TRUSTED DEFENSE MICROELECTRONICS

Future Access and Capabilities Are Uncertain

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Why GAO Did This Study

DOD’s ability to provide superior capabilities to the warfighter is dependent, in part, on its ability to incorporate rapidly evolving, leading-edge microelectronic devices into its defense systems, while also balancing national security concerns. In April 2015, GAO issued a report based on a House Armed Services Committee provision in a bill for the Howard P. “Buck” McKeon National Defense Authorization Act (NDAA) for Fiscal Year 2015, for GAO to review the trusted supplier program. The NDAA for Fiscal Year 2009 required DOD to develop a strategy to ensure access to trusted sources of microelectronics. In response, DOD developed its Trusted Defense Systems Strategy, which included its trusted supplier program.

What GAO Found

In April 2015, GAO found that the Department of Defense’s (DOD) access to trusted leading-edge microelectronics faced challenging consequences stemming from manufacturing costs, supply chain globalization, and market trends, creating uncertainty regarding future access about U.S.-based microelectronics sources.

- Capital costs associated with producing leading edge microelectronics increase with each new generation of technology. Leading-edge microelectronics fabrication facilities can cost several billion dollars annually and rising capital costs of manufacturing have led to increased specialization and industry consolidation.
- Once dominated by domestic sources, the supply chain for microelectronics manufacturing is a global one—primarily in Asia.
- Industry is largely focused on high-volume production driven by demand for consumer electronics. The rapidly evolving commercial microelectronics market has short life cycles, with little need to support older technologies. Conversely, DOD’s needs for microelectronics are low-volume, unique, and, in some cases, for technologies for which there is no commercial demand. As a result, DOD’s requirements have very little influence on the commercial market.

A decade ago, the Defense Science Board concluded that DOD had “no overall vision of its future microelectronics components needs and how to deal with them. Technology and supply problems are addressed as they arise.” GAO found, in April 2015, that DOD took some efforts to address access to trusted microelectronics. For example, to address risk related to foreign sources, DOD initiated its Trusted Foundry Program (later renamed “trusted supplier program”) in 2004 through an annual contract with the IBM Corporation to provide government-wide access to leading-edge microelectronics in a trusted environment. Trust is established by assessing the integrity of the people and processes used to design, generate, manufacture, and distribute national security critical microelectronics. As part of its Trusted Defense Systems Strategy, DOD expanded, through an accreditation process which includes obtaining facility and personnel security clearances, the number of trusted suppliers—which totaled 64 as of August 2014. However, none, other than IBM, offered leading-edge technologies that met DOD’s needs.

In October 2014, IBM, which had been DOD’s sole-source supplier for leading-edge technologies for over a decade, announced the planned transfer of its microelectronics fabrication business to GlobalFoundries—a U.S.-based, foreign-owned entity; and in July 2015, the transfer was completed. As a result, continued access by DOD to the leading-edge technologies formerly provided by IBM is uncertain. By not addressing alternative options when the Defense Science Board first raised them as urgent issues and by relying on a sole source supplier for leading-edge microelectronics, DOD now faces some difficult decisions with potentially significant cost and schedule impacts to programs that rely on these technologies, as well as national security implications.
Chairwoman Hartzler, Ranking Member Speier, and Members of the Subcommittee:

I am pleased to be here today to discuss the Department of Defense’s (DOD) efforts to provide access to trusted leading-edge microelectronics.¹ As we reported in April 2015, DOD’s ability to provide superior capabilities to the warfighter is dependent, in part, on its ability to incorporate rapidly evolving, leading-edge microelectronic devices into its defense systems, while also balancing national security concerns.² However, market trends and globalization of the supply chain have created challenging consequences for DOD. The capital costs associated with production are increasing with each new generation of technology. Leading-edge microelectronics fabrication facilities now require initial capital costs of several billion dollars, in addition to facility operating costs, which can be another several billion dollars annually. Increasing capital costs of manufacturing have led to increased specialization and industry consolidation. Once dominated by domestic sources, microelectronics manufacturing is now largely conducted outside the United States—primarily in Asia—and largely focused on high-volume production driven by demand for consumer electronics. Further, the commercial microelectronics market has short life cycles—commercial firms move on to the latest technology rapidly and have no need to support older technologies. In contrast, DOD requirements for microelectronics are generally low-volume with unique requirements that cover a wide range of technologies, including, in some cases, technologies for which there is no commercial demand. In addition, these requirements are generally needed for long periods because weapon systems are often sustained over decades. As a result, DOD’s low-volume requirements have little influence on the commercial market. According to the Defense Science Board and DOD officials, the use of foreign suppliers increases

¹Microelectronics includes various micro devices, commonly referred to as “integrated circuits,” that form the basis of all electronic products. A trusted environment is required to secure national security systems by assessing the integrity of the people and processes used to design, generate, manufacture, and distribute national security critical components, and include fabrication of classified designs. Smaller feature sizes generally represent more advanced technologies and higher performance, with feature sizes of 90 nanometers or smaller generally considered leading-edge.

²GAO, Defense Technologies: Future Access to Leading-Edge Microelectronics is Uncertain, GAO-15-422RSU (Washington, D.C.; April 15, 2015). This report was issued as “For Official Use Only” given the sensitive and proprietary information involved. Details DOD deemed sensitive and proprietary must be protected from disclosure and are not disclosed in this statement.
opportunities for adversaries to corrupt technologies and introduce malicious code, and for potential loss of national security-related intellectual property.

To mitigate vulnerabilities associated with the increasing reliance on foreign manufacturers for microelectronics and to meet low-volume government needs, DOD and the National Security Agency (NSA) initiated the Trusted Foundry Program for microelectronics in 2004. Implementation of the program included the formation of the NSA’s Trusted Access Program Office, which managed a sole-source contract with the IBM Corporation—the only U.S.-based company able to meet DOD and intelligence community needs for trusted leading-edge microelectronics—to provide government-wide access to these types of microelectronics. In 2006, the Trusted Foundry Program was expanded to include firms offering mature technologies and became the “trusted supplier program.” Further, the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009 required DOD to develop a strategy to ensure access to trusted sources of microelectronics. In response, DOD developed its Trusted Defense Systems Strategy, which includes its trusted supplier program for providing access to critical microelectronics.

I am here today to discuss the extent that the trusted supplier program provides for DOD’s current and future access to trusted microelectronics. This testimony largely leverages our April 2015 sensitive but unclassified report on DOD access to leading-edge trusted microelectronics. This statement also includes updates to information on the transfer of IBM’s microelectronics business based on program documentation and discussions with industry and DOD officials that we conducted in September and October 2015. In addition, the statement draws on some conclusions from our October 2008 work on the defense supplier base, confirmed by DOD officials in 2015, and the Defense Science Board Task Force on High Performance Microchip Supply.


For our April 2015 report, we reviewed DOD’s trusted supplier program and policy guidance documents.\(^5\) We also analyzed utilization data for trusted suppliers and interviewed three of the top defense contractors based on trusted supplier utilization data. In addition, we interviewed officials in the offices of the Secretary of Defense, Defense Microelectronics Activity, NSA, Defense Advanced Research Projects Agency, Intelligence Advanced Research Projects Activity, and Institute for Defense Analysis. For further details on the scope and methodology, see our April 2015 report. We conducted the work on which this statement is based 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.

A decade ago, the Defense Science Board Task Force on High Performance Microchip Supply concluded that DOD had “no overall vision of its future microelectronics components needs and how to deal with them. Technology and supply problems are addressed as they arise. An overall vision would enable the Department to develop approaches to meeting its needs before each individual supply source becomes an emergency.”\(^6\) In addition, the report called for the U.S. government, DOD, and its suppliers to establish a series of activities to ensure that the United States maintains reliable access to the full spectrum of microelectronics components. Moreover, it acknowledged that the pace of technology development shifting to offshore locations was alarming because of the strategic significance this technology has on the U.S. economy and the ability of the U.S. to maintain a technological advantage in DOD, government, commercial, and industrial sectors. At that time of its review, the Defense Science Board strongly recommended urgent action to be taken.


In April 2015, we found, as part of DOD’s Trusted Defense Systems Strategy, the trusted supplier program was, and still is, a primary risk reduction technique for acquiring certain microelectronics for use in mission-critical components in DOD systems. In 2006, DOD began expanding the number of trusted suppliers to establish a trusted supply chain for mature “non-leading-edge” technologies. At that time, the Defense Microelectronics Activity, under the Office of the Secretary of Defense and in conjunction with other organizations, finalized criteria for trusted microelectronics suppliers deemed as “trusted” through an accreditation process, which included obtaining facility and personnel security clearances. As of August 2014, there were 63 other trusted suppliers in addition to IBM, including 15 with fabrication capabilities. Although these other suppliers do not have the leading-edge capabilities of IBM, they do provide access to a range of mature technologies. However, industry officials stated that use of accredited suppliers other than IBM has been minimal primarily because they do not have the same technologies available, especially at the leading edge. Despite DOD’s efforts to expand the number of trusted suppliers, the Department’s strategy did not address alternatives for leading-edge microelectronics. DOD’s strategy focused on two critical elements of risk: integrity—keeping malicious content out, and confidentiality—keeping critical information from getting out. However, it did not address the risk of relying on a single source. For access to leading-edge trusted microelectronics, DOD’s strategy since 2004 has been to rely on IBM as their sole-source provider of leading-edge trusted microelectronics.

In October 2014, IBM announced that its microelectronics fabrication business may be acquired by GlobalFoundries—a U.S.-based foreign-owned entity, subject to completion of applicable regulatory reviews. After this announcement, DOD initiated several actions to identify the risk of potential loss of access to leading-edge microelectronics and to identify and assess alternatives. By July 2015, GlobalFoundries announced that it cleared U.S. regulatory review and it completed the acquisition of IBM’s microelectronics business. As a result, continued future access to the technologies formerly provided by IBM is uncertain. Our work in April 2015 reviewed potential near-term options for access to IBM foundry services, including accredited trusted suppliers other than IBM, other U.S.-owned leading-edge on-shore foundries, and offshore foundries. Although the details of this work are sensitive, based on limitations DOD and defense industry officials described to us, there are no near-term alternatives to the foundry services formerly provided by IBM. We also reviewed potential longer-term options for access, including ongoing research into verification techniques and alternative manufacturing approaches, and a possible government-owned fabrication facility, the
details of which are sensitive. However, we did note that these longer-
term options all have associated risks and limitations.

As far back as our October 2008 report, and confirmed by DOD officials in
2015, we found that increasing globalization in the defense industry has
intensified debate over the use of foreign versus domestic suppliers and
presents uncertainty over the ability of the United States to maintain
military superiority in critical technology areas. Moreover, as the defense
supplier base has consolidated into a few prime contractors, competition
has been reduced and single source suppliers have become more
common for components and subsystems. This is definitely the case for
defense microelectronics. By not addressing alternative options when the
Defense Science Board first raised them as urgent issues and by relying
on a sole source supplier for leading-edge microelectronics, DOD now
faces some difficult decisions with potentially significant cost and
schedule impacts to programs that rely on these technologies, as well as
national security implications.

Chairwoman Hartzler, Ranking Member Speier, and Members of the
Subcommittee, this completes my prepared statement. I would be
pleased to respond to any questions that you may have at this time.

If you or your staff has any questions about this statement, please contact
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our Offices of Congressional Relations and Public Affairs may be found
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