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Intelligence Report

Soviet Economic and Technological Benefits from Detente

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Soviet Economic and Technological Benefits from Detente

US-Soviet detente has already brought a succession of economic and technological benefits to the USSR: grain to offset a crop failure, access to technology and equipment previously denied, and long-term credits to finance imports. If detente continues, these gains will accumulate. Nevertheless, overall Soviet economic growth is unlikely to be affected appreciably. Machinery imports from the United States will be small relative to total Soviet investment, and the USSR will continue to have problems in assimilating new technology. The USSR, moreover, has alternative sources of goods and technology if US-Soviet relations sour. Moscow could benefit substantially, however, if it is able to acquire key military-related technology under the umbrella of detente.

The size and terms of the grain purchases from the United States undoubtedly were influenced by the detente atmosphere. The prices paid for the grain were favorable, and Commodity Credit Corporation credits helped the USSR at a time when it was incurring its largest hard currency deficit in history. The US-Soviet maritime agreement also saved the USSR hard currency, as the USSR was able to move several million metric tons of grain on its own bottoms rather than on third-country ships.

Under detente, export controls were relaxed, and some highly prized US equipment and technology became available to the USSR for the first time. Third-generation computers and components and equipment for their manufacture were high on the Soviet shopping list. If science and technology agreements just signed with US computer firms are implemented, Moscow could modernize its computer industry and thus boost productivity in both military and civilian industry. If negotiations for advanced semiconductor production are successful, the Soviets also could be helped in developing complex electronics systems and instrumentation for advanced weapons.

Heavy industry has also received technological aid from the United States. For the Kama truck complex, the Soviets have been able to buy US equipment and technology for the most advanced foundry in the world as well as other equipment not available elsewhere. US technology probably can also help to alleviate the many serious problems confronting Soviet oil and gas industries, particularly exploration and drilling in permafrost and offshore.

To a substantial degree, these machinery purchases -- like the grain imports -- have been facilitated by US long-term credits, both Eximbank and private. The terms of the Eximbank credits are comparable with or better than those offered in Western Europe and Japan, contributing to the already-existing world competition in promoting exports to the USSR.

US-Soviet trade in technology still has a large potential for growth. Cooperative ventures with US companies for the development of Soviet resources offer important advantages to the USSR. US companies are able to provide the USSR with advanced equipment, technology, and know-how to carry out the large internal development projects currently scheduled. Equally important, the Soviets need to tap US financial markets for government-backed credits if the massive Soviet imports needed for such projects are to be financed at reasonable interest rates.

So far in the detente period, the USSR has obtained US technology mainly through the trade channel. At the same time, however, a network of officially sponsored government-to-government bilateral agreements has been built up which could provide the Soviet economy with a good deal of US technology on an exchange basis. The US-USSR Science and Technology Agreement has led to the conclusion of more than 20 agreements between Soviet agencies and private firms. Most of the agreements call for general cooperation, joint research and development, and exchanges of delegations, information, processes, know-how, and licenses. Most agreements are also in high-technology industries of prime interest to the USSR such as electronics, chemicals, energy, and construction.

The growing imports of machinery and equipment together with cooperative ventures and bilateral agreements will transfer a substantial amount of Western technology to the USSR – whether in the form of informal (and sometimes inadvertent) disclosure of know-how, exchanges of technical data, or finished products. But the ultimate economic effect of technological transfer through either machinery imports or informal contacts and bilateral exchanges depends on how rapidly the technology is assimilated. Soviet R&D and economic administration have been weakest in carrying technology from research through the development and testing stages into production. Many of the reforms in economic administration, science, and education in the past decade attempted to deal with just this problem, but the reforms seem to have petered out. The Soviet economy must do better in this area if imports of US technology are to have a substantial effect.

Other factors will also reduce the impact of US-Soviet trade and technological relations on the USSR. First of all, US leverage is limited because the USSR can go elsewhere for credits and roughly equivalent machinery and technology, except in a few sectors or for a few giant projects. Second, the scale of such relations -- although increasing -- will remain small relative to total production or trade. For example, imported US equipment will be equal to no more than 1% of the total value of equipment scheduled to be installed in Soviet industry in 1971-75.

The effect on military capabilities is another matter. Some US technology could help the Soviets considerably in developing new weapons, especially in modernizing their strategic weapons systems. Although thus far the trade, contacts, and technical agreements associated with two years of detente have not transferred discernible amounts of military technology, the changes in US-Soviet relations under detente have the potential to upgrade Soviet military capabilities. While continuing their efforts to acquire such technology by espionage and theft and by purchase from other countries who evade COCOM controls, the Soviets will attempt to acquire military-related technology directly from the United States by opening up new channels of transfer and widening existing channels. Whether the full potential of transfer is realized depends in part on the care with which US firms, scientists, engineers, and technicians treat the developing contacts. In this regard, the guidelines set and administered by the US Government will be influential in determining private attitudes and decisive in limiting the transfer of military-related technology.

DISCUSSION

Introduction

1. With the easing of tensions, particularly since the May 1972 Summit, there has been a substantial increase in economic, technical, and scientific contacts and exchanges between the United States and the USSR. Aside from political gains from the detente atmosphere, the USSR hopes for concrete economic and technological benefits -- the acquisition of US goods, technology, and know-how, most of which have been denied to the USSR since the beginning of the cold war.

2. In the past two years the decrease in tensions and detente have brought the easing of US and COCOM export controls; Soviet imports from the United States have risen sharply, US Government-backed credits have been made available to the USSR, and numerous bilateral scientific and technical agreements have been concluded. The future also holds out the possibility of large commercial transactions between the two countries and important technology transfers to the USSR. The purpose of this report is to (a) review the nature of US-Soviet contacts and exchanges and (b) assess the economic and technological benefits that the USSR has obtained and may obtain as a result of detente.[1] Because benefits to the United States are not considered, this report does not provide a net assessment of the benefits obtained by the USSR and the United States from detente.

3. The conclusions of this report should be considered to be preliminary because Soviet attempts to obtain US technology under detente are still in an early stage. Little firm evidence is yet available in a number of areas. Even where technology has been acquired by the USSR, often little is known of the impact it has had on the Soviet industry involved. Such factors as the energy crisis and changing attitudes in the United States -- particularly in Congress -- on granting long-term credits to the USSR also may affect these Soviet programs to acquire US and Western technology.

The Impact of Detente on US-Soviet Trade Through 1973

Detente Establishes Preconditions for Greater Trade

4. The US-Soviet negotiations that created the political climate known as detente also led to a marked change in the atmosphere regarding

1. This report is in part an expansion of ER IR 73-26, Transfer of Technology from the United States to the USSR: Problems and Prospects, December 1973, CONFIDENTIAL.

US-Soviet trade. The preconditions for a rapid growth in trade were met when controls on US exports were eased, US credits became available, and the shipping impasse was broken.

Export Controls Relaxed

5. One of the principal effects of detente has been the relaxation of export controls. Multilateral (COCOM) controls and US unilateral controls had been eased gradually over a number of years. Recent COCOM List Reviews and the passage of the Export Administration Act of 1969 hastened the process. In 1972, Congress amended the Export Administration Act, retaining the prohibition on exporting strategic items to the Communist countries but narrowing the definition to allow freer export of items that could be used for both military and civilian purposes. The Act required that the US Commodity Control List (CCL) items not controlled under COCOM agreements be eliminated unless their removal from controls would be considered a national security risk. The 550 entries not under COCOM control at the time the review began have been reduced to about 75. The list is now made up largely of computer, electronics, and telecommunication items. US policy positions on the above items and the technology for producing them will be prepared in time for the next COCOM List Review, which probably will begin in late 1974.

6. The change in the US attitude on trade controls has resulted in US shipments to the USSR of items formerly banned and in US approval of exports by other COCOM countries that the United States had opposed earlier. In 1972 a series of US applications to design and sell machinery for the Kama truck plant in the USSR were approved. The removal of export restrictions on this equipment has given the USSR specialized machinery and technology that was not available elsewhere and that the USSR had sought for many years.

7. US policy perhaps has changed most significantly in the computer and related electronic fields. Initial US reaction to the sale of third-generation computers to Eastern Europe and the USSR was negative because of the strategic uses to which these devices could be put and the risk of diversion. The United States, therefore, devised a system of safeguards intended to limit the risk of exporting third-generation computers.[2] Within this framework, the United States has given its approval to the export of various third-generation computers throughout the Communist area -- including the export to the USSR for "peaceful research" of two ICL 1906s, two ICL 1903s, a CDC 6200, an IBM-360/50, and others. Despite the existing safeguard system and other end-use checks, it

2. Safeguards usually include complete access to machines by the computer firms' engineers and the right to take random "dumps" of memory contents to be examined by computer experts.

is probably impossible to be certain that these systems are not being diverted to strategic uses. Recent intelligence reports indicate that in the past year at least two third-generation computers were directed from their intended end uses in two East European countries to unknown activities within the Soviet Union.

8. Similarly, during the past few years videotape recorders (VTRs) – originally developed through US Government research and financing – have been approved for export in increasing numbers for civilian uses within Communist countries. In December 1973, for the first time in the history of trade controls, 17 highly sophisticated VTRs were approved for export to the USSR. Because of their portability, exporting countries have thus far been unable to place effective controls against the strategic use of these recorders.

9. The United States no longer monopolizes the technology or equipment used in the manufacture of printed circuit boards or semiconductor packaging. As a consequence, several US firms have exerted heavy pressure against US export controls on technology and equipment. COCOM approval has already been granted for the sale to Eastern Europe of production machinery and technology used in the manufacture of integrated circuits. The USSR has yet to purchase any US technology or equipment for the production of advanced semiconductors, but some technical knowledge is being absorbed through increased technical exchanges and greater contact with Western firms. More importantly, technical knowledge and finished devices could be furnished to the USSR from Poland and other East European countries under special agreements for mutual cooperation in semiconductor R&D.

10. Several US firms are now negotiating to sell semiconductor technology to a number of East European countries. One proposed transaction with Poland includes the technology to produce US state-of-the-art integrated circuits (MOS/LSI). Polish acquisition of this technology would make it possible for the USSR to acquire this knowledge and could significantly enhance its production capabilities over the long term, particularly in areas of strategic concern.

Offer of US Credits

11. A second major factor encouraging the growth of US-Soviet trade during the detente period has been the opening up of a large new source of trade credits to the USSR. With Eximbank financing available, US credit terms now compete with those offered by other major Western suppliers to the USSR – in particular, the United Kingdom, France, and Italy – and compare favorably with those offered by West Germany. Lacking access

to low-interest Eximbank and other US Government-backed credits before 1972, Moscow tended to look to other Western countries instead of to the United States because the USSR's hard currency position required that large purchases of machinery be made on medium-term and long-term credit. The meager amount of Soviet imports from the United States was either paid for in cash or financed by short-term credits with generally no more than US $10 million outstanding at any given time.[3]

12. By the end of 1972, in sharp contrast to previous years, more than $800 million in US short-term, medium-term, and long-term credit had been made available to the USSR. Toward the end of 1973 this total grew to roughly $1,400 million, most of which is associated with low-interest US Government-backed credits. They include the following:

- Short-term bank credit outstanding as of 1 November 1973 of $49 million, compared with less than $5 million prior to 1972;

- Short-term non-bank claims outstanding as of 1 July 1973 of $73 million, compared with less than $5 million prior to 1972;

- Long-term bank credits outstanding as of 1 November 1973 of $122 million; prior to 1972, private banks extended only short-term credits to the USSR;

- Three-year CCC line of credit of $500 million; CCC credits were not previously available to the USSR;

- $336 million in potential direct Eximbank long-term credits, including authorizations for $158 million and preliminary commitments for $178 million in direct credits (as of mid-January 1974); Eximbank financing was not previously available for US machinery and equipment exports to the USSR;

- $336 million in potential long-term credits from private banks to match Eximbank participation; such financing previously was precluded by the absence of Eximbank participation.

3. This excludes exports of US capital goods financed by foreign lines of credit. For example, because Eximbank financing was not available, US gear-cutting equipment for the Soviet FIAT plant was financed by long-term Italian credits to the USSR.

13. The decision to open the Eximbank window and the provision of CCC credits signaled the beginning of a new era in US-Soviet economic relations and created an aura of excitement that attracted large numbers of US bankers and financiers eager to enter into or expand financial relations with the USSR. This development has greatly enhanced the USSR's ability to pick and choose among suppliers of credit, thereby enabling the USSR to extract credit concessions from the successful "bidders." For example, all private US banks have so far waived the Eximbank insurance on their export credits to the USSR, thereby reducing the USSR's financing costs by one-half percentage point. The large, multi-billion dollar liquefied natural gas (LNG) projects and other US-Soviet projects now under consideration envision expanded Eximbank participation as well as the mobilization of large amounts of private funds on a long-term basis. The availability of these huge sums to finance Soviet imports will depend on continued detente and on Eximbank lending limitations.

US-Soviet Maritime Agreement

14. The conclusion of a US-Soviet Maritime Agreement in 1972 was a third factor helping to promote trade. The agreement led to major cutbacks in the US port security program (making it easier for Soviet ships to visit US ports and increasing the number of US ports open to such visits) and to withdrawal of a labor union's threat to boycott Soviet ships.[4] Soviet cargo liners and tramp vessels can now participate freely in the movement of US-Soviet trade (moved entirely on third-flag ships through 1968) and in the movement of US trade with other countries.

15. The USSR stands to save considerable hard currency by participating in the movement of its imports from the United States. For example, by using Soviet vessels in moving more than 3 million metric tons of US grain, the USSR saved at least $40 million in hard currency, and prospects for future earnings are good. It also stands to earn hard currency by carrying Soviet exports to the United States and cargoes moving in US trade with Europe and Japan. The USSR now has cargo lines linking the US West Coast with Japan and other Far Eastern countries and linking Great Lakes, East Coast, and Gulf ports with Europe. In the tramp field (largely bulk cargo), Soviet ships under charter have made only a few cross-trade voyages between the United States and third countries thus far.

4. US and Soviet merchant ships stopped calling at each others ports in 1950. Soviet ships were excluded from US ports both by the threat of a boycott by stevedores of the International Longshoremen's Association (ILA) at Great Lakes, East Coast, and Gulf ports and by the USSR's refusal to put up with the inconvenience of US port security regulations applying to Communist ships. In mid-1969 the USSR overcame its unwillingness to operate ships under the US port security system and began a cargo liner service between Japan and US West Coast ports, where the ILA has no jurisdiction. For most ports the Maritime Agreement reduces the number of days' notice of arrival and increases the number of ports-of-call from 6 to more than 40.

When the demands of the grain lift diminish, however, there should be more opportunities for such voyages, especially for ships returning to Europe after delivering Soviet cargoes to Cuba.

Soviet Imports from the United States Soar

16. The relaxation of export controls, the provision of trade credits, and the shipping agreement have had a dramatic impact on US-Soviet trade (see the chart). The USSR's imports from the United States increased much faster than its sales to the United States. Purchases of machinery and equipment and grain accounted for much of the growth in Soviet imports; Soviet sales to the United States continue to consist principally of platinum group metals, diamonds, and chrome ore, but fuel oil became an important commodity in 1973 as well.[5] As a result of the sharp upswing in the volume of trade, the United States became the USSR's leading Western trade partner in 1973.

Machinery and Equipment

17. In the last two years the USSR has contracted for about $800 million in US machinery and equipment (see Tables 1 and 2). This compares with more than $200 million in 1971 and some $30 million annually in previous years. The US share of Soviet orders also has risen since 1970 (see Table 1).

18. The machinery and equipment that the USSR has sought especially in the United States include truck-manufacturing equipment, computers, and certain other electronics equipment, as well as various types of oil and gas field equipment. These are areas in which US technology excels. Most of the other equipment and technology ordered from the United States is available in a number of other countries, however.

19. For the Kama truck plant, the USSR contracted with Swindell Dressler to design and coordinate the procurement of machinery for the most advanced automated foundry complex in the world. Other Kama purchases include gear-making machinery, automated transfer machinery, and computer-controlled conveyor systems, all of which, for reasons of durability, precision, or productivity, are technologically superior to systems available in Western Europe.

20. Kama-built trucks will provide the USSR with badly needed transport for use in agriculture, relieve overtaxed railroads of some of the burden of freight hauling, and expand the supply of off-highway trucks

5. 1973 data are for January-September only.

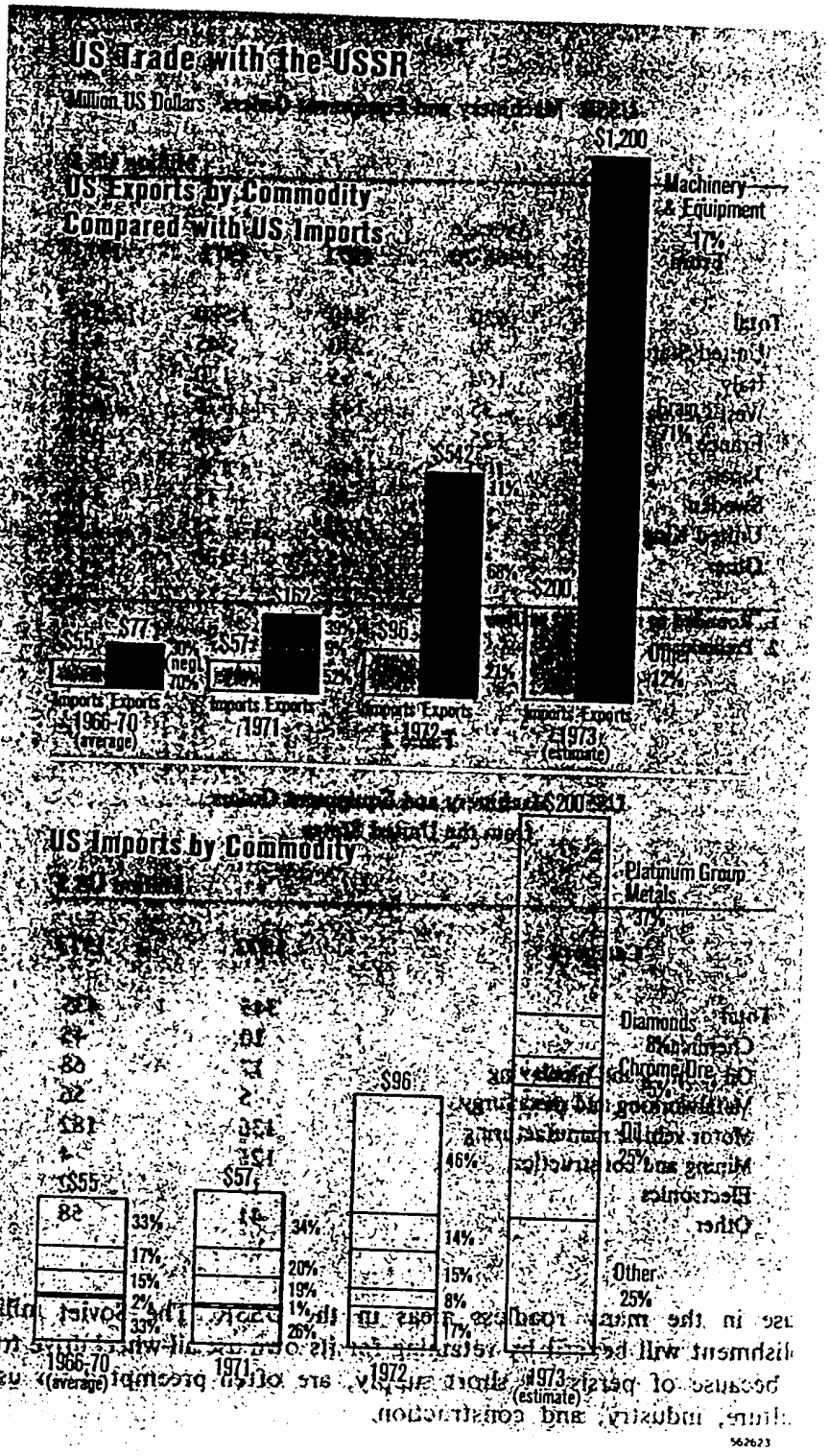
US Trade with the USSR
Million US Dollars
US Exports by Commodity
Compared with US Imports
$1,200
Machinery & Equipment
17%
$542
$200
$96
$57
$55
$77
Imports Exports
1966-70 (average)
1971
1972
1973 (estimate)
US Imports by Commodity
Platinum Group Metals
37%
Diamonds
Chrome Ore
Other
25%
46%
14%
15%
8%
33%
17%
15%
2%
33%
34%
20%
19%
1%
26%
562623

Table 1

USSR: Machinery and Equipment Orders[1]

Million US $

From	Average 1966-70	1971	1972	1973[2]
Total	620	840	1,580	2,530
United States	30	240	345	435
Italy	160	65	170	625
West Germany	35	145	370	425
France	125	75	340	395
Japan	100	140	135	155
Sweden	30	10	15	145
United Kingdom	90	120	75	135
Other	50	45	130	215

1. Rounded to nearest $5 million.
2. Preliminary.

Table 2

USSR: Machinery and Equipment Orders from the United States

Million US $

Category	1972	1973
Total	345	435
Chemicals	10	45
Oil refining and pipelaying	17	68
Metalworking and metallurgy	5	56
Motor vehicle manufacturing	136	182
Mining and construction	121	4
Electronics	15	22
Other	41	58

for use in the many roadless areas in the USSR. The Soviet military establishment will benefit by retaining for its own use all-wheel drive trucks that, because of persistent short supply, are often preempted for use in agriculture, industry, and construction.

21. The USSR has been seeking US technology across the whole spectrum of computer manufacture, including central processing units, peripherals, components (memories and integrated circuits), and computerized test equipment. The Soviets also want to conclude multimillion dollar, multicomputer system deals that include software and training of specialists. For example, they would like to contract for a regional air traffic control system and a system for production and inventory control at the Kama truck plant. Most of this equipment and technology is still embargoed under US and COCOM trade controls, although four large US systems have been sold to the USSR under the COCOM exceptions procedure. Although the benefits to the USSR from US computers already acquired probably are not large, the USSR stands to gain substantially if the large US systems now being negotiated are sold. These sales would include training for specialists in software maintenance and systems analysis, areas in which the USSR is particularly weak. Such training would make possible the creation of a key cadre qualified to train, in turn, large numbers of other specialists. Training in the operation and maintenance of large computer systems is directly applicable to industrial as well as complex military problems.

22. Some US firms in the semiconductor industry also have viewed detente as an opportunity to expand sales. The USSR has not yet acquired US equipment or technology for the production of integrated circuits or other advanced semiconductors because these items are still embargoed. As a result, the direct benefits from detente in this area have been restricted to the random bits of production know-how that may have been acquired through the technical exchanges program and through Soviet contacts with US businessmen and scientists. Several US firms, however, are now negotiating with the USSR for the sale of complete facilities for the production of advanced types of semiconductors. Soviet access to a reliable supply of these devices could speed Soviet development of complex electronic systems and instrumentation for advanced weapons.

23. To help overcome the many serious problems confronting its petroleum industry, the USSR has been especially active in negotiations for US petroleum equipment and technology. Soviet problems include exploring and drilling for oil and gas in permafrost and offshore, maintaining production in older fields, building pipelines for transport of oil and gas, and improving the quality of refined products. A recent exposition in Moscow, at which US firms displayed the latest in petroleum equipment and technology, aroused considerable interest among Soviet petroleum officials and resulted in additional Soviet orders and purchases. Some of the equipment -- down-hole submersible pumps, drill collars, and drill bits -- that the USSR has ordered in large quantities are in short supply in the United States. Sales to the USSR of such equipment resulted in delayed deliveries to US petroleum firms.

24. Over the past 10 to 15 years the Soviet Union has purchased a large volume of chemical equipment from the West. American firms, however, accounted for only a negligible share of the Soviet orders. The United States usually supplied only technical data. Since detente, and particularly during 1973, the US role in supplying chemical equipment and technology to the USSR has grown. An outstanding example of what may be in store for the future under detente is the 20-year, $8 billion agreement announced in 1973 by the USSR and Occidental Petroleum Corporation. This agreement calls for an exchange of fertilizer materials and the construction of eight ammonia and two urea plants in the USSR. The Soviet Union is to receive one million tons of concentrated phosphoric acid starting in 1978 in exchange for Soviet-produced ammonia, urea, and potash. The phosphoric acid should help to raise Soviet agricultural yields. In addition to increasing yields, phosphate fertilizers can hasten the ripening of grain, an important consideration in regions that have a short growing season.

25. The ammonia plants will each have an annual production capacity of 500,000 tons; the largest Soviet-manufactured ammonia units in operation have annual capacities of 200,000 tons or less. The ammonia plants going to the USSR probably will incorporate technology belonging to M.W. Kellogg Company. Kellogg is the world's most experienced firm in engineering and erecting large single-train ammonia plants that use centrifugal compressors and minimize unit energy requirements.

Soviet Grain Purchases

26. During 1972 and 1973 the Soviets bought 37 million tons of grain from the West, including about 25 million tons from the United States. Although the decision to buy US grain was motivated by Soviet internal policy considerations, the exceptional size and the favorable terms of the purchases from the United States no doubt were influenced by the detente atmosphere. The extension of $500 million in CCC credits to Moscow was especially important.

27. Soviet grain output is subject to extreme fluctuations. In 1972, Soviet grain output fell by about 10% below the 1971 level as a result of unusually poor weather. Without imports of Western grain, considerable belt-tightening would have been necessary because grain and potatoes form the core of the Soviet diet. Moreover, the drop in grain production came at a time when the demand for grain as livestock feed was increasing rapidly. A Brezhnev-sponsored program begun in 1965 to provide more meat and other quality foods had boosted the use of grain for livestock feed. If Western grain had not been available, the Brezhnev program would have had to be interrupted and perhaps abandoned. This would have been extremely unpalatable to the leadership, which had pledged itself to better the lot of the consumer.

28. The success of the Soviet livestock program seems to depend on continued access to Western grain. The Soviets could require grain imports of 15 million tons annually through the rest of the 1970s, assuming an average increase in grain output under normal weather conditions. Soviet purchases this year illustrate their continued dependence on Western grain. Despite a record net grain harvest of 170 million tons – compared with the previous high of 150 million tons in 1970 – the Soviets contracted for the delivery of 12 million tons of grain in fiscal year 1974. Although this is only one-half the amount delivered in the previous fiscal year, it will cost them two-thirds as much foreign exchange because of high grain prices.

29. Because the United States has such a large share of world grain trade, a large Soviet grain requirement will almost have to include substantial purchases from the United States. A number of prominent Soviet trade and agricultural officials have admitted to US visitors that the USSR will require long-term imports of food and feed grains from the United States even if the USSR has good harvests.

Outlook for Future Soviet Gains from Trade with the United States

30. The continued growth of Soviet imports from the United States depends on a favorable climate for trade. Whether trade flourishes depends in part on Congressional reception of the US-USSR trade agreement. If detente seems uncertain, the credits necessary for an expansion of trade may dry up. Equally as decisive for trade will be the attitude of American business toward the large cooperative ventures that the Soviets are counting on to support their growing acquisitions of US equipment and technology. Such ventures are likely to materialize only in an atmosphere of confidence.

Trade Agreement and MFN Tariff Treatment

31. If Congress does not approve most-favored-nation (MFN) treatment and ratify the US-USSR trade agreement signed in 1972, US-Soviet economic relations will no doubt be dampened. Ratification of the agreement on the other hand will do little more than provide formal US approval of the upward trend in economic relations between the two countries.

32. The lack of MFN treatment in the past has had a negligible effect on Soviet exports to the United States. With few exceptions, Soviet exports to the United States entered either duty free or suffered little or no discrimination when subject to the full 1930 tariff rate. This is largely because Soviet exports to the United States (and to other advanced market economies) have been dominated by raw materials and semimanufactures,

commodities generally at the low end of the spectrum of tariff discrimination. Currently, the USSR could conceivably increase exports of some commodities such as plywood, particle board, vodka, dressed furs, sheet glass, and the like if it had MFN status. But, in the short run, the additional foreign exchange earnings would be small.

33. Until the recent oil price increases, Soviet oil exports to the United States faced discrimination because oil is subject to the full rate, then equivalent to about 10% ***ad valorem***, compared with roughly 4% or less if the USSR qualified for MFN. Because the duty on oil is specific, at today's higher prices the full rate's ***ad valorem*** equivalent is only about 3%, compared with an MFN rate of 2% or less – thus there is no longer any effective discrimination between the two rates. US imports of Soviet oil (mainly fuel oil) in the first nine months of 1973 were valued at nearly $36 million, compared with about $7 million in all of 1972.

34. Benefits accruing to the USSR because of MFN might be substantial in the longer term if the USSR is successful in carrying out its current plans to produce manufactured goods designed for export to the United States. The product lines envisioned in this future trade are highly finished consumer-oriented goods that face significant discrimination unless the USSR obtains MFN treatment.

Cooperative Ventures

35. Cooperative ventures with US companies probably offer the best chance for large, continuing growth in US-Soviet trade. The USSR wants US companies to provide advanced equipment, technology, and know-how to implement the large development projects currently being considered. US firms are frequently singled out because in many cases they have the best equipment and technology. Equally important is the Soviet need to tap US financial markets for the huge credits required for the massive Soviet imports needed for such projects.

36. In addition to the Occidental project discussed earlier, the USSR has signed preliminary agreements with US firms for two projects involving the exploitation, transportation, and liquefaction of Siberian natural gas. Together, the North Star and Yakutsk projects will require more than $7 billion in long-term credits to finance Western (mainly US) exports of equipment, with Soviet repayments to be covered by US and Japanese guarantees to purchase LNG over a period of 20 to 25 years. If undertaken, these projects will provide the USSR with access to US technology and experience that would be extremely useful in developing other Siberian natural gas and petroleum resources. Moreover, if exploration proves successful, the Yakutsk project, as currently envisioned, will provide the

USSR with an additional one billion cubic feet of natural gas daily for either domestic use or additional exports.

37. US investment in other Soviet raw material development projects – Sakhalin offshore deposits and the proposed Tyumen-Nakhodka oil pipeline – is also being considered. US participation in offshore exploration for natural gas and oil deposits appears particularly desirable to Moscow because of the specialized equipment and large credits involved and the need for US offshore drilling technology. The Tyumen pipeline project, if realized, would generate more hard currency revenue for the Soviets than the two LNG deals combined and has interested some US firms.

38. East Siberian projects such as the Udokan copper deposits and the Yakutsk coal fields are ventures that almost surely must have foreign assistance if they are to be started in the next decade. Besides financing, US participation would provide mining and ore processing equipment, generally superior to Soviet equipment, and US managerial, planning, and engineering skills.

39. The Soviets are also negotiating for the exchange of US industrial processes and technology for Soviet metals and minerals. The best example is a package of proposals put together by a group of US firms, which will provide a variety of services, including specialists for construction, preliminary and planning engineering, assistance in procurement of equipment, advisory construction management, training of USSR operators, start-up assistance, and royalty-free licenses to use the processes. In exchange, the US participants will buy or accept as compensation for services a number of metallurgical and other manufactured products.

39. The large cooperative ventures discussed above would provide the USSR with significant inputs of technology and equipment and would enable it to repay the credits with products. In terms of technology transfer, the ventures differ little from direct purchases of turnkey projects because they provide for nothing in the way of technology transfer or Western assistance after the venture begins to produce.[6] The Soviets, however, are trying to elicit US commercial participation in cooperative ventures that offer continuing technology transfer and Western assistance or that otherwise maintain a vested US interest in the operation of the enterprise.

40. In discussions with some US oil companies for the exploration of offshore oil deposits, for example, Soviet proposals have gone beyond simple commodity pay-back arrangements. To interest US firms, which are often loath to part with advanced technology and know-how for a fixed

6. Additional US assistance would be required, however, if product quality is not up to standard.

Soviet payment, the USSR has indicated a willingness to establish jointly owned firms. Under such a plan, US firms would receive a fixed percentage of all crude oil discovered in return for their exploration expertise and equipment.[7] In addition to a major share of crude oil output, the USSR would acquire US equipment and access to drilling technology for the life of the agreement.

41. The USSR also has considered offering equity participation, which some US firms want if they are to make particularly valuable technology and equipment available to the USSR. After proposing that a US firm provide a plant under such terms, the Soviets backed off, however. The two parties now are talking about a long-term technology sale by the US company in return for periodic Soviet payments and an agreement not to market the output outside the USSR.

42. In still other cases, the USSR has sought to enter into cooperative agreements that would increase sales of their manufactured goods in the West. The Soviets have held discussions with several US firms on the marketing of Soviet products whereby the US firm would, where necessary, modify Soviet equipment to make it more acceptable to Western requirements. Raymond Loewy, a leading industrial designer, has signed a cooperative agreement with the Soviets that calls for the US firm to assist in the design of automobiles, hydrofoils, and watches. The agreement, which initially has a life of 2-1/2 years, will provide the USSR with production and marketing expertise useful in selling manufactured goods on Western markets.

Soviet Acquisition of US Technology Outside the Trade Channel

43. The USSR has acquired foreign technology mainly by purchasing machinery and equipment. However, other channels of transfer have included the acquisition of technical data, attendance at international meetings, visits to Western firms, and formal agreements for collaboration in research and the exchange of scientific and technical information. Under detente, Moscow has been pushing hard to tap all possible sources of US technology.

Informal Contacts Increase

44. An important consequence of the detente atmosphere has been an increase in personal contacts between US and Soviet managerial, technical, scientific, and industrial personnel. In conferences and symposia, as well as in commercial negotiations, useful information is likely to be

7. The Soviets may be reassessing this position. They are now suggesting that the oil repayment be based on current world prices, making it a less attractive proposition to US firms.

passed along. In terms of importance to the USSR, the most important of these contacts probably are those associated with visits by Soviet officials to the United States. Aside from tourists and diplomats, about a thousand Soviets arrived in the United States in 1973 in connection with commercial activities and exchanges, including:

- contract negotiations,
- inspection and acceptance of US equipment destined for the USSR,
- training of Soviet personnel in the use of US equipment and technology,
- attendance at exhibits and conferences,
- familiarization with US plants and factories and with banking, marketing, shipping, and a number of other activities.

45. Many of the several hundred scientists who visited the United States to attend conferences arranged side trips to laboratories, private firms, and universities. In addition, the commercial visits frequently entail visits to plants and laboratories. Some of the visits are quick tours of various plant and laboratory facilities, but those in connection with training and with inspection and acceptance of US equipment last for weeks or months. Other things being equal, the longer the stay, the greater the opportunity to acquire information. Aside from firms with which the USSR has placed orders, the installations visited generally are in those sectors which the USSR has demonstrated an interest in developing: commercial aircraft, computers, machine tools, electric power equipment, oil field equipment, chemicals and chemical equipment, electronic equipment, mining equipment, and others.

46. A major aim of plant visitation is the acquisition of production technology through observation and briefings at US manufacturing facilities and laboratories. Soviet visitors usually ask many penetrating and detailed questions and usually take extensive notes. The head of a recent delegation visiting a US plant stated that every member of his group was required to write a report on all he saw and learned on their tour. This is probably standard operating procedure on all Soviet visiting groups.

47. In attempting to acquire as much information as possible, these delegations often visit several firms. They normally claim that the USSR is interested in acquiring the firms' products and/or technology or desire to undertake some other profitable deal. A case in point was the large

delegation of Soviet aviation officials that visited the United States in the fall of 1973. The delegation visited a number of installations and obtained detailed briefings from officials of leading airframe and aircraft engine firms, ostensibly to help determine which of these companies could best fulfill Soviet requirements for manufacturing wide-body jets. The Soviet delegation returned to the USSR having apparently succeeded in stimulating active competition among the firms for Soviet contracts -- if indeed, the Soviets intend to make such purchases. If they do not, the information acquired will help them in developing their own wide-body and possibly other aircraft.

48. Access to US business and industry has also been facilitated by the establishment of the Soviet Purchasing Commission in New York for the procurement of equipment for the Kama truck complex. This commission supplements the work of Amtorg, the permanent Soviet trade organization in New York. The Kama River Commission was recently expanded to handle the long-term Occidental agreement involving the exchange of chemicals and the supply of US equipment, although the Soviets were permitted to add fewer people than they asked for.

49. The Soviets unquestionably have increased their knowledge of US technology through these visits and through personal contacts. In many plants and laboratories the management is careful about what visitors see, while in others where less care is exercised, the Soviet visitors may obtain some useful information.

Bilateral Scientific and Technological Cooperation Before the May 1972 Summit

50. Bilateral cooperation between the United States and the USSR in science and technology (S&T) had its origin in a series of agreements signed in 1958 under the US-Soviet exchange program. These exchanges were arranged and monitored by the respective governments. The members of the delegations, the topics, and the itineraries were approved in advance, and the exchanges were balanced in terms of numbers and areas of access. Data flow between the United States and USSR also took place during this period at international meetings.

51. US-Soviet S&T collaboration had many of the same characteristics seen in the USSR's bilateral programs with other countries -- the evasion of reciprocity and bureaucratic inertia on the part of the USSR. In retrospect, the USSR gained more than the United States, principally because the United States was ahead in practically all the cooperative areas. In nuclear energy, for example, the Soviets acquired valuable information from the United States on the technology of reprocessing nuclear reactor

fuel elements and the water chemistry of light water reactors that enabled them to surmount some troublesome problems.

52. The benefits to the USSR of the bilateral exchange program with the United States were probably modest, but the USSR won greater recognition for its science program by portraying itself as the equal of the United States in the "big science" areas of space, nuclear science and technology, oceanography, and the like. While the USSR acquired some scientific data, it received little know-how of appreciable benefit to its civilian economy or its military establishment.

53. In the late 1960s and the early 1970s the Soviets began looking harder at ways in which Western technology could be brought to bear on their internal problems. They recognized that bilateral programs were inexpensive but that much of the desired technology was proprietary information in the hands of private industry. As a result, the USSR seems to have conceived a multidimensional approach to acquiring key technology in selected high-priority areas. Overt, personal contacts in these areas were increased through existing and new exchange agreements, commercial overtures, and international forums. At the same time, long-term cooperation agreements with Western governments and firms were emphasized. The USSR prefers these agreements, at least initially, to be all encompassing and government-to-government. Under this overall umbrella, the USSR can then negotiate agreements with private firms and organizations, often with firms or groups that would deal with it only as a result of the government encouragement implied by or resulting from the overall agreement.

Government-to-Government Agreements Under Detente

54. At the May 1972 Summit the United States and USSR signed four major agreements for bilateral cooperation – agreements covering S&T, exploration and use of outer space for peaceful purposes, environmental protection, and medical science and public health. At the June 1973 Summit, five additional agreements for bilateral cooperation were signed. Three focused on S&T – studies of the world oceans, transportation, and peaceful uses of atomic energy.

55. In some respects these agreements simply strengthened the administrative mechanism, not the substance, of cooperative efforts already under way – such as those in oceanography, atmospheric modeling, earthquake prediction, and nuclear energy. Nevertheless, these agreements embodied some significant new features, especially as viewed by the Soviets. First, the two governments gave a clear endorsement to bilateral cooperation between the two countries. The language of Articles 3 and 4 of the S&T

agreement was clearly of particular significance to the Soviets. Article 3 includes an explicit recitation of the various mechanisms for collaboration, and Article 4 calls for each party to encourage and facilitate contacts and cooperation.

56. Since the signing of the first series of agreements in May 1972, the Soviets have moved vigorously toward initiating specific collaborative work projects with US scientists in a very wide range of subjects, including joint manned space flight, non-nuclear energy R&D, chemical catalysis, microbiological synthesis, and the application of computers to management. In general, the Soviets have selected their most capable scientists and their best institutes to participate in these bilateral programs. In addition, they have seen to it that problems of longstanding concern to them have been included in the overall program. In contrast to the pre-1972 exchange program, which tended to stress basic scientific research, the current program is oriented more toward projects offering greater potential impact over a shorter period of time – projects where additional work could lead fairly quickly to improved products and stepped-up productivity for the USSR. For example, joint US-USSR research on catalytic reactor modeling and on the design and operation of thermal and hydroelectric power stations, if pursued along the lines the Soviets probably envision, is likely to benefit the USSR more extensively and within a shorter period than the more scholarly work in pure mathematics or theoretical physics carried out under prior agreements.

57. Soviet activities during this year and one-half period clearly continue the multi-pronged approach to obtaining Western know-how in key technological areas of the previous decade. Computer technology is a good illustration. Under the S&T agreement, the Soviets pushed for cooperation in the application of computers to management, and at least one aspect of many of the other subjects for cooperation – magnetohydrodynamics (MHD), S&T information processing, metrology and standardization, and water resource systems – involves the use of computers. Moreover, the Soviets have signed agreements for joint research with the Control Data Corporation (CDC) and the Hewlett-Packard Corporation.

58. Furthermore, the overall bilateral program appears to offer opportunity for the transfer of US technology to the USSR in areas not explicitly identified for cooperation. A modest amount of advanced US semiconductor technology, for example, went to the USSR in the form of medical equipment under the bilateral agreement on medical science and public health, and other technology conceivably could be transferred in small amounts under other agreements with little notice being taken.

Agreements with Private Firms Under Detente

59. The USSR has markedly increased the number of direct contacts with US industrial firms under Article 4 of the S&T agreement and has signed agreements or protocols with specific US firms for cooperative research.

60. US companies have given information to Soviet agencies in the hope of getting a foothold in Soviet markets. The Soviets often exploit this motivation by baiting US firms to enter into cooperative agreements with hints of subsequent sales to the USSR. With few exceptions, the Soviets have not revealed their own technology for possible licensing or trade with the US firms. There is some feeling, however, on the part of many US firms that there is not much Soviet technology that would interest them.

61. In bilateral agreements with private US firms, the Soviet State Committee for Science and Technology (SCST) has been the principal instrument on the Soviet side. This state committee has signed more than 20 long-term (mainly five-year) agreements with a variety of US firms.[8] Most of these agreements are similar in content, calling for general cooperation, joint R&D, and exchanges of delegations, information, documentation, methods, processes, know-how, research results, production samples, and licenses. Most of the agreements are grouped in industries of high technology of great interest to the USSR, such as electronics, chemicals, energy, and construction.

62. The earliest group of firms to sign S&T agreements with the USSR were large multinational chemical firms, conglomerates of the type favored by the USSR. Agreements in the chemical field between SCST and Occidental Petroleum and BASF Wyandotte Corporation came in July 1972, although the Occidental agreement also covered oil and gas, metal working and metal coating, ecology, and construction. Further agreements with SCST were negotiated by Monsanto, Union Carbide, Dow Chemical, and Armco International in late 1973. As noted above, Occidental also entered into a joint venture with the USSR involving the construction of fertilizer plants and the exchange of superphosphates. Most of the other firms hope that similar trade arrangements will result from their participation in S&T cooperation agreements. The pervasive Soviet interest in computer applications is also in evidence in this initial round of agreements. Monsanto has agreed to cooperate with the USSR on computer applications in the chemical industry.

63. Another group of firms has signed agreements with SCST in the electronics field, with emphasis primarily on computers and communications

8. A resume of each of the bilateral agreements is given in the Appendix.

equipment. CDC signed a 10-year agreement to cooperate in all phases of computer technology. The more standard five-year agreements were signed by Singer Company, Hewlett-Packard, Litton, and General Dynamics for cooperation in computers and other fields. International Telephone and Telegraph also signed an agreement for telecommunications and related fields. In these fields, the technology flow is likely to go in only one direction, and the Soviet need is extensive. Although all of these firms obviously hope to obtain large trade contracts, the extent of the trade and technology flow will depend on trade control policy decisions because much of this equipment and technology is still subject to export controls.

64. Brown & Root, Inc., Dresser Industries, and Stanford Research Institute have signed agreements with SCST for cooperation in the gas and oil industries. These firms have much technology that the Soviets need, and Brown & Root is already part of the consortium identified with the US-Soviet North Star LNG project. Dresser has negotiated a license sale to the USSR for Soviet production of a Dresser-Clark model compressor. Bechtel Corporation signed an agreement with SCST that covers all branches of heavy industry, but the USSR reportedly is most interested in Bechtel's capabilities in the energy field.

65. General Electric (GE) signed a series of agreements with Soviet ministries and SCST in 1972-73. An April 1972 agreement with the Ministry of Heavy, Power, and Transport Engineering provided for the exchange of research and development data on gas turbines, including the joint development of gas turbines. An outgrowth of this was an agreement with Elektrosila of Leningrad for the production of turbogenerators.

66. An agreement between GE and the Soviet Ministry of Electrotechnical Industry in December 1972 called for exchanges of R&D data on current commercial projects. In January 1973, GE and SCST signed an agreement for joint development of electric power generating technology, which could lead to licensing arrangements for the manufacture of GE products in the USSR. This agreement established a formal policy between GE and the USSR of general scientific and technical cooperation, and it specified power generation technology – including steam, gas turbine, and nuclear – as commanding immediate attention for mutual exchange and development.

67. On 23 January 1974, Kaiser Industries concluded an agreement with SCST. The agreement covers cooperation in the fields of alumina-aluminum, iron ore mining, pellet production, coal mining, metal fabrication, and others.

68. The most recent 5-year agreement concluded between a US firm and SCST was the Lockheed agreement signed on 31 January 1974. The

agreement provides for cooperation in navigation systems, civil aircraft building, air traffic control equipment, and other areas.

Potential Benefits to the USSR from Bilateral Scientific and Technological Cooperation

69. The benefits to the USSR from greater S&T cooperation are hard to quantify but can be described in general terms. Without doubt, implementation of the present array of agreements will bring many talented Soviet scientists and engineers into intimate contact with their US counterparts in a wide variety of disciplines. This will serve to spark at least some sectors of the USSR's lackluster civilian R&D program and to help improve the management and quality of the work in these sectors. Moreover, given the US lead over the USSR in practically every technology identified for cooperation, the Soviets through these contacts should avoid many of the mistakes they would otherwise encounter and thus achieve shorter development times for selected projects. The potential for benefits of this nature is substantial in certain areas – for example, chemical catalysis, micro-biological synthesis, and antipollution equipment all have their roots in chemical process technology, areas where US superiority is unquestioned. In non-nuclear energy R&D, the Soviets may gain access to more accurate models of MHD phenomena afforded by stronger US computer capabilities and to better designs for MHD channels resulting from US specialization in this area. Also in the energy area, the United States clearly excels in cryogenic technology, which is necessary for the operation of superconducting magnets and transmission lines, and in the pollution control and heat transfer technology associated with conventional thermal powerplants. And in all the cooperative areas, those aspects of the work involving sophisticated instrumentation and automated control represent a potential boon to the Soviets, again because of the clear lead that the United States has in these technologies.

70. Another less tangible but potential benefit to the USSR is a marked enhancement of their international prestige in S&T. The gain is illustrated very well by the joint Apollo-Soyuz Test Project (ASTP), which will support the illusion that, despite a lack of manned lunar expeditions, the USSR is on a scientific and technological par with the United States in manned space flights. In fact, however, most of the technical and managerial responsibility is being assumed by the United States. The ASTP also offers the possibility of additional benefits to the USSR, such as the closest look to date at US scientific, technical, and managerial know-how as brought to bear on a major undertaking. Thus the USSR is taking a minimum risk and expecting a maximum gain. Potential benefits in prestige also exist in the geophysical sciences such as climatology and earthquake prediction where some of the Soviets' creditable work will receive greater visibility and thus gain more acclaim worldwide.

71. The potential for gains by the Soviets in the nuclear energy field also is extensive, once again because of a juxtaposition of US strengths and Soviet weaknesses. Although the Soviets now have an operating prototype fast breeder reactor, and the United States does not, they lag in almost every aspect of fast breeder technology -- core design, fuel element behavior at high fluence levels, control rod materials behavior, component fabrication, and quality control. In controlled thermonuclear reactions (CTR) research the Soviets could gain markedly in the pellet implosion approach to laser-induced fusion where US work has drawn extensively on the skills and computers of its nuclear weapons designers. In the more conventional areas of CTR, the Soviets could benefit from access to US experience in the plasma heating of Tokamak systems, in conducting diagnostic experiments, and in fusion reactor engineering concepts, calculations, and experiments.

72. Soviet commercial aircraft have been improving steadily in terms of world standards, but at least two remaining technical hurdles must be overcome before Soviet civilian aircraft can be considered truly competitive in the world market. They must have (1) internationally approved navigation systems and (2) performance in terms of engine life and economy comparable with Western aircraft. The USSR presently is attempting to acquire advanced navigation systems by purchase of Western equipment and technology. Improving engine performance may take longer, however, because the Soviet metallurgical industry generally has not been able to control quality adequately in the production of high-temperature materials and because the direct military application of Western technology in this field has kept it on the embargo list.

73. Finally, over the longer run, the technical agreements with US computer firms offer the prospect of large benefits to the USSR. Under the umbrella of these agreements, the Soviet could gain large-scale manufacturing know-how for advanced central processers, peripherals, and electronic components that it does not now possess, as well as advanced software and training. In short, such agreements, if implemented, could do a great deal for the Soviet computer industry. Before these agreements are implemented, however, export controls will have to be relaxed considerably.

Problems in Assimilating Foreign Technology

74. The USSR has relied heavily on foreign technology throughout its history. In practically every industrial sector, much of the technology is of foreign origin. Technological transfer, however, has been too slow to bring the Soviet Union abreast of Western technology. As a result, a substantial technological gap persists in most parts of the economy. The

Soviet campaign to acquire foreign technology is particularly vigorous now because traditional domestic sources of economic growth have been drying up.[9]

Research and Development

75. The great unevenness of the R&D sector has been a major hindrance to the assimilation of US or other foreign technology. Basic research, particularly theoretical work, is considered strong, while applied R&D has been weak except in priority military sectors (including military applications of the space program), which attract the best scientific and material assets. In large part, the weakness of applied R&D in the civilian economy stems from its incompatibility with rigidly centralized direction and management. In addition, the indifferent quality of many Soviet engineers and applied scientists has hampered the civilian R&D effort. The training of Soviet engineers and applied scientists is rather narrow, and many of the engineers are best described as technicians by Western standards.

Piecemeal Purchase of Machinery

76. Imported machinery has been of less help to the Soviet Union than expected in a great many instances, especially when bought piecemeal. Frequently, the purchased machinery fails to mesh well with existing Soviet equipment, with other foreign equipment, or with Soviet inputs within a production process. In part, this interface problem is a natural one. The Soviet applied R&D sector, however, takes an inordinate length of time to solve problems of compatibility in the civilian economy. In the case of the Kama truck factory, where most of the equipment is being supplied by numerous foreign firms, Western engineers estimate that several years will be required to interface all of the equipment into an integrated operation. By the time trucks roll off the assembly line, they will be obsolete by Western standards.

77. The USSR's difficulties stem partly from a tendency to import equipment that is too advanced for rapid assimilation, given existing levels of domestic technological development. This overreaching is especially evident in the computer field but extends into other sectors such as production of color television sets. In 1968 the USSR purchased from a US firm a complete package of very advanced automated machinery and technology for the fabrication of shadow masks for color television tubes, capable of supporting an output of one million color television sets annually.

9. For a number of reasons, the rate of increase in the productivity of labor and capital inputs fell off abruptly in the 1960s. Looking into the future, Soviet leaders recognize that the rate of economic growth will not trend up again unless increases in productivity can be accelerated. Because of lower birth rates, the labor force will eventually grow more slowly while the expansion of plant and equipment is becoming harder to sustain in the face of competing demands for consumer goods.

By the end of 1971, despite a year's training in the United States for four Soviet technicians, the equipment still was not operational, and, in fact, had suffered severe damage through improper operating procedures and poor maintenance. Thus the Soviets were forced to procure, at a cost greater than the original purchase price, additional technical assistance and parts to restore the line to its original condition. This line, now operating at only a fraction of its rated capacity, is a major bottleneck in Soviet production of color television sets, which in 1972 reached a level of only 200,000 a year.

Secrecy

78. As a result of Soviet reticence to supply foreign companies with information on how the imported machinery is to be used, purchased Western machinery is sometimes less productive than it otherwise would be. The Kama plant is an example; the buildings at the truck plant are standing, and foreign equipment will have to fit into space allotments that have already been designated. Yet foreign suppliers have been hindered in obtaining useful drawings of the factory and in obtaining permission to visit the site. Where security is considered critical, the USSR would rather forgo a purchase than release details necessary to make an interface possible. For this reason, purchases of aircraft navigation equipment, radar equipment, and the like have been deferred in the past.

Labor Quality

79. Assimilation of foreign technology also depends on the quality of the labor force. Soviet workers must first master the unfamiliar and complex foreign machinery; therefore, many foreign-built plants reach rated capacity only after lengthy delays. For example, the huge FIAT-equipped passenger car facility in Tol'yatti became fully operational about 2 years behind schedule. A major factor retarding assimilation of the technology was the quality of the Soviet labor force. Soviet workers frequently shut down an entire line to make minor adjustments to a single piece of machinery. Despite intensive training in Italy, technicians commonly reassembled machines improperly after repairs, and workers were casual in their approach to the maintenance of precision machinery. Supervisory personnel at the working level, reluctant to make even minor decisions, bucked upstairs virtually all problem-solving decisions.

Spare Parts

80. To keep foreign plants and equipment operating, the USSR needs a steady supply of spare parts and solid maintenance programs. Shortcomings in these areas have often put foreign equipment out of

commission. Foreign-made spare parts seem to be purchased only for high-priority industries such as the chemical industry. Industries with lower priority apparently get no foreign exchange to buy spare parts. Because of the shortage of foreign spare parts, low-priority industries may favor less modern domestic machinery or East European machinery, even if hard currency is available for the purchase of original equipment from the West.

Cost of Turnkey Plants

81. Because of its problems in digesting imported technology piecemeal, the USSR, as indicated earlier, has turned increasingly to the purchase of turnkey factories. Foreign firms design the factory, supervise construction, and are responsible for the selection and installation of equipment; Soviet workers assume control once the plant is operating.

82. Turnkey plants have not proved to be a completely satisfactory answer to the USSR's difficulties with foreign technology because they are too expensive to buy on a massive scale and because they do not resolve all of the interface problems. As in the case of the FIAT plant, the Western plants often require labor skills in construction and operation that exceed the skills available on site in the Soviet Union. In addition, as the Soviets found in taking over Western-built chemical plants, the processes sometimes demand raw and semi-finished materials of a quality that the domestic economy is not prepared to supply.

Management

83. It should be noted, too, that the Soviets' relative lack of experience in managing large complexes of very modern technology may cause problems. Soviet managers have been trained to concentrate on meeting narrowly defined production goals in an organizational environment that does not promote the coordination of many complex parts. Western corporate management has invested heavily in specifically training middle-level managers in problems of complex organization before advancing them to higher levels. The Soviets have displayed much interest in importing these Western management techniques.

The Impact of US Technology

84. An assessment of the Soviet gains from technology transfer under detente should consider both the economic and the military gains. On either count, assessment is risky, primarily because measurement of technology transfer is elusive. First, we do not fully understand the present Soviet capability in some of the key areas for cooperation, so it is hard to judge their needs and their ability to exploit the know-how they might receive. Second, no satisfactory methodology exists for assessing the degree and

consequences of specific examples of technology transfer. Third, in the case of the bilaterals, Soviet gains depend to a great extent on the actions of the individuals involved at or near the working level, particularly on the US side – all of whom appear to have considerable latitude. Last, in the case of the cooperative ventures and joint research involving US industry, proprietary considerations will play a part, and each firm will have to decide for itself how much technology it is willing to reveal or supply and what it expects to receive in return. The judgments set out below are therefore tentative.

The Economy

85. So far, the impact of rising Soviet-US trade on Soviet economic growth has been small. The volume of trade has not been large enough to have an appreciable effect on the Soviet economy. If trade and bilateral contacts continue to develop, the benefits to the USSR will accumulate.[10] For several reasons, the increasing US-Soviet economic ties are likely to be useful but not decisive in the efforts of the Soviet leadership to deal with domestic economic problems.

The Question of Leverage

86. First of all, the United States has strong competition in supplying technology to the USSR. To some extent, the growing importance of the United States in Soviet machinery imports is politically motivated, not a technical necessity. US companies are the preferred sources of automotive equipment, oil field equipment, both computer hardware and software, and civilian aircraft technology. In other areas, such as oil field equipment for Arctic exploration, the United States is the only technology source in the eyes of the Soviets. The Soviets are also seeking equipment and know-how from the United States in numerous other specialized areas such as cryogenics, air traffic control, and advanced metallurgical processing. If contracts cannot be reached with US companies, however, the Soviets recognize that other countries often can provide technology that is as good or almost as good. The USSR has had success, for example, in buying computer hardware and some kinds of automotive equipment and machine tools from Western Europe and Japan.

The Quantity of US Technology

87. Projections of US-Soviet trade suggest that the amount of technology the USSR will receive in the form of imported machinery will

10. The United States, of course, will obtain substantial economic benefits in the form of hard currency earnings from its exports and alternative (and sometimes cheaper) sources of imported commodities. As indicated in the Introduction, this report does not attempt to strike a net balance of gains.

be small relative to total domestic investment. In the 1971-75 plan period, for example, American machinery will be equal in value to no more than 1% of the equipment installed in industry and will be less than 1/2 of 1% of all investment in equipment in the whole economy.

88. In specific narrow sectors, of course, the acquisitions of US technology and machinery will have a relatively large impact. For example, the ammonia plants now on order from the West incorporate Kellogg technology, which is far more advanced than Soviet technology. By the time they are completed, they will have a capacity of 8.7 million tons per year. Operating through the 1980s, these plants would save the USSR between 2 billion and 3 billion rubles, compared with the cost of building and operating ammonia plants like those they already have.[11]

The Speed of Assimilation

89. Because the quantity of embodied technology transferred from the United States will be limited, greater weight attaches to its qualitative impact. The imported machinery will be more productive than the machinery available domestically, but clearly the contribution of US machinery will be limited unless it can be duplicated and adapted on a wide scale. Similarly, the technology acquired outside the trade channel through direct and indirect contacts must be translated into blueprints and brought to series production. Thus the efficiency of assimilation will be critical in determining the effect of US technology on Soviet economic performance. But, there is no indication that the USSR's record with respect to assimilating foreign technology will improve markedly in either the short term or the medium term.

The Allocation of the Detente Dividend

90. The technology transferred to the USSR will permit larger output with the same amount of resources or, perhaps, the same output with fewer resources. In either case, the additional resources present the leadership with a policy choice – how to allocate this dividend among consumption, investment, and defense. Some assessments of the effect of technology transfer on economic growth or military spending assume that the freed resources are allocated all to investment or to defense. While the Soviet leaders are continually faced with the problem of balancing defense needs against their economic objectives, defense has traditionally been afforded the highest priority claim on the resources of the Soviet economy.

11. Such a saving is roughly equivalent to recent annual total investment in the chemical and petrochemical industries, or alternatively may be compared with estimated total output of chemical fertilizers during the 1980s of about 35 billion rubles.

91. Recently, however, Moscow's announced policy has been to pay more attention to consumer needs. This reorientation in favor of the consumer was demonstrated concretely by Moscow's willingness to buy so much Western grain in 1972-73. A policy trend in favor of the consumer can also be detected in the allocation of national product. The share of GNP devoted to consumption fell from 67% in 1956 to 59% in 1964. Since then, however, the consumption share has been maintained at about 60%. In addition, many of the most expensive investment programs -- notably those in agriculture and the chemical industry – will benefit the consumer primarily. Because of the commitment to improving the population's standard of living, additional resources will probably ultimately be used mainly for producing consumer goods.

Military Capabilities

92. The USSR is pursuing vigorously a program to modernize its strategic weapons systems. This program had its origins in the mid-1960s before the onset of detente and the signing of the SALT agreements but has continued unabated to the present time. The program seeks to introduce advanced technologies along the lines pursued earlier by the United States and incorporated into US offensive systems – for example, multiple independently targetable reentry vehicles (MIRVs) and computer-controlled in-flight navigation and guidance systems for ICBMs.

93. It is well documented that since World War II the Soviet Union's military-strategic capabilities have benefited from advances made by the United States. The USSR acquired US military technology by espionage and theft, capture of equipment in wartime, and purchase from other countries who evaded COCOM controls as well as by close scrutiny of the open literature. These efforts have continued in the detente era.

94. Nevertheless, this way of acquiring US high-technology hardware and know-how with potential military applications is often incomplete and does not give the USSR capabilities equivalent to those the United States enjoys. As in the case of civilian technologies, the Soviets have had only mixed success in mastering and replicating the production technologies involved – and, in general, the more complex the manufacturing technology, the less creditable have been their accomplishments. In addition, controls on the export of military-related technology to the USSR have been reasonably successful, especially in the high-technology fields in which the United States has had a pronounced competitive advantage. In assessing the military benefits of detente to the Soviets, then, the following questions should be addressed.

- Is detente opening up ***new*** channels for the transfer of US military-related technology to the USSR?

- Is detente affecting the flow of US military-related technology to the USSR through ***existing*** channels?

Benefits to Date

94. Soviet military capabilities probably have not yet been affected by the US-Soviet detente in spite of the numerous developments that have taken place since early 1972. It is true that personal contacts between Soviets and Americans in government, academic, and, most importantly, industrial areas have increased substantially during this period. And Soviet imports of machinery have expanded markedly during the detente period, with contracts already signed pointing to still greater exports of equipment to the Soviet Union. At the same time, the list of American firms that have agreed to cooperate with Soviet organizations in science and technology is growing week by week. Thus far, however, the trade, contacts, and technical agreements have not transferred discernible amounts of military technology. American firms have been relatively cautious so far in dealing with Soviet delegations in sensitive technological areas. While export controls have been relaxed, the critical areas of military-related technology have not been affected appreciably. For example, the USSR is receiving help for a backward computer industry, but the aid has not yet included technology vital to advanced weaponry.

Potential Benefits

95. Two years of detente marked by traditional Soviet opportunism, however, have laid the groundwork for the possible transfer of important military-related technology to the USSR.

96. The cooperation agreements between American firms and the USSR have opened up a new channel for the potential transfer to the USSR of technology having ultimate military applications. Many of these firms produce military or military-related equipment. This new channel, therefore, could provide the USSR with valuable help through informal contacts, the supply of finished equipment, or cooperation in R&D. Soviet initiatives to US aircraft, computer, and metallurgical companies are of special interest in this connection.

97. The flow of technology through existing channels – trade, technical exchanges, and the like – could also expand to encompass military-related technology. Under detente, the attitude of US firms doing business with the Soviet Union has changed. They are now requesting

government approval for the sale of production technologies that they would not have considered supplying to the USSR a few years ago. Some Soviet acquisitions that are not now banned by export controls, moreover, could be adapted in time for military purposes. Quality control procedures and the employment of computers in managing complex development projects are examples.

98. Finally, detente is likely to improve Soviet prospects for obtaining military-related technology by lowering barriers in third countries. To the degree that the United States relaxes its controls on the export of strategic goods, other countries will almost certainly let their standards fall to even lower levels. The COCOM partners of the United States have generally been less strict in applying controls, and they are strong competitors in some of the advanced technologies that the Soviets are seeking.

99. In short, the changes in US-Soviet relations under detente have the potential to upgrade Soviet military capabilities. The flow of technology already touches militarily significant areas in the computer and electronics fields. Whether the full potential is realized depends in part on the care with which US firms, scientists, engineers, and technicians treat the developing contacts. Moreover, the guidelines set and administered by the US Government will be influential in determining private attitudes and decisive in limiting the transfer of military-related technology.

APPENDIX

SOVIET SCIENTIFIC AND TECHNICAL COOPERATION AGREEMENTS WITH US FIRMS*

1. American Can Company announced on 20 December 1972 that it had signed a three-year agreement with the Ministry of Engineering for Light and Food Industry and Domestic Appliances. The agreement covers all aspects of container and packaging technology involving various segments of American Can operations, but centers initially on high-speed can manufacturing. The agreement reportedly stipulated an exchange of technical information and specialists and a feasibility study regarding the Soviet purchase of American Can high-speed equipment for manufacturing tinplate cans.

2. Armco International signed a five-year cooperation agreement with the SCST in December 1973. The agreement covers ferrous metallurgy and off-shore oil projects, but Armco reportedly hopes the agreement will spur a favorable Soviet decision on Armco's proposed projects, including a $1.2 billion polyurethane complex for which Armco would be the prime contractor.

3. Arthur Andersen and Company signed a protocol with the SCST in Moscow on 25 May 1973. The agreement provides for the Andersen accounting firm to hold a series of seminars in the USSR on such topics as production accounting, information systems, auditing and accounting operations, and taxation. In addition, the agreement provides for Soviet experts to visit the United States in an exchange program with the firm. The Anderson Company also hopes to receive permission to open an office in Moscow.

4. BASF Wyandotte Corporation, a member of the worldwide BASF Group of chemical companies, signed an agreement for S&T cooperation with the SCST on 17 July 1972. The five-year agreement calls for exchanges in various fields, with the interests of several technical ministeries to be coordinated by SCST.

5. Bechtel Corporation on 2 July 1973 signed a five-year S&T cooperation agreement with SCST. The agreement covers all branches of heavy industry and calls for transfer of technology. The USSR reportedly is most interested in the energy operations of Bechtel.

* The information available in these agreements is sketchy. Many of the firms no doubt regard detailed information as proprietary.

6. Brown and Root, Inc. signed a five-year agreement with the SCST in May 1973. The agreement provides for the exchange of S&T information, documentation, and production samples; exchanges of delegations and specialists and trainees; organization of lectures and symposia and demonstration of production samples; mutual consultation to discuss and analyze S&T problems, principles, ideas, and concepts; joint research and development; exchanges in research results and experience; and joint programs and projects anywhere in the world. Other forms of cooperation are to include exchange, acquisition, or transfer of methods, processes, know-how, and/or licenses.

7. Control Data Corporation in October 1973 signed a 10-year cooperation agreement with the SCST. The agreement could include cooperation in the joint development of a technically advanced computer, computer peripheral equipment, and information processing systems. Other areas of cooperation may include software development and communications equipment.

8. Dow Chemical is believed to have signed a standard five-year cooperation agreement with the SCST in mid-1973. Dow had proposed a draft for such an agreement in 1972.

9. Dresser Industries' subsidiary, American Petroleum Service Division, in early November 1973 signed a five-year S&T cooperation agreement with the SCST. An official of the Oilfields Products Division of American Petroleum signed the agreement that provides for the exchange of information, delegations of specialists, product samples, and research results as well as joint R&D and implementation of programs and projects. Initial cooperation is to be in increasing Soviet well-logging efficiency. A licensing agreement has also been signed for Soviet production of a Dresser-Clark model compressor.

10. Food Machinery Corporation (FMC) in November 1973 signed a five-year cooperation agreement with the SCST. The agreement covers joint R&D of farm machinery and agro-industrial plants and cooperation in the food industry, production of soft drinks, packaging materials and machines, and mining equipment. FMC is also negotiating with Traktoroeksport for an order, expected to be worth almost $3 million, for a complete set of machinery for growing and processing fruits and vegetables.

11. General Dynamics Corporation and the SCST signed a five-year S&T cooperation agreement in September 1973. The agreement involves cooperation in the manufacture of telecommunications equipment, computers, computer-operated microfilm equipment, asbestos mining and

processing, commercial and special-purpose aircraft, ships and shipbuilding, and navigation and weather buoys.

12. General Electric and the SCST on 12 January 1973 signed a wide-ranging agreement for general scientific and technical cooperation. Power generation technology, including steam and gas turbine and nuclear, was identified for immediate attention. The agreement also calls for exchange of specialist delegations, information, and production samples; for exchange, acquisition, or transfer of licenses; and for joint R&D projects. GE had signed two previous agreements, one with the Ministry of Heavy, Power, and Transport Engineering in April 1972 for the exchange of R&D on gas turbines and one with the Ministry of Electrotechnical Industry in October 1972 for exchange of R&D on current commercial projects.

13. Hewlett-Packard signed an agreement with SCST on 28 May 1973 involving cooperation and exchanges on computers and other electronic equipment and technology.

14. International Telephone and Telegraph (ITT) on 12 June 1973 signed a five-year S&T cooperation agreement with SCST. According to ITT, the agreement provides for a trading of knowledge in four fields – telecommunications, electronic and electromechanical components, consumer products, and publishing of S&T data.

15. Joy Manufacturing Company signed a cooperation agreement with the Ministry of Heavy, Power, and Transport Engineering on 25 July 1972. The agreement provides for the exchange of technical licenses, scientific documentation, and the results of R&D in the manufacture of mining machinery. Exchanges of delegations of specialists also are expected.

16. Litton Industries has proposed and may have signed a general S&T cooperation agreement with the SCST. Any agreement would cover a wide range of technology, including electronic, chemical, and machine building.

17. Monsanto Company signed a five-year S&T cooperation agreement with the SCST on 9 October 1973. The agreement covers cooperation on computer applications in the chemical industry and the development of products for rubber compounding. It also envisions exchanges of information and delegations of specialists and the joint development of new products and projects.

18. Occidental Petroleum signed a broad S&T agreement with the SCST on 14 July 1972. The agreement provides for the exchange of S&T information, documentation, specimens of products, delegations, and

trainees; arranging reports, symposia, and mutual consultations with a view to discussing and analyzing S&T problems; joint research, elaborations, and tests; carrying out joint programs and projects; and exchanging the know-how and licenses to manufacture products. The areas of cooperation include production and processing of oil and gas; production of agricultural fertilizers and chemicals; and metallurgy, ecology, and construction.

19. Singer Company on 11 September 1973 signed a five-year agreement with the SCST for S&T cooperation and possible manufacture of Singer products in the USSR. Initially, the accord calls for cooperation in the fields of data collection and data communications, education and training devices, aerospace and marine products, electronic instrumentation, advanced sewing technology, textile machinery, climate control equipment, industrial control equipment, and metering equipment. The agreement covers the exchange of information, specialists, and production samples and joint research, development, and testing. Singer reportedly expects to deliver to the USSR computers, household appliances, cash registers, and navigation equipment.

20. Stanford Research Institute on 18 September 1973 signed a five-year agreement with the SCST to exchange scientific and economic information. The agreement provides for exchanges of experts and joint participation in a series of studies on business opportunities. Areas for joint work are in determination of international business potential, arrangements of international industrial conferences, application of S&T to develop the economy and industry, and technical and economic estimation of various measures in which Soviet, American, and international firms participate.

21. Union Carbide is believed to have signed a standard five-year cooperation agreement with SCST in mid-1973. Union Carbide had previously notified the SCST of its willingness to discuss such an agreement.

22. Kaiser Industries signed a five-year S&T agreement with SCST on 23 January 1974. It calls for cooperation in alumina-aluminum production; iron ore mining and pelletizing; coke, iron, and steel production; metal products fabrication; and other areas.

23. Lockheed signed a five-year S&T agreement with SCST on 31 January 1974. It calls for cooperation in navigation systems, civil aircraft construction, air traffic control systems, oceanographic apparatus, and other areas.