

Controlling Technology Exports: Security vs. Knowledge

Government efforts to control technology exports more effectively are evoking strong objections from scientists and engineers

BY IVARS PETERSON

Thread by thread, the federal government seems to be weaving a web of regulations that could restrict the flow of technical information and hamper scientific research. The administration's aim is to curb the flow of technology to the Soviet Union, where it is adapted for military purposes. However, many critics of the new policies say unimpaired, worldwide communication through scientific exchanges, conferences and publications is essential for advancing the state of the art.

The technology transfer debate centers on export controls and government secrecy. In the last few years, emphasis has shifted from controlling the export of goods to the transfer of technology, defined as the transfer of knowledge leading to better and more efficient performance. At a recent conference on technology transfer and East-West trade, Col. William Baxter of General Research Corp. indicated one of the problems with this new emphasis. "It is infinitely more difficult to control the flow of knowledge than the flow of goods," he said. Others ask whether the effort is even worthwhile.

Few deny that at least some information exists that a government should keep confidential. The real problem is defining the extent to which the flow of technical information should be restricted and how it should be done. Already, numerous laws and regulations govern the disclosure and export of sensitive technologies. After reviewing some of these means in a recent statement to Congress, Rep. George E. Brown Jr. (D-Calif.) said, "Our government has at its disposal a truly vast array of means by which it can control, restrict or impede the free flow of information, materials, technology and individuals." In the past, administrations have not interpreted their authority in a sweeping manner.

The new concern about changes in enforcement and new policies was evident last month among engineers and scientists in San Francisco at the spring meeting of the Computer Society of the Institute of Electrical and Electronics Engineers. In his keynote address, IBM chief scientist Lewis M. Branscomb warned, "We must all take very seriously the debate in Washington about the need for additional government controls to keep our scientific and technical information from flowing to potential adversaries." Later, conference participants listened to a defense department spokesman describe a case study of how the Soviet Union acquired a superior anti-tank missile by using information in unclassified, western publications, and to

University of California President David S. Saxon review university worries.

The government's efforts are embedded in a bureaucratic maze that involves the departments of Commerce, State, Energy and Defense. The State Department compiles a Munitions List and places restrictions on the sale of arms through its International Traffic in Arms Regulations. However, the regulations are of such wide scope that they can be invoked against publication of scientific or technical material, although it may be unclassified. Cryptology research was one target of these regulations (SN: 10/17/81, p. 252).

The Commerce Department compiles Export Administration Regulations and a Commodities Control List and requires licenses for the sale or transfer of specified goods overseas. The 1979 version of the authorizing act shifted the focus from the export of specific products, like missiles, to the control of broader technologies and management skills, like integrated circuit design and production. In addition, it includes meetings, training agreements, technical exchanges and workshops. A Defense Department working group is drafting a new Military Critical Technologies List as the basis for a revised Commodities Control List. This list also includes technologies judged critical by the Energy Department.

Saxon says the universities are worried about the vagueness and broad sweep of the restrictions embedded in the regulations. "'Technical data' and 'exporting' are so broadly defined that it is hard for scientists to know what is and isn't covered," he says. "In the broad scientific and technical areas defined in the regulations, it is feared that without advance approval, faculty could not conduct classroom lectures when foreign students were present; engage in the exchange of information with foreign visitors; present papers or participate in discussions at symposia and conferences where foreign nationals were present; employ foreign nationals to work in laboratories or publish research findings in the open literature."

Columbia University computer scientist Stephen H. Unger, in a paper prepared for the American Association for the Advancement of Science Committee on Scientific Freedom and Responsibility, reports, "... virtually all methods for effectively constraining the flow of information out of the country entail the imposition of restrictions on its domestic circulation." Because ideas published in a U.S. journal could not be kept from reaching potential

enemies or rivals, these ideas would have to be kept out of general circulation publications, and then would not be accessible to most U.S. citizens.

Unger says, "A direct consequence of this point is that a restrictive information policy would inhibit technological progress within the U.S. by making it necessary to duplicate the work of others and interfering with the interactive process that is so vital to progress in scientific and engineering work."

One sign of changes in domestic policy is the draft executive order on classification of national security information. Omitted from the order now in effect is the phrase: "Basic scientific research information not clearly related to the national security may not be classified." Oscar N. Garcia, Computer Society president, says, "The fact that it's missing doesn't say that it will be classified, but it leaves it open." Other changes, which appear to lower the standard for classifying information, are equally worrisome.

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At the same time, government officials are suggesting that the voluntary system of prior review of cryptology manuscripts be extended to other research areas (SN: 1/16/82, p. 35). Scientists may have to submit papers on certain topics to the government for prepublication screening.

Research involving computers and integrated circuits is particularly vulnerable to controls, partly because of the great success of past research in creating new electronic products that are found in everything from video games, sewing machines and automobiles to missiles, sophisticated weapons and detection equipment. Hylan B. Lyon Jr. of Texas Instruments recently described the difficulties in defining what is militarily critical. "If a broad category, like microprocessor, is used, a significant portion of manufactured goods and almost all consumer electronics will be then termed critical," he said. "The difficulty is that adding more nouns and more adjectives to modify the nouns adds exponentially to the verbiage and bulk of the documents. And we soon run into the problem that we have today of a large bulky book that's almost incomprehensible to read, but it's still too vague to distinguish critical from noncritical."

Lyon also pointed out that advances in electronics are continually overtaking progress in making up lists of militarily critical technologies. "In two years, you get a two order of magnitude increase in performance," he said. "We're still thrashing around on list reviews that are three years old."

Not only are there problems with technologies that may be used in both civilian and military applications, but also

Continued on p. 206

"The best solution is to get ahead and stay ahead."

the distinctions between basic research and applied engineering are often fuzzy. As a result, some people favor even more sweeping controls than the present regulations. For example, a bill (H.R. 4934) now before Congress to amend the Export Administration Act changes "make a significant contribution to the military potential" to "could make any contribution to the military or economic potential."

Edward Gerjuoy, past chairman of the Panel on Public Affairs for the American Physical Society, wrote in an editorial in *PHYSICS TODAY* last fall, "Effective enforcement of controls on the newly characterized exports seems impossible without expensive and stultifying expansions of paperwork, bureaucracies and measures that will greatly impede the free exchange of information between our own nationals; these measures will be a source of possible harassment to seminar speakers and university lecturers, and they may endanger the established publication policies of our major scientific journals."

Garcia says, "The way to protect national security is by training people who can use the information, and training them well, not by hiding the information." He says it's very hard for people to keep up to date with what's going on, even when it's all available. This also raises the question of whether the Commerce Department could find enough qualified people to judge the material that is submitted for export licenses.

Defense Department spokesmen say there is a carefully orchestrated Soviet effort to gain access to western technology. The list of technology acquired from the West includes high-speed computers used for designing weapons systems and intelligence gathering, semiconductor manufacturing techniques, guidance technology for aircraft, ships and missiles, and equipment to improve the Soviet industrial base, ranging from precision machine tools to process technology.

Deputy Defense Secretary Frank Carlucci has written, "By the very nature of our open and free society, we recognize that we will never be able to halt fully the flow of militarily critical technology to the Soviet Union. Nevertheless, we believe that it is possible to inhibit this flow without infringing upon legitimate scientific discourse."

Lawrence J. Brady, assistant secretary of commerce for trade administration, noted recently, "There is a vastly different perception of the threat than there was a year or a year and a half ago, when the Export Administration Act was up for review and the only concern was how to expedite licenses and how to decrease licensing requirements."

The various participants in the debate are spending much of their time on educational efforts. The administration is trying to persuade educators of the dangers involved in passing information on too freely, while calling on businessmen to be more cautious in their dealings with foreign countries. A feeling exists that the U.S. scientific and technical community is naive about the nature of civilian and military research in the Soviet Union. At the same time, the academic community is trying to explain how scientific research is most successful in a free environment, and how universities are poorly equipped for controlling information.

Branscomb says, "Universities should not be asked to do either proprietary or classified work and should remain free and open. Companies and the government should control that which must be controlled and not depend on universities to exercise control in their behalf."

The academic and national security communities "must be willing to sit down together and look for practical policies on technical data exports that are compatible with a national commitment to technical excellence, effective protection for sensitive military information, and the tradition of open scholarship in our universities," says Branscomb.

As part of that effort, several organizations are studying the technology export issue and meeting with government officials. In the last month, the Department of Defense and the Association of American Universities formed a joint committee to discuss the issue. The Committee on Science, Engineering and Public Policy of the National Academy of Sciences and the Academy of Engineering will be conducting a year-long study of the impact of national security regulations regarding technology transfer on the conduct of unclassified scientific and technological research. The Academy is also reviewing its policy on scientific exchanges.

Saxon says, "I believe there is a solution to this matter that would involve a reasonable mix of some security classification, some immigration control and some good faith. I know that responsible officials are working for such a solution."

A year ago, Saxon and four other university presidents wrote to the Secretaries of Commerce, State and Defense: "Restricting the free flow of information among scientists and engineers would alter fundamentally the system that produced the scientific and technological lead that the government is now trying to protect and leave us with nothing to protect in the very near future. The way to protect that lead is to make sure that the country's best talent is encouraged to work in the relevant areas, not to try to build a wall around past discoveries."

Branscomb says, "The best solution is to get ahead and stay ahead, in basic research, industrial technology and military capability." □

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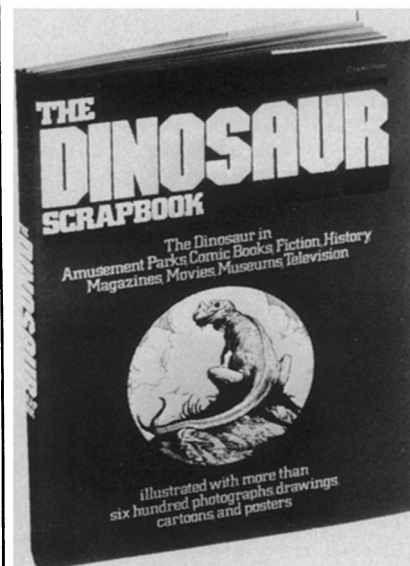
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