Export Control

Arden L. Bement Jr.

The turbulent changes that have occurred in the world since the beginning of the Bush administration, principally the dramatic transformation of Eastern Europe and the Soviet Union and dramatic shifts in military power projection versus economic power projection, are causing a dramatic rethinking of export control policies. In many respects this thinking transcends traditional considerations about assessing threats and planning national response strategies. The recent NRC study, *Finding Common Ground, U.S. Export Controls in a Changed Global Environment,* not only addresses the fundamental export control questions embedded in these trends, but also focuses on changing requirements for the export control of advanced industrial materials, especially those which have dual military and civilian use.*

The export control of many dual-use advanced materials technologies considered critical for defense applications (such as metal-matrix composites and advanced ceramics) has long been of increasing concern for small and large companies alike:

- Re-export license requirements imposed on our trading partners have resulted in the delisting of some U.S. sources of supply for these advanced materials because of regulatory uncertainty.
- The high transaction costs inherent in applying for and tracking export licenses through the review process have imposed "anti-competitive" financial burdens on many small- and medium-sized specialty materials companies that compete for civilian export markets.

In reviewing the classes of materials currently on the Department of Commerce Commodity Control List and the Department of Defense Militarily Critical Technologies List, I find they can be divided into four general categories:

1. Long-established, conventional materials with important military or nuclear applications, and for which there exist not only multiple sources outside the CoCom and 5(k) countries,** but also established production capabilities within the more advanced control countries. Examples include nickel-based superalloys, polymeric substrates, (such as polycarbonate sheet), fibrous and filamentary materials, and tantalates and niobates.
2. Established advanced materials with high military leverage, but for which the more advanced control countries have enough technological know-how and production capability to produce small but sufficient quantities for key strategic military systems. Examples include metal-matrix composites, ceramic composites and specific intermetallic compounds, e.g., titanium aluminides.

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3. New materials in the early stages of development. Some have high military potential but are several years away from significant-scale applications in the United States and NATO countries. Examples include diamond films, high-bandwidth compound semiconductors, high-temperature superconductors.
4. And some materials for which the U.S.S.R. is very likely ahead of the United States in both technological development and production capability. Examples include high-energy-density materials, superplastic ceramics, and magnetic materials.

For most controlled materials, the critical advantage for U.S. industry is its processing technology and "know-how." It is the "know-how" that is difficult to replicate and transfer on a global basis. Furthermore, it cannot be easily inferred through written publications. Because such procedural knowledge has long diffusion constants, it generally affords a significant lead-time advantage. Our private sector carefully protects such proprietary knowledge to gain competitive advantage in the world marketplace. Therefore, it is most difficult for the Soviet Union or any other controlled country to obtain it covertly. Generally, this type of information would be protected whether or not a material is placed on the export control list.

There are relatively few materials for which the United States controls the total materials cycle, from primary mineral extraction and reduction to finished part fabrication, eventual scrap recycling and refabrication. Mill-form shapes and semifinished parts are currently imported for most materials on the control list, and this trend is increasing.

A recent DARPA report shows that the DOD is becoming increasingly dependent on foreign sources of defense products. DARPA could not find a single weapon system that could be built entirely with U.S.-origin components. For entire categories of materials on the export control list, such as fine ceramics, semiconductors and magnetic materials, the United States is no longer in a sole technology leadership position. For several militarily critical materials, U.S. industry has fallen to the position of "fast follower." This has been highlighted in several recent assessments by the Office of Science and Technology Policy, the Departments of Commerce and Defense, and the Council on Competitiveness.†

Sometimes, effective export control involves not only the material but also the tools required to fabricate it. In some cases, the availability of the tooling in a controlled country may be more important than the availability of the semifinished materials. Because of the complexity of listing tools and materials in combination, they are currently listed separately. This leaves many options for substitution or alternate fabrication routes that may yield components of adequate quality and availability even though they do not parallel Western standards.

Another problem in assessing foreign availability for new materials technologies involves the definition of a "U.S." corporation. Because of the international nature of most materials cycles, many suppliers of new materials are subsidiaries of foreign parent companies. Likewise, many U.S.

**See news article in From Washington section in this issue.*

***CoCom (Coordinating Committee for Multilateral Export Controls) is a nontreaty organization of 17 member nations that cooperatively restricts strategic exports to controlled countries. Section 5(k) of the Export Administration Act provides preferential treatment (CoCom license privileges) for countries that promise to adopt the "five essential elements" defined by CoCom as constituting an effective export control program.*

†See related articles on critical materials lists in the June 1991 MRS Bulletin, *p. 13-14.*

materials corporations have foreign subsidiaries outside the CoCom and the 5(k) blocks. These characteristics affect a substantial fraction of materials-intensive companies. Technology in these multinational industries is transferred around the world.

Does a self-standing U.S. subsidiary of a foreign parent company which has R&D facilities in the United States, sources materials and technology from U.S. suppliers, and which serves and distributes to the U.S. marketplace, classify as a U.S. or a foreign company? Many such companies are already forming interlocking business relationships in Eastern Europe and the U.S.S.R.

I believe the time has come to adopt a more realistic policy for the export control of dual-use technologies, especially for advanced materials. In reality, the U.S. defense mobilization base has diffused around the world. We depend much more on foreign sources of advanced materials for defense hardware today than in the past.

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