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# The Soviet Machine-Building Complex: *Perestroika's* Sputtering Engine



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An Executive Summary

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# The Soviet Machine-Building Complex: *Perestroyka's* Sputtering Engine




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**An Executive Summary**

This paper was prepared by   
 Office of Soviet Analysis,  
with contributions from analysts in the Defense  
Industries Division and the Foreign Trade Branch,  
SOVA 

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Comments and queries are welcome and may be  
directed to the Chief, Defense Industries Division,  
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*Increasing economic efficiency, carrying out the planned structural improvements, resolving social tasks, strengthening the country's defense capability and its international prestige, increasing the attractiveness of our economic example, and developing trade with foreign countries—all these major problems are pulled together into a single tight knot by the results of the restructuring of machine building.*

Lev Zaykov  
Politburo Member  
October 1986

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**The Soviet Machine-Building  
Complex: *Perestroyka's*  
Sputtering Engine**

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**Key Judgments**

*Information available  
as of 12 April 1988  
was used in this report.*

At the center of General Secretary Gorbachev's economic revitalization strategy is his sweeping program to modernize the critical, and heretofore ignored, civil machine-building sector. After nearly two and a half years, the modernization effort has made little progress and is far behind schedule:

- Machinery production is below plan, with 1987 output no better than 1986 output.
- Product quality has improved but is well below leadership expectations.
- New equipment improves only slightly on the technical level of existing models, and new designs have been slow to appear.
- Retooling has been plagued by inadequate equipment supplies and problems in installing and operating new machines.

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The challenges of rejuvenating a largely antiquated and stagnant sector have been formidable, and contradictions in the program itself have further stymied progress. Gorbachev insists that enterprises meet tough—often countervailing—performance targets all at once. Moreover, measures to reform the sector have often been introduced piecemeal, leaving machine builders responsible for operating under new regimes without the benefits of a supporting infrastructure. As a result, the sector has been thrown into a potentially volatile state of flux. Machine builders, tasked with what they believe to be unattainable goals and besieged by high-level criticism, have begun to display a sense of desperation. Indeed, one machine-building official reported in the Soviet press that “we are, to put it bluntly, being skinned alive.”

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Gorbachev's immediate challenge is to ease pressure on the sector while still moving forward with his program. He appears to recognize that machine builders cannot be pushed to the extremes witnessed over the past two years and has begun laying out a conciliatory course of action. At the same time, the party chief does not want machine builders to interpret his actions as signs of weakness and to begin resisting the modernization strategy across the board. Therefore, he has not publicly backed off from his reform schedule and exacting performance targets, even though most plans for 1986-90 are beyond reach. To partially offset these shortfalls, he is leaning heavily on defense industry and, to a lesser extent, on Eastern Europe for increased equipment deliveries. Soviet orders for Western machinery and equipment, however, have remained relatively low, suggesting Gorbachev still adheres to his stated policy of limited reliance on the West.

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In the near term, Gorbachev must forge a leadership consensus on the viability of pursuing civil modernization into the 13th Five-Year Plan (1991-95). A high-investment, high-growth strategy must, at a minimum, continue through at least the first few years of the period to renew the sector's capital stock. We believe Gorbachev will argue strongly for this—even if it means postponing some investment in defense production capacity. He has taken steps to minimize a serious challenge from the military in large part by replacing top military and defense industry officials with personnel supportive of his policies. 

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Over the long run, Gorbachev's program will result in some improvement in the quality and technological level of Soviet manufactured goods and in a one-time modernization of the nation's production capital. However, it will not achieve the more important goal of transforming civil machine building into a sector characterized by the use of successive generations of increasingly productive equipment and the continuous, rapid introduction into production of advanced, high-quality goods. For this to occur, Moscow would have to relinquish major elements of central planning and price setting. Although existing decrees would allow for these reforms, their implementation would overturn the basic working arrangements of the Soviet economy, and the chances of such fundamental changes occurring are small, particularly over the next few years. 

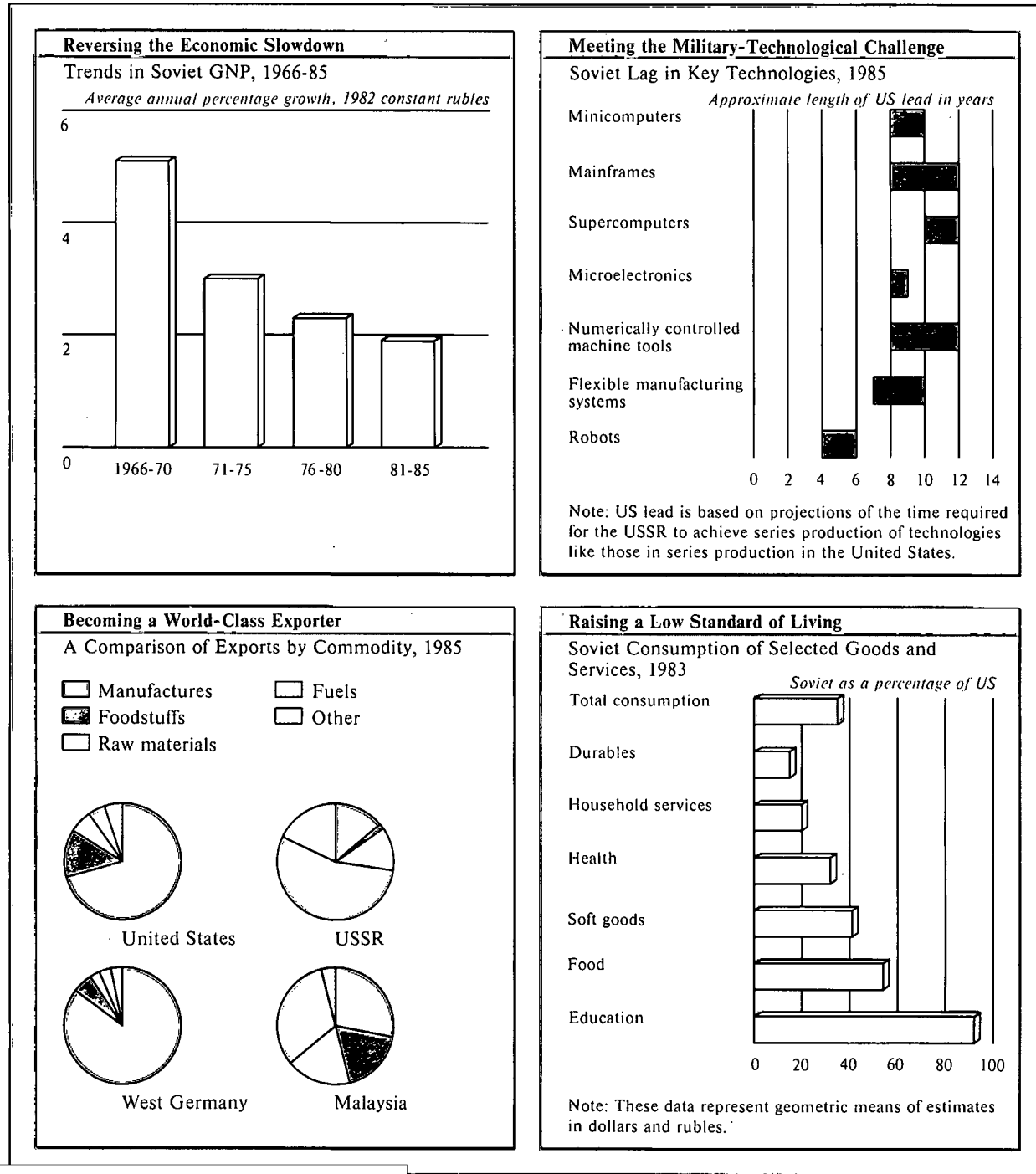
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**Figure 1**  
**Gorbachev's Domestic Imperative**



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### The Soviet Machine-Building Complex: *Perestroika's* Sputtering Engine



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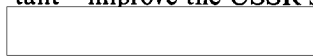
#### Gorbachev's Objective: Routine Product and Process Renewal

Even before Mikhail Gorbachev came to power, Soviet leaders blamed the slippage in economic growth and the USSR's technological lag on the fact that Soviet industry was hobbled by an obsolete industrial base, gross systemic inefficiencies, and a perverse system of incentives. They believed that the economy's problems placed the USSR's hard-won military gains at risk, seriously threatened the legitimacy of the country's claim to be the socialist economic model, and weighed heavily on a population faced with poor quality and chronic shortages of basic consumer items (see figure 1).



Gorbachev has made economic revitalization—*perestroika*—a top policy priority, emphasizing that it is essential for the regime's long-term viability. He has argued, we believe correctly, that the key to long-lasting improvement of the country's economic situation is *continuing, self-sustaining product and process renewal*. In particular, he believes that:

- The routine infusion of reliable, technologically sophisticated equipment into the nation's industrial capital stock is crucial to securing long-lasting productivity gains throughout the economy.
- The rapid development and production of high-quality, advanced consumer goods will directly improve consumer welfare and the USSR's export position.
- Developments in critical technologies, such as microelectronics and computers, will foster advance across industry, and—equally, if not more important—improve the USSR's military capabilities.



Machine building is the sector of industry on which Gorbachev is relying to ensure the success of his strategy. The hub of Soviet industry, this complex

employs over 16 million workers at more than 9,000 research institutes, design bureaus, and production enterprises, and is responsible for designing, developing, and producing over one-fourth of the country's industrial output. Of the 17 industrial ministries that make up the machine-building complex (detailed in foldout at back of paper), nine—collectively referred to as the defense industry—specialize in military hardware. The other eight produce primarily consumer goods and equipment for investment in the civil sector.



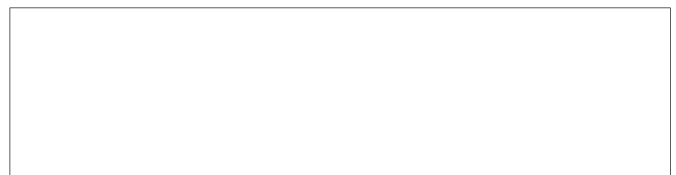
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The Soviets historically have striven to steer the defense industry to the forefront of world technological and industrial prowess through high-level oversight, top priority in personnel and resource allocations, and lavish investments of the best Western and Soviet production capability.<sup>1</sup> Nevertheless, the Soviets have confronted ever increasing problems in the production of sophisticated weapons. Despite extensive efforts in the 1970s to upgrade these capabilities,<sup>2</sup> rapidly advancing production technologies in the West and Japan seriously threaten to outpace those of Soviet weapons producers. By the early 1980s the Soviet military leadership was well aware that, without a comprehensive and responsive industrywide infrastructure to support, if not lead, routine modernization, defense plants would fall ever further behind the West.



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At the same time, civil machine-building capabilities have fallen well behind the Soviet defense industrial state of the art and woefully behind Western achievements. The sector has historically, in the words of Gorbachev himself, "not been allocated sufficient



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resources for its development." Its personnel and management have been recruited from what defense could not hire away, and its priority for investment and material allocations was typically overshadowed not only by that of the defense industry but also by those of other civilian sectors, such as energy and agriculture. Most important, civil machine building had little incentive to satisfy its customers and produce the best or most advanced equipment possible. Thus, before it could be called upon to nurse the economy back to health, civil machine building had to be modernized [redacted]

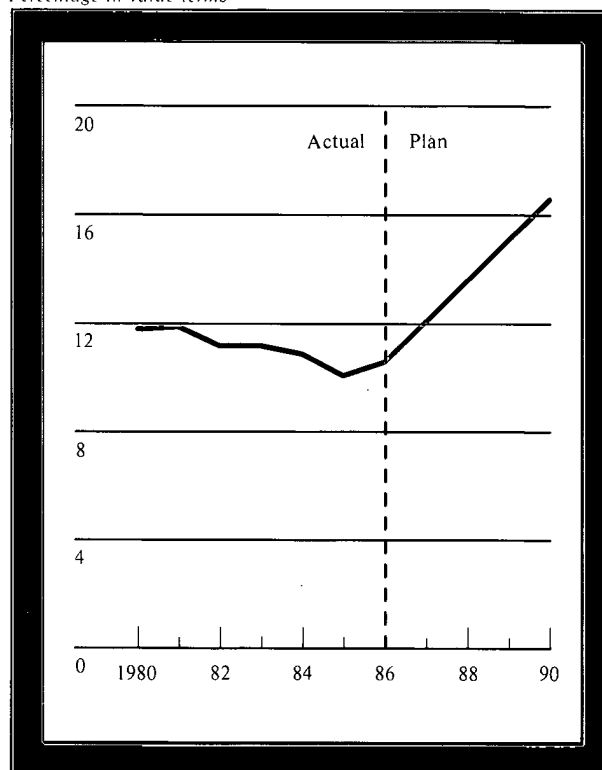
### The "Kick-Start" Program: Administrative Measures

Gorbachev wasted no time in addressing the sector's ills. He initially attempted to revitalize, or kick-start, civil machine building using administrative levers. In particular, he:

- *Applied sanctions and introduced incentives to boost production.* To motivate machine builders to increase production by 43 percent during the 12th Five-Year Plan (FYP), Gorbachev tasked them to work harder, introduced a better wage and bonus system, and pushed them to use equipment during more hours of the day and to employ materials and equipment more efficiently. He fined the enterprises and reduced worker bonuses when they failed to meet production targets.
- *Introduced a stringent quality control program.* On 1 January 1987, the Soviets selectively introduced a quality control system known as State Acceptance. Ostensibly, the system acts on behalf of the buyer as it reviews products for compliance with technical standards and for visual appearance. State Acceptance is in effect at more than 1,200 civil machine-building enterprises that produce a wide range of the most important investment and consumer goods. Roughly 80 percent of civil machinery production is subject to it.
- *Pressured machine builders to raise their rate of innovation.* By the early 1990s, Gorbachev expects 85 to 90 percent of Soviet machinery to correspond to "world technical levels"—a lofty target given the

**Figure 3**  
USSR: The Percentage of Production Equipment in Civil Machine Building That Is New Each Year, 1980-90

Percentage in value terms



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USSR's position vis-a-vis Western machinery producers (see figure 2). To force machine builders to transfer existing technologies into production more rapidly, the Soviet leader has required them to produce only that equipment that their customers ordered. He has also provided equipment designers with monetary incentives and upgraded their experimental test bases to encourage them to create new designs capable of reducing the Soviet technological lag. In particular, he has devoted considerably more resources to the development of those technologies that have been the key to effective

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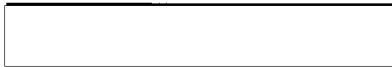
**Key Technologies: A Bear in Sheep's Clothing?**

*Soviet improvements in key technologies will benefit more than just the civilian economy—they will undoubtedly help the military confront the technological challenge looming on the Western horizon. The highly capable weapons the USSR plans to deploy in the late 1990s and beyond will depend on dramatic improvements in manufacturing technologies. These weapons will use more complex guidance, sensor, computer, and communications subsystems, which in turn require sophisticated microelectronics, computers, and automated manufacturing.*


*Automated machine tools, robots, and flexible manufacturing systems (FMSs) are particularly attractive in weapons manufacturing because they are ideally suited to batch production of highly complex and precise parts. Moreover, the military places a premium on minimizing leadtime between design and manufacture and on high quality—and FMSs deliver these features. The military applications best suited for automated manufacturing include airframe and engine part fabrication; milling and finishing of tank hulls, turrets, and guns; and fabrication of mechanical components and subassemblies of other ground, air, and naval weapon systems.*

*The USSR's effort to develop microelectronics has been driven by military concerns, and, consequently, the military has been the main recipient of advances in this area. The Soviets place a high priority on including sophisticated microelectronics in avionics, missile guidance, fire control, antisubmarine warfare, and intelligence systems. Moreover, because advances in automated manufacturing depend heavily on microelectronics, this technology is becoming more important in military production.*

*Finally, computers are essential to the performance of many strategic and tactical military systems: airborne, spaceborne, missileborne, and shipboard, as well as fixed and mobile ground-based systems. In fact, computers are involved in the entire life cycle of military systems, from design, development, manufacture, and testing through operations, maintenance, diagnostics, upgrades, and logistics. The Soviet military recognizes these roles and is actively pursuing indigenous computer technologies as well as exploiting advances in the West.*



industrial modernization and economic growth in the West, as well as to advances in military capabilities in the USSR (see inset).

- *Dramatically shifted renovation policies to turn over the sector's capital equipment.* The sector must more than quadruple its rate of withdrawal of capital equipment by 1990. Simultaneously, through the infusion of massive capital investments in the form of advanced and highly productive equipment, machine builders are to retool their industrial base. By 1990 Gorbachev wants more than 60 percent of the sector's production equipment to have come on line during the preceding five years (see figure 3). To achieve this goal, civil machine building has first claim to its own production and is receiving support from the defense industry and equipment producers in the socialist community and in the West. 

**The "Overhaul" Program: Systemic Change**

The leadership realized that administrative measures would be insufficient to bring lasting change to civil machine building and that the sector would have to be reformed. Thus, Soviet leaders looked for a way to make product and process renewal routine rather than forced. Their solution was to augment much of the top-down, centralized push with a decentralized pull, so that workers and managers would be continually motivated to innovate (see figure 4). The leadership is:

- *Decentralizing decisionmaking authority to the enterprise.* To motivate workers and managers to work on their own initiative, Gorbachev is giving them more responsibility for their plant's operations

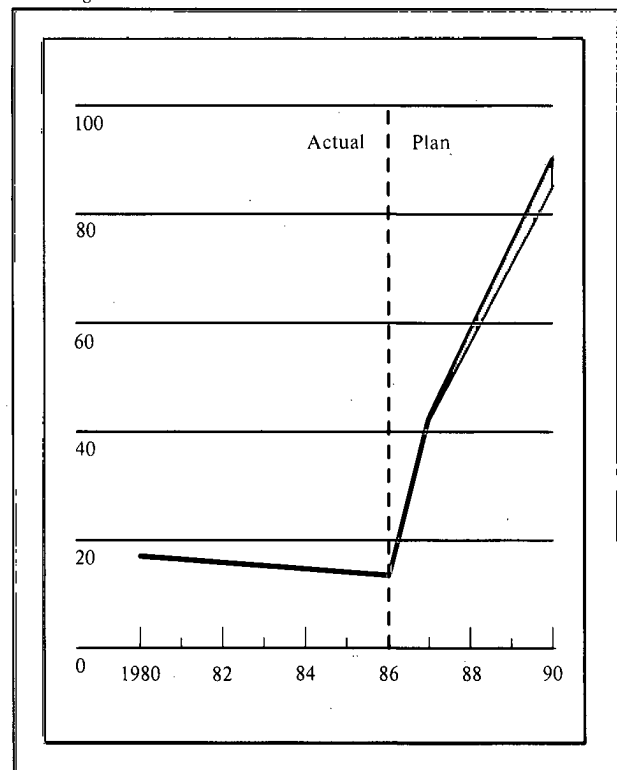
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**Figure 2**  
**USSR: The Share of Civil Machinery**  
**Meeting World Standards, 1980-90**

Percentage in value terms



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and, hence, its success or failure. He is introducing reforms that give enterprises greater authority in deciding what and how much they produce, who they purchase supplies and equipment from, and how much they sell their products for.

- **Removing deadwood at middle layers of the bureaucracy.** In an effort to ensure that ministries do not interfere with enterprises' new responsibilities, Gorbachev has reduced the number of civil machine-building ministries from 11 to eight and has eliminated unnecessary bureaucratic layers. In addition, he is taking steps to consolidate machine-building facilities into large organizations that are designed to improve the innovation process and the development-to-delivery cycle.

- **Adding coordinating bodies at the uppermost levels.** To break down departmental barriers and provide national-level oversight, Gorbachev has created new high-level coordinating bodies and expanded the authority of existing ones. He created a Bureau for Machine Building subordinate to the Council of Ministers; introduced organizations to provide support to and direct technology development; reinvigorated joint institutions and programs with Eastern Europe; and authorized joint ventures between Soviet and Western firms.

#### **The Pressure Builds: Limited Success With Mounting Frustration**

The program for restructuring civil machine building has been impressive in its range and intensity, if not in results. The initiatives and reforms implemented over the past three years have addressed the most pressing, significant issues at each level of the sector—from the research and production work at institutes and plants to high-level planning and administration in Moscow. The effect of many of these initiatives, however, has been to threaten the sector's stability. By altering traditional objectives and priorities and severing long-established lines of authority and communication, the leadership has thrown machine building into chaos.

In large part, machine builders have been troubled by contradictions in the modernization strategy. Gorbachev insists that enterprises meet an entire range of tough, often countervailing, performance targets all at once. For example, the sector must increase production sharply while improving product quality and pulling down antiquated production lines to retool. Moreover, measures to reform the sector have often been introduced piecemeal, leaving machine builders responsible for operating under new regimes without the benefits of a supporting infrastructure. For example, enterprises must turn a profit, but they have not received authority to set prices that would cover costs and yield a return.

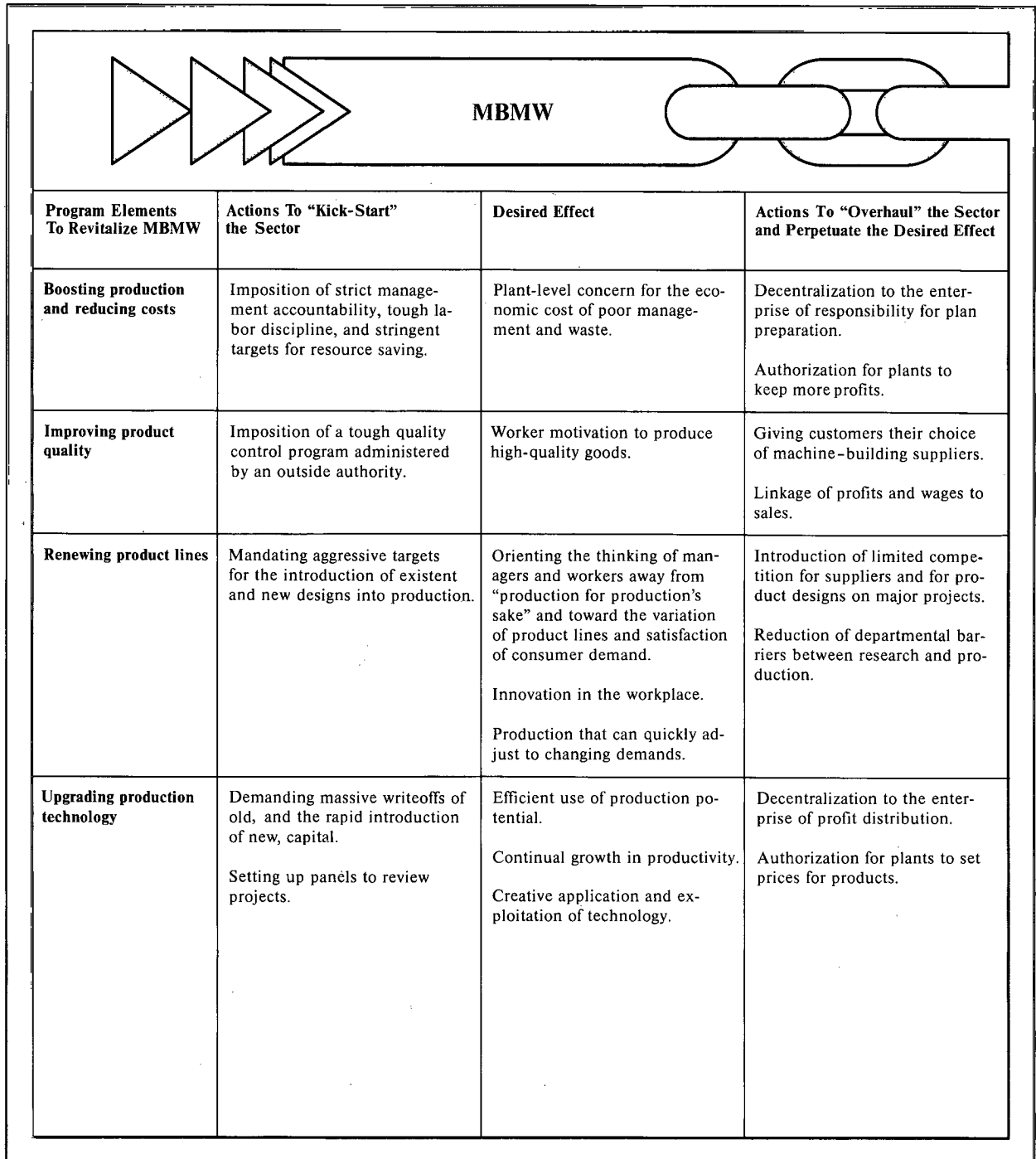
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**Figure 4**  
**Modernizing Civil Machine Building:**  
**The Initial Push and the Long-Term Pull**



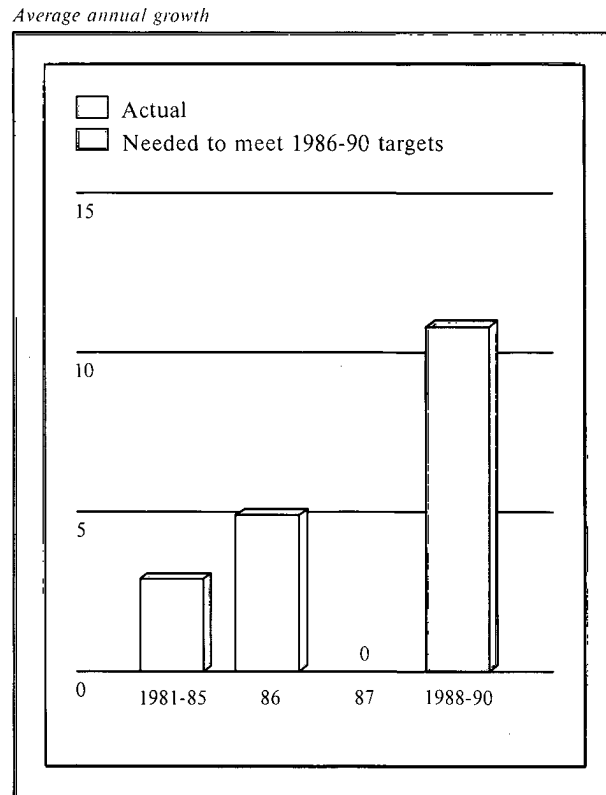
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Although we cannot precisely gauge the impact of any one reform on any other reform or on performance indicators, the Soviets have on occasion admitted that the conflicting targets and new reforms have combined to limit modernization progress. Indeed, the sector's performance to date has not met expectations:

- *Production levels are below plan.* We estimate that civil machine-building output grew by about 5 percent in 1986—better than in recent years, but still short of the 6.6-percent target. In 1987, however, we estimate that civil machine-building production was at the same level as in 1986, despite planned growth of 7.3 percent (see figure 5). In addition, equipment supplies from the defense industry, Eastern Europe, and, to some degree, the West have fallen short of Soviet targets (see inset).
- *The quality control program has so far proved to be too much for civil machine builders.* During the first several months of 1987, the program was highly disruptive and resulted in production stoppages at several plants. Soviet press reporting indicates that inspectors rejected an average of 20 percent of all the products they checked. Equipment deliveries fell sharply, and Moscow was forced to relax some of the standards.
- *New products represent only slight improvements, and new equipment designs are slow to appear.* During 1987, civil machine builders reportedly made headway in introducing new product lines—9 percent of their output was new, more than the planned 7.6 percent. Open-source reporting suggests, however, that many enterprises are making minor adjustments to machines and classifying them as new, while others have little regard for the machines' productivity or reliability. Moreover, the sector has fallen behind on targets for equipment designs. In mid-1987, Gorbachev criticized it for insufficient progress and stated its work "remains unfavorable as yet."
- *The retooling effort has run into difficulties at each step.* The supply of new equipment is not large enough to support planned investment; those machines reaching the plant are not being quickly installed; and equipment that is installed is not

**Figure 5**  
**USSR: Estimated Growth in Civil Machinery Production, 1981-90**



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being brought on line ("commissioned") as scheduled. Last year alone, the sector fell 20 percent short of targets for commissioning new equipment (see figure 6). In June 1987, a senior machine-building official acknowledged that the replacement of obsolete equipment in the machine-building complex was being conducted at a "snail's pace."

Although the leadership realized that its sweeping reforms and exacting demands for production, quality, innovation, and retooling would disrupt the sector, it was almost certainly surprised by the extent of the impact. When performance dropped sharply at the

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**Tapping Additional Resources:  
More Difficult Than Expected**

Besides squeezing more output from civil machine builders, Gorbachev has tapped the defense industry and equipment suppliers both within the socialist community and in the West. So far, however, results have not met expectations.

Defense Industry. The leadership has tasked the weapons producers to boost production of consumer goods and machinery for investment. [redacted] they are not meeting these obligations:

- At the June 1987 Central Committee plenum, Gorbachev attacked three defense industry ministries for having a "formal attitude to consumer goods production as something secondary."
- During a May 1987 Central Committee conference, several defense industry ministries were criticized for failing to meet commitments for food-processing equipment.
- In October 1987, a planning official speaking before the Supreme Soviet warned the defense industry that it would be held "strictly to account" for failure to make its expected contribution to light industry.

Eastern Europe. Moscow wants to double imports of equipment from Eastern Europe during 1986-90. To date, however, trade figures show that the East

[redacted]

beginning of 1987 and showed no signs of improving, the leadership was forced to ease up on quality standards and on implementation of some of the reforms. Moscow probably thought this would cause performance indicators to rebound rapidly. However, only marginal improvements were made as the months passed by. [redacted]

Europeans are far off the pace needed to meet this demand. The steady growth in East European equipment deliveries was interrupted in 1986 as exports actually fell. Perhaps most distressing to Moscow is that the countries on which it is relying the most—East Germany, Czechoslovakia, and Hungary—led the downturn. Preliminary data for 1987 suggest that equipment deliveries from Hungary and Czechoslovakia picked up, but those from East Germany continued to stagnate. This slow growth may continue, in large part because Eastern Europe is stretched to the limits. East Germany already ships 80 percent of its machine-tool production to the Soviet Union.

The West. Although Gorbachev has stated that he does not want to rely on the West for equipment imports—preferring instead to develop indigenous production capabilities—he does need to purchase key advanced Western machinery for specific industries, such as machine-tool building, oil, metals, and chemicals. Evidence is mixed, however, on how much input the West will have to these sectors. Imports of equipment from Western countries in real terms picked up in 1986 but, according to preliminary data, declined in 1987. In the wake of the oil price decline and the resulting loss of hard currency, Moscow probably was forced to make some tough investment decisions among competing demands for Western imports. In addition, reduced hard currency earnings will most likely limit Soviet equipment imports from the West during the next few years.

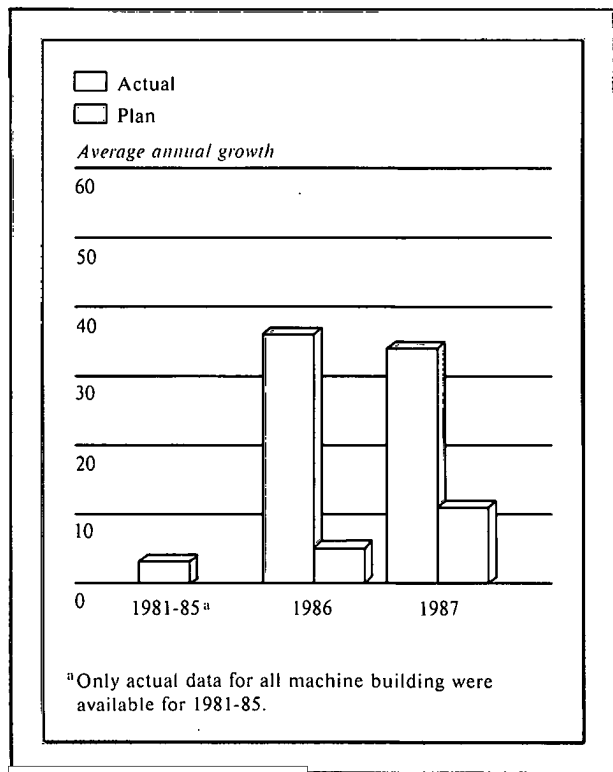
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**Figure 6**  
**USSR: Growth of Commissionings in**  
**Civil Machine Building, 1981-87**



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front-page *Pravda* article that claimed machine-building managers had succumbed to "sentiments of hopelessness," a situation it described as "extremely alarming." [redacted]

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**The Immediate Task: Easing Pressure While Pushing Forward**

Moscow appears to recognize that it cannot push the sector to the extremes witnessed over the past two years. Indeed, Soviet leaders have already begun laying out a more conciliatory course of action by:

- Implementing a discreet retreat in a reform measure that attempts to make machine-building enterprises financially self-sufficient. The leadership has announced that it will provide financial help to enterprises having difficulty adjusting to this reform.
- Easing up on its criticism of the sector. In recent months, the leadership has become more upbeat about machine-building performance and is accenting the positive.
- Leaning heavily on defense industry and, to a lesser extent, on Eastern Europe for above-plan equipment deliveries, and looking to the West for help in key technologies. Even the most optimistic leadership elements realize by now that most five-year and remaining annual machine-building targets are beyond reach and that additional support will be needed to partially offset these shortfalls. [redacted]

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of the sector's progress. Summing up the extent of the pressure being levied against them, one machine-building official complained in early 1988 that "we are, to put it bluntly, being skinned alive. . . ." [redacted]

Besieged by high-level criticism and tasked with what they believed to be unattainable goals, machine builders began to display a sense of desperation. For example, in October 1987, both Soviet and Western media reported a three-day strike at a major bus factory. Workers who were losing income because of attempts to increase quality and to retool simultaneously refused to resume work until a more realistic approach to modernization could be worked out. Perhaps the most telling description of the strife that had crept into the sector was reflected last fall in a

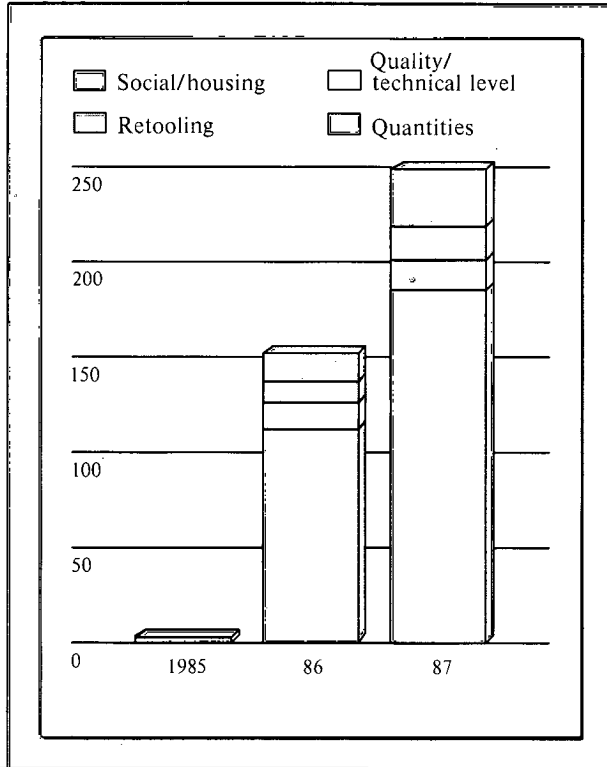
At the same time, however, the Kremlin does not want machine builders to interpret its moves as signs of weakness and to begin resisting the modernization strategy across the board. Therefore, the announced program for 1988 includes stiff performance targets for civil machine building and introduces several new reforms and expands existing ones. [redacted]

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**Figure 7**  
**Soviet Criticisms of Machine-Building Ministries in**  
**Monthly Industrial Performance Reports, 1985-87**

Number of criticisms



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**The Near-Term Challenge:**  
**Holding Leadership Consensus**

Although Gorbachev has been forced to relax a few key elements of his modernization program, his economic revitalization agenda as a whole has yet to be called into serious question by the leadership. Indeed, Gorbachev himself has asserted on numerous occasions that his policies reflect a consensus within the ruling councils (see inset). Still, he appears to be working under a definite schedule for proving the viability of his strategy. In an early 1987 speech, he noted that the next two or three years would be crucial for his program, and in January 1988 he

**The Soviet Leadership: Committed to Perestroika**

*Since the introduction of his modernization agenda, Gorbachev—usually at times when performance was suffering—has often taken the opportunity to remind foot-dragging bureaucrats, cautious party officials, and concerned Soviet citizens of the imperative of perestroika and the high-level consensus on it:*

If I were told that we must now stop *perestroika* . . . then, in the first place, I would never agree to that, and I do not want to link myself with any other policy. Therefore, for me there is no other course; and for the comrades who work with me in the Politburo and the government they have also made the same choice. It is our common position, our common line. . . . We'll see it through to the end.

Speaking before crowd in Tallin  
19 February 1987

No retreat is permissible from the program outlined for [civil machine building's] development. There will be no turning back.

Central Committee Machine-Building  
Conference  
24 July 1987

If we stopped the emerging processes, got frightened by them, this would have most serious consequences, for we will not be able to mobilize our people for an undertaking of this scope one more time.

Speech before media chiefs  
12 January 1988

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acknowledged that over this period the fate of *perestroyka* would be decided. Barring a crisis in East-West relations or a wide-scale collapse in machine-building performance, most Politburo members probably are willing to give him this much time to prove the effectiveness of his program. [redacted]

However, Gorbachev's window of opportunity may close sooner than he expects. At the All-Union Party Conference in June 1988, progress in modernization will almost certainly be discussed. Gorbachev could use the conference to claim a partial victory for his modernization program and emphasize the positive achievements made to date to deflect opposition to reform, strengthen his power base, and set the tone for formulating the 13th FYP (1991-95). On the other hand, he could become even more aggressive and critical of machine-building performance to rout out resistance. Whichever tactic he chooses, when Soviet leaders decide early next year on control figures for resource allocations during the 13th FYP, they will have to confront the unpleasant reality that the modernization program is far behind schedule and that most 12th FYP targets are already beyond reach. [redacted]

Leadership reaction to these likely shortfalls in machine-building performance will be critical to the support for Gorbachev's economic revitalization strategy. At issue in the high-level debates that could affect the party chief's political future will be whether civil machine building:

- Will continue to be the focal point of the Soviets' economic agenda and, thereby, continue to receive investment resources to the probable detriment of the defense industry and other industrial sectors.
- Will be able to "turn the corner" in an acceptable time frame, if it continues to receive such attention.

Our analysis of the performance data suggests that, because the retooling program is behind schedule, much of the sector's capital equipment will still be outdated by 1990. At a minimum, to modernize production capital in the sector, a high-investment strategy must be pursued into the 13th FYP. [redacted]

Because Gorbachev has based much of his political future and long-range plans for sustaining the USSR's superpower status on his economic agenda,

we believe he will want to give the civilian economy the investment resources it needs—even if this means forgoing or deferring some investment in defense production capacity. The General Secretary's task, therefore, will be to hold the consensus on the need for civil modernization and build agreement in favor of pursuing his agenda in the next five-year period. [redacted]

Interference with defense needs would most erode support for modernization. Gorbachev probably originally tried to convince the defense establishment to support civil modernization by arguing that doing so would not jeopardize the USSR's military security—and in fact would enhance military strength over the longer term. However, in light of civil machine building's slow progress and the need to begin serious resource commitments to support production of the Soviet weapons we expect to see near the turn of the century, the military sector may not be easily convinced to continue its support of civil modernization. [redacted]

We believe Gorbachev has tried to minimize the possibility of a concerted challenge from the defense lobby by:

- Appointing Gen. Dmitry Yazov as Defense Minister and replacing other military leaders and defense industry officials.
- Trying to put the military on the defensive by declaring that it must be more efficient and that in the future military requirements will be based on the principle of "reasonable sufficiency."
- Pushing for further arms control accords that would slow the pace of US weapon programs, especially SDI. [redacted]

The leadership probably will decide to continue the priority for civil modernization through at least the first few years of the 13th FYP. Indeed, we have evidence that the defense industry will be a major contributor to the civil program during this period. Gorbachev has asked the weapons producers to step up production of consumer durables and has managed to impose on them a program for reequipping light

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industry and food-processing plants. Defense industry has also taken over many of the 260 enterprises orphaned after the dissolution of the civil ministry responsible for producing the equipment needed for that program. [redacted]

If the modernization program runs into further difficulties, we will be able to gauge the leaders' commitment to it by their willingness to accept shortfalls in other policy areas. Indications of such commitment might include:

- Such intense pressure on Eastern Europe to supply machinery and equipment that those countries' own economic programs are impeded.
- A surge in orders for and imports of Western machinery and equipment—despite the leadership's stated policy of limited reliance on the West.
- A further dilution of the defense industry's focus on weapons production by assigning it responsibility for additional civilian projects.
- Large transfers of workers, materials, and output such as microelectronics and communications equipment from weapons production to the civil sector.
- Postponement of some investment needed to create the capacity to produce new weapons near the turn of the century. [redacted]

Although we believe Gorbachev and the rest of the Soviet leadership will continue to press the modernization program, we are much less certain how much they will push the pace and extent of reform. While stressing that reform must go forward quickly, Gorbachev will have difficulty maintaining that position if other members of the Politburo get cold feet. If the situation in machine building does not improve markedly, overall economic growth continues to falter, and workers become more restive, the balance in the leadership could easily shift in favor of more conservative policies. In this situation, the reforms most likely to be weakened would be those that call for a major decentralization of economic decision making. [redacted]

**The Long-Term Necessity:  
Building in Systemic Responsiveness**

Although plan goals for 1986-90 will be underfulfilled by a considerable margin and the reforms will still be under way when the 13th FYP begins, the real test of

the modernization program's success over the long run will be whether civil machine building becomes a self-regulating "economic mechanism" capable of routine product and process renewal into the 1990s and beyond. [redacted]

The modernization program will result in some improvement in the quality and technological level of Soviet manufactured goods and in a one-time modernization of the nation's production capital. Gorbachev recognizes the importance of market information and decisionmaking authority at the enterprise level to the success of his revitalization strategy, and his program attempts to create such an environment. We believe that purchasers of Soviet machinery and equipment are better off under Gorbachev than they would have been if Brezhnev were still in power. Machine builders have begun to provide the Soviet industrial and agricultural sectors with a better selection of more reliable equipment. As a result, some improvement can be expected in production technology and, hence, productivity. [redacted]

Gorbachev's program as currently envisioned, however, is not sufficient to induce self-sustaining product and process renewal. It retains major elements of central planning and price setting and, hence, does not go nearly far enough in creating conditions that will encourage machine builders to respond to demands for new products and to improve production processes. They will not be motivated to supply the rest of the Soviet economy with the advanced equipment needed to achieve self-sustained growth. Consequently, productivity gains will be short lived. [redacted]

We believe that, although Gorbachev is moving in the right direction, the reforms he has introduced so far will not transform the sector into an effective engine of *perestroika*. In addition, his program probably will be insufficient to close the gap in advanced, military-related technologies and will fail to address the USSR's other domestic and international challenges (see inset). For this to occur, the Soviets would need to implement further, more radical reforms that create a market environment, including freeing up prices and further decentralizing the planning system. Although existing decrees allow for these reforms, their full

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implementation would overturn the basic working arrangements of the Soviet economy, and the chances of such fundamental changes occurring are small, particularly over the next few years.<sup>3</sup>



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**Civil Modernization:  
Waiting for the Return**

*Gorbachev is looking to civil machine building to help him surmount the military, international, and domestic challenges the Soviet Union is facing. We believe his modernization program will go part way in addressing these challenges but will not give him the boost to overcome them:*

- *Maintaining military parity. In the near term, civil modernization is not likely to hinder or help the USSR's defense industry or military forces. The changes in the civil sector and the assignment of new responsibilities to the defense industry have had no discernible effect on weapons production, and we see little likelihood that the capital goods and raw materials required to support modernization will be drawn from ongoing military production. Similarly, the defense industry probably will receive limited benefits from high-priority civil programs to advance key technologies during this five-year period; in fact, defense industry experts have been tasked to bring civilian researchers up to speed. Over the longer term, the impact of civil modernization on military capabilities will probably be mixed. To the extent that it is successful, the program will boost the USSR's capability to produce the advanced weapons that we expect to appear near the turn of the century. We believe, however, that gains will be limited by the leadership's decision to centrally manage critical technologies, which could make the USSR less able than the West to pursue new technological opportunities. Moreover, if the Soviets encounter severe difficulties in pursuing civil modernization into the next decade, the defense industry may be required to defer planned investment, which could delay production of some military systems.*
  - *Improving consumer welfare. Soviet consumers will undoubtedly be able to choose from a wider selection of more reliable and high-quality household appliances and other consumer items. The new quality control program has improved, and will*
- continue to improve, the quality of consumer goods. In addition, the above-plan rates of product renewal to date and the new equipment recently installed in enterprises suggest that additional quality gains and technological advance will occur over the next several years. Moreover, if the Soviets are successful in retooling the light and food industries, consumers can expect to see further improvements beginning in the early 1990s. However, the benefits realized from the increased availability of better consumer goods must be weighed against the costs. Because Soviet workers are being pressured to work harder and within a less secure environment, it is not clear that—on balance—workers will favor this new social contract.*
- *Improving international prestige. Glasnost and the positive image Gorbachev portrays will probably do more than anything else to improve the USSR's international prestige. The Soviets will become more familiar with international trade and financial activities, but we are confident they will not achieve their stated goal of attaining recognition as a major economic and trading power during this century and hence will not radically change their trading position vis-a-vis other countries. We project that the Soviets will not be able to boost exports across the board as they originally planned, but will be forced to focus on select areas. Moreover, leaders of many socialist and Third World countries will probably be hesitant to look to the "new" Soviet economic system as a model for their own countries. Some leaders have already indicated they will not follow in Moscow's footsteps because they refuse to reject the "Stalinist" model as the Soviets have done. Others may be reluctant because they do not have the control and determination that is clearly required to push the reforms through.*

# The Soviet Machine-Building Complex

## Civil Machine-Building Ministries\*

## Defense Industrial Ministries

### Key

- C: Known production of consumer durables.
- I: Known production of machinery for investment.
- M: Known production of military hardware.

**Automotive Industry**  
Number of enterprises: 389  
Nikolay Pugin, Minister



C: Personal automobiles and trucks.

I: Bearings and rotary-conveyor lines.

M: Industrial sewing machines, trucks, armored personnel carriers, and equipment transporters.

**Construction, Road, and Municipal Machine Building**  
Number of enterprises: 170  
Yevgeniy Varnachev, Minister

C: None known.

I: Excavators, ditchdiggers, bulldozers, scrapers, and machinery for the construction materials and timber industries.

M: Military construction equipment.

**Heavy, Transport, and Power Machine Building**  
Number of enterprises: 144  
Vladimir Velichko, Minister

C: None known.

I: Power, energy, metallurgical, mining, hoist-transport, railway, and printing equipment.

M: Armored vehicles, diesel engines, and generators.

**Machine Tool and Tool Building Industry**  
Number of enterprises: 378  
Nikolay Panichev, Minister

C: None known.

I: Machine tools, automated lines, robots, metal-processing equipment, and forge and press equipment.

M: None known.

**Chemical and Petroleum Machine Building**  
Number of enterprises: 94  
Vladimir Luk'yanenko, Minister

C: None known.

I: Compressors; pipeline equipment; pumps; and equipment for the chemical, oil, gas, pulp, and paper industries.

M: Missile propellants.

**Electrical Equipment Industry**  
Number of enterprises: 365  
Oleg Anfimov, Minister

C: Light bulbs.

I: Equipment for electrical plants, electric motors, generators, cables, light bulbs, electrical insulation, and batteries.

M: Batteries, electrical and radar components, communications equipment, and biological/chemical warfare detectors.

**Instrument Making, Automation Equipment, and Control Systems**  
Number of enterprises: 287  
Mikhail Shkabardina, Minister

C: Watches and clocks.

I: Computers, control systems, instruments, and optical and medical equipment.

M: Computers and instrumentation control systems.

**Tractor and Agricultural Machine Building**  
Number of enterprises: 244  
Aleksandr Yezhevskiy, Minister

C: None known.

I: Agricultural machinery, tractors, combines, and machinery for animal husbandry and poultry farms.

M: Tanks and tracked vehicles.



**Aviation Industry**  
Apollon Sytsov, Minister

C: Cameras, refrigerators, washing machines, tape and video recorders, vacuum cleaners, clocks, baby carriages, utensils, and snowmobiles.

I: Commercial aircraft, robots, machine tools (including numerically controlled machine tools), rotary lines, and knitting machinery.

M: Aircraft; spacecraft; and aerodynamic, defense, antisubmarine warfare (ASW), air-to-air, and tactical air-to-surface missiles.

**General Machine Building**  
Vitaliy Doguzhiyev, Minister

C: Televisions and refrigerators.

I: Tractors, tractors, and machine tools (including numerically controlled machine tools).

M: Liquid- and solid-propellant ballistic and surface-to-surface cruise missiles; submarine fire control systems; lasers; space launch vehicles; and spacecraft.

**Communications Equipment Industry**  
Erles Peryshin, Minister

C: Tape recorders, televisions, and radios.

I: Intercoms, facsimile equipment, outside-broadcast cameras, studio equipment for television stations, and radio receivers.

M: Communications, electronic warfare, and facsimile equipment; radar components; and military computers.

**Machine Building**  
Boris Belousov, Minister

C: Bicycles, refrigerators, washing machines, tape and video recorders, electric razors, clocks, and samovars.

I: Machine tools and textile machinery.

M: Conventional ordnance munitions, fuzing, and solid propellants.

**Shipbuilding Industry**  
Igor' Koksasov, Minister

C: Pleasure craft (sail and power), washing machines, and tape and video recorders.

I: Radio receivers and machine tools.

M: Naval vessels and weaponry, submarine detection systems, naval acoustic systems, and radars.

**Defense Industry**  
Pavel Finogenov, Minister

C: Passenger cars, washing machines, refrigerators, fishing gear, cameras, and motorcycles.

I: Tractors, railway freight cars, machine tools (including numerically controlled machine tools), lasers, drilling rigs, and light industrial and optical equipment.

M: Conventional ground force weapons; optics; lasers and antitank guided, tactical surface-to-air, ASW, and mobile solid-propellant ballistic missiles.

**Medium Machine Building**  
Lev Ryshev, Minister

C: None known.

I: X-ray equipment.

M: Nuclear weapons and high-energy lasers.

**Electronics Industry**  
Vladislav Kolesnikov, Minister

C: Radios, televisions, tape and video recorders, and clocks.

I: Telephone equipment.

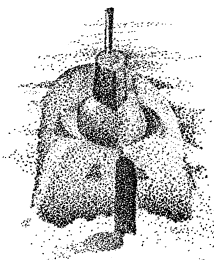
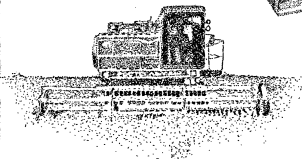
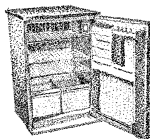
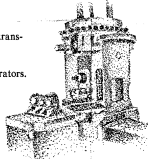
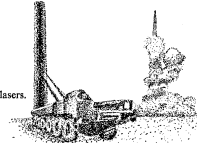
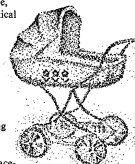
M: Electronic parts, components, and subassemblies.

**Radio Industry**  
Vladimir Shimko, Minister

C: Television, refrigerators, radios, and tape recorders.

I: Telephone equipment, radio receivers, and computers.

M: Radars, communications equipment, special-purpose computers, guidance and control systems, and lasers.



\* Three civil machine-building ministries were recently disbanded or merged with other ministries. They are:  
 • Ministry of Machine Building for Animal Husbandry and Fodder Production, which was merged with the Ministry of Tractor and Agricultural Machine Building in July 1987.  
 • Ministry of Machine Building for Light and Food Industry and Household Appliances, which was disbanded on 1 March 1988. Its assets were distributed to defense industry and other civil machine-building ministries.  
 • Ministry of Power Machine Building, which was merged with the Ministry of Heavy and Transport Machine Building in July 1987.

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