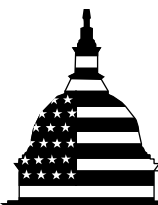January 2013

PROTECTING DEFENSE TECHNOLOGIES

DOD Assessment Needed to Determine Requirement for Critical Technologies List

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PROTECTING DEFENSE TECHNOLOGIES

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Why GAO Did This Study

DOD spends billions of dollars on sophisticated weapon systems and technologies to maintain military superiority. Such technologies are vulnerable to exploitation when exported, stolen, or lost during military missions. To identify critical technologies and help minimize these risks, DOD established the MCTL—a technical reference—as well as a compendium of worldwide emerging technologies. In 2006, GAO reported that the MCTL was out of date and not meeting users' requirements, and subsequently included the list as a key component of GAO's high risk area on protecting critical technologies. This report updates GAO's 2006 work and reviews the extent to which 1) DOD has addressed weaknesses in updating and maintaining the MCTL, and 2) agencies use the MCTL as a resource in identifying critical technologies. GAO reviewed laws, directives, and guidance, as well as documentation of DOD actions since 2006 to address MCTL concerns and interviewed officials from DOD and the Departments of Commerce, State, and the Treasury.

What GAO Recommends

GAO recommends that DOD take steps to (1) determine the best approach for meeting users' requirements for a technical reference to consistently identify critical technologies, whether it be the MCTL or an alternative and (2) ensure adequate resources are available to sustain the approach chosen. Further, if DOD determines that the MCTL is not the optimal solution, it should seek necessary relief from its responsibility to develop the list. DOD concurred with GAO's recommendations.

View GAO-13-157. For more information, contact Belva Martin at (202) 512-4841 or martinb@gao.gov.

What GAO Found

While the Department of Defense (DOD) took steps to address previously identified weaknesses in updating and maintaining the Militarily Critical Technologies List (MCTL), the list remains outdated and updates have ceased. For example, DOD has solicited users' requirements and feedback on the MCTL, and added a search engine capability to improve navigation of the list and updated each technology section at least once. DOD also determined the list's purpose is to support export control decisions and in October 2008, issued an instruction that (1) recognized the list's usefulness for other DOD programs and activities and (2) outlined the roles, responsibilities, and procedures for updating and maintaining the list. However, in 2011, DOD cut funding for the program from $4 million in prior years to about $1.5 million and ceased MCTL content updates. Subsequently, DOD removed the public version of the list from the Internet, and officials posted a disclaimer for the restricted version noting that the list should only be used for informational purposes as it had not been updated. Similarly, the compendium of emerging technologies is outdated and two sections have not been updated since 1999. Program officials from the Militarily Critical Technologies Program have devised a plan to improve how MCTL content will be updated in the future, including relying on contributions from the user community, but implementation of the plan has been limited due to funding constraints. However, program officials have yet to get input from users to agree to this approach and would still require additional funding to implement it.

The MCTL is not used to inform export decisions—its original purpose. Export control officials from DOD and the Departments of Commerce and State reiterated their longstanding concern that the MCTL is outdated and too broad to meet export control needs. DOD officials who provide input on the criticality of technologies as part of export license determinations and reviews of foreign acquisition of U.S. companies told us that they do not rely on the MCTL to inform their decision making despite DOD guidance to do so. Instead, they consult their own network of experts, which they consider to be a more reliable source to get current technology information. Other DOD programs to protect critical technologies need a technical reference such as the MCTL and have integrated the list to help inform decision making. For example, the MCTL has been fully integrated into DOD's anti-tamper critical technology tool, which is designed to facilitate analysis and decision making to protect the most valuable military assets from tampering when exported or lost in military missions. Also, to inform its analysis of industrial espionage activities such as foreign targeting of U.S. technologies, the Defense Security Service relies on the MCTL to identify overlap and connections between different technology categories. With the suspension of MCTL updates, these programs are seeking alternatives, and in one case, developing their own technical reference which could result in inefficient use of resources. DOD officials working with MCTL users have an opportunity to coordinate efforts and help minimize inconsistent approaches to identify critical technologies and any potential duplication of effort.

_____ **United States Government Accountability Office**

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United States Government Accountability Office
Washington, DC 20548

January 23, 2013

Congressional Committees

Each year, the Department of Defense (DOD) spends billions of dollars to develop and produce sophisticated weapon systems and technologies to maintain military superiority. The growing complexity and availability of these systems and technologies pose risks to U.S. national security interests. There have been increasing attempts by foreign entities to obtain illegal or unauthorized access to U.S. sensitive or classified information and technology, such as information systems, lasers, optics, and sensor technologies, which are among the most targeted technologies by foreign entities, according to the Defense Security Service (DSS). Identifying which technologies are critical to U.S. interests helps counter the threats of unauthorized access to U.S. technologies which are at risk of exploitation when exported, stolen, or lost or damaged during combat or routine missions. Failure to do so, accurately and consistently, could significantly enhance the military capability of a potential adversary and may result in insufficient protection of those systems, thereby increasing U.S. national security and economic risks.

To help minimize these risks, DOD invests resources to develop and maintain the Militarily Critical Technologies List (MCTL). The Export Administration Act of 1979 established the MCTL and required DOD to identify technologies possessed by the U.S. and which, if exported, would permit a significant advance in the military system of another country.[1] Since then, the list has expanded to capture technology capabilities developed worldwide. In 2006, we reported on several challenges facing the MCTL including that it was significantly out of date and not meeting users' requirements.[2] At that time, we made a number of recommendations to improve the utility of the list and subsequently included the identification of critical technologies as a key component of a

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[1] 50 U.S.C. app. §§ 2401-2420. Authority granted by the Act lapsed on August 20, 2001. However, the President has, to the extent permitted by law, kept in effect the provisions of the Act and its implementing regulations through Executive Order 13222 of August 17, 2001 (66 Fed. Reg 44,025). Executive Order 13222 was most recently extended by Presidential Notice on August 15, 2012.

[2] GAO, Defense Technologies: DOD's Critical Technology Lists Rarely Inform Export Control and Other Policy Decisions, GAO-06-793 (Washington, D.C: July 28, 2006).

GAO high risk area on protecting technologies that are critical to U.S. national security interests.[3] This high risk area includes eight separate programs at DOD and the Departments of Commerce, State, and the Treasury, that each have roles in protecting critical technologies. We also reported that DOD program managers faced difficulties in identifying critical technologies, increasing the risk that some technologies may not be identified and resulting in, for example, inadequate anti-tamper protection that deters or delays exploitation of critical technologies.[4] We prepared this report under the authority of the Comptroller General to evaluate government programs as part of our continued effort to assist Congress with its oversight responsibilities regarding the protection of critical technologies. This report updates our 2006 work and reviews the extent to which (1) DOD has addressed identified weaknesses in updating and maintaining the MCTL and (2) programs use the MCTL as a resource in identifying critical technologies.

To conduct our work, we reviewed the Export Administration Act of 1979, as amended, and reviewed Executive Orders, DOD directives and guidance regarding the use of the MCTL to inform export control and other policy decisions. We also obtained information and documentation on actions DOD has taken since our 2006 report to address the challenges facing the MCTL. We interviewed officials from the Departments of Commerce, Defense, State, and Treasury involved in the 8 programs that we previously identified as central to the identification and protection of critical technologies about the extent to which they use the MCTL or other resources to identify critical technologies. See appendix I for more details on our scope and methodology; the 8 programs on critical technology identification and protection are described in appendix II.

We conducted this performance audit from May 2012 through January 2013, in accordance with generally accepted government accounting standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe

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[3]GAO, High Risk Series: An Update, GAO-07-310 (Washington, D.C.: January 2007).

[4]GAO, Defense Acquisitions: Departmentwide Direction Is Needed for Implementation of the Anti-tamper Policy, GAO-08-91 (Washington, D.C.: January 11, 2008).

that the evidence obtained provides a reasonable basis for our findings and conclusions based on our objectives.

Background

DOD's key priority is maintaining military superiority. To this end, DOD has established a department-wide policy to ensure that military and dual-use articles—items that have military and commercial applications—are treated as valuable national security resources and critical U.S. military technological advances are preserved. Under the Export Administration Act, which governs exports of dual-use items, DOD has primary responsibility for developing the MCTL,[5] which has broadened to a compendium of worldwide science and technology capabilities—existing or under development—that could significantly enhance or degrade U.S. military capabilities now or in the future. First published in 1980, the MCTL's original purpose was to inform export licensing determinations and was to be integrated with expediency into the Commerce Control List,[6] which is maintained by the Secretary of Commerce and lists goods and technologies subject to export controls. The MCTL itself is not an export control list. Rather, according to DOD, it is the department's recommendation for the criteria, parameters, and operating conditions that constitute militarily critical capabilities for defense and dual-use items that should be controlled. This knowledge can be used to limit a potential adversary's access to technologies that would enable a significant military advantage.

A range of DOD components, other federal agencies, and non-government entities need to know what is militarily critical to facilitate decision making in efforts to minimize or prevent the compromise of U.S. technological or military advantage. Knowledge about which technologies are critical and warrant protection from illegal or unauthorized access is needed for, among other things:

- export controls and licensing decisions for dual-use and arms exports, which fall under the purview of the Departments of Commerce and State, respectively;

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[5]50 U.S.C. app. § 2404(d)(2).

[6]50 U.S.C. app. § 2404(d)(4).

- consideration of anti-tamper protection of critical technologies on defense systems, which is primarily coordinated by anti-tamper officials and acquisition program offices within the military services;
- review of foreign acquisitions of U.S. firms that are involved in the development or manufacture of defense technologies, which is coordinated with several federal agencies;
- counterproliferation and counterintelligence programs and activities performed by DOD entities such as DSS to protect against industrial espionage; and
- determinations about the public release of technical or scientific information.

To meet the range of information requirements and enhance knowledge of what is militarily critical, the Militarily Critical Technologies Program within DOD oversees periodic assessment of dual-use and military technologies. The program, which has resided in various DOD offices throughout its 30-year history, currently is part of the Office of the Assistant Secretary of Defense for Research and Engineering with program oversight provided by the Technology Security Office. Since its inception in 1980, the program has contracted with the Institute for Defense Analyses, a federally funded research and development center, to provide scientific and technical support to develop and maintain the MCTL.

Produced in both public and restricted versions, the list is divided into 20 sections and covers a range of technologies that are of concern in the near term. Its content is derived from periodic technology assessments completed by various technology working groups consisting of experts from government, industry, and academia, who identify the parameters and associated values at which technologies are assessed as being militarily critical, based on definitions established by the Export Administration Act. To develop the list of critical technologies, DOD is required to consider the collection of elements of technologies—design, manufacturing, inspection, testing, operations, and maintenance—which, if exported to another country, would permit a significant advantage to a

military system of that country.[7] Using the latest version of the MCTL as a baseline, experts may add or remove technologies and make other modifications based on their assessments. The experts' findings are presented in individual datasheets that profile a specific technology type. In addition to describing the technology and the technical issues that drive or influence the technology, the datasheets include quantitative and qualitative information to help facilitate determinations about the criticality of a technology. Figure 1 describes the key elements of a datasheet.

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[7]The act requires that DOD, in developing the list of militarily critical technologies, consider (1) arrays of design and manufacturing know-how; (2) keystone manufacturing, inspection, and test equipment; (3) goods accompanied by sophisticated operation, application, or maintenance know-how; and (4) keystone equipment which would reveal or give insight into the design and manufacture of a United States military system. 50 U.S.C app. § 2404(d)(2).

Figure 1: Key elements of a MCTL technology datasheet

Militarily Critical Technologies datasheet	Datasheet field	Description
	Critical technology parameters	Identifies performance levels at which a technology would permit significant advances in the development, production, and use of military capabilities of potential adversaries. For example, a Global Positioning System (GPS) device capable of receiving navigation information at speeds of 100 miles per hour might not be considered militarily critical, while a GPS device functioning at speeds in excess of 1,000 miles per hour might be considered militarily critical depending on its military application and the operating environment in which it is being used.
	Critical materials	Describes materials that are unique or enable the capability or functionality of the technology.
	Unique test, production, and inspection equipment	Includes any critical or unique test, production, and inspection equipment.
	Unique software	Includes unique algorithms and other key data to produce, operate, or maintain the technology.
	Major commercial applications	Describes commercial uses of the technology.
	Affordability issues	Describes the factors that affect the cost of the technology.
	Export control references	Identifies the export control lists, regimes, and treaties that control the proliferation of the technology such as the Commerce Control List, U.S. Munitions List, and Wassenaar Arrangement Dual-Use and Munitions List.
	Rationale	Describes the basis on which the technology would provide significant military capability.
	Worldwide technology capability	Describes which countries produce a given technology and ranks their capability.

Source: GAO summary of DOD data.

In total, the MCTL is comprised of more than 500 datasheets. As shown in table 1, the number of datasheets in each section ranges from 2 for biomedical technologies to 77 for lasers, optics, and sensors technologies, which are among the most targeted technologies by foreign entities, according to the DSS. DOD also created a companion compendium of emerging technologies being developed worldwide which includes basic research, applied research, and advanced technology development. As these emerging technologies mature and become a concern in the near term, they transition from the emerging list to the MCTL.

Table 1: Technologies Covered by the MCTL

Technology	Number of subsections	Number of data sheets
Aeronautics	5	19
Armaments and energetic materials	13	53
Biological	4	14
Biomedical	2	2
Chemical	3	19
Directed energy systems	2	9
Energy systems	4	25
Electronics	5	47
Ground systems	3	3
Information systems	6	25
Lasers, optics, and sensors	9	78
Processing and manufacturing	6	50
Marine systems	5	34
Materials and Processes	3	26
Nuclear systems	2	6
Positioning, navigation, and time	5	30
Information security	3	16
Signature control	3	22
Space systems	12	61
Weapons effects	4	29

Source: DOD.

Despite DOD's Actions to Address Weaknesses, MCTL Is Outdated and Updates Have Ceased

DOD Took Steps to Respond to MCTL Weaknesses

Since our 2006 report, DOD has taken steps aimed at clarifying the MCTL's purpose and improving its utility. For example, to better understand users' requirements, the program office solicited feedback from DOD, Commerce, State, and the Defense Technology Security

Administration (DTSA), military services, and DOD counterintelligence offices. Based on users' requirements provided at that time, DOD determined that the MCTL's purpose is to serve export control decisions. However, the department also recognized that the MCTL had expanded to serve other purposes such as counterintelligence and weapon system program protection, among other things. In addition, to allow users to more easily access the list content, DOD added a search engine capability to improve navigation and initiated efforts to convert the MCTL into a dynamic database to enable users to conduct advanced analytical queries such as identifying interdependencies across multiple technology types. In fiscal year 2007, the program's budget was doubled to $4 million, which program officials said was the appropriate funding level at the time to update and maintain the MCTL. To address concerns about the currency of the list, DOD began updating the MCTL to ensure that each technology section had been updated at least once since our 2006 report.

As part of these efforts to revamp the MCTL, DOD issued an instruction, in 2008, that clarifies MCTL implementation by outlining roles and responsibilities for informing the list's content, specifying procedures for updating and maintaining the list, and designating the purposes for which certain DOD components are to use the MCTL. Among other things, the instruction:

- specified that it is DOD policy that the MCTL serve as a technical reference to inform the development and implementation of technology security policies on international transfers of defense-related goods, services, and technologies;
- directed DTSA to consult the MCTL when developing DOD export control proposals, processing export license requests, and making technology transfer decisions;
- specified that DOD components are to use the MCTL in making decisions about what information can be shared with foreign entities and provide subject matter expertise in identifying and assessing technologies for the MCTL;
- required the development of a methodology—based on objective criteria that produce logical and repeatable results—for determining whether a given technology is militarily critical; and
- accelerated the frequency of technology section updates from every 4 years to every 2 years to keep pace with technology development.

DOD also planned to migrate its emerging technologies list to the MCTL rather than maintaining two separate lists.

According to program officials, the findings from our previous report served as a roadmap for corrective action and informed the development of a new concept of operations, drafted in 2010, which aims to implement the MCTL program requirements outlined in the 2008 DOD instruction. Further, implementation of the operational concept has been limited due to funding constraints; however, it calls for enhancing the functionality of the MCTL by:

- supporting real-time technology updates from approved contributors as information becomes available rather than updating a technology section with all its sub-sections and datasheets in a single effort;
- transitioning to a web-based application that will make data available in various document formats;
- providing a more robust capability to search across multiple MCTL technology sections which is beneficial in cases where a given technology may have relevance to multiple sections;
- enabling users to track content changes to each section and providing rationale for changes and access to previous versions; and
- linking a given technology to its corresponding reference in export control lists such as the Commerce Control List and U.S. Munitions List.[8]

MCTL Updates Have Ceased and Public Version Is Not Published Online

After responding to our 2006 report with such actions as issuing the 2008 instruction and developing the 2010 concept of operations, DOD ceased updating the MCTL in 2011 and disbanded the technology working groups that assessed technologies and produced updates because of funding constraints, according to officials. DOD provided $1.49 million for the program in fiscal year 2012, which program officials say is not sufficient to support the work needed to meet the DOD requirement to update each technology section every 2 years. In light of expected funding decreases that began in fiscal year 2012, officials decided not to invest resources in updating MCTL sections and instead dedicated resources to complete archiving of research material for section updates that were underway. In the past 6 years, each section has been updated at least once; however, the Militarily Critical Technologies Program has not fully met its goal to update each section at least every 2 years in

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[8]The Commerce Control List is maintained by the Department of Commerce and lists goods and technologies subject to export controls. The U.S. Munitions List is compiled by the Department of State and specifies defense goods and services requiring a license in order to be exported.

accordance with the 2008 DOD instruction. The majority of updates—15 of 20 technology sections—took place in 2009 as shown in figure 2.

Figure 2: MCTL Section Updates by Calendar Year

Technology	2007	2008	2009	2010	2011	2012
Aeronautics			●			
Armament and energetic materials		●	●			
Biological		●				
Biomedical			●			
Chemical			●			
Directed and kinetic energy			●			
Energy systems			●			
Electronics			●			
Ground systems	●			●		
Information security			●			
Information systems			●			
Lasers, optics, and sensors	●			●		
Marine systems			●			
Materials and processing	●		●			
Nuclear			●			
Positioning, navigation, and time			●			
Processing and manufacturing	●		●			
Signature control		●	●			
Space systems		●				●
Weapons effects				●		

///// Requirement for two-year update implemented

Source: DOD.

Although five technology sections—armament and energetic materials, materials and processing, processing and manufacturing, signature control, and weapons effects—were updated in accordance with the new

instruction, currently none of the MCTL sections are in compliance with the 2-year update requirement. While funding was not reduced until fiscal year 2012, none of the sections were updated in 2011 and only one section—space systems—was updated in 2012 to support DOD's report to Congress on the risks associated with moving certain satellite components from the U.S. Munitions List to the Commerce Control List. Four sections were updated after 2009; however, none of these updates have been validated, published, or made available to users, according to officials. Technology areas that advance rapidly, such as information security and information systems, have only been fully updated once in the past 6 years. These two sections, along with sections on electronics; biological; and position, navigation, and timing technologies, have been prioritized for updates once resources become available given the increasingly dated content in the MCTL, the technologies' impact on national security, and the rate at which these technologies are being produced.

In light of the risks associated with using outdated content to support technology protection decisions, in March 2011 program officials removed access to the public version of the list from the DOD website that hosted the list. The restricted version is still available via the same website, but program officials have posted a disclaimer noting that the list is no longer being updated and that content is being provided for information purposes only and is no longer intended to support technology decisions.

DOD has also halted its plans to integrate the compendium of emerging technologies with the MCTL. Similar to the MCTL, the emerging technologies list is no longer being updated despite DOD guidance to identify and assess such technologies. Some sections of the emerging technologies list are more outdated than the MCTL. For example, based on information we obtained from DOD, the biomedical and biological technology sections have not been updated since 1999 because of lack of funding and oversight to ensure that the Institute for Defense Analyses conducted the assessments and produced the necessary updates.

Additionally, officials noted that recent decreased funding levels hinder their ability to implement the new concept of operations to maintain and update the MCTL. In anticipation that funding may eventually be restored to execute program requirements, the program has devoted resources to begin developing electronic tools for the MCTL envisioned in the new concept of operations. These efforts are taking place without input from users on their requirements because, according to program officials, users have not been responsive to their efforts to solicit user

requirements for the new automated system. Standards for Internal Control in the Federal Government specifies that agencies should obtain information from stakeholders that may have a significant impact on a program's ability to achieve its goals.[9] Such information has an operational and budget impact and helps managers identify specific actions that need to be taken to achieve program goals and objectives.

MCTL Is Not Being Used for Its Original Purpose, and Other Programs Face Challenges Because It Is Outdated

The Absence of the MCTL's Use in Export Control Decisions Remains Unchanged

As we reported in 2006, the MCTL is not being used to inform export control or license determinations as originally established under the Export Administration Act. Specifically, Commerce, which is primarily responsible for reviewing and approving export licenses for dual-use and other items subject to the Export Administration Regulations, does not rely on the MCTL to inform such decisions.[10] Instead, Commerce relies on the technical and policy expertise of its staff and that of DOD, State, and the Department of Energy to inform decisions on export licenses and revisions to the Commerce Control List. Commerce officials reiterated longstanding concerns that the MCTL is too broad to be useful in reviewing individual export license applications. As early as 1982, soon after the MCTL was established, we reported that Commerce found the MCTL lacked the specificity needed to inform licensing decisions.[11] In 2006, GAO again reported that Commerce officials were not using the list because the content is too broad and is not current. Commerce officials

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[9]GAO, Standards for Internal Control in the Federal Government, GAO/AIMD-00-21.3.1 (Washington, D.C.: November 1999).

[10]Commerce shares this responsibility with DOD, State, and the Department of Energy.

[11]GAO, Export Control Regulation Could Be Reduced Without Affecting National Security, GAO/ID-82-14, (Washington, D.C.: May 26, 1982).

also added that the MCTL may need to be produced, in part, as a classified product to better serve export control and licensing decisions. Although not specifically required to consult the MCTL, State also does not use it to inform its export license decisions for military technologies or in its review and approval of Foreign Military Sales. Instead, in deliberating export license applications State defers to DTSA for technical expertise. Commerce and State officials noted that the absence of the MCTL and suspension of MCTL updates have not impeded their ability to conduct export control or licensing functions.

DTSA, which plays a central role in export controls and technology transfer and security functions, also does not consult the MCTL, despite DOD guidance to do so for licensing and export control decisions. Under the Export Administration Act, the MCTL is to be sufficiently specific to guide export licensing decisions. However, DTSA, Commerce, and State officials agreed that the MCTL lacks the specificity needed to inform such decision making. In addition to export controls decisions, DTSA provides input on behalf of DOD on decisions related to proposed foreign acquisitions of U.S. companies to determine whether the transaction involves technologies critical to U.S. interests. In its assessments of militarily critical technologies for export controls or other purposes, DTSA relies on its resident experts—which includes 50 engineers, who are considered to have unique knowledge of military and dual-use systems and capabilities—because these experts regularly consult with industry to bolster their knowledge of new capabilities and technologies and frequently seek the military services' perspectives on the exportability of military and dual-use items. In addition, DTSA relies on its informal network of experts across DOD, the defense industrial base, and the research and development community in lieu of relying on a technical reference such as the MCTL, which they describe as a static product that has had difficulty keeping current with technology advancements. According to DTSA officials, its network of experts has a greater understanding of the technologies that DTSA reviews than can be obtained from the MCTL because DTSA's network of experts can provide up-to-date information about a rapidly-developing technology that is not easily captured in a reference publication.

While DTSA officials do not directly consult the MCTL, DTSA has convened its own technical working groups, that, in the past, have enlisted experts from the MCTL technology working groups to provide assistance in developing and evaluating proposed changes to the Wassenaar Arrangement—a multilateral export control regime with 41 member countries that focuses on controlling the spread of certain

conventional arms and sensitive dual-use items.[12] DTSA officials stated that disbanding the technology working groups has not adversely affected DTSA's ability to carry out its responsibilities, since DTSA has its own in-house technology working groups, which draw from the same pool of expertise as the MCTL technology working groups.

An official from the Militarily Critical Technologies Program cautioned that using DTSA's informal approach to determine critical technologies impedes DOD's ability to maintain a record of these decisions for future analysis and decision making and does not ensure the use of objective criteria to produce repeatable results. Officials from the Militarily Critical Technologies Program explained that the MCTL is not an export control list, but rather an inventory of military and dual-use items that pose a threat to U.S. interests if obtained by an adversary. As provided in the Export Administration Act, the list is to be sufficiently specific to guide determinations regarding export licensing decisions.

Other Programs Rely on the MCTL and Face Challenges Because Updates Have Ceased

The purpose of the MCTL has evolved from informing export control and licensing decisions to serving various DOD programs, such as anti-tamper and counter-espionage. While these functions are outside of the original purpose of the MCTL, these programs and initiatives require knowledge on what is militarily critical. While these programs have different missions, they refer to the MCTL and have integrated this technical reference into their processes. In an effort to create a consistent and standardized method for identifying critical technologies across multiple programs, the Army and Navy have issued guidance that designates the MCTL as a reference that can be used to support the identification of critical technologies as part of the broader spectrum of critical program information.[13] For example, the Navy issued guidance identifying the MCTL as an available resource for acquisition programs to use in determining critical technologies, among other things. Similarly, the Army Research and Technology Protection Center Handbook recommends that Army acquisition programs use the MCTL to categorize

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[12]Wassenaar Arrangement has two control lists: a munitions list and dual-use list.

[13]Critical program information includes components of an acquisition program such as information, technologies, or systems that, if compromised, would degrade combat mission effectiveness, shorten the expected combat effective life of the system; reduce technological advantage; significantly alter program direction, or enable an adversary to counter, copy, or reverse engineer the technology or capability.

their critical technologies according to the applicable MCTL technology sections. Additionally, the DOD instruction regarding the MCTL that was issued in 2008 recognized that the list informs a range of functions including intelligence, counterintelligence, and weapon systems program protection, among others.

In the absence of MCTL updates, DOD efforts that have a need for a technical reference to inform critical technology protection now face challenges. For example,

- DOD's Anti-Tamper Executive Agent integrated the MCTL into its critical technology tool, which was developed to provide greater consistency across DOD programs in identifying critical technologies and determining whether anti-tamper solutions should be applied.[14] Using this tool, DOD acquisition program managers draw on the MCTL in determining which technologies are critical to their weapon systems and need anti-tamper protection to deter or delay exploitation of critical technologies. While DOD anti-tamper officials had a generally favorable view of the premise of the MCTL, they expressed concerns about the currency of the list as well as delays in publishing updated content, noting that in some instances, the content had become outdated by the time the information was published. Similar to Commerce officials, DOD anti-tamper officials noted that greater specificity in describing critical parameters is needed for the MCTL to be fully useful; however, this would require that the list be produced as a classified reference. The critical technologies tool is intended to be widely used across DOD and is also used by the defense industry, which plays a role in the initial identification of critical technologies and associated protective measures. Recently, DOD anti-tamper officials met with industry representatives to discuss a range of issues including the impact of suspending MCTL updates. Given the suspension of MCTL technology assessments and updates, the list may no longer be a viable reference for assisting in anti-tamper decisions. As the MCTL content ages, the list may increasingly lose relevance to ongoing acquisition programs. The absence of updates for technologies that advance rapidly, such as microelectronics, could render the related MCTL technology section unreliable. While a replacement for the MCTL has not yet been identified, a Navy anti-

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[14]In addition to the MCTL, the tool also includes the Missile Technology Control Regime and a stealth technology reference.

tamper official noted that export control lists such as the Commerce Control List or U.S. Munitions List would need to be bolstered with additional information to provide the utility that the MCTL provides in program protection efforts to be considered as potential alternatives. Currently, however, as part of the President's export control reform initiative, efforts are underway to restructure the U.S. Munitions List and Commerce Control List in order to create a single positive control list, which would describe items using objective criteria, such as qualities to be measured—accuracy, speed, and wavelength—as well as units of measure—such as hertz and horsepower. Navy anti-tamper officials stated that it is too early to tell whether this will be a viable replacement as the reform efforts are in the early stages.

- The MCTL's taxonomy was adapted for use in DOD's Acquisition Security Database, which the department has adopted to aid information sharing on critical program information—including critical technologies—across DOD acquisition programs. Within the database, the MCTL does not function as a decision-making tool, but rather ensures uniformity in how critical technology determinations are cataloged, referenced, and searched. DOD officials noted that the MCTL taxonomy provides a useful means for grouping technologies that acquisition programs have identified as critical. Such grouping of acquisition programs' critical technologies facilitates more efficient analysis of horizontal protection and helps minimize inconsistent protections when identical or similar technologies are present in multiple weapon systems. In the absence of a replacement, the MCTL remains part of the database, though DOD officials stated that relevance of the MCTL content will diminish over time given the rapid changes in technologies for many of the technologies covered by the MCTL.

- DSS uses the MCTL to support its counter-espionage activities. Specifically, DSS monitors suspicious attempts to obtain illegal or unauthorized access to restricted information. DSS refers to the MCTL to identify and define the U.S. defense technologies being targeted by foreign entities. Additionally, the list of militarily critical technologies allows DSS to assess the overlap and connections between different categories of technologies which, in turn, bolsters its analysis. DSS had previously relied on the compendium of emerging technologies for its analysis, but found it to be outdated and too broad for its purposes. Despite the aging content and lack of updates, DSS first reported using the MCTL in its 2011 report on foreign targeting of U.S. technologies. DSS officials consider the MCTL to be a standard reference that is recognized by the broader community involved in identifying and protecting critical technologies. Unlike other users, DSS does not require specificity in the MCTL, but uses the broader

descriptions of the technology areas. Given the lack of MCTL updates, DSS officials considered adopting other references they had identified within DOD, Commerce, and State. For example, it considered using a list relating to items of proliferation concern, but decided against it because the list was too broad and not organized in a manner that would meet DSS's needs. Faced with difficulty in finding a suitable alternative to the MCTL that sufficiently meets its needs, DSS now plans to develop its own technology reference. Such an undertaking will be time consuming and diverts resources from other missions, according to DSS officials.

- DOD currently has efforts underway to inform a methodology for vetting potential critical technologies. However, DOD is unable to consider the MCTL as part of this methodology because of concerns about the currency of the list and the suspension of updates. A DOD official we spoke with noted that other resources such as the Commerce Control List, Missile Technology Control Regime,[15] U.S. Munitions List, and Wassenaar Arrangement Dual-Use and Munitions List are being considered instead of the MCTL. It is too early to tell whether this methodology will meet the needs of programs that currently use the MCTL and help to standardize critical technology identification as the effort has not yet been completed.

Scientists and researchers involved in the development and manufacture of critical technologies for DOD may also have a need for a standardized reference and refer to the MCTL to make determinations about the public release of scientific and technical information for existing and emerging technologies. For example, a representative from a federally-funded research and development center we spoke with noted that it continues to rely on the MCTL despite its aging content as the center has not yet identified a suitable replacement that is as user-friendly. However, using an outdated resource increases the risk of unauthorized disclosure about existing or developing technologies, since an aging MCTL might not include new technology types developed subsequent to publication and could result in inadvertent disclosure. The risk of such disclosures poses a threat to U.S. interests and could result in fines or other penalties. Amid concerns about the currency of the MCTL, the official told us the center is considering adopting the Commerce Control List in lieu of the MCTL, but

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[15]The Missile Technology Control Regime (MTCR) is a multi-lateral export control regime with 34 member countries. The MTCR members control a common list of items which is contained in the MTCR annex and covers rocket systems and UAVs, as well as a broad range of equipment, software, and technology.

is waiting for completion of the ongoing export control reform efforts that includes establishing a positive control list before pursuing this alternative.

Conclusions

Since its inception, the MCTL has experienced challenges in meeting its original purpose to support export licensing decisions as established by the Export Administration Act. Consequently, the export control community has identified ways to obtain DOD input without the MCTL. Despite this, use of the list has evolved to meet other needs for a technical reference that provides a baseline to help achieve consistency in identifying what technologies are critical in order to maintain a technological advantage for the warfighter and to preserve U.S. investment in critical technologies. Faced with uncertainty about the availability of the MCTL, programs are considering alternatives, and in one case, developing their own technical reference, which may not be in the best interest of the federal government as such actions redirect resources from other critical missions and may result in unnecessary duplication and inconsistent approaches to identify and protect critical technologies. Having a technical reference that is current and available in a format that meets users' needs could help to minimize the risk of inconsistent identification and protection of U.S. critical weapon systems and technologies and, in turn, preserve U.S. technological edge for the warfighter. Gaining an understanding of users' information requirements on what is militarily critical is an important first step as DOD builds a case for future program funding for the MCTL or other approaches.

Recommendations for Executive Action

Recognizing that there are widespread requirements to know what is militarily critical, we recommend that the Secretary of Defense take the following two actions:

1. determine the best approach to meeting users' needs for a technical reference, whether it be MCTL, other alternatives being used, or some combination thereof; and

2. ensure that resources are coordinated and efficiently devoted to sustain the approach chosen.

If DOD determines that the MCTL is not the optimal solution for aiding programs' efforts to identify militarily critical technologies, we also recommend that the Secretary of Defense seek necessary relief from DOD's current responsibility.

Agency Comments

We provided a copy of this report to DOD, Commerce, and State for their review and comment. In its written comments, reproduced in appendix III, DOD concurred with our recommendations. DOD, Commerce, and State provided technical comments that we have incorporated as appropriate.

We are sending copies of this report to interested congressional committees, as well as the Secretaries of Commerce, Defense, State, and Treasury. In addition, the report will be available at no charge on GAO's web site at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-4841 or martinb@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

Belva M. Martin
Director
Acquisition and Sourcing Management

The Honorable Carl Levin
Chairman
The Honorable James M. Inhofe
Ranking Member
Committee on Armed Services
United States Senate

The Honorable John Kerry
Chairman
The Honorable Bob Corker
Ranking Member
Committee on Foreign Relations
United States Senate

The Honorable Howard P. McKeon
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

The Honorable Ed Royce
Chairman
The Honorable Eliot L. Engel
Ranking Member
Committee on Foreign Affairs
House of Representatives

Appendix I: Scope and Methodology

To determine the extent to which the Department of Defense (DOD) addressed identified weaknesses in updating and maintaining the Militarily Critical Technologies List (MCTL), we obtained program documents such as the MCTL Concept of Operations which was drafted in 2010. We also reviewed various DOD policy documents such as DOD Instruction 3020.46, The Militarily Critical Technologies List, which was issued in 2008. We interviewed officials from the Militarily Critical Technologies Program and the Institute for Defense Analyses (IDA) about initiatives or actions taken to address MCTL shortcomings and obtained program funding data. Using program documentation and reviews of MCTL content available on the IDA and Defense Technology Information Center websites, we assessed DOD's efforts to update MCTL technology sections in accordance with requirements set forth in DOD policy. We also interviewed officials within DOD and the Departments of Commerce, State, and Treasury to obtain their perspectives on the MCTL. We compared DOD's efforts to enhance the MCTL with criteria in Standards for Internal Control in the Federal Government specifically that agency management should ensure there are adequate means of obtaining information from external stakeholders who may have a significant impact on the agency achieving its goals.[1]

To determine the extent to which programs use the MCTL as a resource to identify critical technologies, we interviewed officials from DOD, Commerce, State, and Treasury. These officials represent programs that we have previously identified as central to the identification and protection of critical technologies. (See appendix II for a description of these programs.) Within DOD, we discussed use of the MCTL with officials from various offices including the Anti-Tamper Executive Agent, Defense Security Cooperation Agency, Defense Security Service, Defense Technology Security Administration, Deputy Assistant Secretary of Defense for Systems Engineering, and the U.S. Navy Anti-Tamper Technical Authority. We also interviewed representatives from a defense contractor and a federally funded research and development center about their use of the MCTL. We also reviewed applicable statutory provisions such as the Export Administration Act of 1979 to identify the purposes for which the MCTL was established. To assess the degree to which the MCTL has been integrated in various DOD program activities and initiatives, we interviewed DOD officials and reviewed department and

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[1]GAO/AIMD-00-21.3.1.

military service-level guidance and policy documents regarding the use of the MCTL to inform export control and other policy decisions.

We conducted this performance audit from May 2012 through January 2013 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: U.S. Government Technology Protection Programs

The U.S. government has a number of programs to identify and protect critical technologies. These programs include those that regulate the exports of defense items and investigate the proposed foreign acquisitions of U.S. national-security related companies. Multiple federal agencies administer or play a role in these programs which are described in Table 2. In 2007, GAO named these programs as part of a high risk area, Protection of Technologies Critical to U.S. National Security Interests.[1]

Table 2: U.S. Government Programs for the Identification and Protection of Critical Technologies

Program	Agencies	Program's purpose
Militarily Critical Technologies Program	Defense	Identify and assess technologies that are critical for retaining U.S. military dominance
Dual-Use Export Control System	Commerce (lead), State, Central Intelligence Agency, Defense, Energy, Homeland Security, and Justice	Regulate export of dual-use items by U.S. companies after weighing economic, national security, and foreign policy interests; the Commerce Control List is maintained under this system
Arms Export Control System	State (lead), Defense, Homeland Security, and Justice	Regulate export of arms by U.S. companies, giving primary to national security and foreign policy concerns; the U.S. Munitions List is maintained under this system
Foreign Military Sales Program	State and Defense (leads), Homeland Security	Provide foreign governments with U.S. defense articles and services to help promote interoperability while lowering the unit costs of weapon systems
National Disclosure Policy Process	State, Defense, and intelligence community	Determine the releasability of classified military information, including classified weapons and military technologies, to foreign governments
Committee on Foreign Investment in the United States (CFIUS)	Treasury (lead), Commerce, Defense, Homeland Security, Justice, State, and six offices from the Executive Office of the President	Investigate the impact of foreign acquisitions on national security and to suspend or prohibit acquisitions that might threaten national security
National Industrial Security Program	Defense (lead), applicable to other departments and agencies	Ensure that contractors, licensees, and grantees appropriately safeguard classified information in their possession by ensuring uniformity in security procedures
Anti-Tamper Policy	Defense	Establish anti-tamper techniques on weapons systems when warranted as a method to protect critical technologies on these systems, thereby preventing and/or delaying exploitation of critical technologies in U.S. weapons systems

Source: GAO.

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[1]GAO-07-310.

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RESEARCH
AND ENGINEERING

DEC 20 2012

Ms. Belva M. Martin
Director, Acquisition and Sourcing Management
U.S. Government Accountability Office
441 G Street, N.W.
Washington, DC 20548

Dear Ms. Martin:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-13-157, "PROTECTING DEFENSE TECHNOLOGIES: DoD Assessment Needed to Determine Requirement for Critical Technologies List," dated November 30, 2012 (GAO Code 121070).

Sincerely,

Alan R. Shaffer
Principal Deputy

Enclosure:
As stated

GAO DRAFT REPORT DATED NOVEMBER 30, 2012
GAO-13-157 (GAO CODE 121070)

"PROTECTING DEFENSE TECHNOLOGIES: DOD ASSESSMENT NEEDED TO
DETERMINE REQUIREMENT FOR CRITICAL TECHNOLGOIES LIST"

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATIONS

RECOMMENDATION 1: Recognizing that there are widespread requirements to know what
is militarily critical, the GAO recommends that the Secretary of Defense determine the best
approach to meeting users' needs for a technical reference, whether it be Militarily Critical
Technologies List (MCTL), other alternatives being used, or some combination thereof.

DoD RESPONSE: Concur.

RECOMMENDATION 2: Recognizing that there are widespread requirements to know what
is militarily critical, the GAO recommends that the Secretary of Defense to ensure that resources
are coordinated and efficiently devoted to sustain the approach chosen.

DoD RESPONSE: Concur.

RECOMMENDATION 3: If DoD determines that the MCTL is not the optimal solution for
aiding programs' efforts to identify militarily critical technologies, the GAO recommends that
the Secretary of Defense to seek necessary relief from DoD's current responsibility.

DoD RESPONSE: Concur.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Belva Martin, (202) 512-4841 or martinb@gao.gov

Staff Acknowledgments

In addition to the contact named above, John Neumann, Assistant Director and Candice Wright, analyst-in-charge, managed this review and Emily McClintock and Jonathan Mulcare made significant contributions to the work. Richard Burkard and Hai Tran provided legal support and technical expertise, respectively. Laura Greifner provided assistance in report preparation and Roxanna Sun provided graphics support.