

# Controls on Sensitive Research—Their Evolution

According to *Soviet Acquisition of Militarily Significant Western Technology*, a report published by the Department of Defense (DOD) last year, information gleaned from scientific conferences in the West has contributed substantially to the success of the Soviet military-industrial manufacturing base. It says the Soviets estimate that data picked up at some 35 targeted conferences in the late 1970s and early 1980s "produced savings of millions of rubles in long-range military research projects—savings roughly equivalent to 100 man-years of effort." Moreover, the DOD report says, "The fact that numerous professional and scientific conferences are specifically identified as valuable sources in advance by the VPK indicates their exploitation is not fortuitous, but carefully planned."

DOD considers the VPK, or Soviet Military Industrial Commission, to be the most powerful organization in the Soviet defense-research establishment. It says VPK not only coordinates development of all Soviet weapons but also the national-level Soviet program to acquire Western technology. The U.S. intelligence community believes many if not most of the roughly 2,000 Soviet Bloc scientists and engineers on professional visits to the United States each year probably attempt to fulfill high-priority VPK requirements. Each such requirement is a document, piece of hardware, or set of data specifically targeted for collection. According to DOD, the Soviet Academy of Sciences, State Committee for Science and Technology, (GKNT) and State Committee for Foreign Economic Relations (GKES) all contribute to meeting VPK's stated "requirements" through the directives they give researchers before sending them into the West to attend conferences or to participate in cooperative exchanges.

In an effort to thwart what DOD describes as the West's "subsidizing" of the Soviet military buildup, the Reagan administration has since 1980 stepped up measures to control the communication of much science and technical data in disciplines deemed "militarily critical." While most U.S. scientists do not object to the motives driving the government's clamp down, many are nonetheless concerned about the negative effects this program has had on both individual scientists and scientific societies. In particular, they object that extensive restrictions are being placed on access to unclassified information—information that until recently has largely been freely communicated within the international research community. Many scientists and research societies have begun

arguing strenuously that by placing limits on the exchange of scientific and engineering information, the U.S. government may inadvertently stifle innovation, and in so doing, jeopardize national security.

As the American Physical Society's Robert L. Park said in testimony before an August 11 Senate Foreign Relations Subcommittee hearing on free trade in ideas: "One has only to look at our political adversaries to witness the effect of government restraints. Soviet biology trails far behind that of the West, largely as a result of years of official support for the discredited genetic theories of Lysenko. Solid-state electronics in the Soviet Union has never fully recovered from the official decision to stress germanium-based technology over silicon-based. It is hard to believe that these decisions could have long persisted in an atmosphere of free discussion." It's unfortunate, he said, but "at times the U.S. seems intent on emulating the Soviet Union's failed system by careless application of export control laws to the transfer of information."

In a letter to Defense Secretary Caspar Weinberger last year, the presidents of 12 scientific and engineering societies voiced their objections to many of these new controls, especially to what they termed DOD's de facto imposition of a new category of classification—one that limits publication of affected unclassified data to a limited audience, usually one consisting of U.S. residents only. Arguing that such a classification runs counter to the principal missions of their organizations, the presidents vowed their groups "will not be responsible for, nor will they sponsor, closed or restricted access technical sessions at meetings or conferences conducted under their auspices."

"[T]he U.S. scientific and technical enterprise has been battered in the past several years by actions and threats of actions on the government's part to suppress the normal disclosure of unclassified findings," according to William D. Carey, executive officer of the American Association for the Advancement of Science (AAAS). In congressional testimony this past summer he noted that "open scientific and technical conferences have been interfered with repeatedly and obnoxiously, hundreds of prepared papers have been sequestered, scientists have been warned to clean up their act or face severe penalties, universities have been pressured to exercise surveillance over foreign students, and publishers of journals have had to walk a tightrope in trying to judge whether or not a technical discussion contains something

that will strike some government functionary as requiring an export license." The result, he said, is that "[t]here is a lot of intimidation in the atmosphere, and it is driving some of our best government, industrial, and university scientists to decline to discuss their work at conferences of their peers."

## National Security Decision Directive 189

The Reagan administration, mindful of these arguments by influential scientists and societies, has sought to appease the research community—in part, by eliminating some of the uncertainty about which programs will be subject to controls. For instance, on September 21, 1985, President Reagan signed a directive establishing White House policy on the extent to which certain nonclassified research data could be controlled. According to that National Security Decision Directive (NSDD)189:

"It is the policy of this administration that, to the maximum extent possible, the products of fundamental research remain unrestricted. It is also the policy of this administration that, where the national security requires control, the mechanism for control of information generated during federally funded fundamental research in science, technology and engineering at colleges, universities and laboratories is classification. Each federal government agency is responsible for: (a) determining whether classification is appropriate prior to the award of a research grant, contract, or cooperative agreement and, if so, controlling the research results through standard classification procedures; (b) periodically reviewing all research grants, contracts, or cooperative agreements for potential classification.

"No restrictions may be placed upon the conduct or reporting of federally funded fundamental research that has not received national security classification, except as provided in applicable U.S. statutes."

## What is Fundamental Research?

A key to this policy is the definition of *fundamental* research. Government gatekeepers readily admit that what one contract manager may consider "applied" could appear quite "fundamental" to another. In fact, notes Stephen B. Gould of the AAAS Committee on Scientific Freedom and Responsibility, "The label 'fundamental research' was not commonly used as a descriptive term within the scientific and

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engineering research community prior to release of [NSDD 189] in draft form in May 1984." Identifying "fundamental-research" programs is probably easiest within the National Science Foundation, because the agency uses that term as a budget category. In other funding agencies, where basic research is not so well earmarked, contractors may have a more difficult time assessing whether their nonclassified work is subject to government controls. Moreover, NSDD 189 policy does not formally address whether industrial contract work or in-house government research should be judged by the same standard.

### The Policy at DOD

To clarify this situation among the researchers it funds, the Air Force this year completed implementation of a policy first articulated in 1983 by a DOD Committee on National Security and Technology Transfer. All nonclassified basic-research and exploratory-development work—designated within DOD by the contract category designations 6.1 and 6.2 respectively—is, when performed in academia, open to unrestricted communication, except as privacy and proprietary (i.e. trade secrets) considerations dictate. Similarly, all unclassified basic research—or 6.1 work—performed for the Air Force either within industry or within its service laboratories can now be shared through unrestricted communication.

Exploratory-development (6.2) work in industry or Air Force laboratories is screened case by case for evidence that it might ultimately evolve into areas sufficiently "applied" that the work would involve things contained on DOD's Militarily Critical Technologies List (MCTL)—a cataloging of technologies for which export controls are in effect.

What type of 6.2 program might acquire controls? Explains one official: If, in a weapons-development program, a question crops up about how one of the new materials to be used will behave, "we'll want to jump back in and do a little bit more studying of that material. This will be a 6.2 project. And if, in the course of doing that work we find we're likely to give away how vulnerable that weapon might be in different environments, that's where we would want to put a review situation [potential controls] on to make sure that anything that's published sticks to the basics of evaluating characteristics of the material—and not to its usefulness in the weapons system."

To avoid surprises, the Air Force designates to researchers when a contract is signed whether such controls may/will be in effect. Where such a designation has not been made, the Air Force has pledged not to slap restrictions, after the fact, on the communication of scientific or technical data from that work.

This policy effectively clarifies for re-

searchers receiving Air Force funding—especially those within industry and the Air Force's own labs—whether there is any need to seek government approval before they communicate any technical aspect of or data derived from their studies. Those not warned of any controls at the contract signing are free to publish work developed under that contract anywhere, as long as they submit a copy of their paper to the Air Force at the same time. Notes one official, "We cannot restrict or withdraw [their papers submitted for publication]. All we can do is comment." Similarly, these researchers may discuss their work at scientific conferences attended by foreign nationals—including Soviet Bloc colleagues—without government approval.

Other DOD branches currently abide by a similar though somewhat more restrictive policy. Nonclassified 6.1 research in academia or industry is still automatically granted unrestricted communication privileges. A small number of 6.2 contracts with universities and some of those with industry will contain designations that the work is or may fall under export controls. However, unless potential restrictions are negotiated at the time of a contract's signing, DOD will put no controls on the communication of or data from this nonclassified 6.1 or 6.2 work.

For research performed at other than Air Force DOD labs, the situation is less clear. Most services have set their own policy, the general attitude being that everything a government employee writes for public distribution should be reviewed.

However, such reviews may be for matters other than national-security considerations, including export controls. For example, they may be to screen material for statements at odds with official agency doctrine or policy. The Deputy Undersecretary of Defense for Research and Advanced Technology is said to be considering extending the more liberal Air Force policy to cover Navy and Army research as well. While agency officials acknowledge such a move toward unifying DOD policy is possible, they add that the subject's relatively low priority virtually assures there will be no formal action on it any time soon.

### DOE's New Program

The Department of Energy (DOE) estimates that each year hundreds of its contract scientists and engineers are subtly lied for data—much of it unclassified—by Soviet colleagues attempting to fulfill VPK's requirements. Concerned that its contract employees in unclassified programs are inadvertently sharing more information with these Eastern Bloc colleagues than the administration deems wise, DOE has targeted a massive "education" campaign. Said one DOE official, "We're trying to put the fear of God into some of our people." The agency hopes that doing so will make its researchers more

circumspect about the type and quantity of unclassified research data they share with Soviet colleagues at international meetings and during exchange programs.

In explaining the program, the DOE official noted that many scientists conducting unclassified basic research for the agency aren't aware that their labors involve or risk encroaching on disciplines mentioned in the Militarily Critical Technologies List (MCTL). That's not necessarily surprising since the MCTL and the justification for listed technologies are both classified. Moreover, unlike DOD, DOE has not made it a practice to identify in its contracts with researchers whether information coming out of or relating to contract work will be subject to export controls. Adding still further to the confusion is the fact that although the program is ostensibly designed to be consistent with NSDD 189 policy, there is no one operational definition of what constitutes fundamental research. In fact, one agency security official noted that there are probably at least 10 different definitions floating around DOE. Nonetheless, the agency feels it's important to indicate to some researchers that as their investigations mature, discussion of program details and data may violate export-control laws.

Although DOE's new program will initially focus on agency contractors at the national laboratories, the agency intends to eventually expand it to encompass outside contract workers as well. The program was inaugurated in February at Lawrence Livermore National Laboratory, with an anti-espionage campaign known as SAFE—for Security Awareness for Employees. It included talks on "You are the Target" by the director of intelligence and counterintelligence programs for the U.S. National Security Council and by Soviet defectors.

### Revisions to Commerce Department Export Rules

Congress amended the Export Administration Act in July 1985 to include new language saying that: "It is the policy of the United States to sustain vigorous scientific enterprise. To do so involves sustaining the ability of scientists and other scholars freely to communicate research findings, in accordance with the applicable provisions of law, by means of publication, teaching, conferences, and other forms of scholarly exchange." Based on the Act's changes, the Commerce Department proposed revisions to its Export Administration Regulations (EAR), which were published in the May 16 *Federal Register*. They included the same rough definition for fundamental research as appears in NSDD 189:

"basic and applied research in science and engineering, the results of which ordinarily are published and shared broadly within the scientific community, as dis-

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## Militarily Critical Technologies List

tinguished from proprietary research and from industrial development, design, production, and product utilization, the results of which ordinarily are restricted for proprietary or national security reasons."

They also state explicitly that university research "normally will be considered fundamental research." While that has pleased many academic research organizations, a subsidiary clause has not. It states that the general freedom to communicate fundamental-research findings may be withdrawn "if a university or its researchers accept specific national security controls on a research project or activity sponsored by the U.S. government." Several academic groups, including the Council on Governmental Relations (an organization of research universities), have objected to that phrase on the grounds that it appears to violate the policy set forth in NSDD 189—that only classified fundamental research is open to export controls.

In a July 15 letter to the agency, Mark Ryan, a senior attorney for Hewlett-Packard Co., objects to another ambiguous clause in the proposed EAR which says that unclassified fundamental research within industry may be freely communicated unless it is subject to proprietary or "national security considerations." What those national-security considerations might entail is never discussed. The Commerce Department is expected to formally address these and other contested EAR provisions later in the year.

### Another Proposal to Limit Confusion

A proposed DOD directive published February 12 in the *Federal Register* attempts to resolve some of the remaining confusion. Not only does the new directive—expected to be issued in final form before the year's end—formally incorporate NSDD 189 policy, but it also formally states for the first time DOD's functional definition of fundamental research for the purposes of unrestricted scientific and technical communication—6.1 and 6.2 academic research, and 6.1 industrial research. (Until this time, DOD's evolving definition of fundamental research could only be discerned from various pieces of correspondence.) The directive also proposes formal changes to defense acquisition regulations—changes that make identification of fundamental research a contract requirement. Contracts so designated will require—in terms of publication accountability—only the simultaneous submission of papers to DOD when they are submitted to journals.

The new directive also sets target dates by which DOD will attempt to clear for publication papers that have been written by in-house researchers. Moreover, it identifies in broad terms who conference organizers should talk to within DOD when they plan scientific and technical

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Since 1976, there has been a growing shift away from controlling the export of actual products to a focus on controlling the export (sharing, communication) of what the Defense Department terms "technological know-how." To help those charged with controlling exports determine which technologies warrant control, the Defense Department developed a Militarily Critical Technologies List (MCTL), first published in October 1980. Not all militarily critical technologies are included. For example, those already possessed by or available to Warsaw Pact countries are not listed.

Since 1980, the list has been updated and revised many times. Generally, these changes reflect higher performance characteristics necessary for something to be deemed critical to enhancing the Soviet weapons program or their understanding of U.S. weapons. For example, between 1980 and 1986, the performance requirements of covered oscilloscopes and precision-time-interval measuring equipment have doubled and frequency standards have increased by an order of magnitude. Similarly, microwave-power frequency-measuring technologies have lately been restricted to "above 18 gigaHertz." However, technologies may be deleted when intelligence information confirms that they are already possessed by the Soviet Union, Bloc countries, or other "controlled destinations."

For each heading on the list, there is a general description of the technology, the military rationale for controlling it, and a list of the technology's critical elements, which include:

...manufacturing and design know-how (such as procedures, design criteria, or testing techniques) which are not in the public domain and which are necessary for the significant development, production, or use of this technology;

...equipment necessary for effectively using or applying the information or techniques on the list;

...materials specifically necessary for applying the controlled information or technology; and

...products from which controlled information or techniques can be gleaned—for example by reading a users' manual or by reverse engineering.

As of July 1986, there were 1,657 items on the list, and another 432 proposed for listing. That reflects, for this year, 65 new items, 14 deletions, and 42 revisions. The list is used throughout the federal government as a basic reference for those who make policy decisions regarding technology transfer—or export control. It has been described as the bible for those who review scientific papers or topics for scientific-conference sessions to determine whether specific unclassified but sensitive information can be openly communicated. However, the full list is classified. Only a generic list of the technologies is available to persons without an appropriate security clearance.

The following unclassified subject headings were added between January and July 1986. Most, either directly or indirectly, represent materials-related technologies. Those marked with asterisks are not entirely new: Explains DOD, portions may have been picked up from a category slated for deletion.

- Signal Processing Technology
- Computer Aided Design Technology
- Magnetic Tape Read/Write Head Technology
- Magnetic Tape Recording Media Technology
- Magnetic Tape Drive Electronics Technology
- Magnetic Tape Drive Mechanical Technology
- Advanced Graphics Workstation Technology
- Alphanumeric and Graphic Controller Technology
- Trusted Computer Base Technology
- Carbon/Carbon Composites Technology
- Direct-Acting Hydraulic Pressing Technology
- Coatings and Surface Modification Technology
- Coatings for Metallic and Metal Matrix Composite Substrates
- \*Coatings for Superalloys
- Coatings for Titanium Alloys
- \*Coatings for Metal Matrix Composites
- Coatings for Aluminum Alloys
- Coatings for Steels
- \*Coatings for Refractory Alloys
- Coatings for Ceramics, Ceramic Matrix Composites, and Carbon-Carbon Composites
- \*Coatings for Ceramics
- \*Coatings for Ceramic Matrix Composites
- \*Coatings for Carbon-Carbon
- \*Optical Coatings
- Coatings Technology for Seals
- Coatings Deposition Technology
- \*High-Current Electron Beam Generation Technology
- \*Electron Beam Injector Technology
- Electron Beam Post-Injection Accelerator Technology
- \*Electron Beam Short-Term Energy Generation Subsystem Technology
- \*Electron Beam Pointing and Control System Technology
- \*Electron Beam Propagation Technology
- \*Electron Beam Material Interactions Technology
- \*Electron Beam Target Effects and Countermeasures Technology
- \*Neutral Particle Beam Systems Technology
- Neutral Particle Beam Generation Technology
- \*Ion Beam Injector Technology
- \*Ion Beam Post Injection Accelerator Technology
- Particle Beam Short-Term Energy Generation Subsystem Technology
- \*Particle Beam Pointing and Control Subsystem Technology
- Kinetic Energy Propulsion Systems Technology
- Kinetic Energy Projectiles Technology
- Kinetic Energy Target Effects and Countermeasures Technology
- Communications Network Control Subsystems Technology
- Vehicular Survivability Technology
- Survivability Analysis/Threat Characterization Technology
- Susceptibility Reduction Technology
- Vulnerability Reduction Technology
- Ramjet Propulsion Technology
- Inlet Technology
- Ramjet Fuels and Fuel Delivery Systems Technology
- Ramjet Combustor and Nozzle Technology
- Ramjet Booster System Technology
- Undersea Vehicle Technology
- Biological, Chemical and Toxin Materials Technology
- Recombinant DNA Technology
- Bioprocessing Technology
- Biomaterials Technology
- Biosensor Technology
- Technology for Manufacture and Dissemination of Toxic Substances
- \*Primary Power System Technology

(List adapted from 7/17/86 DOD MCTL report.)

meetings—both open (unrestricted) and closed (for U.S. residents only)—on sensitive subjects.

Under U.S. federal export laws, it is the responsibility of an exporter to determine whether he/she needs to obtain a license. Explains one Defense Department official, "The State Department has no technical review capability, so it forwards papers [it receives] to DOD for advice. And they [the State Department] typically act on DOD's recommendation." A new provision in the directive would shorten the review cycle by allowing authors to submit their papers directly to DOD, instead of the State Department, for review. It reflects a deal whereby the State Department has agreed not to prosecute for export-control publication violations anyone whose work has received previous DOD clearance for public dissemination. More controversial is a provision the agency was in the process of adding this summer. It would formalize DOD's policy of encouraging scientific societies to hold restricted sessions (attendance generally limited to U.S. residents only) at their technical meetings for topics that might be straying into areas covered

by export controls.

### Actions Meet with Mixed Reviews

While, taken as a whole, these government measures do much to resolve confusion that has hovered over the scientific community since 1980 regarding what may be controlled, some confusion yet remains. And several recently articulated policies have created new concerns among scientists and research societies. For example, Robert Park believes that the growing tendency to make controls on the dissemination of research findings a contractually agreed-upon provision "should eliminate the insidious uncertainties that have been responsible for the 'chilling effect,' that leads to self-censorship." However, he adds, "Restrictions written into a contract are still restrictions and have the potential to retard our progress."

In an article on controlling access to unclassified research (to be published in the summer 1986 issue of *Library Trends*) Stephen Gould of AAAS notes that the International Traffic in Arms Regulations (ITAR), administered by the State Department, is now among the few national security

regulations which do not explicitly exempt fundamental research from export controls. Since ITAR implements provisions in the Arms Export Control Act, Gould says this Act "could be considered one of the 'applicable U.S. statutes' available [by which the government might] restrict unclassified technical data arising from such research."

And while William Carey of the AAAS applauds the qualified exemption for fundamental research from tight export controls, he—as have the heads of many other research societies—castigates the attempt by DOD to begin excluding access to some unclassified fundamental research based on nationality. Technical societies may be increasingly pressured by the U.S. government to prevent their foreign members from attending sessions on applied research. The effect, Carey says, "is to make it difficult for the scientific societies to schedule presentations representing leading-edge but unclassified work in applied and exploratory fields. And I cannot think of a faster route to mediocrity for American science and technology."

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## AAAS Survey

### Scientific Societies' Policy on Foreign Attendance

In recent years, the Department of Defense (DOD) has sought to control foreign access to scientific and technical information deemed militarily critical by urging the organizers of scientific and professional meetings to restrict foreign members or attendees from participating in state-of-the-art sessions dealing with "sensitive" technologies. DOD's rationale has been that by doing so, scientific and technical societies can continue to disseminate research findings to the widest possible audience. Officials of societies and sponsoring organizations that attempt to hold meetings on militarily critical technologies but that refuse to control who attends have in some cases been threatened with prosecution of export-control regulations.

Not surprisingly, many societies have objected to DOD's policy—especially its attempt in many cases to have the meeting organizers police who is allowed into each session. Last year the American Association for the Advancement of Science (AAAS) surveyed 61 AAAS-affiliated technical societies for their policies in holding closed meetings. Of them, 45 societies responded. Polled organizations were selected on the basis of the disciplines that their members represented (primarily physics, electronics, computer science, and engineering) "with an emphasis upon societies thought to represent the scientific and technical fields included in the Militarily Critical Technologies List." In addition, AAAS polled 24 nonaffiliated societies—including MRS. Only eight of these nonaffiliated societies responded.

Results of the survey, published earlier this year, showed that 40% of the AAAS-affiliated respondents have policies regarding foreign access to their meetings: Of these 18 societies, 12 directly prohibit sponsorship of restricted or closed meetings. The remaining six indicated they would sponsor either classified or restricted nonclassified meetings under some circumstances. Among those 22 lacking an explicit policy, several noted that the subject had never come up but that they had also never hosted either a classified or restricted session. When asked whether they had ever encountered problems with government interference in the matter of foreign participation in their meetings, only four of 24 respondents said they had. Among those four, two had adopted a formal policy.

Of the eight non-AAAS affiliated societies, five reported difficulties with government interference over attendance by foreign nationals. "The difficulties of at least three societies," according to the survey, "spring from the strict control placed by the government on all information in one area of research, the field of composite materials." It went on to add that virtually all papers springing from government research in this field have been subjected to export controls—or restricted conference attendance. Only two of the responding unaffiliated organizations had a formal policy: One allows restricted sessions, explaining that their philosophy was that "technology transfer to some is better than to none." The other does not allow restricted sessions but admitted that it was encountering pressure from within to change that policy. In general, the AAAS survey said, the response rate was too small to permit general conclusions about this group. However, it adds, "The poor response rates perhaps suggests that this is a subject that these societies are not ready to discuss because of its political sensitivity."

By contrast, the AAAS survey was able to hazard some conclusions about the affiliated societies. It says their decisions to sponsor closed or restricted meetings tend to be made "at the discretion of the officers of the affiliated societies without guidance by written or unwritten policies." Moreover, it says that within the affiliated societies, concern over this issue appears to be increasing—noting that most of those with policies have only adopted them since the government crackdown on export controls in 1980.

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