simply mount the system's radar on a 30-meter-high tower to reduce ground clutter and thereby enhance lowaltitude coverage. Maintainability and transportability suffer somewhat, but the essential military mission is accomplished and the technological requirements are minimized.

Using these techniques, Soviet designers often develop weapon systems whose performance on the battlefield is better than the underlying technology would suggest. In effect, Soviet design ingenuity is generally more advanced than the technology used

The Soviets also often rely on the direct imitation of Western weapon designs to save time and money in development. This allows them to select a proven design without much preliminary investigation and to use Western test data to evaluate their own designs. However, this practice does not directly address the problem of technology. The transfer of paper designs, specifications, and configurations rarely involves the transfer of underlying technology in the form of better materials or processes.

#### The Problem of Advanced Technology

The combination of executive management, weapon design, and manufacturing practices that constitutes the Soviet style of weapon acquisition has produced a large quantity of formidable arms in the past. However, in the 1970s the Soviets began to experience a growing number of difficulties in the development of highly advanced systems that have prolonged schedules and delayed deployments. For example:

- The Soviet SS-X-24 medium solid-propellant ICBM was probably scheduled to begin deployment in about 1978, but difficulties in developing an acceptable solid-propellant motor have delayed its deployment to about 1985.
- The Pechora ABM phased-array radar, which was authorized for construction in 1973, was intended to become operational in 1981. Significant problems with the electronics have postponed this milestone until about 1986.

• The SA-10 surface-to-air missile system, which the Soviets probably began designing in about 1967, appears to have been intended for deployment in 1979.

appears to have been intended for deployment in 1979.

• The SH-08 ABM interceptor program and the SA-12/antitactical ballistic missile (ATBM) program, which appear to be technologically related, have both experienced delays. The SH-08 and SA-12 began flight tests in late 1973; and the ATBM, in the spring of 1974. None of these

ATBM, in the spring of 1974. None of these weapons have been deployed as yet,

The command-driven institutional and managerial practices, which have served so well in the past, have probably compounded the technical difficulties and prolonged the search for solutions to problems in these and other programs. These practices—exemplified by the VPK approach to programing—ensure that technical delays in one area will have a ripple effect throughout system development. Subsystems well along in development may have to be redesigned to accommodate solutions to problems elsewhere in the system. The inability of command decrees to advance technology across the board means that advances will be highly uneven. Advances in a selected component or material—explicitly ordered in a decree—may prove incompatible with a lagging technology elsewhere in the system. Early commitments and prompt accountability of developers to the executive leadership motivate developers to search for excuses and scapegoats—rather than solutions—in the short run. This, in turn, hinders the long-run search for resolution. Finally, the momentum of resource commitment to programs means that manpower and facilities committed to a program may be idled for extended periods while technical problems are resolved elsewhere in the program.

The Soviets can regain their former momentum if, having mastered the technologies of the 1970s, they then can apply traditional, evolutionary, but clever

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design practices to improve weapon preformance in the late 1980s and 1990s. In this case, late 1970s technologies will be translated by the design practices previously described into increasingly effective weapon systems. On the other hand, weapon performance may not keep up with the challenges from the West by the reuse and redesign of these technologies in subsequent weapon programs. Then the Soviets will probably feel compelled to continually upgrade materials, component, and manufacturing technologies. The resulting high turnover of new technologies would preclude the use of simplicity, brute force, and the ingenuity that comes from familiarity with older technology. In this case, the VPK-orchestrated development process will probably not be able to avoid protracted and costly development in future weapon programs.

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Soviet Force Modernization		
in the 1980s:		0574
Resource Implications		25 <b>X</b> 1
Soviet resources devoted to weapons procurement	provided sufficient resources to sustain ongoing pro-	
grew rapidly from the early 1960s through the mid-	curement programs as well as undertake a number of	
1970s. Although we believe weapons procurement	new programs.	25X1
showed little or no growth from 1976 through 1982,		
the level was such that substantial modernization	Force Modernization, 1976-82	
continued. Our uncertainty about why weapons pro-	Since 1975 the Soviets have continued their long-	
curement did not grow during this period clouds our	standing efforts to improve both their offensive and	
assessment of future resource trends, but not our	defensive strategic forces. In the 1976-82 period, they	
perception that modernization of key strategic and	procured about 2,500 ballistic missiles and more than	0EV4
general purpose forces will continue.	doubled the number of reentry vehicles (RVs) and	25 <b>X</b> 1
Soviet Defense Spending: Trends Since 1965	bomber weapons available for strategic operations,	
Total Soviet resources devoted to defense—measured	from about 5,000 warheads in 1976 to over 10,000 in	
in constant ruble prices—grew in real terms at rough-	1982. They also continued to improve their strategic air defense, building a sophisticated defensive network	
ly 4 to 5 percent annually in the period 1965-76 as the	with good capabilities against aircraft penetrating at	
Soviets vigorously pursued both R&D and weapons	medium and high altitudes. Major programs included:	
procurement programs. We estimate, however, that	the replacement with new missiles of over 700 older	
much slower growth of total outlays has occurred	ICBMs and the deployment of 18 additional D-class	
since 1976, at about half the annual average rate of	SSBNs; the addition of over 300 SS-20 launchers and	
the 1965-76 period. The slower growth in defense	100 Backfire bombers; the replacement of older air	
spending coincides with slower growth in Soviet GNP,	defense interceptors with 1,400 new-generation air-	
and we estimate that a fairly constant share of GNP	craft; and the introduction of the SA-10 in late 1980.	
has been devoted to defense since the early 1970s—on		25 <b>X</b> 1
the order of 13 to 14 percent when measured in		
constant prices.	The weapons inventory of Soviet ground forces ex-	25 <b>X</b> 1
The cloudeway of arough in total anomaling accounts from	panded during this period as the USSR increased the	
The slowdown of growth in total spending results from almost no growth in 1976-82 in the largest category of	size and firepower of its divisions and added 13 new	
spending, military procurement. In turn, the trend in	combat divisions. The Soviets concentrated on deploying new and increasingly sophisticated land arms,	
procurement expenditure observed since 1976 reflects	which increased both the firepower and mobility of	
relatively slow or negative growth in its three major	their ground forces. Major programs included the	
components—naval ships, missiles, and aircraft.	procurement of about 15,000 tanks (primarily T-64s	25 <b>X</b> 1
• • • • • • • • • • • • • • • • • • • •	and T-72s), over 30,000 armored vehicles, and over	23/1
It is important to note that, despite the plateau in	10,000 artillery pieces, including a large number of	
military procurement since 1976, the Soviets contin-	self-propelled guns and howitzers.	25X1
ued to significantly improve and, in some cases,		20/(1
expand their forces over the period. This is because	The Soviets also continued to modernize their tactical	
Soviet procurement during 1976-82 remained at a	air forces primarily through the continuation of a	
very high level, roughly 50 percent higher than that of	number of procurement programs begun in the early	
the mid-1960s. The high level of procurement has	1970s. The new aircraft incorporated more sophisti-	
	cated avionics and had greater payload capability	25X1
		20/(1

Sanitized Copy Approved for Release 2011/08/05: CIA-RDP84T01083R000100120005-1 **Top Secret** 25X1 Decisions to comply with the SALT I and unratified than the aircraft they replaced. Major procurement SALT II agreements also slowed the pace of proprograms included about 1,000 fighter-interceptors, curement growth in certain areas. 25X1 over 1,500 fighter-bombers, and almost 800 light bombers. 25X1 During 1976-82 the Soviets continued their efforts to Implications for Force Modernization in the 1980s 25X1 The new trend we have observed in military procurebuild an open-ocean navy with greater endurance and ment, together with slower economic growth and the improved survivability constructing 75 major surface unsettled leadership picture, raises the question combatants, all equipped with guided missiles. They whether the Soviets will continue to show little growth have also constructed 81 general purpose submarines, in military procurement, seek some marginal increase, most of which were nuclear powered 25X1 or attempt to return to (and possibly even exceed) the growth rate of the 1966-76 period. 25X1 Factors Behind the Recent Procurement Trend We do not have any information on what the actual On the one hand, there is evidence suggesting that the procurement plans were for the 10th Five-Year Plan Soviets are planning a broad-based and pervasive (FYP), 1976-80. 25X1 modernization program through the mid-1980s. As a 25X1 result of the expansion of floorspace at Soviet production facilities that occurred during the 1976-80 plan period, defense industrial capacity appears to be sufficient to support substantial force modernization. Moreover, since 1981 the expansion of R&D facilities has continued and about 60 major new weapon sys-Beyond the relatively sparse evidence available on tems have been deployed. We project that over 60 procurement intentions in the 10th FYP, we can more could reach initial operational capability by identify several major factors that may have damp-1985. Over half of the total are of completely new or ened the growth in defense outlays since 1976. We highly modified designs—a larger share than in any cannot be sure, however, that these factors alone, or 25X1 five-year period since the mid-1960s. even in combination, fully explain the trend of the last six years. Initially, at least, the absence of growth in Any major effort to pursue an intensive, broad-based military procurement can be attributed to concurrent modernization of the forces that would sharply accelgaps between the procurement cycles of several large, erate growth of military procurement would mean expensive weapon programs. 25X1 overcoming certain constraints. For example, Soviet economic growth continues to be sluggish and is These concurrent dips in major systems procurement, projected to average only about 2 percent annually however, are only a partial explanation of the slowthrough the end of the decade. This reflects the likely down. Other factors appear to involve technical probcontinuation of lagging productivity, raw material lems, industrial bottlenecks, and weapons-specific shortages, and transportation bottlenecks from which policy decisions: the defense industries do not appear to be totally isolated. A sharp upswing in procurement of military 25X1 hardware would draw important resources-skilled number of major weapons ran into technical delays labor, high-quality plant and equipment, raw materithat pushed their serial production back at least a als, and energy—from other sectors of the economy. few years. In other areas, the Soviets apparently had Such a development would probably, in the long run, problems manufacturing systems even when testing erode the industrial base supporting the defense effort was completed successfully. 25X1 by limiting investment resources available for the expansion of industrial capacity. raw material, energy, 25X1 and transportation bottlenecks disrupted military production, but the evidence is largely scattered and we cannot measure the extent of their impact on procurement. 22 Top Secret

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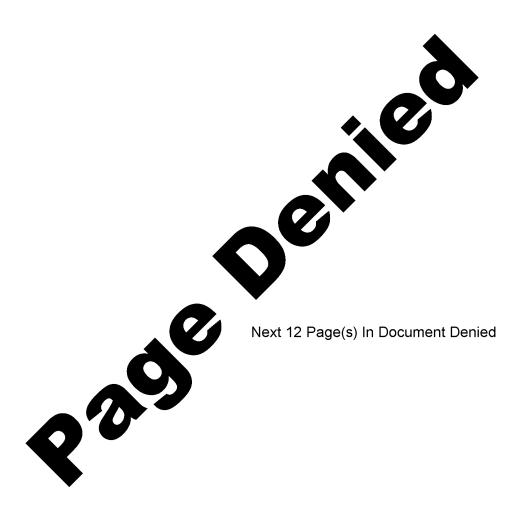
We believe that, beyond general economic constraints likely to affect weapons production, there is also the question of whether the Soviets will be able to overcome the technical and manufacturing problems with advanced weapons that have contributed to the recent procurement slowdown. Some of the constraints appear pervasive and will be difficult for the Soviet system to correct. Further, we expect the potential for design and manufacturing difficulties to increase as the proportion of new weapon systems embodying Soviet state-of-the-art technology increases.

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Despite these conflicting indicators which cloud our assessment about the pace and level of future weapons production, it is clear that the Soviets plan to continue to modernize their forces. We remain confident that improvements will be made across the board in key strategic and theater forces areas and probably will include, among others, new ICBM programs, new fighter and interceptor aircraft, general purpose submarines, and tank modernization programs. Further, we believe the Soviets are likely to procure these new systems in large numbers. The difficulty arises in determining which programs or combinations of programs will be pursued and at what pace. We believe that not all systems currently under development will be introduced, certainly not in concert. Thus, while we believe that it is possible that additional resources could be made available to support modernization at a slightly more rapid pace than at present, it is unlikely that growth in military procurement during the 1980s would attain the high rates seen in the mid-1960s to mid-1970s.

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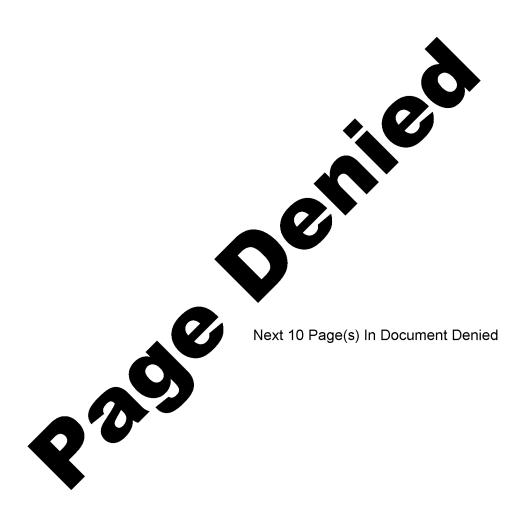
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# **Briefs**

25X1 **Soviet Force** Changes in Soviet training patterns in East Germany and the apparent extension Preparedness in of the troop rotation period suggest the USSR is using new approaches to maintain Eastern Europe the combat preparedness of its ground forces. at least six of the 19 Soviet divisions in East Germany have adopted a new training program that allows more time to master combined-arms tactics by avoiding repeating elementary training as new recruits arrive every six months. 25X1 The Soviets may be experimenting with ways to control steep fluctuations in the preparedness of ground force combat units while making more efficient use of the limited training space in East Germany. Since 1968 troop rotation has involved the rapid turnover of about one-fourth of the conscripts—uniformly throughout the force—with a resulting temporary plunge in combat preparedness every half year. The new approach aims to isolate rotation effects to those small units that will be completely manned by new conscripts, which train in their garrison areas, while units that do not receive them continue with more advanced field training. 25X1 Tactics for Soviet and East European delegations in Helsinki, evidently to court West Disarmament European opinion on the INF deployment issue, were unusually cooperative last Conference 25X1 month in adopting on schedule an agenda and timetable for the coming Conference on Disarmament in Europe. Soviet negotiators at the preparatory meeting indicated that, once the conference opens in Stockholm on 17 January, the East intends to introduce contentious issues. These would include nuclear-free zones and an extension to the Atlantic of the area covered by some military confidencebuilding measures. 25X1 Eastern attempts to raise nuclear and other issues opposed by the United States and its allies will make the Stockholm talks much more difficult. A Soviet press handout in Helsinki confirmed that INF will be a major Eastern issue there. Moscow almost certainly will use the conference to exploit any West European discontent following the first INF deployments. 25X1

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