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Brazil and High Technology: A Source for the Soviet Bloc



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**Technology Transfer
Intelligence Committee**

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Note to Readers

The Technology Transfer Intelligence Committee (TTIC) is the DCI Committee whose mission is to serve as the focal point within the Intelligence Community on all technology transfer issues. The Committee coordinates Community activities and is the principal source of intelligence support for those US Government entities charged with the responsibility for policy and action on technology transfer issues. It works with other Intelligence Community committees and appropriate agencies to ensure that intelligence information collected on technology transfer is consistent with the DCI's priorities and guidance and meets the needs of Community production organizations.

The TTIC Chairman and members are:

[Redacted]	Central Intelligence Agency Central Intelligence Agency Defense Intelligence Agency	25X1
Mr. Vincent DeCain Mr. David Whitman Dr. Robert Bingham Mr. A. R. Cinquegrana Mr. Rodney Huff Maj. Mario Avalos Lt. Col. J. Rob Robinson Mr. Russ Vaughn Mr. Arthur Long Mr. William Meglen Mr. Roger Diehl	Department of Commerce Department of Defense Department of Energy Department of Justice Department of State Department of the Air Force Department of the Army Department of the Navy Department of the Treasury US Customs Service Federal Bureau of Investigation	
[Redacted]	National Security Agency National Security Council Office of the Secretary of the Air Force	25X1
Ms. Kristine Langdon Lt. Col. Robert Davie	Technology Transfer Intelligence Committee	25X1
[Redacted]		
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Preface

This report assesses the role of Brazil as a target for Soviet Bloc acquisition of controlled commodities and technology. It examines several indigenous high-technology industries, including telecommunications, computers, strategic minerals, robotics, and weapons, that the USSR and its allies could acquire. The report also discusses Brazil's firm stance on economic sovereignty and its effect upon Brazil's attitude toward export control practices and technology transfer safeguards.

The report was prepared for the State-chaired Senior Interagency Group on the Transfer of Strategic Technology. Information as of 24 April 1987 was used in preparing this report. Members of the Working Group were:

- | | | |
|----------------------|---------------------------------------|------|
| [Redacted] | Central Intelligence Agency | 25X1 |
| Mr. Richard Bray | Air Force/Foreign Technology Division | |
| [Redacted] | Defense Intelligence Agency | 25X1 |
| [Redacted] | Defense Intelligence Agency | |
| [Redacted] | Central Intelligence Agency | |
| [Redacted] | Central Intelligence Agency/TTIC | |
| Ms. Lisa Hilliard | National Security Agency | |
| [Redacted] | Department of Commerce | |
| Ms. Margaret Shields | Central Intelligence Agency | 25X1 |
| Ms. Paula Todrin | Department of Commerce | |
| [Redacted] | United States Customs Service | |
| [Redacted] | Central Intelligence Agency | 25X1 |

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**Brazil and High Technology:
A Source for the Soviet Bloc**

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**Summary
and Conclusions**

Brazil currently is a potential source of certain militarily critical technologies for the Soviet Bloc. In the past two decades, Brazil has registered remarkable economic growth and achieved impressive gains in scientific and technological development. We believe, however, that Brazil continues to upgrade its indigenous capabilities and improves its access to Western high technology, it will present an even more attractive target for Soviet Bloc acquisition efforts. [redacted]

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Impressive advances have been made in areas where Brazil has devoted adequate resources. We believe that the telecommunications sector, where Brazilian scientists collaborate closely with Western researchers, will provide the USSR with the best opportunities for acquiring high-technology equipment and data. Brazilian capabilities in niobium production and processing—a metal vital to the development of superconductors—is also an area the USSR can exploit. [redacted]

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Brazil's information technology industry is a less attractive target for the Soviet Bloc; its low quality and high cost in relation to other sources in the world market make sizable exports to the USSR unlikely. Brazilian computer companies' lack of capital, management expertise, and research infrastructure, coupled with highly protectionist policies, militate against the development of an innovative informatics industry. We believe, however, the ties that some Brazilian computer companies have to Western firms make small-scale diversions of COCOM-controlled¹ equipment possible.

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Because of its growing capability, emphasis on upgrading the arms industry, and a commitment to expanding a scientific manpower base, Brazil could be a viable source of additional sensitive technologies in the coming years. Computer-assisted design systems now under development and advanced semiconductor research may be future Soviet targets. At present, the capabilities of Brazil's arms industry are too low to attract Soviet attention, but Brasilia's determination to incorporate Western technology into arms for export will present a threat to COCOM efforts to safeguard sophisticated technology. Finally, the growing number of Brazilians studying scientific and technical subjects at Western universities presents a potential source of technical data transfer. [redacted]

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¹ Members of the Coordinating Committee on Multilateral Export Controls (COCOM) include Japan and all NATO countries except Iceland. [redacted]

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Over the last year, Soviet efforts to increase the still embryonic scientific and technological cooperation have gained momentum; the Soviets have been pushing aggressively for commercial deals in informatics and telecommunications. Brazilian decisionmakers have been unwilling to conduct significant exchanges in these two technologies, but they have agreed to a commercial contract for the sale of optical fiber.

[Redacted]

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We believe the Soviet Bloc probably will continue to improve its access to advanced indigenous and Western technology in Brazil; the transition to civilian rule has brought a thaw in Brazilian-Bloc relations.

[Redacted]

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[Redacted]

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In our judgment, US efforts to reach an accord on technology transfer safeguards will continue to meet Brazilian resistance. Resurgent nationalism and economic exigencies will cause Brasilia to strongly resist any pressure from Washington to curb its exports. The stalemated negotiations over end use assurances on the purchase of a US supercomputer well illustrate Brasilia's reluctance to retreat from its position that technology transfer restrictions should be decided on a case-by-case, rather than generic, basis. The politically embattled President Sarney will remain vulnerable to a nationalistic backlash that could result if he agreed to accept more wide-ranging technology transfer safeguards sought by the United States and COCOM. Finally, if tensions between Brasilia and Washington over trade issues or the foreign debt intensify, President Sarney will come under considerable pressure from within and outside his administration to take a hardline approach toward a technology transfer agreement.

[Redacted]

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Over the longer term, however, we believe that Brazil may become more accommodating of the US position on protecting high technology. Resistance to an agreement will erode if bilateral tensions are reduced. To a large extent, however, Brasilia's stance will be determined by its reaction to any potential cutoff of high technology from the United States and its availability elsewhere; we believe Brasilia is counting on its strengthened ties to Western Europe and Japan for access to advanced technology that would be free from US restrictions. Even if Brasilia enters into serious negotiations with the United States, it could well find a way to restrict provisions of an agreement.

[Redacted]

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Nevertheless, Brazil probably will not grant the extent of protection that the United States requires and over time may skirt the restrictions. At best, Brasilia will look upon controls as a burdensome, but necessary, expense of obtaining the technology it wants and probably will be lax in enforcing Memorandum of Understanding provisions. [Redacted]

[Redacted]

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Brazil and High Technology: A Source for the Soviet Bloc

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A Growing Technology Target

In recent years Brazil has attracted the attention of the Soviet Bloc as a potential source of strategic technology. Brazil's solid scientific and technological achievements, coupled with a thaw in relations with the Eastern Bloc that resulted from the transition from military to civilian rule, have led the USSR to step up efforts to acquire science and technology there.

In only two decades Brazil has moved from the ranks of a developing to a newly industrialized nation. The military government that assumed power in 1964 embarked on a program of state-driven capitalistic development that resulted in remarkable economic growth, which has been dubbed the "Brazilian miracle." In the past 20 years Brazil has transformed itself from a semi-industrialized economy into a major industrial power and exporter of a diverse array of products, including airplanes, aluminum, petrochemicals, automobiles, industrial automation equipment, computers, and telecommunications equipment. This economic transformation has been powered by:

- Brazil's ability to improve its manufacturing efficiency by importing a diverse array of sophisticated Western industrial goods and services .
- A willingness to allow foreign multinational corporations to invest in the industrial sector and to transfer manufacturing processes and technology.
- Determined efforts to obtain sophisticated Western technology via licensing and coproduction agreements with Western firms in specialized product niches.

Level of Technological Development

Brazil's indigenous scientific and technological development has expanded steadily against the backdrop of rapid economic growth. Brazilians have made impressive advances in areas where they have devoted adequate resources: the nuclear industry, computers, and telecommunications. While still at the low end of the scale as compared with industrial countries, Brazil is making a concentrated effort to upgrade its domestic capabilities.

Brazil has numerous science and technology research institutions sponsored by the federal and state governments and by private industry. Most have been operating since the early 1970s, although some of these facilities—such as the National Institute of Technology (INT)—were founded much earlier. In general, most technological research is applied rather than basic; a number of major institutes focus on technology adaptation and pilot plant facilities for industry, rather than on basic or original research.

The US Embassy reports that the Brazilian Government is committed to increasing research and development capabilities. The government finances the bulk of scientific and technological research and development; the private sector contribution is negligible, albeit growing. In recent years governmental research and development expenditures have averaged between 0.6 and 0.7 percent of gross domestic product, a figure that compares favorably with expenditures by similar newly industrialized countries such as India (0.8 percent), but one that pales in comparison with those of the USSR, the United States, and Japan at 4.9, 2.5, and 2.4 percent, respectively. The government, however, has pledged to increase substantially R&D funding, despite budgetary stringencies.

Brazil's reservoir of scientific and technological manpower is steadily growing, although it is small when compared with that of developed nations. The number of students graduating from university-level degree programs in science and technology rose more than 20 percent between 1981 and 1983. A slight dip occurred during the 1984 economic slump, but the trend has started upward again. Most educational training is provided by state and federal universities, although some research institutes offer advanced instruction and graduate degrees. The Technological Institute of Aeronautics—part of the Air Force's Aerospace Technical Center—provides undergraduate and graduate education in aeronautical engineering for more than 600 Brazilian and foreign students, only 10 to 15 percent of whom are military.

A Beleagured President

Thrust unexpectedly into the presidency in April 1985 by the death of the immensely popular President-elect Tancredo Neves, Jose Sarney performed effectively in the crucial first year of the transition from military to civilian rule by adept political maneuvering, enacting political liberalization measures, and promoting economic growth. When inflation threatened his popular base, however, he took a bold step in February 1986 by implementing the Cruzado Plan—a comprehensive stabilization program involving a new currency and wage and price controls. That move caused a meteoric rise in his popularity and led the electorate to give the governing party, the Brazilian Democratic Movement (PMDB), a sweeping victory in the congressional and gubernatorial elections in November 1986.

In the first few months of implementation, the plan quashed rising prices, but it has since veered off track. Business investment is down, interest rates have soared, and inflation as of April 1987 rebounded to a 880-percent annualized rate. A sharply declining trade surplus, a halt in foreign borrowing, and a slump in foreign investment have caused Brazil's international reserves to dwindle to extremely low levels, leading Brasilia to suspend payments on its

US \$110 billion foreign debt. The US Embassy reports that Brazil faces a major economic crisis: confrontation with foreign debtors, hyperinflation, and low growth.

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President Sarney has suffered a precipitous drop in public confidence and political support because of the unraveling of the Cruzado Plan.

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his support within the party leadership is slipping, business groups are extremely critical, and labor strikes are proliferating. Political setbacks have introduced fissures within Sarney's Cabinet, impeding efforts to regain support and hindering the formulation of new economic and political strategies.

the military, heretofore very supportive of the President, is becoming increasingly worried about his ability to govern.

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The President faces an uphill struggle to regain political support and to govern effectively. His decision in February 1987 to suspend payments on Brasilia's debt has given him a temporary political boost, but his reprieve could be short lived without additional actions to put Brazil's domestic economy in order and to restore public confidence.

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The Brazilian Government is assisting a number of students in obtaining advanced scientific and technological training in foreign countries. At present 2,000 to 3,000 Brazilians are studying abroad; most are studying in high-technology fields, and 45 percent are in the United States. According to the US Embassy, Brasilia hopes to increase the number to 10,000 by 1988. Most students will be doing graduate work in informatics, biotechnology, precision machinery, and new materials; almost all of them will be studying in the United States, Western Europe, and Japan.

assignment of responsibility depends to a large degree on the political influence of individual ministers and subministers. In the past year, however, Renato Archer, Minister of Science and Technology and a prominent member of the left wing of the dominant party, has expanded his influence in the scientific establishment.

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High-Technology Industries

We believe Brazil may be a potential Soviet source of sensitive Western technologies via scientific cooperation agreements, as well as outright sales of commodities or technological know-how. A current area of

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Science and technology policymaking is ostensibly the purview of the Ministry of Science and Technology. In practice, however, decisionmaking is diffused in a number of ministries and subministries, and the

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Protectionist Policies

Despite high costs and inefficiencies, protectionist policies have enabled Brasilia to develop successfully a number of industries, most notably automobiles and steel. On the basis of this experience, Brazil extended protection to high-technology industries, culminating in the passage of the Informatics Law in 1984.

The Special Secretariat for Informatics (SEI)—the executive agency charged with administering the law—has been allowed a virtual free rein in regulating joint ventures and direct investment, in allocating import quotas, and in overseeing the introduction of new technology for the sector.

the SEI, a bureaucracy dominated by strident economic nationalists, has interpreted the law to affect every company involved with the production or distribution of computers—including integrated circuits and software—and is using the legislation to justify protection for industrial automation equipment, and, most recently, for any product with electronic or digital components. Moreover, the SEI, like CACEX, the official foreign trade agency, subjects each new foreign investment or import proposal to the “national similars” test. It prohibits new multinational investment, joint ventures, or imports if the product can be manufactured domestically, or if a Brazilian firm promises to produce it.

Soviet interest is telecommunications research, a field in which Brazilian scientists work closely with Western groups to develop gallium arsenide and indium phosphide semiconductor lasers and fiber optics.

the Soviets also are interested in Brazilian telecommunications equipment—fiber-optic cable, modems, and multiplexers—

The USSR lags the West in utilization of fiber optics and is interested in acquiring this technology. Brazil is developing an indigenous capability in this critical, COCOM-controlled area and could become a source of supply. In addition, we

believe telecommunications switching centers locally manufactured by Elebra Telecon are also of potential interest to Soviet end users. 25X1

We believe major exports of Brazilian-made computer-related equipment to the USSR are unlikely in the short to medium term because of their high cost as compared with similar items available from Singapore and Taiwan and because Brazil resists countertrade. However, computer-aided design (CAD) systems currently under development in Brazil may be of future interest to the Soviets. Brazilian companies are establishing a research infrastructure in the informatics industry that also could be of interest to the USSR. Additionally, the policies of the government’s Special Secretariat for Informatics (SEI) are currently under attack at home, and, should they change significantly over the medium term, the local informatics sector would probably seek more sophisticated equipment and technology for the domestic market. We believe any redirection of policy will necessarily be gradual, however, because of the power of vested interests in the computer industry. 25X1

Brazil’s electronics manufacturing capabilities are growing gradually, and, with a few exceptions, items produced locally are at the low end of the high-technology scale. Although some companies license foreign technology for their production operations, many others import kits and components for local assembly. In addition, the heavily protected market protects many inefficient producers. Although costs are high, quality is low, and many technologies are obsolete by world standards, we judge there are selected segments that could be of interest to the USSR because of industrial applications or scientific potential. 25X1

Microelectronics. Brazil’s microelectronics industry consists mainly of assembly, packaging, and testing operations based on imported die wafers. Devices currently produced include memories, bipolar logic chips, and discrete devices, with output destined for both local consumption and export. Several large 25X1

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multinationals, including Texas Instruments and Siemens (West Germany), have operations in Brazil. Because the current Brazilian microelectronics capability centers on assembly, rather than on front-end silicon processing, we believe there is little chance that sensitive microelectronics technology could be transferred to the Soviet Bloc. [redacted]

Brazil is unable to produce commercial quantities of monocrystalline silicon that is used in semiconductor manufacturing. Such electronic-grade material must be more than 99.99 percent pure, and the production technology needed to achieve this purity is sophisticated and costly. Brazil currently produces metallurgical-grade silicon (98.5 percent purity) for steel making. A small domestic market, coupled with the large amounts of capital required, make it unlikely that Brazil will produce commercial quantities of electronic-grade silicon in the medium to long term. Research efforts on silicon purification are under way at the Minas Gerais Technology Center, and a Sao Paulo firm, Heliodynamica, is reported to be producing some electronic-grade silicon. [redacted]

SID (Sistemas de Informacao Distribuda) is the only Brazilian firm with front-end wafer production capabilities, which it purchased from Philco/Ford (a US firm). [redacted] Philco/Ford shut down its Minas Gerais wafer front-end plant for automobile circuits in January 1984 because of weak demand and market reserve problems that kept the facility operating at only 65 percent of capacity. This plant had two processing lines for handling three-inch wafers (outdated technology by Western standards). The line for discrete power transistors had a capacity of 60 million transistors per year; the other line could produce 10 million integrated circuits (ICs) annually. SID purchased the plant in late February 1984 after SEI guaranteed a market reserve for digital ICs. According to press reports, SID acquired the Philco/Ford facility for the bargain basement price of \$9 million—less than one-third its original value—because the multinational was resigned to selling the plant for scrap. [redacted]

[redacted] SID is currently processing 2- and 3-inch wafers and plans to move into production of 3-micron line width, complementary metal oxide semiconductor (CMOS) devices by

1989. Current capacity, utilization, and yield rates for SID's fabrication lines are not available. SID is also looking into using US foundries to manufacture semi-custom and custom devices on 4-inch wafers. However, 4- to 5-inch-wafer technology would require replacement of the current production equipment. [redacted]

Brazilian press and US Embassy reporting indicates that two other Brazilian companies, Itaucom and Edisa, have been authorized by SEI to produce digital ICs. Itaucom signed an agreement with a US firm in 1984 to acquire gate-array technology and standard-cell libraries used in the design of very-large-scale ICs for computer and telecommunications equipment. The circuit designs by Itaucom were to be sent to the US company for front-end processing; Itaucom would then perform assembly and testing operations. We have no information concerning the status of this agreement. [redacted]

Elebra, the Brazilian electronics manufacturer, does not yet have any semiconductor manufacturing capabilities. A recent DOD report indicates the firm will begin production of 16-bit microprocessors in 1987 under an agreement with Intel (USA). These devices are of a type that currently are subject to COCOM restrictions. [redacted]

SEI's Centro for Informatics Technology (CTI) in Campinas performs research in microelectronics and other informatics technologies. In 1984, CTI purchased semiconductor packaging, assembly, and testing equipment from a US firm that had abandoned Brazilian operations because of the protectionist informatics law. Output from CTI was targeted at 1 million chips annually in 1985. Front-end wafer processing is to be performed by a foreign contractor offshore until SEI invests in the necessary production equipment. [redacted] CTI recently began accepting bids for the establishment of

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an electron-beam mask-making facility at its Campinas headquarters. This \$20 million facility would be the first of its kind in Latin America and would be utilized by CTI, as well as private Brazilian firms.

[redacted]

[redacted]

We believe that the financial burden of investment in new microelectronics manufacturing facilities is too onerous for most local firms because of the small size and varied requirements of local microcircuit consumption. As such, the establishment of major Brazilian facilities is unlikely in the near term.

The government's plans for development of microelectronics technologies for later transfer to private industry are likely to be largely unfulfilled, at least in the short-to-medium term. We believe Brazil's past experience with such cooperative ventures indicates that private industry and research groups are probably not yet ready for undertakings of this type. For example, in 1978 Transit Semiconductors, a Brazilian assembler of imported electronic diodes and transistors, began a wafer diffusion project with the University of Sao Paulo using technology from SGS-ATES (Italy). The project ran into difficulties because of inexperience with technology transfer and inadequate and insufficiently skilled engineering staffs. The venture, and Transit itself, were disbanded in 1981 because of a lack of human and financial resources for the proper absorption and utilization of technology.

Local universities have been involved in microelectronics R&D for more than 15 years. The University of Sao Paulo has done work on bipolar, MOS, and hybrid ICs, and in 1986 it began the country's first experiments in semiconductor manufacturing. Its facilities are now oriented mainly toward postgraduate training rather than R&D. The Federal University of Rio de Janeiro (UFRJ) is currently working on large-scale IC design and development of a related CAD system. UFRJ does not have large-scale fabrication facilities and sends its chip designs to the United States for diffusion.

The University of Campinas (Unicamp) acquired microelectronics laboratory facilities in 1978 as an outgrowth of a project being carried out by the Telebras Research and Design Center. Discussions with Unicamp researchers indicated that they are working on basic MOS and bipolar semiconductor manufacturing techniques, silicon purification, and computer-aided IC design.

[redacted]

Computers. The Brazilian computer industry is developing rapidly and has some indigenous R&D in progress that could be of interest to the Soviets because of technological breakthroughs and commercial adaptations, especially if Brazil is assisted by Western and Japanese firms. According to press reports, more than 150 Brazilian firms now make computers and related equipment, producing enough to supply about 45 percent of the local market. Because the computers are produced largely from imported kits and components, prices are high. US Embassy reports indicate that Brazilian-owned firms account for 70 percent of domestic production, but because domestic models are less sophisticated, they account for only 20 percent of the value of the computer market.

Small/Medium Computers. In 1977 the market reserve for small (mini) computers was established, and four local companies—Cobra, Sharp, Edisa, and Labo—were initially chosen to develop the machines through the purchase of foreign technology. By 1982 these firms were supposed to incorporate 80 percent of the local input in their finished products, but, according to one press report, this ratio had reached only 35 percent by 1983. A number of other small companies produce pirated versions of US and Japanese personal computers. Brazilian companies manufacture other items that SEI places in the microcomputer/minicomputer category, including microcomputers, calculators, word processors, and bank terminals.

A number of Brazilian firms tried to design their own medium-sized (supermini) computers, but eventually turned to foreign technical ties in order to speed local

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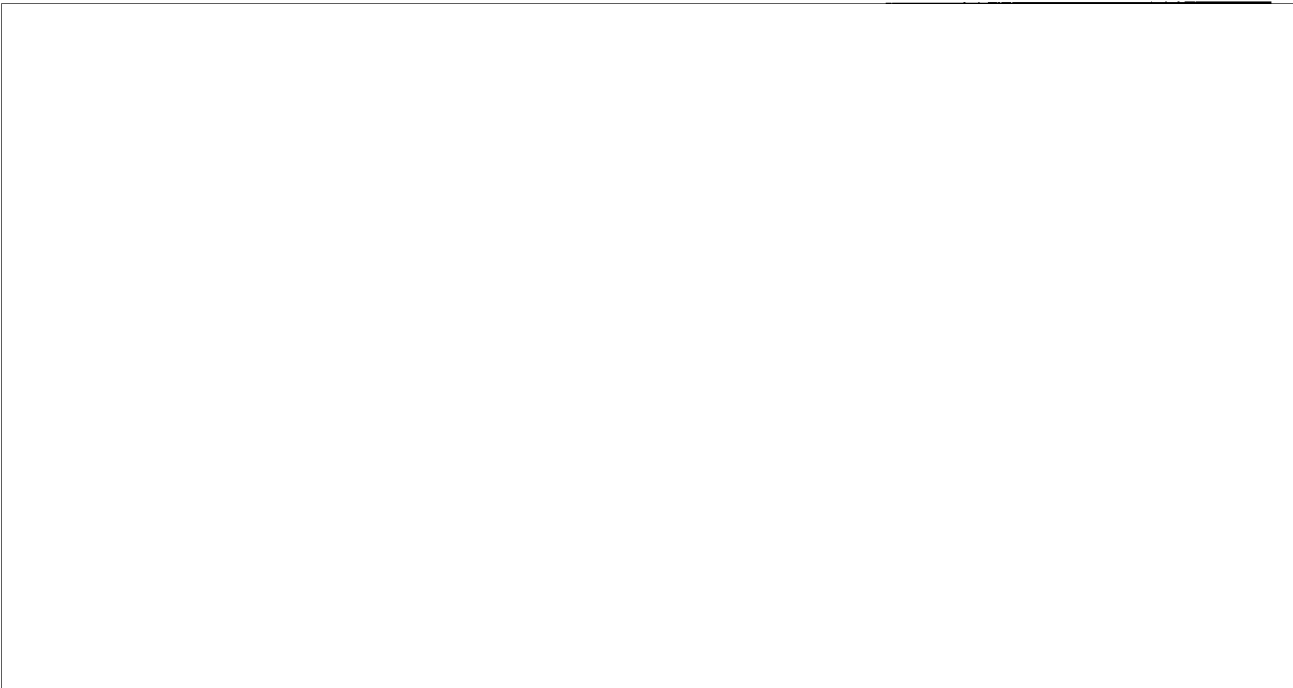
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development. Several local companies now use foreign technology and also import components or semi-knocked-down units for assembly into 32-bit computers. In addition, IBM recently received SEI approval to manufacture four models of its 4381 computer line. Cobra, the government-supported computer manufacturer, reportedly did develop the G-10 supermini in association with a local university. However, no information is available to confirm that this machine has ever been produced on a commercial scale. [redacted]

Mainframes. Currently no market reserve extends to the production or marketing of mainframe computers, and no Brazilian firms produce them. [redacted]

[redacted] few Brazilians are willing to invest in the manufacture of items that are not subject to market reserve, nor are they attracted by joint-venture opportunities, because firms that are less than 100-percent Brazilian-owned generally do not receive benefits such as tax breaks. [redacted]

Peripherals. Local firms produce computer and video game keyboards, dot matrix and line printers, Winchester and floppy disk drives, tape drives, and color and monochrome video monitors and terminals. Multinational firms, including Burroughs and IBM, have

licensed a number of Brazilian companies as original-equipment manufacturers of modems, video terminals, and printers. IBM will also begin its own local manufacture next year of 2.5 and 5-8 gigabyte, large-scale hard disk drives, which are a definite Soviet target for both production technology and finished products. Several Brazilian companies also hope to produce similar equipment. [redacted]

The local content of peripheral equipment varies among products. According to one open source publication, some printers have 90 percent and some disk drives about 45 percent local content, measured in terms of final value added. Sophisticated peripheral components that must be imported include magnetic heads and stepper motors for disk drives. [redacted]

Software. According to US Embassy reporting, there is little reliable data available on Brazil's software industry. Brazilian computer manufacturers and software houses have developed systems and applications software. Many of the programs are designed for

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accounting and business use. [redacted]

[redacted]

[redacted] Government-sponsored re-
search groups and at least one private firm are
working on CAD software development, mainly for
semiconductor design. [redacted]

According to Brazilian press reports, SEI recently
drafted a computer software law that would require
imported software programs to be registered with the
Secretariat to receive only limited copyright protec-
tion. We believe such a law could facilitate piracy of
imported software, which then could increase Soviet
software acquisitions. SEI currently prevents foreign
firms that supply information services such as soft-
ware design from upgrading their level of activities in
order to allow Brazilian firms to establish Computer-
Assisted Design/Computer-Assisted Modeling
(CAD/CAM) and other sophisticated software capa-
bilities. [redacted]

Advanced Machine Tools/Robotics. Brazil's output of
advanced industrial automation equipment has grown
slowly since production began in 1982. According to
press reporting, only 400 pieces of numerically con-
trolled (NC) equipment were produced in Brazil in
1985. Local NC machine tool producers, most of
which are undercapitalized, are having difficulty ex-
panding their manufacturing capacity. In addition,
the cost of Brazilian-made machines—two to three
times higher than comparable foreign equipment—
hampers their marketability. [redacted]

[redacted]

[redacted] One
local publication indicated that Brazilian-developed
technology accounts for more than 30 percent of the
sector's output. Local manufacturers continue to de-
pend on imported microelectronic components for the
equipment they produce. Of the estimated 120 Brazil-
ian machine tool makers, 17 produce NC machine
tools and five firms manufacture numerical control
units. [redacted] we believe Brazilian-
made NC machine tools are comprised of a mixture of
foreign and local technology—some derived through

reverse engineering—and imported and domestic 25X1
components. Most of the sophisticated technology is
imported from Japanese or German firms. [redacted]

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Brazilian manufacturers plan to move aggressively
into the production of industrial robots, which is a
technology the USSR has been seeking in order to 25X1
upgrade its industrial capabilities. In 1984, SEI au-
thorized 17 firms to enter the sector, only four of
which will be able to use imported technology [redacted]

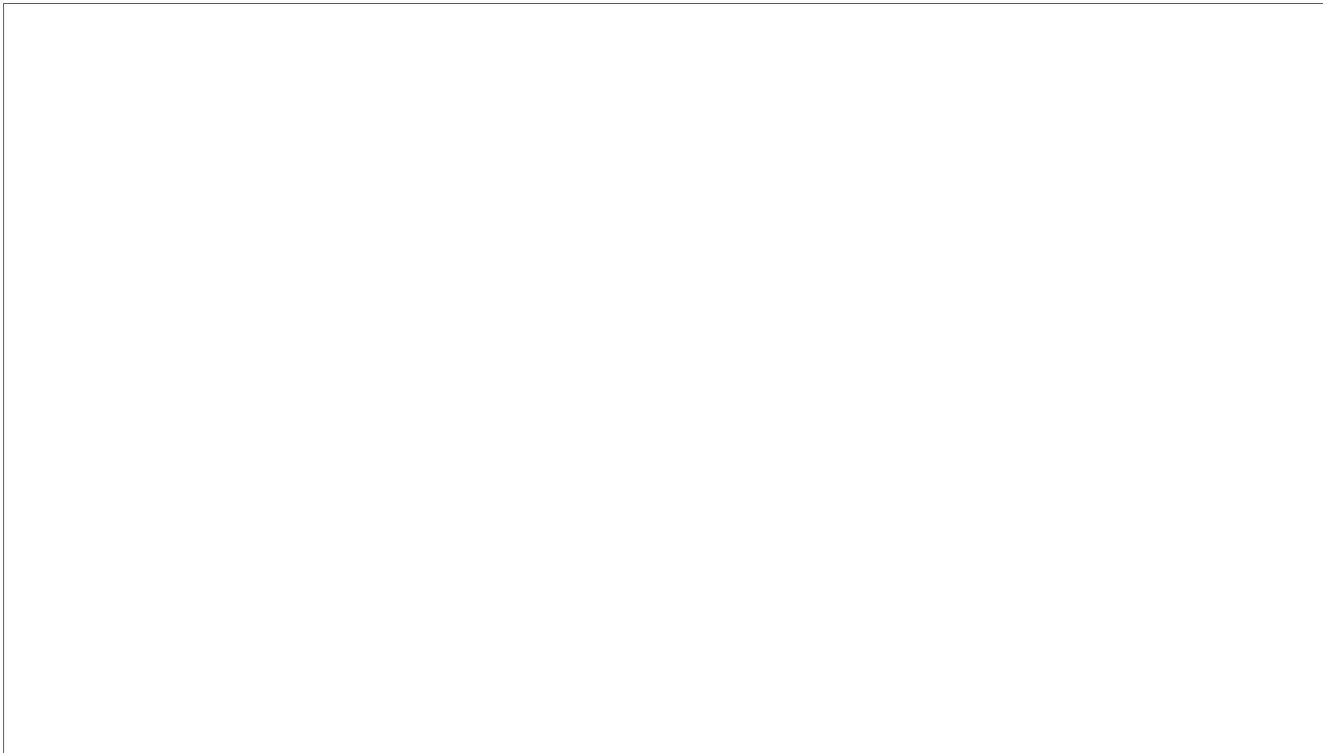
[redacted] The local market for robots is small—estimated a 25X1
some 200 units over the next three years—and we
believe it will be difficult for some of those firms to 25X1
stay afloat, particularly those that produce robots
exclusively. [redacted] 25X1

An unconfirmed report in a Brazilian journal indi-
cates that Brazilian firms are also involved in other
aspects of the industrial automation sector. According
to the article, some 23 local companies produce 25X1
industrial process control systems, and 20 firms re-
portedly manufacture CAD/CAM systems. We be-
lieve any Brazilian-made CAD/CAM systems are
probably capable of only elementary design applica-
tions. Many of the firms probably produce only low-
end CAD terminals. [redacted] 25X1

Telecommunications Equipment. The telecommuni-
cations sector, under the direction of the Ministry of
Communications, has generally not been subject to
regulations as stringent as the informatics market
reserve. Foreign telecommunications manufacturers
may set up local subsidiaries provided the majority of 25X1
shares is held by Brazilian partners, as compared with
the 100-percent Brazilian control required in the 25X1
informatics sector. [redacted] 25X1

Brazil's 25-year-old, crossbar telephone switching sys-
tem is gradually being replaced by equipment incor-
porating locally produced, stored program-controlled
(SPC) switching centers and fiber-optic cable. Local
companies also manufacture teleprinters, PABXs,
FM transmitters, and statistical and time division
multiplexers. Satellite communications equipment is
being manufactured on an increasingly wider scale, 25X1

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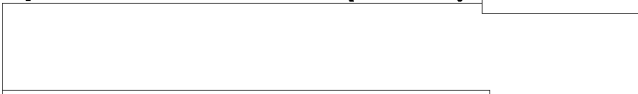


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and satellite antennas, signal processors, and transponders all have been developed locally. [redacted]

from 82 cents to 26 cents/meter since production began, indicating improved manufacturing efficiency. [redacted]

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[redacted] Brazil depends on foreign sources for some of the sophisticated components used in its telecommunications products. [redacted]

New monomodal fiber is under development by the Telebras Research and Design Center and is scheduled to be ready for commercial production in 1987. It will be capable of transmitting over 100 kilometers without an amplifier, and there are hopes of increasing the effective distance to 400 kilometers. [redacted]

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Fiber Optics. SEI has awarded a five-year, optical fiber market reserve to ABC-XTAL, a local firm that will supply Telebras with 10,000 kilometers of optical fiber annually. [redacted] ABC-XTAL currently produces 500 to 650 km/month of 850 nanometer multimode optical fiber using a modified chemical vapor deposition (MCVD) process. The company hopes to double its fiber production in the near future. [redacted] this multimode fiber has typical characteristics that include an attenuation rate of 2.5 to 3 decibels/km and a 250 megahertz/km bandwidth. According to press reports, ABC-XTAL's price for this fiber has dropped

Other companies in Brazil are involved in fiber-optics-related production. A subsidiary of the Italian firm Pirelli produces small amounts of fiber-optics cable—using imported fiber—but is restricted to exports or nontelephonic applications. Two local firms, Elebra and Condugel, are reportedly planning to manufacture fiber-optics connectors, and Condugel and FICAP also manufacture fiber-optics connectors and fiber-optic cable. [redacted]

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[redacted] Unicamp [redacted] is working on gallium arsenide (GaAs), indium phosphide (InP), and indium antimonide (InSb) system semiconductor lasers and detectors for telecommunications applications. The research involves devices for longer wavelength fiber-optic applications—1.3 and 1.55 micrometer, single-mode operation. First-generation GaAs lasers developed by Unicamp have already been tested in substations in Rio de Janeiro. The InP-GaAs wafers used by Unicamp are imported, primarily from Japan. Unicamp handles wafer diffusion and mounting operations and then delivers the finished devices to Telebras. [redacted]

Strategic Minerals. Brazil claims a significant share of world reserves of strategic minerals that are used in such important high-technology industries as aerospace, computers, and precision instruments. Brazil is a leading producer of niobium, as well as beryllium, bauxite, manganese, and iron ore, all of which are exported to the United States. (Brazil is the dominant US supplier of niobium and beryllium.) These minerals are essential for the manufacture of high-strength steels and alloys for weapons systems production. [redacted]

Brasilia's dominance of the international niobium industry is a key resource for the USSR to exploit (niobium alloys and compounds are COCOM-controlled). According to press reports, Brazil contains 85 to 90 percent of the world's reserves of niobium, and the USSR appears to be short of domestic supplies. This strategic mineral is used in advanced superconductors; two primary uses of niobium superconductors are in magnetohydrodynamic (MHD) equipment and as a component of sensors in military equipment. The Brazilian firm Companhia Brasileira Metalurgia and Mineracao, an affiliate of the West German firm Niobium Products Company, has a technical cooperation agreement with the USSR for niobium processing technology in return for ferroniobium and niobium oxide. [redacted]

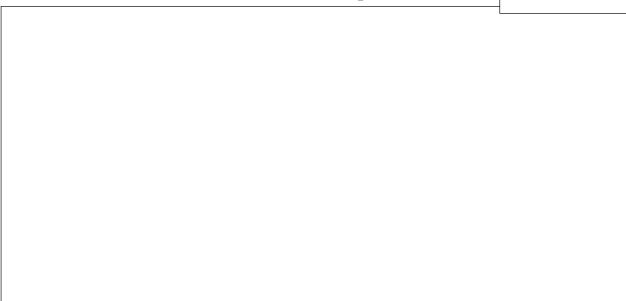
Arms Industries. Brazil is the largest producer of arms in the Third World and the seventh largest non-Communist arms exporter. The government is encouraging arms manufacturers to keep abreast of technology advances, to expand specialized industries and

refine their products, and to enter into coproduction and licensing arrangements for new weapons systems. We have no evidence that indigenous Brazilian systems have been of interest to the USSR; Brazil has offered spare parts and training for USSR-origin equipment to Third World Soviet clients, which suggests some flow of technology from the USSR. Brasilia is shopping aggressively for advanced, primarily Western, arms both to bolster its own arsenal as well as to incorporate the technology into domestically produced systems designated for export. As Brazil improves its access to advanced Western defense and defense-related equipment, its arms industries will attract Moscow's attention. [redacted]

Much of the technology used in Brazil's arms production and some of the more sophisticated components have come from abroad, either directly through licensing arrangements or indirectly through nonmilitary subsidiaries of multinational corporations operating in the country. In the widely exported armored personnel carrier, the Cascavel, Brazil frequently uses a General Motors diesel engine that requires a US license to export. Ground forces equipment is, however, gradually becoming more sophisticated. Brazilian tanks are now just beginning to incorporate laser night vision sights and rangefinders. Sights currently being used are of Yugoslav design, but Brazil is seeking British-designed laser sights. The next-generation tank is expected to use specialized engines and advanced suspension systems. Brazil always attempts to obtain arms technology transfers through licensing arrangements or joint ventures that allow for a majority Brazilian equity and the achievement of indigenous production. Significantly, Brazil only accepts those licensing or joint-venture agreements that also allow for the export sale of the item produced. [redacted]

The main weapons systems where high technology will have an immediate impact are helicopters, fighter aircraft, rockets, and missiles. Italy and Brazil have a joint venture for the development of the AMX fighter aircraft. Approximately 70 percent of the aircraft will be imported, including avionics, the engine, heads-up

display, fuselage, and armament. The Brazilian tactical and strategic rocket development programs are expected to become major technology transfer issues because Brasilia intends to export rockets. [redacted]



The Brazilian arms manufacturer Engesa has received large orders for armored vehicles from Iraq and other Middle Eastern countries. The company may face production constraints if large new orders are placed. To remedy this deficiency, Engesa is seeking computer-aided manufacturing and numerically controlled machine systems, advanced metal-cutting systems, and probably flexible machining systems in order to increase production rates and manufacturing sophistication. There are no indications that such high-technology machine tools are being reexported to Communist Bloc nations; these items are remaining in Brazil for assimilation in the domestic industry. [redacted]

Nuclear Industry. We do not believe that the USSR would be interested in Brazilian nuclear technology, and we have seen no efforts by the Soviets to target it. Brazil's nuclear research is pursued along two separate tracks: a safeguarded nuclear power program directed by Brazilian Nuclear Enterprises and an unsafeguarded program involving technologies that could lead to the production of materials used in nuclear weapons. The latter program is nominally administered by the Nuclear Energy Commission, but the military services play the major role. [redacted]

The safeguarded nuclear program is based on a Western pressurized water reactor design, which is similar to the Soviet VVER reactor series. The enrichment technology under development in Brazil, the Becker Jet Nozzle, has never been proved on a commercial scale; we do not believe the project will be

completed. The USSR, which already has a well-established nuclear weapons program and advanced power reactor development, does not need Brazilian nuclear technology. Also, we do not believe that Brasilia would open its unsafeguarded program to foreign inspection. [redacted]

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Relations With the United States

We believe that Brazil will continue to look to the United States as its primary source of advanced technology. Most Brazilian scientists are trained in the United States and have a high regard for US technology. The Brazilian Congress's recent ratification of a bilateral agreement on scientific and technological cooperation and the formation of a high-level joint scientific panel illustrate Brasilia's interest in improving scientific ties. [redacted]

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According to the US Embassy, bilateral scientific relations have been improving steadily under the Sarney regime. The Science and Technology Ministry has focused attention on several key research areas and has supported Brazilian agencies that have major cooperative programs with American organizations, especially in space sciences. Brasilia has initiated new joint projects in seismology, environmental science, meteorology, health, telecommunications, and water resources. [redacted]

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We expect, however, divergences between Brazil and the United States on a number of issues, and these may affect bilateral scientific and technological cooperation. Brasilia's growing competitiveness in world markets, its use of protectionism to spur economic development, and the strong element of government control over its industries will continue to be contentious issues. Serious conflict could result if Brazil embarks on a confrontational course with foreign debtors. [redacted]

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The Informatics Controversy

Brasilia's protectionist computer policy has been a major irritant in US-Brazilian trade relations for the last two years. Bilateral talks have averted outright trade confrontation, but progress has been slow in resolving differences. A growing number of industrialists have criticized the policy, claiming that it will retard seriously the development of an innovative computer industry, as well as damage industrial competitiveness. The hardliners—composed of an active minority of highly nationalistic military officers, the leftist political parties, domestic computer executives, Minister of Science and Technology Archer, and numerous congressmen—still have the upper hand and have effectively exploited nationalistic sentiments by portraying Washington as challenging Brazil's sovereign rights to industrial development and economic growth.

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The Sarney administration has made two concessions: it agreed to revamp SEI's administrative procedures for handling complaints, processing import applications, and approving joint ventures; and it allowed the import, heretofore banned, of a number of high-technology items, although for one year only.

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We believe that the computer market reserve policy will remain a contentious issue in bilateral relations. In practice, the concessions mentioned above have done little to open up the computer market because SEI continues its stringent interpretation and application of the Informatics Law. Moreover, Brasilia appears unlikely to address US concerns on two of the most important issues—software protection and joint ventures. The US Embassy reports that the current political situation, coupled with economic difficulties, could adversely affect the effort to settle the dispute. A politically weakened Sarney will have difficulty in convincing the hardliners to make additional concessions.

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carriers because of US export restrictions on the General Motors diesel engines it used before. More recently, Brazil has been considering purchasing French helicopters. Petrobras and INPE have both approached Japanese computer firms about purchasing a supercomputer if they cannot obtain one from the United States, and they also have asked the US Embassy in Brasilia for details of the US-Japanese computer safeguard agreement. [Redacted]

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Relations With the West and Japan

While we expect Brazil will continue to look primarily toward the United States, it is increasing its scientific ties to other COCOM nations. Brasilia has general scientific cooperation agreements with Italy, Canada, and the United Kingdom, and it has exchanged scientists with West Germany in the priority areas of biotechnology, informatics, environmental science, and nuclear research. Brazil has cooperated most closely with France; interest has centered on space research, notably in the development of the Sonda rocket. [Redacted]

Brazil also is seeking stronger links to Japan. Tokyo is well placed to take advantage of enhanced ties because Brazil is host to the largest Japanese community outside Japan and maintains a number of business ties to Japanese companies. During 1986, Japan and Brazil were involved in complex negotiations on the modalities of a general scientific accord. Moreover, the SEI has contacted several Japanese computer manufacturers about importing mainframes, components, and peripherals and about manufacturing such products in Brazil. [Redacted]

We believe that the Japanese are unlikely to transfer technology through joint ventures if they can gain market position through exports. [Redacted]

[Redacted] At most, they may establish assembly operations in Brazil that would allow a limited transfer of technology. [Redacted]

In our judgment, the Brazilians hope that strengthened ties to Western Europe and Japan will allow them to obtain sophisticated technology free from US end use and other restrictions. In 1983-84 the armaments firm Engesa switched to Mercedes-Benz engines for its Urutu and Cascavel armored personnel

Brazil and the Soviet Bloc

The transition from military to civilian rule in Brazil has brought a thaw in relations with the Soviet Bloc. Several events illustrate the friendlier tone of relations: the Brazilian Foreign Minister's visit to Moscow in December 1985—the first high-level visit in 25 years; President Sarney's acceptance of a Soviet invitation to visit Moscow; and the reestablishment of diplomatic ties to Cuba in the summer of 1986. [Redacted]

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We believe President Sarney has shifted from the former military government's correct, but cool, approach in order to preempt an issue that the left might try to use against him, expand exports, and gain access to whatever technological and scientific assistance the Bloc countries can provide. The new tack also reflects Brazil's longstanding conviction that it is an emerging international power that should have relations with both superpowers. [Redacted]

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[Redacted] the Soviets have stepped up their efforts to increase ties to Brazil. The new Soviet Ambassador is a veteran diplomat with many years of service in Washington. He has taken advantage of civilian rule to project himself into the limelight by publicly promoting improved relations. Moreover, the number of official delegations traveling between Brazil and the Bloc countries has increased significantly, and the Soviets have been trying to

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The Third Country Initiative

Early in 1986 the COCOM nations decided to include Brazil in the Third Country Initiative on technology transfer. This had its origin in discussions that were held in March 1985 by the COCOM Subcommittee on Export Controls about the problem of protecting strategic goods that were exported from, or in transit through, non-COCOM, non-Communist nations. COCOM members feared that their controls would become ineffective unless certain countries were willing to protect COCOM-controlled and comparable indigenous technology. The subcommittee identified key Third Countries, and the COCOM members agreed that these countries would be urged to cooperate with COCOM along the following lines: establish an import certification delivery verification system; control reexports of COCOM-regulated commodities; provide for preclearance and postshipment checks and enforcement cooperation; and enact export controls for indigenous commodities having strategic importance.

Canada has taken the lead on the Third Country Initiative with Brazil. Canadian and Brazilian officials have held preliminary discussions in Ottawa on the issue of exports of strategic technology. To date, Brazilian officials have continued to assert that Brazil will determine export controls on such commodities. Brasilia has agreed to receive a Canadian delegation to discuss the Third Country Initiative in early 1987.

establish close relations with Brazilian congressmen. The Soviets provide most of the funds for the small Brazilian Communist Party, which normally supports Moscow's international policies. Moreover, [redacted] the USSR, through East Germany and Cuba, is attempting to gain influence with the major non-Communist leftist party.

The Soviets do not sell arms or provide military assistance to the staunchly anti-Communist Brazilian armed forces. Brazilian senior officers have repeatedly rejected Soviet invitations to visit the USSR and to

send a Navy ship to make a port call. Recently Moscow approached the Brazilians about demonstrating a helicopter to compete for the new Army aviation program, but Brasilia has not responded. The US defense attache reports that most officers remain opposed to an exchange of attaches, even though such an exchange has taken place with China. [redacted]

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The Bloc countries are also attempting to establish ties to private arms manufacturers. Engesa, a manufacturer of armored personnel carriers and tanks, has had preliminary discussions with Yugoslavia about coproduction of laser rangefinders and reportedly is scheduled to exhibit computers and railroad equipment at an exposition to be held in June 1987 in the USSR. [redacted]

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Economic and commercial links between Brazil and the Soviet Bloc are still weak. There are no economic assistance programs sponsored by Communist countries; nevertheless, during the Foreign Minister's visit to Moscow in December 1985, Brazil and the USSR signed an economic and technological agreement. [redacted]

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Moscow may furnish hydroelectric equipment for a project in Parana and may enter into a coproduction agreement with a Brazilian firm to manufacture electrical equipment for sale to third countries. The Soviets also have offered to provide advanced equipment and financing for the Carajas mining project and would buy large quantities of its pig iron and manganese. [redacted]

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Since the reestablishment of diplomatic relations in 1986, Cuba has been pressing Brazil for increased commercial ties. The Cubans reportedly are looking to Brazil as a source for the technology, equipment, and raw materials that are otherwise inaccessible to them. Because of its severe hard currency shortage and its limited variety of exports, Havana apparently is emphasizing joint ventures and other forms of economic cooperation. [redacted]

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[redacted] Cuban officials are frustrated with the minimal improvement in their commercial relations with Brazil because of Brasilia's lack of interest in Cuban goods and its unwillingness to finance exports to Havana. [redacted]

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It appears that high-technology flows from Brazil to the Soviet Bloc have been minimal, [redacted]

[redacted]

Exchange visits by Soviet and Brazilian scientists are just beginning. In 1986 a Brazilian scientist conducted space-sensor research in Moscow, and during 1987 the two countries will exchange two scientists for training in space matters. The National Council for Scientific and Technological Research reportedly has approved travel to Brazil for at least nine Soviet scientists, and three Brazilian scientists will travel to Moscow. [redacted]

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We believe, however, that the Soviets regard Brazil as a potentially fertile field for acquiring sensitive technologies in the computer and telecommunications industries. [redacted] the USSR has stepped up its acquisition efforts in these areas, relying primarily on science and technology cooperation and exchange agreements, on trade fairs, and on commercial transactions to obtain high technology. [redacted]

Brazil's scientific ties to other Communist countries are even less developed. There are no cultural accords with East European nations, nor are there any official student exchange programs. Since mid-1986, East Germany has been seeking increased scientific and technological cooperation with Brazil, and Hungary recently announced that it would begin discussions on a bilateral science and technology agreement. The Bulgarian computer manufacturer ISOT and the trading firm Tekhnika have expressed interest in an exchange of computer technology and in representing Brazilian computer firms in other markets. [redacted]

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Scientific and Technological Agreements

In recent years Soviet efforts to improve scientific and technological ties to Brazil have gained momentum, but we do not believe these agreements have been or are likely to be used to obtain sophisticated Western equipment. Instead, the transfer of design information and other sensitive intellectual property as a result of such agreements is more likely. By improving links to Western-trained Brazilian scientists, the Soviets undoubtedly hope to obtain significant amounts of technical data on advanced technologies, especially those having military applications. Moreover, if Brasilia significantly increases the number of its scientists studying in COCOM countries, scientific agreements and exchanges could eventually become a means for technology transfer to the Bloc. [redacted]

The USSR has had only limited success in formulating agreements for cooperation in two of their high-priority fields: informatics and telecommunications. We believe that the Soviets hope to advance their own computer industry by acquiring technology through Brazil, rather than by merely purchasing computers. Evidence of this interest in technology, rather than commodities, is the two-year science and technology bilateral agreement that was signed in April 1986 and included joint research on informatics. Also, in March 1985, Soviet foreign trade officials indicated interest in importing Brazilian computers and in exchanging computer technology. [redacted]

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Brazil and the USSR have had an agreement on limited scientific and academic exchanges and on the sale of low-level technologies for almost 10 years. Since 1983, however, Brasilia and Moscow have held discussions on the expansion of scientific agreements in a wide range of fields. The meeting in Brasilia during April 1986 of the subcommittee on science and technology of the Brazilian-Soviet mixed commission was a key event in Moscow's drive to promote bilateral cooperation. The two governments tentatively agreed on expanded cooperation, especially in the fields of basic physics and space research. [redacted]

[redacted] the Soviets have placed greater priority on gaining access to the Brazilian telecommunications industry. The USSR has focused on fiber-optics technology since Telebras began initial research and development in the early 1980s, and it has consistently pushed Brasilia to agree to joint research projects in this field. [redacted]

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To date, the Brazilians have ignored Soviet pleas for a cooperative venture in fiber-optics research. [redacted]

Brazilian firms apparently are cognizant of the risks.

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[redacted] In 1984 a Brazilian diplomat in Paris informed the US COCOM delegate that Brasilia was considering joint research with the USSR in the field of fiber optics, but stated that Brazil did not want to operate counter to COCOM. In the spring of 1986, Brasilia put off discussions on fiber optics, refusing to establish specific scientific exchanges or even to agree in general terms to cooperative activities. [redacted]

[redacted] In some cases, contracts with US and European firms prohibited Brazilian computer companies from selling certain technologies to the Soviet Union. Apart from the possible sale of Nexus microcomputers at the 1985 Moscow fair, we know of no technology transfers that resulted from the Brazilian or the Moscow expositions. We believe, however, that the potential for technology loss through trade fairs will increase as the Soviets and Brazilians expand their direct trade contacts in high-technology sectors. [redacted]

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In our view, the lower and middle levels of the Brazilian scientific establishment are not pushing for enhanced ties to the USSR. [redacted]

The USSR has increased its efforts to acquire Brazilian informatics and telecommunications equipment through legal commercial sales. In 1985, the Soviets were investigating the purchase of large numbers of 8-bit personal computers (PCs) from Brazil, primarily for use in their educational system. There has been no confirmation of sales or shipments of such computers, however, so it is unlikely that the USSR completed the transaction. [redacted]

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[redacted] most researchers are not enthusiastic about improved relations because they have strong ties to the United States and Europe and believe the USSR is unlikely to share its advanced technology. [redacted]

We believe that Brasilia is likely to follow a pragmatic approach toward technological cooperation with the Soviet Bloc. The Ministry of Science and Technology and the National Council for Scientific and Economic Research will continue to take the lead in promoting improved ties; they probably favor increased cooperation, in part, to underscore Brazil's sovereignty on the technology transfer issue. Most key decisionmakers, however, would support ascertaining what benefits Brazil can obtain from greater cooperation with the Bloc, while limiting or avoiding exchanges in the applied sciences because of a potential military or industrial impact. [redacted]

While the Soviets have not been able to conduct joint research with Brazil in fiber optics, they may meet with greater success by purchasing fiber-optic-related equipment. In the last few years, Brazil has sensed the opportunity for lucrative contracts and has warmed to the idea of fiber-optic sales to the Soviet Union. During the April 1986 science and technology negotiations, Brazil indicated interest in the workings of COCOM's export control system, perhaps believing that such information might facilitate trade in certain Brazilian products such as fiber optics. [redacted]

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Trade Fairs and Commercial Transactions

The Soviets also have sponsored trade fairs to obtain advanced technology through Brazil. In response to Soviet requests, Brazil held high-technology trade fairs in Moscow in 1985 and 1986. The Soviet Embassy sponsored a trade fair in Rio de Janeiro in September 1986. East Germany has also been urging Brazil to participate regularly in the Leipzig trade fair. So far, participation by Brazilian firms has been limited. [redacted]

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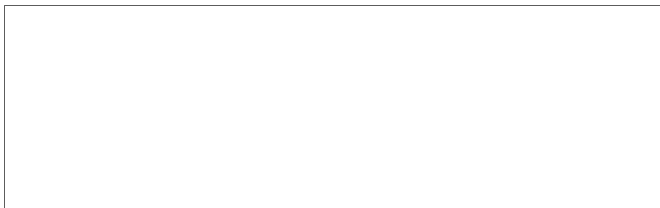
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although gradual, will enhance the Soviet Bloc's ability to mount illegal and covert science and technology operations there. [redacted]

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Brazil's growing indigenous capability in certain technologies—especially fiber optics—and its increasing access to COCOM-controlled technology will pose a problem for current international trade control mechanisms. We see little likelihood that Brazil will tighten its export policies; the export control system will remain guided largely by political and economic concerns more than by any effort to restrict strategic technologies. Brazil will view US pressure to curb exports to certain countries as an infringement on its sovereignty. Moreover, because it faces an overwhelming debt-servicing crisis, Brazil is unlikely to jeopardize badly needed foreign exchange by curbing exports. [redacted]

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Outlook and Implications

We believe that Brazil's economic and political problems may have a damaging impact on its high-technology sector in the short-to-medium term. Budgetary stringencies and low growth will reduce both indigenous research and development and the purchase of sophisticated Western equipment. Nationalistic sentiments resulting from tensions or confrontations with the United States and other developed nations over debt and trade issues may lead to increased protectionism and restrictions on foreign investment, thereby further restricting Brazil's access to high technology [redacted]

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Over the longer term, Brazil will continue efforts to upgrade its scientific and technological capabilities. However, Brazil's policy will be guided by economic and nationalistic concerns that frequently operate at cross purposes. We believe that, unlike a number of newly industrialized countries, Brazil probably will not attempt to be on the cutting edge of a broad range of technologies; it will focus more on obtaining less expensive, more readily available technology to incorporate into products for export and bolster the capability of key industrial sectors. Moreover, Brasilia probably will remain willing to risk slower technological growth by pursuing highly protectionist policies in some areas—such as computer technology—to reserve those sectors for domestic industrialists. For reasons of national pride, security, or crucial economic development, we believe that Brazil will try to improve indigenous capabilities in the areas of telecommunications and defense-related technologies by keeping open avenues to sophisticated Western technology, and these areas of technology are of particular interest to the Soviet Bloc. [redacted]

We believe that negotiations on an MOU on technology transfer or a GSOMIA will be complex and arduous. Some officials in Brasilia—the President, the secretary general of the Foreign Ministry, and some military chiefs—may be more sensitive to technology diversion concerns, but most policymakers do not worry about leakage of high technology to the Soviet Bloc. So far, Brasilia does not control any of the dual-use technologies of concern to COCOM; only technology that is directly utilized in sensitive areas such as the nuclear industry and sophisticated weapons research and development is restricted. Moreover, we believe that the Brazilian military services and the arms manufacturers steadfastly will oppose any agreement that in their view would give Washington explicit rights to block particular arms exports to third parties. [redacted]

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We believe that nationalistic sentiments fueled by the economic crisis will stiffen Brasilia's resistance toward technology transfer safeguards. President Sarney's dire political situation will make it difficult for him to retreat from Brasilia's refusal to grant generic end use assurances. He probably views adherence to the case-by-case imposition of restrictions as

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We expect that the Soviets will improve their access to controlled technology in Brazil during the coming years. The thaw in Brazilian-Soviet relations,

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the best way to avoid a nationalistic backlash against his administration. Finally, should tensions heighten between Brazil and the United States over informatics, other trade issues, or the foreign debt situation, we believe that President Sarney will come under considerable pressure to take an uncompromising attitude in MOU negotiations. [redacted]

Over the longer term, however, we believe Brazil may become more willing to reach an agreement with the United States. An improved economic climate and resolution of bilateral tensions would play a role in lessening Brazilian resistance. To a large extent, however, Brazil's stance on an MOU will be determined by how it would handle a possible cutoff of US high technology if an agreement is not signed and by the availability of such equipment from non-US sources. We expect that even if Brasilia does begin serious bilateral negotiations on a MOU, it may attempt to find ways to restrict its scope. [redacted]

We believe, however, that, if an MOU is agreed to, Brazil will not afford it the degree of protection Washington expects, and that, over time, Brazil even

may evade its provisions. To a significant degree, Brasilia probably will adopt the same stance toward MOU enforcement that it has toward nuclear safeguards. Many Brazilian officials may view technology transfer controls, at least in part, as an effort by Washington to hamper Brazil's quest for economic independence and its ability to compete against the United States in world markets. At best, Brasilia will look upon the controls as a burdensome, but necessary, expense of obtaining the technology and will probably be lax in enforcing them. Finally, we believe that Brazil, with its increasingly sophisticated technological and manufacturing base, will attempt to reverse engineer-imported, high-technology components and then seek to export "Brazilian" versions of such products. Regardless of the legal questions involved, any Brazilian attempt to export such systems could pose political problems for Washington in enforcing its reexport regulations. [redacted]

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