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# Soviet Management of Technology and Military Systems Development

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**Interagency Intelligence Memorandum**

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# SOVIET MANAGEMENT OF TECHNOLOGY AND MILITARY SYSTEMS DEVELOPMENT

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## KEY JUDGMENTS

Soviet military research and development capabilities and practices can produce systems competitive with both existing and future US military systems, even though they lag the West in many important technologies. The way the Soviets conduct R&D poses multiple threats for long-range US weapon and technology planning, despite the gains in system performance the United States expects to make by applying technologies in which we lead the USSR:

— The Soviets have established a large, varied infrastructure that provides the foundation for the frequent, evolutionary improvements to operational military systems and has produced steadily improved military capabilities in the field. We are confident that this will continue at least through the end of the century.

— Military requirements drive Soviet research and development activities to a large extent.

— Within the last decade, we have noted the introduction of several new management approaches to technology development that seek to further integrate research, design, and production of systems to reduce longstanding problems in transitioning from technology development to production in the Soviet Union.

— The Soviets have a well-organized planning and acquisition system for weapons and space development programs. They minimize the cost and risk of new systems development by using an approach that incorporates proven technologies.

— *To offset the cost growth inherent in developing and producing more technologically complex weapons, the Soviets plan to increase productivity in their defense industry. As costs and capabilities rise, we see a trend toward reducing the quantities of advanced technology military systems produced and deployed.*

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Soviet leaders recognize that technology plays a major role in determining the USSR's future military weapon and space capabilities. We now know that Soviet planners are well informed about the status of technology in development and are likely to specify the best available technology when they generate design requirements for new or improved systems.

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### Key New Insight—Soviet Technology "Maturity"

We believe a key analytical advance is our new insight to the status a technology must achieve before the Soviets select it for incorporation into military system designs. The new insight changes many previous judgments. We now believe we can and must carefully differentiate between Soviet military-related or sponsored technology developments and military system developments. The status of Soviet technical advances can provide better insights as to when technology developments can affect Soviet military system performance capabilities that will threaten the United States or US military systems.

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We believe that after a technical phenomenology has been proved in a laboratory the Soviets will prove its technical feasibility through testing, and prove its producibility before applying it to new or improved products. When a technology is intended for a military product the military will conduct further testing to demonstrate feasibility. When the technology and the system application are new and unique, a system concept feasibility demonstrator may also be built and tested. Such feasibility testing is likely to occur at a military test range.

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Soviet design standards now call for technology to be proved feasible before application to preliminary designs for choosing a model to build in the full-scale engineering phase of this acquisition cycle. Before proceeding to system development the technology must be proved producible by the successful establishment of pilot production. Technologies achieving pilot production are deemed "mature" by the Soviets and military system development on normal schedules can follow.

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There are alternative views that hold that the Soviets have other criteria that must be considered to assess when microelectronics and laser technologies are or were selected by designers for incorporation in specific weapon systems.

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The Soviets conduct feasibility tests of new military technology before they decide to use the technology to develop a military weapon system. Many feasibility tests of large system-like items have in the past been misidentified as prototypes for system development programs. We expect continuing problems in analyzing Soviet activities in cases where feasibility tests cannot be distinguished from system prototype tests.

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Soviet leadership supports a large and stable base for conducting R&D that provides for continued improvement of military systems. They have allocated a steady high level of R&D funding over long periods.

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To develop the large numbers of military programs the Soviets have chosen to pursue per decade as technology becomes increasingly complex, they have been steadily increasing the resources they allocate to military R&D. Estimated manpower devoted to RDT&E has about doubled since 1965. We estimate the physical growth in facilities at 1,500 organizations associated with military RDT&E increased from 1965-84 at an average rate of about 3 percent per year.

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Our improved capability to characterize Soviet programs indicates to us that the Soviets have undertaken a greater number of defense

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programs than we previously believed. They conduct at least 5,000 research programs and have over 300 military products in production per year. They also conduct about 350 military weapon, space, and support system development programs per decade for new and improved equipment. The number of Soviet military research projects in the 1980s is about 20 percent more than those in the 1970s.

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The Soviets have sustained a high and steady rate of systems development for the last 30 years despite fluctuations in Western military programs and budgets, arms control, and internal economic problems. We believe over the long term their large research effort will provide Soviet designers and military planners with more flexibility, when required, to go beyond evolutionary upgrades in meeting operational shortfalls, new threats, and taking new mission area initiatives. The Soviet leadership has made decisions to reallocate or change emphasis in weapon system and technology development areas that they believe will provide them with political advantages or opportunities in the future. For example, the Soviets made decisions in the mid-1970s to reemphasize bomber and strategic cruise missile development and to expand their space program. Decisions to support the larger cruise missile and space programs coincided with cutbacks in their ICBM and SAM programs. Moreover, they assigned ABM and early warning radar system managers to direct new technology development—primarily in the directed energy area.

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The Soviets use a schedule-dominant management approach for military systems development. We do not expect them to change their schedule-dominant approach. This management approach, similar to that used by US corporations for the development of large commercial systems, is one in which meeting a predetermined delivery date takes precedence over changing the system's design during development. Normal Soviet development time for major new military systems averages 12 to 15 years; major system improvements or conversions average eight to 10 years; and minor system improvements or conversions average five to seven years. These average development times have not changed since the late 1950s. Using this management approach to military system development the Soviets complete a high percentage of programs—in excess of 90 percent. We are concerned, however, that an observed key technology transfer or advance could allow an earlier program start than otherwise possible for a high-performance system that would reach the field sooner than anticipated.

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The development time for Soviet military systems is not reduced by implementing what the United States would consider a "crash" program. When the Soviets describe a program as "accelerated," their

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aim is to hold to the normal schedule even when a project is difficult or complex. When a Soviet program is described as "priority," that should be interpreted to mean that it is allowed first call on resources rather than to speed up the program. The Soviets have used their conservative approach in selecting technology for use in a new military system development since the late 1960s.

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The Soviets have placed a high priority on improving their weak production base and have had some success in increasing their pace of technology through:

— Since the 1960s, the Soviets have managed the development of certain critical military high technologies using a goal-oriented approach that has many characteristics of a weapons program, but in fact precedes weaponization.

— The Soviets often use a "follower" research strategy, which usually results in lower technology development risks but sometimes stifles indigenous research. They regularly plan the use of inputs from their technology transfer acquisition program to supplement their indigenous military technology development efforts. This allows them to truncate indigenous military research when targeted Western technology is acquired. As a result they are often able to incorporate technology into a weapon system development program, shortly after the United States achieves full production. The Soviets, however, take longer to achieve full production.

— Large amounts of Western military technical and programmatic data available early to Soviet planners allow them to design-to-market as a way of competing. Using this approach they begin similar or offsetting programs about the same time as the United States enters the engineering phase of development, whereas US planners usually receive comparable information on Soviet systems late in the engineering phase. Design-to-market is a common competitive technique used in the US commercial sector.

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Another part of the improved Soviet management of defense planning has been to establish a national program to forecast technological developments that are closely tied to their major military mission areas. The forecasts project 20 to 30 years ahead and guide current planning of technology development in an attempt to ensure that technologies applicable to military requirements are not overlooked.

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Centrally managed, goal-oriented technology development programs guide Soviet efforts from the emerging scientific concept through

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feasibility demonstration to system development. In emerging scientific areas, like high-energy lasers and particle beams, computers, and production technologies (robotics and advanced machine tools), it takes the Soviets 10 to 25 years to develop the technology for weapons applications and another 10 to 15 years to develop and produce the weapon system that uses the technology.

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Technologies the Soviets have chosen for development using their goal-oriented management style will provide them with potential future opportunities. In the mid-to-late 1960s they organized a wide-ranging directed energy research program. And in the 1980s the Soviets have begun new research programs to develop technology for industrial lasers, optical supercomputers, and advanced kinetic energy systems. We do not know how long it will take the Soviets to accomplish their technology goals in all these areas, but for the most part the technical maturity to allow system development is still years away. The major military advantages that could emerge from most of these investments will most likely *not* be available for Soviet leadership to exploit until after the turn of the century. We believe the Soviet management practices that have recently served them well, goal-oriented programs, and the follower strategy have a downside to them. In the USSR's centralized economic system, goal-oriented research tends to be narrow and overdirected and leads to a lack of commitment to basic science, essential for innovation. The continued use of a follower strategy—like technology transfer—tends to impede indigenous development.

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The major portion of Soviet systems which are deployed in the 1990s and early 2000s will involve evolutionary improvements in the types of systems now in service. A small portion of the new systems will provide capabilities new to the Soviets

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