SECTION I
PART B

U.S. EQUIPMENT APPROVED FOR CHINESE NUCLEAR, MISSILE OR MILITARY SITES

From 1989-1993, the U.S. Commerce Department approved hundreds of licenses worth over $75 million for the export of sensitive American technology to Chinese entities that are involved in the development of weapons of mass destruction and the buildup of the Chinese military. Some of these Chinese entities have also, in turn, supplied military equipment to Iran and Pakistan. Among the most notable approvals are the following:

- **China National Electronics Import-Export Corporation (CEIEC)** was licensed to receive American microwave research equipment, integrated circuit testing equipment, computer gear and other equipment useful for developing radar. The Corporation then exported a three-dimensional air surveillance radar to Iran that could someday threaten American pilots.

- **China Precision Machinery Import-Export Corporation (CPMIEC)** was licensed to receive American network analyzers and a computer workstation for simulating wind effects, both of which were apparently useful for building China's new C-801 and C-802 anti-ship cruise missiles. After receiving the American imports, CPMIEC exported the missiles to Iran where, according to the U.S. naval commander in the Persian Gulf, they threaten U.S. ships and personnel.

- **Chinese Academy of Sciences (CAS)** was licensed to receive American computer equipment to help develop nuclear data from an experimental fusion reactor. The Academy then exported the reactor to Iran, where it is being used to train scientists in the Iranian nuclear program, which U.S. intelligence believes is devoted to developing nuclear weapons.

- **China National Nuclear Corporation (CNNC)** was licensed to receive American computer and image analysis equipment for uranium prospecting. CNNC then helped Iran prospect for uranium that U.S. intelligence believes will be used for nuclear weapons.

- **China Aerospace Industry Corporation (CASC)** was licensed to receive $2.6 million worth of American equipment including computers for computer-aided design, and signal processors and computers for vibration analysis and structural testing, all useful for missile design and development. CASC develops most of the missiles that China offers for export, including the M-11 missile, and was sanctioned by the U.S.

government in 1993 for selling Pakistan the M-11. Pakistan has also received Chinese help in designing a plant to produce the M-11.

- **China Great Wall Industry Corporation** was licensed to receive equipment for developing vibration-related instruments such as frequency signal generators, charge amplifiers, accelerometers, magnetic recorders and data acquisition units, all useful for missile development. China Great Wall manufactures China's Long March rockets and was sanctioned by the U.S. government in 1993 for supplying missile components to Pakistan.

The Commerce Department also approved sensitive exports to key organizations in China's nuclear weapon, missile and military infrastructure, including the following:

- **China Academy of Space Technology (CAST)** was licensed to receive $3.3 million worth of equipment for electronic circuit design, including oscilloscopes, sweep generators, spectrum analyzers and computers, all apparently useful for developing missile-related electronics. CAST is China's main space research center, and was sanctioned by the U.S. government in 1993 for supplying missile technology to Pakistan.

- **Beijing University of Aeronautics and Astronautics (BUAA)** was licensed to receive over $650,000 worth of equipment for computer-aided design and for aviation and radar design and simulation. The university develops systems for simulating the flight conditions of missiles and conducts classes in inertial guidance, navigation, and flight dynamics. In the 1960s it helped design China's first aerial casings for nuclear bombs.

- **China National Aero-technology Import-Export Corporation (CATIC)** was licensed to receive over $17 million worth of equipment including computers, flight testing equipment, data recorders and turbofan engines. CATIC imports and exports China's advanced military aircraft including fighters and bombers, as well as helicopters, aero-engines and aircraft components. In 1995, CATIC illegally diverted American machine tools imported for civilian use in Beijing to a missile and military aircraft plant in Nanchang.

- **China National Electronics Import-Export Corporation (CEIEC)** was licensed to receive $8.4 million worth of high-performance computers and other equipment for microwave research, semiconductor wafer testing, and semiconductor manufacture. CEIEC markets military radar, cryptographic systems, laser rangefinders, and equipment for military communication, command, control and intelligence. As stated above, CEIEC exported a three-dimensional air surveillance radar to Iran after importing American equipment useful for building the radar.

- **Chengdu Aircraft Industrial Corporation** was licensed to receive $5.3 million worth of high-performance machine tools and computer equipment for producing aircraft parts. Chengdu manufactures China's F-7 series of fighter aircraft, is reported to be developing more advanced fighter aircraft in cooperation with Russia and Israel, and is reportedly China's second largest fighter aircraft production plant.

- **Shanghai Jiaotong University** was licensed to receive advanced computers, oscilloscopes, diagnostic equipment and computer software to conduct vibration and structural analysis. The University conducts research sponsored by the Chinese Ministry of Defense, and specializes in aerospace and nuclear activities, including the development of testing equipment for the Long March-4 rocket, high precision inertial navigation devices, and inertial and satellite hybrid navigation systems. In the nuclear field, the University conducted early research on thermohydraulic experiments for the design of research reactors, nuclear production reactors, and pressurized-water power reactors.

In addition to these approvals, other organizations that are part of China's nuclear, missile and military production base also received permission to import sensitive U.S. equipment. These include the **National University of Defense Technology**, which trains personnel from the People's Liberation Army in the design of advanced weapon systems, the **University of Electronic Science and Technology**, which develops advanced military radar and technology for stealth aircraft, and **China Electronics Systems Engineering Corporation**, which manufactures electronic equipment for the People's Liberation Army.

The approvals reveal an alarming pattern. Sensitive American equipment has been approved for sale by the Commerce Department to organizations that form China's strategic backbone. These organizations develop Chinese nuclear weapons, build China's largest long-range missiles and furnish some of the most advanced equipment available to the Chinese armed forces. Several of these organizations have also contributed, through their exports, to the nuclear and missile programs of proliferant countries. The data show that American exports to China have helped increase China's strategic might and outfitted Chinese companies that fuel proliferation around the world.

APPROVALS FOR CHINESE COMPANIES HELPING IRAN AND PAKISTAN

China Aerospace Industry Corporation (CASC)

The China Aerospace Industry Corporation (CASC - now known as the Astronautics Industry Corporation) was sanctioned by the United States in August 1993 for providing missile components to Pakistan. CASC was created as the successor to the Ministry of Aerospace Industry. It is involved in the research and development of China's long-range nuclear missiles, submarine-based strategic missiles, surface-to-surface tactical missiles, air defense missiles, and cruise missiles. It oversees more than 300 academies, factories, research institutes, companies and universities located throughout China dedicated to the design and production of launch vehicles, rocket control systems, propulsion systems, computers and inertial guidance systems, and ground facilities. According to a bill introduced in the U.S. Senate in 1997, CASC transferred approximately 24 medium-range M-11 missiles to Sargodha Air Force Base in Pakistan in December 1992, and transferred as many as 30 more M-11s from September 1994 to June 1996.

CASC was licensed to obtain over $2.6 million worth of equipment useful in missile design, including computers to conduct vibration analysis, structural testing, and mechanical computer-aided engineering (CAE), and spare parts for aircraft.

Approved licenses to the China Aerospace Industry Corporation, 1989-1993:

License #	Date	Value	Technology
D 047544	11/13/89	$7,985	Electronic equipment used in the development of a PABX system
D 053023	1/8/90	$80,446	Equipment, including a signal processor and multi-channel measurement system, to conduct vibration analysis and structural testing
D 054243	10/13/89	$115,506	Computer equipment to conduct vibration analysis and structural testing
D 097671	5/24/90	$1,000,000	Computer equipment for mechanical computer-aided engineering (CAE) design, drafting and analysis

License #	Date	Value	Technology
D 127026	2/13/91	$84,000	Computer workstation for machinery design in the aviation industry
D 143432	6/25/91	$170,000	Computer and related equipment
D 148114	8/26/91	$1,000,000	Aircraft engine spare parts
D 155243	12/23/91	$164,316	Computers and related equipment

Total: $2,622,253

China Great Wall Industries Corporation

China Great Wall Industries Corporation coordinates and provides international space launch services from China. Overseen by the China Aerospace Industry Corporation (CASC), Great Wall imports and exports space technology and equipment, precision machinery, electronics, instruments and meters. In 1993, it was sanctioned by the United States for supplying missile components to Pakistan. In 1997, it reportedly supplied, according to Israeli military intelligence, telemetry equipment for testing missiles to Iran.

Great Wall was licensed to receive a system for developing vibration-related instruments such as frequency signal generators, charge amplifiers, accelerometers, magnetic recorders and data acquisition units, all of which could be useful in missile development.

Approved licenses to China Great Wall Industries Corporation, 1989-1993:

License #	Date	Value	Technology
D 020464	10/24/89	$123,443	Equipment to manufacture signal generator, accelerometer and vibration-related instruments
D 027383	1/10/90	$124,155	Calibrator and assorted equipment
D 067582	6/20/90	$12,655	Microwave devices for satellite reception

License #	Date	Value	Technology
D 091145	4/23/90	$37,400	Communication equipment
D 092012	5/17/90	$35,675	Microwave testing equipment
D 117787	1/13/91	$1,364	Circuits for electronic equipment
D 131564	5/3/91	$56,810	Equipment to measure electromagnetic interference (EMI) levels
D 160937	5/15/92	$15,377	Integrated circuits for microcomputer numerical control system

Total: $406,879

China National Nuclear Corporation (CNNC)

It was revealed in 1996 that a subsidiary of the China National Nuclear Corporation (CNNC) exported specialized ring magnets, which are used in the suspension bearings of gas centrifuge rotors, to the A. Q. Khan Research Laboratory in Pakistan, which enriches uranium for nuclear weapons. CNNC may also be helping to construct Pakistan's secret nuclear reactor at Khusab. A CNNC subsidiary is currently constructing a 300 megawatt power reactor for Pakistan at Chashma.

CNNC has been discussing with Iran the sale of a 25 to 30 megawatt nuclear research reactor, a size capable of making enough plutonium for up to two nuclear weapons per year. Also on the horizon is a plant to produce uranium hexafluoride from uranium concentrate, a step necessary to enrich uranium to nuclear weapon grade.

The China National Nuclear Corporation was licensed to receive U.S. computer and image analysis equipment for uranium prospecting. CNNC then helped Iran prospect for uranium that U.S. intelligence believes will be used for nuclear weapons.

Approved licenses to the China National Nuclear Corporation (CNNC), 1989-1993:

License #	Date	Value	Technology
D 040656	12/11/89	$2,223	Computer equipment for a uranium feasibility study

License #	Date	Value	Technology
D 046971	12/11/89	$9,630	Computer equipment
D 105713	5/14/91	$43,405	Image viewing and analysis stations for uranium resource assessment

Total: $55,258

China Precision Machinery Import-Export Corporation (CPMIEC)

Sanctioned by the United States in August 1993 for missile proliferation, the China Precision Machinery Import-Export Corporation (CPMIEC) has supplied C-801 and C-802 anti-ship cruise missiles to Iran, and, according to United States intelligence, shipped M-11 missiles to Pakistan in 1992. CPMIEC markets and sells the M-family of medium-range surface-to-surface missiles, a variety of shipborne, anti-ship, and tactical missiles, as well as liquid and solid rocket motors, precision machinery, optical equipment, and radars.

It is estimated that Iran received 60 C-801 and C-802 missiles, some of which are mounted on "Houdong" highly maneuverable fast attack boats which China also supplied (above). The missiles are a threat to U.S. ships and sailors in the Gulf as well as to commercial shipping.

The U.S. Commerce Department approved six licenses for export of equipment to CPMIEC from 1989 to 1993. Most notably, exports of computer workstations for the simulation of wind effects, flight data recorders, and navigational instruments were all licensed. The ability to simulate wind effects is something the designer of an anti-ship missile could find useful. All of this equipment was deemed so sensitive that it required an individual validated export license to leave the United States.

Approved licenses to the China Precision Machinery Import-Export Corporation (CPMIEC), 1989-1993:

License #	Date	Value	Technology
D 062049	4/9/90	$45,834	Cables and adapters
D 078850	3/12/90	$7,707	Computer equipment

License #	Date	Value	Technology
D 082433	3/27/90	$4,876	Analyzers
D 110105	8/3/90	$32,628	Modems for data transmission
D 114649	8/28/90	$6,630	Modem for data transmission
D 131751	11/7/91	$43,700	Computer workstation for simulation of wind effects

Total: $141,375

Institute of Plasma Physics, Chinese Academy of Sciences

In 1993-94, the Institute of Plasma Physics of the Chinese Academy of Sciences (CAS) transferred a "Tokamak" nuclear fusion research reactor to the Azad University in Tehran. The reactor is being used to train scientists in the Iranian nuclear program, which U.S. intelligence believes is devoted to developing nuclear weapons.

Approved licenses to the Institute of Plasma Physics, 1989-1993:

License #	Date	Value	Technology
D 102345	7/24/90	$500	Equipment for a control and data acquisition system for a Tokamak reactor
D 108676	8/24/90	$88,800	Computer equipment to conduct experiments with Tokamak reactors
D 135538	10/30/91	$454,886	Computer with scaler/vector capabilities, used for numerical calculations in nuclear physics, fusion-related engineering, and data processing for Tokamak reactors

Total: $544,186

APPROVALS FOR CHINESE COMPANIES DEVELOPING NUCLEAR WEAPONS AND LONG-RANGE MISSILES

China Academy of Space Technology (CAST)

Also known as the Fifth Academy of the China Aerospace Industry Corporation (CASC), CAST was sanctioned by the United States in August 1993 for missile proliferation to Pakistan. CAST is China's primary research center for space and satellite technology, and oversees a myriad of research institutes and factories working on satellites, spacecraft systems, structures, attitude control and on-board electronics.

CAST was licensed to receive $3.3 million worth of equipment for electronic circuit design, including oscilloscopes, sweep generators, spectrum analyzers and computers, all useful for developing missile-related electronics.

Approved licenses to the China Academy of Space Technology (CAST), 1989-1993:

License #	Date	Value	Technology
D 042609	1/10/90	$12,075	Oscilloscope for space research
D 057869	1/8/90	$38,092	Sweep generator for use in characterization and calibration of microwave components
D 076153	8/24/90	$747,560	Electronic equipment for testing electromagnetic susceptibility (EMS) and electromagnetic interference (EMI)
D 090101	5/30/90	$1,670,000	Computer equipment for mechanical product and electronic circuit design
D 116909	11/21/90	$30,941	Spectrum analyzer for use in testing of satellite receivers
D 121378	11/16/90	$475,000	Computer equipment for mechanical and electronic circuit design

License #	Date	Value	Technology
D 136141	6/17/91	$127,007	Computer equipment, including coprocessor and software
D 136153	6/17/91	$10,920	Computer equipment
D 136643	6/11/91	$190,254	High-density digital recorder/reproducer to record satellite sensor data
D 140621	7/26/91	$6,177	Universal counter for telecommunications system

Total: $3,308,026

China Institute of Atomic Energy (CIAE)

The China Institute of Atomic Energy (CIAE) conducted early research on development of the Chinese hydrogen bomb and uranium hexafluoride production. Overseen by the China National Nuclear Corporation (CNNC) and the Chinese Academy of Sciences (CAS), the CIAE conducts research and development in nuclear physics, reactor engineering, nuclear technology, plutonium extraction and uranium isotope separation. Its laboratories are equipped with ten accelerators, two electromagnetic isotope separators, hot cells, and other facilities for reactor engineering, radiochemistry and isotope research and production.

CIAE was licensed to receive computer equipment used for nuclear research, as well as integrated circuits used in an accelerator.

Exports to the China Institute of Atomic Energy, 1989-1993:

License #	Date	Value	Technology
D 029456	12/11/89	$16,669	Computer equipment for isotope research and production, and nuclear research
D 029457	12/11/89	$5,866	Equipment for neutron analysis, charged particle activation and X-ray fluorescence analysis

License #	Date	Value	Technology
D 037799	12/11/89	$8,287	Computer for isotope and nuclear research
D 091161	5/9/90	$4,906	Computer equipment for nuclear research on an accelerator
D 100827	10/2/90	$3,885	Controller for use in a data acquisition system to measure neutron spectra
D 102592	7/3/90	$867	Integrated circuits and transistors for the HI-13 tandem accelerator
D 124870	12/23/90	$21	Integrated circuits for the HI-13 tandem accelerator
D 128850	1/28/91	$4	Integrated circuit for the HI-13 tandem accelerator

Total: $40,505

Chinese Academy of Sciences (CAS)

Also known as the Academica Sinica, the Chinese Academy of Sciences is China's highest academic institution in the fields of natural sciences, mathematics, physics, chemistry, geology, systems engineering, energy, remote sensing, computers, automation, semiconductors and microelectronics. It helped develop liquid hydrogen and oxygen rocket boosters, conducted early research on the development of a computer for the DF-5 ICBM, and developed a large-scale integrated circuit 16-digit microcomputer, used in or to develop strategic missiles and large rockets. In the nuclear field, CAS institutions conduct research on copper vapor lasers, uranium isotope spectroscopy and uranium vapor generation collection technology, and have developed separation membranes for gaseous diffusion uranium enrichment diffusers.

CAS was licensed to receive over $4.2 million worth of nuclear- and missile-related components, including instruments useful in molecular reaction dynamics, lasers, transducers, krytrons (above), semiconductor wafer manufacturing, array processors for satellite data, nuclear reactor control equipment, and laser rangefinding equipment.

Approved licenses to the Chinese Academy of Sciences (CAS), 1989-1993:

License #	Date	Value	Technology
B 293188	11/16/89	$10,235	Digital instrument for research on molecular reaction dynamics
D 051501	11/16/89	$3,000	Attendant console for telephones
D 058698	11/9/89	$25,000	Extended silicon intensified target vidicon detector for two-dimensional measurement of light scattering and angle shifts caused by pulse laser stimulation of complex polymers, and for research on surface molecular structures
D 065559	12/2/89	$19,669	Computer equipment for computer data processing
D 066764	2/6/90	$1,430	Transducers for use in a laser molecular beam interaction chamber
D 067087	12/8/89	$3,740	Computer equipment for research on X-ray lasers, and collection, memory and processing of data
D 068335	12/27/89	$3,524	Linear photodiode array, and printed circuit boards for use in radio frequency spectrum analyzer
D 070022	2/7/90	$1,840	Computer equipment
D 070829	6/30/90	$66,240	Computer equipment for studies in remote sensing for natural resources
D 072068	1/19/90	$37,000	Computer graphics controller
D 072070	1/19/90	$49,920	Computer graphics controller
D 073417	3/14/90	$7	Triethyl phosphite used for organic synthesis

License #	Date	Value	Technology
D 074830	5/15/90	$226,000	Digital ionospheric sounder used in gathering geophysical data of the higher atmosphere
D 075220	6/5/90	$15,000	Microwave pulse counter for measuring microwave frequencies
D 075243	1/24/90	$21,790	Graphics workstation
D 075542	3/29/90	$10,087	Electronic encoders to be used in polarizer experiments
D 091442	8/31/90	$749,000	Wafer stepper for semiconductor device fabrication
D 097473	6/18/90	$4,060	Vacuum gauge and tunable diode laser for a spectrometer
D 102345	7/24/90	$500	Control and data acquisition system for a Tokamak nuclear reactor
D 102834	8/30/90	$78,789	Equipment for LAN and software development
D 103402	7/20/90	$500,000	Floating point array processors to process satellite data
D 107258	7/3/90	$512	Krytrons for use in the single-pulse acquisition unit of a high power YAG laser
D 108676	8/24/90	$88,800	Computer equipment to conduct experiments with Tokamak nuclear reactors
D 109674	7/20/90	$637,500	Computer equipment to be used in the development of China's National Computing and Networking Facility (NCFC)

License #	Date	Value	Technology
D 109830	8/22/90	$74,200	Computer equipment for scientific data processing
D 111596	8/9/90	$3,688	Computer equipment for use in machinery computer-aided design (CAD)
D 112952	11/21/90	$60,000	Laser systems
D 113418	8/28/90	$2,680	Unix computer system
D 115537	9/12/90	$230,980	Laser reliability test system used for semiconductor laser research
D 118870	12/14/90	$8,112	Equipment for laser ranging system
D 119608	12/24/90	$50,000	Spare parts for equipment previously exported
D 120425	10/12/91	$119,991	Computer equipment for simulation of non-linear phenomena, such as gravity waves, vortex and separation, bifurcation, chaos and turbulence in fluids
D 120570	1/2/91	$295,650	Computer equipment
D 1257695	3/6/91	$60,000	Computer workstation
D 126084	4/17/91	$25,500	Ion beam system for pre-cleaning of substrates and ion assisted deposition
D 127266	1/22/91	$174,216	Computer server
D 130568	3/8/91	$42,600	Computer workstation
D 131138	3/18/91	$1,750	Absolute transducers for research on infrared laser chemistry of inorganic molecules

License #	Date	Value	Technology
D 132184	11/15/91	$49,341	Computer workstation to develop software
D 132178	3/26/91	$32,851	Computer workstation to develop software
D 133196	3/21/91	$1,240	Power operational amplifiers for optical research instruments
D 135538	10/30/91	$454,886	Computer with scaler/vector capabilities, used for numerical calculations in nuclear physics, fusion-related engineering, and data processing for Tokamak nuclear reactors
D 138957	8/9/91	$20,070	Cesium beam tube
D 140061	5/22/91	$49,731	Computer equipment
D 140285	6/4/91	$50	Finished mask for lithography
D 140681	1/28/91	$104,000	Advanced computational element (computer equipment)
D 143110	7/16/91	$27,841	Synthesized microwave signal generator to test telecommunication systems
D 144563	8/13/91	$180,000	Software for integrated circuit design
D 144870	7/8/92	$4,125,000	Computer equipment
D 148145	9/27/91	$4,040	Transducers for basic physics research
D 149661	10/8/91	$75	Bacteria

License #	Date	Value	Technology
D 151268	2/14/92	$236,590	Magnetic property measurement system for measuring induced and residual magnetic moments of small quantities
D 184762	3/5/93	$33	Diisopropylamine for organic synthesis

Total: $8,988,758

APPROVALS FOR CHINESE MILITARY SITES

Beijing Institute of Radio Measurement

The Beijing Institute of Radio Measurement has expertise in military radar system engineering and radio electronic technology. It conducts research and development in modern radar systems (right) for precision tracking and instrumentation, vessels and air traffic control radar systems, high precision antennae, feed systems and servo control systems.

The Institute was licensed to receive over $480,000 in electronics and radio measurement equipment.

Approved licenses to the Beijing Institute of Radio Measurement, 1989-1993:

License #	Date	Value	Technology
B 326445	12/27/89	$30,580	Portable microwave spectrum analyzer and a frequency converter
D 057520	6/25/91	$350,400	Phase noise measurement system to be used for the design, development and metrology of radio measurement equipment
D 057521	11/8/89	$18,900	Instrument controller to be used with an arbitrary waveform synthesizer used for the design, development and metrology of radio measurement equipment
D 114534	8/31/90	$770	Oscillator
D 114535	8/31/90	$520	Pin diode switches and attenuators
D 114536	8/30/90	$7,125	Decoder and encoder
D 127522	3/22/91	$73,530	Spectrum analyzer for emissions and susceptibility testing of electric and electronic products

Total: $481,825

Chengdu Aircraft Industrial Corporation (CAIC)

Reportedly China's second largest fighter plane production base, CAIC produces the F-7 (J-7) series of fighter aircraft (right). CAIC is reportedly cooperating with Pakistan's Aviation Integrated Company and Russia's Mikoyan Aero-Science Production Group in the development of the FC-1 lightweight multi-purpose fighter plane, and is reportedly developing with Israeli assistance the J-10 multi-role combat aircraft (modeled on the Lavi fighter developed by Israel Aircraft Industries [IAI]). CAIC was licensed to receive over $5.3 million worth of equipment for building military aircraft including machine tools, generators, frequency synthesizers and computer equipment.

Approved licenses to Chengdu Aircraft Industrial Corporation (CAIC), 1989-1993:

License #	Date	Value	Technology
D 059356	3/19/90	$1,269,000	Three-axis milling, drill/router gantry-type machine to manufacture structural parts for aircraft
D 059394	7/20/90	$2,320,000	Single spindle five-axis bridge-type tooling machine to manufacture structural parts for aircraft
D 082205	3/21/90	$19,626	Tracking generator to calibrate electronic equipment on aircraft
D 082776	5/9/90	$205,491	Computer equipment to aid in design of aircraft
D 093117	4/27/90	$29,285	Frequency synthesizer for development of aircraft antenna
D 125218	1/3/91	$6,100	Computer equipment used in aircraft
D 129176	2/22/91	$685,432	Computer equipment to automate aircraft manufacturing process
D 147627	6/19/91	$842,855	Horizontal machining center and accessories to produce aircraft parts

Total: $5,377,789

China Electronic Systems Engineering Corporation (CESEC)

Overseen by the General Staff Department (GSD) of the People's Liberation Army (PLA), the China Electronic Systems Engineering Corporation (CESEC) manufactures communications and electronics technology and equipment for the Chinese military.

CESEC was licensed to receive over $6.6 million worth of equipment for electronic circuit design, including integrated circuits, a spectrum analyzer, a reflectometer, and an oscilloscope, all useful in developing military electronics.

Approved licenses to the China Electronics Systems Engineering Corporation, 1989-1993:

License #	Date	Value	Technology
D 055329	4/10/90	$25,327	Equipment to be used with a sweep oscillator mainframe for testing bandwidth and frequency response
D 089051	4/6/90	$354,043	Digital telecommunications switch equipment for intra-city telecommunications network
D 090922	7/18/90	$6,900	CCD imager for solar and astronomical observation
D 100804	5/24/90	$1,762	Integrated circuits and IC boards for measuring frequency signals
D 115332	2/22/91	$4,040,000	Digital switching equipment for telecommunications network
D 115354	7/12/91	$558,586	Spectrum analyzer
D 171593	8/29/92	$89,892	Optical time domain reflectometer and an oscilloscope
D 173345	3/2/92	$1,535,699	Spare parts for a digital switching system
D 173564	11/4/92	$50,000	Training for a digital switching system

Total: $6,662,209

China National Aero-Technology Import-Export Corporation (CATIC)

CATIC imports and exports aviation systems including advanced fighters, attack aircraft, bombers, primary and advanced trainers, transport planes, helicopters, aero-engines, and aircraft components. It is cooperating with Russia and Pakistan in the manufacture of the FC-1 fighter, and with Pakistan alone in the development of the Karakorum-8 (K-8) trainer aircraft (right). In 1995, CATIC illegally diverted American machine tools imported for civilian use in Beijing to a missile and military aircraft manufacturing plant in Nanchang.

CATIC was licensed to receive over $17 million worth of equipment including computers, flight testing equipment, data recorders and turbofan engines.

Approved licenses to the China National Aero-Technology Import-Export Corporation (CATIC), 1989-1993:

License #	Date	Value	Technology
D 032648	5/30/80	$2,480,000	Four turbofan engines for training aircraft
D 037864	1/16/90	$146,782	Equipment for Y-8DII aircraft
D 044973	12/18/89	$104,524	Airborne weather radar equipment for Y-8DII aircraft
D 054438	10/24/89	$1,908	Voltage regulator and amplifier
D 057459	10/26/89	$24,400	Computer equipment
D 060733	11/14/89	$146,000	Computer equipment
D 074349	2/26/90	$25,420	Decommutator and synchronizer spare parts
D 077151	2/6/90	No declared value	Unigraphics computer and software equipment for demonstrations to potential end users
D 078438	4/10/90	No declared value	Sale of air data instruments

License #	Date	Value	Technology
D 086054	9/12/90	No declared value	Equipment to make the K-8 trainer aircraft, which are exported to Pakistan
D 086869	4/6/90	No declared value	Provision of technical data for Boeing 727 aircraft engine starters and control valves
D 096962	7/23/90	No declared value	Testing equipment for aircraft development
D 100549	5/29/90	No declared value	Airplane engine parts
D 101621	6/11/90	$288,000	Auxiliary power units for aircraft
D 102468	9/28/90	$500	Boron trifluoride monoethylamine complex for resale to Xian Aircraft Company
D 103193	7/6/90	$250,000	Aircraft spare parts
D 103868	6/27/90	$5,500,000	Computer equipment
D 108705	8/8/90	No declared value	Technical data and other information to support aircraft sales
D 112310	10/30/90	$68,089	Weather radar test set and portable spectrum analyzer
D 121804	12/7/90	$17,356	Flight data recorder and spare parts
D 127493	2/21/91	$36,070	Air data computer for flight testing
D 128830	1/25/91	$23,578	Flight data recorders and spare parts
D 130990	6/12/91	$7,500,000	15 turbofan engines for K-8 Pakistani trainer aircraft
D 134487	6/20/91	No declared value	Technical data for machining of nickel alloy non-air-cooled low pressure turbine castings

License #	Date	Value	Technology
D 136101	4/11/91	No declared value	Engineering data and concept drawings for MD-90 aircraft engine
D 142586	6/10/91	No declared value	Data blueprints and specifications of specific aircraft engines
D 143003	7/18/91	No declared value	Participate in discussions on telemetry, data acquisition and equipment
D 152762	12/4/91	$4,025	Low-level multiplexer card for aircraft flight testing
D 156716	12/18/91	$21,695	Vaxbi to VME adapter for aircraft design and development
D 160061	5/16/92	$165,200	“Pyralin” polymide coating for LCD manufacture
D 164240	6/10/92	$4,350	“Pyralin” polymide coating for LCD manufacture
D 170943	12/2/92	$528,000	“Pyralin” polymide coating for LCD manufacture
D 174630	9/30/92	$51,920	Laser modules for cable optics transmitters and cable optics receivers

Total: $17,387,817

China National Electronics Import-Export Corporation (CEIEC)

Overseen by China’s Ministry of Electronics Industry (MEI--which is now known as the Ministry of Information Industry [MII]), the China National Electronics Import-Export Corporation (CEIEC) markets cryptographic systems, radars, mine detection equipment, fiber and laser optics, and communications technology. MEI, also known as Chinatron or the China Electronics Industry Corporation (CEIC), is responsible for overseeing the development and manufacture of electronics systems, equipment and products and oversees the research,

development and production of special purpose electronics equipment and auxiliary products for Chinese national defense.

Iran recently imported a powerful surveillance radar from CEIEC (right). The radar is now part of Iran's air defense system, and it can detect targets up to 300 kilometers away. This radar may have been built using U.S. equipment. Microwave research equipment, a very large scale integrated system for testing integrated circuits, equipment for making semiconductors, and computer equipment were all licensed for export to CEIEC. All of this equipment appears highly useful for developing military electronics and radar.

Approved licenses to the China National Electronics Import-Export Corporation (CEIEC), 1989-1993:

License #	**Date**	**Value**	**Technology**
D 023062	10/12/89	$13,648	Transistors and amplifiers
B 332160	3/19/90	$60,000	Equipment for electronic component testing
D 038099	2/5/80	$32,610	Electronic test equipment
D 038931	1/9/90	$10,916	Equipment for basic microwave research
D 064996	3/5/90	$82,610	Wafer parameter tester for semiconductor wafer testing
D 069736	1/8/90	$82,610	Wafer parameter tester for semiconductor wafer testing
D 083410	3/2/90	$4,375,000	Computer equipment and software
D 085246	4/18/90	$20,770	Ten Omnimux 162 computers
D 089299	3/27/90	$32,000	Equipment for sweep generators for resale to Ministry of Machinery and Electronics Industry
D 094261	9/6/90	$243,160	Circuit design software

License #	Date	Value	Technology
D 095600	5/11/90	$15,000	Telephone system
D 098338	5/14/90	$1,820	Computer chips
D 110588	8/13/90	$107,000	Plasma etchers to make semiconductors
D 112343	11/1/90	$1,924	Computer equipment
D 112622	8/20/90	$10,457	Computer equipment
D 115678	10/22/90	$9,580	Equipment to design circuit boards
D 122069	2/15/91	$33,600	Traveling wave tube amplifier
D 123120	12/12/90	$92,916	Computer equipment for oil reservoir numerical simulation
D 123122	11/29/90	$32,500	Computer equipment
D 129310	3/29/91	$6,124	Microwave frequency counter
D 129964	4/17/91	$21,754	Radio communication service monitor for testing radio signals
D 134017	3/22/91	$75,632	Statistical multiplexer systems and accessory boards
D 138056	9/6/91	$1,579,830	Personal computers and processor boards
D 138611	5/14/91	$4,100	Protocol tester for telecommunications
D 139577	5/29/91	$17,326	Integrated circuits
D 139587	5/13/91	$46,022	Computer equipment
D 155642	12/16/91	$29,094	Computer equipment

License #	Date	Value	Technology
D 161429	11/7/92	$1,315,000	VLSI system to test integrated circuits
D 161965	3/18/92	$65,120	Statistical multiplexers for use in data communications network
D 181497	1/23/93	$7,397	Phosphorus oxychloride (nerve gas precursor) for transistor manufacture

Total: $8,425,520

China North Industries Corporation (NORINCO)

NORINCO develops, manufactures and exports armored fighting vehicles, howitzers, mortars, rocket launchers, anti-aircraft weapons, anti-tank missile systems, small arms, ammunition, radars, sighting and aiming systems, high-performance engines, optical-electronic products, nuclear/biological/chemical warfare protection systems, sensor-fuzed cluster bombs, explosives and blast materials. Established in 1980, NORINCO oversees hundreds of research and manufacturing complexes and is responsible for the production of Chinese weaponry. NORINCO was indicted in 1996 by the United States for illegally conspiring to import 2,000 fully automatic AK-47 assault rifles into California intended for street gangs.

Approved licenses to China North Industries Corporation (NORINCO):

License #	Date	Value	Technology
D 070761	2/16/90	$39,980	Computer spare parts
D 073635	6/11/90	$1,400	Computer software updates
D 124949	3/15/91	$28,042	Switches and circuits for electronics measurement data conversion
D 150867	10/3/91	$71,000	Spare parts for a PABX system

Total: $140,422

North China Institute of Computing Technology

The North China Institute of Computing Technology designs, develops and produces advanced computer systems for China's national defense. The Institute has participated in tests of Chinese atomic and hydrogen bombs, and provided computer engineering for the measurement and control system for the launch of the first Chinese ICBM into the Pacific Ocean, as well as for a submarine-launched ballistic missile (SLBM). The institute also performs research on massive parallel processing technology and artificial intelligence.

Approved licenses to the North China Institute of Computing Technology, 1989-1993:

License #	Date	Value	Technology
D 075816	1/31/91	$104,763	Electronic computer equipment, including floating point accelerator
D 105265	6/27/90	$134,738	Computers and related equipment
D 105275	3/7/91	$5,000	Computers and related equipment
D 115105	11/21/90	$1,200	Computer training classes
D 116520	12/24/90	$261,865	Computer equipment
D 120245	12/26/90	$84,080	Computer equipment
D 132785	4/1/91	$2,700	Mechanical design and drafting software for engineering design and drafting of factory equipment
D 162550	6/26/92	$54,389	Computer workstation for computer aided design (CAD) of electronic circuits for minicomputers

Total: $648,735

Polytechnologies

Polytechnologies was formed in 1983 and is reportedly authorized to sell abroad every type of conventional weapon and military equipment, including AK-47 assault rifles, handguns, advanced military aircraft, tactical missiles and surface-to-surface short-to-medium range ballistic missiles. Indicted in 1996 in the United States for illegally importing 2,000 AK-47s into

the U.S., Polytechnologies also negotiated the $2 billion 1987 sale of nuclear-capable DF-3 (CSS-2) missiles to Saudi Arabia, which were reportedly installed by a People's Liberation Army (PLA) engineering corps. According to the U.S. Defense Intelligence Agency, Poly is controlled by the Equipment Department of the PLA General Staff Department.

Approved licenses to Polytechnologies, 1989-1993:

License #	Date	Value	Technology
D 032929	10/17/89	$2,430	Switching equipment
D 085213	3/19/90	$19,640	Spare parts for packet switching equipment
D 130207	2/25/91	$5,000,000	Non-military aircraft engines

Total: $5,022,070

Shanghai Institute of Metallurgy, Chinese Academy of Sciences

The Shanghai Institute of Metallurgy manufactures integrated circuits and application specific integrated circuits (ASICs) for the Chinese defense industry. It develops semiconductor materials and devices, magnetic and superconducting materials, and conducts research on physics and physical chemistry of materials, internal friction in solids, quantum chemistry, computational chemistry, and physical chemistry of compound semiconductors. It also performs research on the development of pressure transducers, infrared thermal sensors, special metallic materials for powder metallurgy, and ion beam technologies.
Approved licenses to the Shanghai Institute of Metallurgy, 1989-1993:

License #	Date	Value	Technology
D 054781	2/6/90	$310	Phosphine for production of semiconductor devices
D 065327	12/2/89	$1,190	Controller board for use with an analysis system
D 092743	6/4/90	$2,640	Arsine and phosphine for semiconductor device production

License #	Date	Value	Technology
D 116180	12/28/90	$710,000	Photo-optical step and repeat system for manufacture of integrated circuits
D 144308	7/29/91	$200,000	Computer software package for integrated circuit design verification
D 144558	7/26/91	$258,000	Software for integrated circuit design
D 146603	8/7/91	$500,000	Plasma etch system for production of integrated circuits
D 146604	8/7/91	$500,000	Plasma etch system for production of integrated circuits

Total: $2,172,140

Tianjin Institute of Power Sources (TIPS)

The Tianjin Institute of Power Sources is China's largest research institute for electrochemical and physical power sources, and has developed over 400 types of batteries and energy conversion devices, including sealed lead-acid batteries, solar cells, thermoelectric generators, and semiconductor cooling modules. TIPS develops and manufactures nickel-cadmium, nickel-hydrogen and nickel-metal hydride alkaline batteries for aerospace vehicles, aircraft, high voltage switches, communication equipment and "sophisticated weapons of national defense." It develops and manufactures silver-zinc batteries for use in guided missiles, torpedoes, space vehicles, and electronic instruments. It also manufactures thermal batteries for missiles, bombs, decoys and jammers, and lithium-thionyl chloride batteries for use in missiles, torpedoes, satellites, lasers, mines and portable communication devices.

Approved licenses for Tianjin Institute of Power Sources, 1989-1993:

License #	Date	Value	Technology
D 089216	7/6/90	$6,835	Multimeter used to test power sources

License #	Date	Value	Technology
D 103654	6/26/90	$228,800	Diffusion furnace and related accessories to manufacture batteries and solar batteries
D 122523	2/11/91	$122,500	Evaporator and dying saw for manufacture of batteries and solar batteries

Total: $358,135

APPROVALS FOR CHINESE UNIVERSITIES AND RESEARCH INSTITUTES

China's universities and research institutes provide the education and training needed to develop China's nuclear, missile and military arsenals. Many of these institutions possess "key laboratories" or research centers equipped with advanced instruments and technologies to boost research in strategic and military areas. These universities and institutes develop defense technologies which are then transferred to production entities for integration into the Chinese military.

Beijing University of Aeronautics and Astronautics (BUAA)

The Beijing University of Aeronautics and Astronautics (BUAA) is one of China's premier aerospace research universities. BUAA conducts classes in aerodynamics, air-breathing engines, inertial guidance and navigational equipment, space vehicle control, guidance and simulation, flight dynamics, solid mechanics, metallic materials, and heat treatment. It possesses "state key laboratories" for aerodynamics and aero-thermodynamics and laboratories for research on fluid dynamics, thermal dynamic engineering, and fluid mechanics. It developed a numerically-controlled system to simulate aerodynamic flight conditions of missiles, and has assisted in research on the aerodynamic configurations of aerial nuclear bomb casings. BUAA also develops unmanned aerial vehicles (UAVs) including the WZ-5 high altitude photographic reconnaissance UAV.

Approved licenses to the Beijing University of Aeronautics and Astronautics (BUAA), 1989-1993:

License #	Date	Value	Technology
D 035535	1/18/90	$26,956	Gallium arsenide (GaAs) equipment for research on non-invasive automatic detective instruments
D 063078	3/19/90	$26,016	Horizontal situation indicator and a heading course panel
D 063935	9/28/90	$75,468	Computer workstations for use in computer-aided design and manufacturing systems (CAD/CAM)
D 075891	6/18/90	$5,085	Absolute transducer for research on optical materials storage
D 078073	2/7/90	$17,000	Computer workstation

License #	Date	Value	Technology
D 085070	3/27/90	$78,500	Computer equipment to develop a program for mechanical computer-aided design (CAD) software
D 089330	3/28/90	$23,618	Computer equipment for teaching computer-aided design and manufacture (CAD/CAM) programs
D 105293	7/27/90	$10,888	Computer equipment to enhance computer-aided design and manufacture (CAD/CAM)
D 112639	8/29/90	$5,950	Computer equipment
D 116009	5/10/91	$330,700	Computer equipment to be used in the CAD/CAM laboratory for aviation and radar design and simulation
D 133981	3/21/91	$2,500	Computer equipment
D 140260	5/17/91	$4,500	Computer equipment
D 142227	6/7/91	$50,000	Computer workstation
D 148921	9/20/91	$61,816	Computer equipment
D 150791	9/23/91	$3,269	Computer equipment for mechanical CAD/CAM software research

Total: $722,266

Fudan University

Fudan University in Shanghai was named by the U.S. Department of Commerce in 1994 as a suspect buyer engaged in tomography, which allows non-destructive testing of solid propellants for missiles and testing of the reliability of the detonation package and nuclear material used in atomic bombs. Faculty at Fudan conduct research in accelerator-based atomic and nuclear physics, applied chemistry, laser chemistry, nuclear electronics, modification of materials by electron, ion and laser beams, low temperature conductivity, superconductivity, and

semiconductor physics. Staff from the university were involved in the early development of a separation membrane for use in uranium enrichment by the diffusion method. Its Parallel Processing Research Institute developed a parallelizing compiler system for computers, and transferred a version of the software to the National University of Defense Technology (NUDT) where the software will be used with China's Yinhe ("Galaxy") supercomputers.

Approved licenses to Fudan University, 1989-1993:

License #	**Date**	**Value**	**Technology**
D 039312	12/4/89	$5,400	Flight mass detector for research in atomic and molecular physics
D 039313	12/20/89	$67,343	YAG laser with accessories for research in atomic and molecular physics
D 060326	1/19/90	$8,035	Digital signal averager to record fluorescence decay in photochemistry and photophysics
D 089022	3/28/90	$5,000	Computer equipment
D 091717	4/11/90	$23,360	Electronic testing equipment to be used with a sweep oscillator mainframe
D 094516	4/9/91	$3,125	WAN software
D 096058	8/10/90	$2,470	Transducer
D 105911	6/28/90	$3,814	Multichannel buffer and emulation software for teaching time spectroscopy
D 108291	7/31/90	$109,915	Computer equipment
D 112800	8/21/90	$206,482	Computer equipment
D 126371	1/23/91	$46,500	Engineering workstations for training in integrated circuit design
D 127261	2/18/91	$18,923	Computer workstation

License #	Date	Value	Technology
D 128359	2/5/91	$78,605	Computer workstation
D 128642	3/27/91	$1,650	Variable leak valve
D 141902	7/30/91	$71,206	Computer equipment
D 141906	9/9/91	$6,552	Computer equipment
D 148412	9/18/91	$51,093	Computer equipment for computer-aided design (CAD) research
D 149710	9/17/91	$88,400	Computer equipment
D 156614	3/27/92	$70,000	Computer workstation
D 156970	12/13/91	$34,325	Computer workstation
D 160305	4/23/92	$21,486	Computer workstation
D 164480	5/21/92	$11	Trimethyl phosphite for studying chemical modification of phosphorus on metal

Total: $923,695

Harbin Institute of Technology (HIT)

Overseen by the China Aerospace Corporation (CASC), China's principal missile and rocket manufacturer, the Harbin Institute of Technology (HIT) has developed a remote-controlled responder automated testing system for surface-to-air missile guidance equipment. HIT has manufactured aluminum alloy plates for rocket casings, and conducts space robotics research. It has reportedly developed a new radar system to detect low-altitude and ultra-low-altitude aircraft targets, as well as a spaceflight simulator featuring a drive mechanism with permanent magnet brushless DC torque motor. Its School of Astronautics trains specialists and scientific researchers in astronautics, and conducts courses in flight vehicle control, guidance and simulation, intelligent control systems, tunable (gas) laser technology, electronics, communications, optics and optoelectronics, astrodynamics, vibration and control, and composites. HIT's School of Material Science and Engineering conducts doctoral programs in metals and heat treatment, casting, welding and the technology of plasticity and maintains laboratories for precision welding production technology and precision hot-processing of metals.

Approved licenses to the Harbin Institute of Technology (HIT), 1989-1993:

License #	Date	Value	Technology
B 314776	2/9/90	$40,615	Equipment for mass data storage, plug-in modules, and an X-Y plotter
D 056764	12/26/89	$18,233	Controller to measure signal spectrum, frequency stability and accuracy of amplitude frequency
D 056770	12/5/89	$62,025	Microwave frequency counter to measure signal spectrum, frequency stability and accuracy of amplitude frequency
D 071396	1/19/90	$66,261	Computer equipment
D 074791	7/17/90	$53,972	Laser processing system, laser discharge tube, laser beam expander, deionizer cartridge, and particle filter for lasers
D 078960	2/8/90	$27,281	Computer equipment
D 085589	4/10/90	$1,335	Metrology software to be used with a laser measurement system
D 088291	3/27/90	$20,000	Computer equipment
D 088732	3/29/90	$56,188	Semiconductor chips
D 088945	4/16/90	$92,556	Computer equipment for use in laser measurement experiments
D 099944	6/6/90	$1,144	Signal processing software for use with an oscilloscope
D 122109	3/28/91	$9,035	Logic analyzer
D 133350	3/11/91	$25,000	CAD/CAM software

Total: $473,645

Institute of Computing Technology, Chinese Academy of Sciences

The Institute of Computing Technology participated in the early development of the "109C" transistorized digital electronic computer, which was used in the theoretical computation of launch vehicle models, the flight orbit of the Long March-1 rocket, the computation of the trajectory of a long-range rocket which landed in the Pacific Ocean, and the trajectory of the Long March-3 rocket. It conducts research on large-scale computers and computer technology, and possesses a computer-aided design (CAD) laboratory.

Approved licenses to the Institute of Computing Technology, 1989-1993:

License #	Date	Value	Technology
D 078755	6/5/90	$18,342	Four channel oscilloscope (similar to above) for digital magnetic recording research
D 082943	3/7/90	$17,193	Microprocessor analysis system used for digital magnetic recording
D 091024	5/3/90	$1,178,284	Computer workstation for research on artificial intelligence applications
D 093730	8/7/90	$45,367	Very large scale integrated (VLSI), large scale integrated (LSI), and medium scale integrated (MSI) devices
D 125942	1/15/91	$26,000	Computer workstation CPU for research on artificial intelligence
D 126953	1/25/91	$41,716	Computer equipment
D 128895	3/20/91	$300,000	Computer equipment
D 139315	6/4/91	$165,000	Computer workstation for use in developing computer-aided design and engineering (CAD/CAE) systems

License #	Date	Value	Technology
D 139316	12/13/91	$175,000	Computer workstation for use in developing computer-aided design and engineering (CAD/CAE) systems
D 139431	5/13/91	$8,195	Computer software
D 139445	5/13/91	$1,625	Computer software
D 139446	5/14/91	$2,640	Computer software
D 139527	6/12/91	$8,500	Computer software
D 139431	5/13/91	$8,195	Computer software
D 139528	5/30/91	$9,800	Computer software to develop artificial intelligence systems
D 140044	5/30/91	$6,600	Computer workstation software for development of artificial intelligence language
D 140113	5/14/91	$11,000	Computer software
D 141373	6/3/91	$5,760	Computer workstation computer software
D 141377	612/91	$10,530	Oracle database computer software
D 141378	6/3/91	$15,500	Computer software
D 141568	5/30/91	$26,600	DEC Station 5000 computer for computer-aided design and engineering (CAD/CAE) research
D 141569	5/30/91	$44,000	DEC Station 5000 computer for computer-aided design and engineering (CAD/CAE) research

License #	Date	Value	Technology
D 141570	8/9/91	$15,000	Logic analyzer prism used to analyze and debug microprocessors in computer workstations
D 142127	8/7/91	$900,000	Spare parts for computer microcomputer systems
D 142599	10/15/91	$47,650	Computer equipment
D 142667	7/9/91	$70,000	Computer software for computer-aided design (CAD)
D 144882	7/9/91	$122,600	Computer equipment
D 152474	4/6/92	$52,890	Peripheral image processing workstation for imaging, computing, calculation, analysis and processing technology
D 161547	4/1/92	$33,000	Systems programmers package for computer RISC stations
D 164252	6/26/92	$257,400	Computer workstations
D 174331	12/9/92	$60,000	Computer workstation

Total: $3,684,387

Nanjing University of Aeronautics and Astronautics (NUAA)

Previously known as the Nanjing Aeronautical Institute (NAI), the NUAA develops the CK-1 (Changkong) medium-high altitude unmanned aerial vehicle (UAV) (right), superlight aircraft, Y-2 helicopters and the WZ-1 remote pilotless helicopter. It also developed the CK-1 nuclear test sampling UAV, the CK-1 maneuvrable UAV, and the CK-1 ultra-low altitude UAV. NUAA possesses research institutes for aerodynamics, automatic control, computer research, electrical engineering, electronic engineering, mechanical engineering, sensors and testing, and vibration engineering.

Approved licenses to the Nanjing University of Aeronautics and Astronautics (NUAA), 1989-1993:

License #	Date	Value	Technology
D 063419	1/16/90	$1,510	Adapters for research on noise analysis on receiving systems
D 071056	2/15/90	$5,885	Memory module and high density data cartridges for enhancement of a computer system
D 071374	1/19/90	$67,889	Computer equipment
D 071946	1/19/90	$68,985	Computer equipment for use in photo-geography, mapmaking and image matching
D 074823	1/22/90	$123,625	Computer for computer-aided design (CAD)
D 076315	8/24/90	$10,758	Computer equipment
D 078962	2/13/90	$7,740	Reciprocal counter and oven oscillator
D 086702	6/27/90	$9,498	Microwave silicon bipolar semiconductor transistors for an air traffic control system
D 087599	3/27/90	$4,633	Computer equipment to upgrade an existing workstation
D 097650	5/9/90	$18,634	Computer workstations
D 107528	6/30/90	$700	Computer equipment
D 117446	12/21/90	$9,371	Microwave amplifier for remote sensing
D 117992	9/28/90	$44,605	Computer memory board to enhance a controller

License #	Date	Value	Technology
D 118272	12/24/90	$27,276	Laser head for laser measurement system, angular optics and laser head cable
D 118414	1/29/91	$35,903	Vision system and accessories for existing robots
D 130511	2/13/91	$121,413	Computer equipment for computer-aided design (CAD)
D 131767	4/25/91	$4,352	Equipment to measure analog output signals, to be used with a signal processing system

Total: $562,777

National University of Defense Technology (NUDT)

The National University of Defense Technology (NUDT), also known as the University of Science and Technology for National Defense (USTND) or the Changsha Institute of Technology, is a science and engineering college overseen by the People's Liberation Army (PLA). Its main tasks are to train PLA technical personnel in scientific research, design, production, test and operation of highly sophisticated weapons and equipment, and to train technical personnel and commanders from strategic weapon test and operation units.

Approved licenses to the National University for Defense Technology (NUDT), 1989-1993:

License #	Date	Value	Technology
D 010084	1/8/90	$9,194	Graphics station for computer-aided design of circuits and printed circuit boards
D 093000	4/25/90	$157,512	Computer equipment
D 103778	6/15/90	$120,500	Computer equipment
D 140453	6/5/91	$282,578	Computer equipment

License #	Date	Value	Technology
D 149714	9/6/91	$50,000	Computer equipment

Total: $619,784

Shanghai Jiaotong University (SJU)

The Shanghai Jiaotong University conducts research sponsored by the Chinese Ministry of National Defense, and has academic departments performing aerospace and nuclear research, including the Department of Instrumentation Engineering, which developed a low overload acceleration tester for the Long March-4 rocket, for which it received the Chinese National Science and Technology Achievement Award. Other departments conduct research on composites, inertial and satellite hybrid navigation systems, optics, acoustics, image processing, computational fluid mechanics, hydrodynamics, underwater noise and cavitation.

Approved licenses to the Shanghai Jiaotong University, 1989-1993:

License #	Date	Value	Technology
D 046808	1/9/90	$9,143	Dual trace portable digital storage oscilloscope
D 076223	4/30/90	$4,000	Positive resistors for development and manufacture of magnetic recording heads for computer disk drives and peripherals
D 097509	5/23/90	$4,866	Computer equipment
D 101948	6/5/90	$369,095	Computer workstations and equipment
D 110079	7/31/90	$1,420	Microprocessor interface module to be used with a logic analyzer
D 111674	8/15/90	$203,200	Analog interface for use in measurement of mechanical properties of metallic materials
D 124868	11/30/90	$16,290	Computer equipment

License #	Date	Value	Technology
D 127391	1/9/91	$23,000	Computer workstation
D 128325	2/15/91	$21,904	Computer workstation
D 129636	3/28/91	$2,500	Aluminum oxide/titanium carbide ceramic composite
D 132474	5/3/91	$28,041	Control systems analyzer
D 138285	6/17/91	$27,625	Computer equipment
D 138286	4/25/91	$23,780	Computer equipment
D 138410	6/12/91	$773	Preprocessor for use with a logic channel analyzer
D 139597	7/26/91	$19,000	Logic analyzer for development of microprocessor-based node stations for fiber-optic network
D 139883	7/12/91	$18,700	Computer software to conduct vibration and structural analysis
D 141443	6/17/91	$16,637	Computer equipment
D 147478	9/20/91	$80,701	Computer equipment
D 156601	3/24/92	$20,000	Computer workstations
D 156704	3/24/92	$45,000	Computer workstation
D 159186	1/29/92	$79,079	Computer equipment for design of robot peripherals and interfaces
D 162876	3/30/92	$360,000	Computer equipment
D 164860	7/10/92	$81,747	Computer workstations
D 177490	1/8/93	$34,995	Computer equipment

Total: $1,491,496

University of Electronic Science and Technology (UESTC)

The University of Electronic Science and Technology (UESTC) conducts military research on the design and use of low radar cross section (RCS) radar antennae, and aircraft stealth techniques. It also conducts research on communications and electronics systems, physical electronic and optoelectronics, signal and information processing, circuits and systems, electromagnetic field and microwave technology, electronic materials and devices, computer applications, semiconductor devices, microelectronic sciences, and optical sciences. Its Department of Electronics Engineering conducts research on data processing algorithms for synthetic aperture radar (SAR), and its Research Institute of Applied Physics has developed a multimedia laser imaging radar system which can report target information, target shape, velocity, and range.

Approved licenses to the University of Electronics Science and Technology (UESTC), 1989-1993:

License #	Date	Value	Technology
D 066992	5/15/90	$10,350	Four-channel portable oscilloscope for testing an optical electronic converter
D 075865	2/13/90	$169,913	Computer equipment and software
D 076332	4/3/90	$101,722	Computer workstation
D 148888	9/17/91	$1,000,000	Computer equipment for use in computer-aided design (CAD) applications
D 148893	3/2/92	$900,000	Computer equipment for use in computer-aided design (CAD)
D 173023	8/20/92	$13,885	Computer equipment

Total: $2,195,870

Xian Jiaotong University

One of China's most prestigious universities in science and engineering, the Xian Jiaotong University has participated in the construction of thermohydraulic experimental facilities and experimental research on research reactors, nuclear fuel production reactors and pressurized-water power reactors. Its Ceramics Division produces boron carbide reactor control rods.

Approved licenses to the Xian Jiaotong University, 1989-1993:

License #	Date	Value	Technology
D 078746	2/7/90	$177,834	Computer equipment
D 093913	4/25/90	$19,641	Computer equipment
D 133297	3/22/91	$6,336	Data analysis software for use with a computer to conduct turbulence measurement in air flow using an anemometer and digitizer
D 133357	6/17/91	$86,988	Three component signal analysis systems including “dynamic signal analyzers” to be used in fluid mechanics experiments to process signals in particle velocity measurements
D 141503	12/13/91	$110,000	Computer workstations
D 154378	1/7/92	$24,799	Computer equipment
D 156321	5/6/92	$40,000	Computer workstation for computer aided design (CAD) training
D 156604	2/29/92	$20,000	Computer workstation
D 162274	3/27/92	$70,043	Computer equipment
D 170697	10/7/92	$35,681	Computer workstation for computer-aided design (CAD) education
D 170709	9/23/92	$1,027,632	Computer equipment

Total: $1,618,954

Xidian University

Xidian University is a leader in research in communications engineering, signal processing, computer peripheral equipment, microwave technology and antenna engineering, and cryptography. Its Information Science Institute (ISI) is China's primary military communications institute, and conducts research on key technologies required to develop an Integrated Battlefield Area Communications System (IBACS), on mobile and personal communications, packet radio networks, digital high frequency communications, VHF/UHF telemetering and control systems, meteor burst communications, speech and audio signal processing, image processing, application specific integrated circuits (ASIC) design and broadband integrated services digital networks (B-ISDN). Xidian maintains a Key Laboratory for Radar Signal Processing conducting research on radar signal processing, spatial temporal two-dimensional signal processing, array signal processing, target identification and imaging, artificial neural network and wavelet theory and their applications, and high speed parallel algorithm and electronic design automation (EDA). Its School of Mechanical and Electronic Engineering (SMEE) conducts research in mechatronics, computer-aided design and manufacturing (CAD/CAM), vibration and control, antenna structures, computer peripherals, electronic and electromagnetic technology compatibilities, and electromagnetic protection technology for electronic devices. It receives funding from China's Defense Technology Foundation and the Chinese Military Electronic Technology Project.

Approved licenses to Xidian University, 1989-1993:

License #	Date	Value	Technology
D 042286	12/4/89	$37,031	Programmable spectrum analyzer for teaching signal processing
D 093857	7/3/90	$27,660	Sweep generator and waveguide detector
D 141549	8/9/91	$158,800	Sample integrated circuits

Total: $223,491

Total value of licenses approved in Section I, Part B: $75,300,267