

Testimony

of

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Chairman Tierney and members of the Committee, I am Mark Gordon, Director of Defense Programs at the National Center For Advanced Technologies and a member of the Executive Committee of the Manufacturing Division at the National Defense Industrial Association (NDIA). On behalf of the 1704 corporate members of NDIA including 83,000 individual members, I'm pleased to appear before the House Subcommittee on National Security and Foreign Affairs today to discuss the national security implications of U.S. manufacturing policy, and present several recommendations to improve that policy.

It must seem odd to some in the field of manufacturing and industrial production that after years of raising the alarm about the destructive trends in the U.S. industrial base and the lack of investment in vital manufacturing science, manufacturing technologies, and production infrastructure that the recent economic crisis brought on by the financial sectors has focused more attention on the inherent value of the U.S. manufacturing industrial base. This increased focus is driven by a growing recognition of the crucial role that manufactured goods play in our economic security and the potential for future growth. Likewise, the impact on National Security from an Industrial Base under pressure is beginning to get attention in critical forums such as this.

Simply put, the U.S. Manufacturing sector is of critical importance to our country, given its enormous impact across the fundamental underpinnings across many aspects of our nation's security, both economic and defense related. While manufacturing has been declining as a percent of our GDP since the 1950s, manufacturing still remains the largest productive sector in the overall U.S. economy at 11%, and the U.S. produces more goods than any other country — almost \$1.6 trillion worth in 2009, according to the Federal Bureau of Economic Analysis. Manufactured goods also represent 50% of the country's exports, limiting the deficit in our balance of trade.

The most critical benefit of manufacturing is not simply the size of the sector, but that manufacturing CREATES wealth within the U.S. by producing something of higher value from materials or common components. There are only three ways of creating wealth: Dig

it up, Grow it, or Make it. It is not a service sector which simply transfers wealth between entities; rather, it creates something of inherent value. And unlike other wealth creating sectors, such as mining or agriculture, the jobs produced by manufacturing activities are generally high paying and represent an entry into the middle class for a large portion of the workforce. To further bolster its importance, the U.S. Bureau of Economic Analysis (BEA) shows the manufacturing sector to generate a substantial benefit for other economic sectors, showing that manufacturing multiplies each dollar spent within the sector into an additional \$1.41 of economic activity, higher than any other economic sector.

Our National Security depends heavily upon our domestic manufacturing capabilities: the Defense Department relies upon the US defense industrial base for leap-ahead, innovative technologies with which to equip our warfighters and our national security is contingent upon our economic strength and viability. It is critical to understand that in the defense sector, if the government doesn't fund a particular system, industry will abandon the effort, including the underlying industrial capabilities. Work force and resources will move on to other funded programs. The segment that is not funded will eventually wither and industry will lose that capability, and once lost, these domestic capabilities take substantially more time and funding to regain. The US industrial Base is in crisis and needs attention, and based upon several key studies, the Defense Industrial base is facing a similar and parallel crisis. Moreover, the current government procurement policies will not produce the competitive, responsive, efficient and innovative industrial base that is required to face these challenges.

In my remaining testimony today, I would like to discuss four main themes for dealing with manufacturing: Leadership and cultural perceptions; Research and Development in Manufacturing; Strategic Manufacturing Capabilities for National Security; and Workforce and Infrastructure.

### **Leadership and the Cultural Perceptions**

It should be fairly obvious at this point that manufacturing and the health of the industrial base has to be elevated to a higher level in the scope of U.S. Policy considerations, and this

requires active and senior leadership, both within the Administration and the Defense Department. To crystallize this point, let me make a simple comparison: the Agriculture sector represents 1% of GDP, employs 1% of the workforce, and is represented by a cabinet Secretary. The manufacturing sector is 10x larger and is represented by an Assistant Secretary for Manufacturing and Services within the International Trade Administration of the Department of Commerce. Manufacturing and the industrial base are important enough for representation by at least a Deputy Secretary, which would also raise the level of coordination between government agencies.

In turn, defense manufacturing issues need more senior leadership within the Department of Defense, to unite policy, strategy, investment and implementation. Currently the DoD has a Director for Industrial Policy, with responsibility for stimulating competition and sustaining industrial capabilities within the defense industrial base. This office monitors the industrial base and uses authorities to promote competition or defense priorities over commercial production. However, DoD requires senior leadership for manufacturing which has the authority to define strategy and set policy, but also implement R&D alignment, infrastructure revitalization and workforce investment across all of DoD. I have recently seen legislative proposals to create a position such as this.

There is also a problem in this country with the perception of manufacturing. In a recent survey by the Manufacturing Institute and Deloitte, 81% of respondents believe that America's manufacturing base is either important or very important to their standard of living and to economic prosperity, and 77% think the U.S. needs a more strategic approach to the development of its manufacturing base. However, only 30% of respondents would encourage their children to pursue a manufacturing career. The perception is that manufacturing is something akin to a 1900 iron foundry, but the reality is a manufacturing workforce as likely to use a keyboard as a wrench, and operates in a clean, safe environment. The government needs to change this perception in order to get the high-caliber workforce which is needed for the high-tech manufacturing, particularly in the defense sector where the workforce is aging.

## **Research and Development**

Manufacturing research and development is literally the core of an innovation machine that this nation's economic engine is founded upon. Specifically, 70% of industrial R&D is performed by manufacturing-based companies, and the bulk of that R&D is applicable to manufacturing processes and procedures. This R&D results in the application of new technologies, new materials, and overall increased productivity within the manufacturing processes. All of these advances can make U.S. manufacturing more competitive within the global market, but only if the results of the R&D stay in the U.S. and add to the GDP for a significant period. Put simply- if R&D stays within the U.S., it represents an investment; if it goes offshore, it represents a cost and the country gain little benefit from the R&D.

The federal government has a role in the determination of R&D priorities, development of R&D clusters, investments for national security, and leveraging/incentivizing private industry investment. A crucial need at the macro level is the planning and management of a collaborative and highly connected research enterprise which spans large and small businesses, academia, and government research labs. Recent studies of best in class foreign R&D strategies have concluded that developing regional "Clusters" of specialized R&D partners provide the most effective model for government, academic and industry innovation, and increase the probability of transition to domestic manufacturing capabilities. These clusters also offer the highest leveraging potential for government investment and have proven to drive associated capital investment in regional facilities and infrastructure. Government policy should support the formation and management of these clusters by offering a centralized process for creating and developing them and provide for collaboration between these clusters utilizing a 'Hub and Spoke" model. Collaboration between the clusters offers innovation and product development opportunities that drive technology transition into complex systems, which offer the greatest benefits.

Turning to Manufacturing R&D for national security, the Defense Department has a single program that is chartered under USC Title 10 to develop and transition manufacturing processes and fabrication required for the production and support of Defense Systems: The DoD Manufacturing Technology (ManTech) Program. For over 50 years, the ManTech Program has been department's investment mechanism for staying at the forefront of defense essential manufacturing capability. This program has recently (March 2009)

delivered to Congress a strategic plan titled “Delivering Defense Affordability,” and I have enclosed a copy of the executive summary with my testimony today. This plan establishes four Strategic Thrusts for the program:

- 1) Effective management and **delivery of processing and fabrication technology solutions**
- 2) Active support for **a highly connected and collaborative defense manufacturing enterprise**
- 3) Active support for a **strong institutional focus on manufacturability** and manufacturing process maturity
- 4) Active support for a healthy, sufficient and effective **defense manufacturing infrastructure and workforce.**

The effectiveness of this joint program is well demonstrated: a recent report to Congress identified over 100 projects funded by ManTech from FY03-FY05 which have been implemented and yielded a cost avoidance of \$6.3B! However, the investment in the ManTech program, currently averaging \$210M level in the President’s FY11-FY16 budget, is not at the level required to effect substantial changes in the defense industrial base. A 2006 Defense Science Board study on the ManTech program concluded that the proper investment level for ManTech should be 1% of the DoD RDT&E budget, or about \$700M. This investment level would enable the DoD to pursue technical solutions for the most pressing defense manufacturing and industrial base problems facing the U.S. today and in the future.

### **Strategic Capabilities for National Security**

One of the most critical balancing acts within the industrial policy domain is between open market competition and the creation or subsidizing of a domestic industrial capability. Industrial capabilities in manufacturing processes, raw materials, components, and technologies are disappearing from the U.S. every day in the form of off-shoring, business failures, supplier mergers, material shortages, global environmental restrictions and lack of demand. In some cases, disappearing domestic capabilities can be replaced with oversea suppliers, but this is not possible for defense-essential capabilities, where access to

domestic sources is a national security requirement. The current Defense industrial policy is to rely on market forces (competition) to create, shape, and sustain the industrial, manufacturing, and technological capabilities necessary to provide our fighting forces with systems that can engage and win full-spectrum warfare. However, when absolutely necessary the Department will intervene to create and/or sustain competition, innovation, and essential industrial capabilities. If intervention is warranted, the department can use mechanisms such as direct investment in supplier infrastructure, leveraging R&D investments, procurement assistance, purchase commitments, or collaboration with other federal agencies to drive growth in domestic vendor demand.

One vital program which provides direct support for defense-essential manufacturing capability is the Title III program, part of the Defense Production Act. The Title III program provides a set of broad economic authorities, found nowhere else in law, to incentivize the creation, expansion or preservation of domestic industrial manufacturing capabilities for technologies, components and materials needed to meet national security requirements; each of which is determined through extensive evaluation as both defense essential and in need of support. The Title III program has the following four authorities:

- 1) Purchases/Purchase Commitments (*Sec. 303a*)
  - Purchases provide direct subsidy to company to assist in establishing production capacity
  - Purchase Commitments
- 2) Installation of Production Equipment (*Sec. 303e*)
- 3) Development of Substitutes (through R&D contracts) (*Sec. 303g*)
- 4) Loans/Loan Guarantees

The Title III program is, unfortunately, small in comparison to the needs of the industrial base, and multiple studies and reports have recommended a 10x increase in the funding, which has not been forthcoming.

Another critical issue is the need for steady, long-term access to affordable raw materials. Sometimes, having domestic manufacturing capability is not enough, as in the case of secure access to raw materials. A U.S. industrial base can depend upon materials which are not readily available or affordable, causing additional cost, schedule or failure. The Government Accountability Office concluded that the Defense Department lacks a consistent, department-wide framework to monitor its supplier base. This vulnerability is particularly salient for strategic materials such as titanium, cobalt and rare earth materials, which have major applications in advanced weapons systems such as smart bombs, night-vision goggles and radar. Today, China produces 97.3 percent of the world's supply of rare earth minerals; Russia produces 1.6 percent, while the United States produces only 1.1 percent. Policy is needed on this topic establishing a federal-level working group to identify and act upon the multiple options, such as stockpiling, pursuing trade violation cases, developing domestic/alternate sources, or entering into long-term purchase commitments.

Other key requirements exist for defense manufacturing, including the growing problems with counterfeit parts, environmental regulations, and visibility into the lower levels of the supply chain. Counterfeit parts are increasingly finding their way into the defense supply chain, particularly for legacy systems with longer life cycles. A key enabler for reducing counterfeit components is dealing with domestically based trusted suppliers, using a Qualified Vendor List. Trusted suppliers keep record of all transitions and thus can trace parts back to the Original Equipment Manufacturers (OEMs). However, in cases of obsolescence, there are no longer parts available from the OEM, and sources are used to procure these parts which do not have clear provenance. The DoD is defining both processes and technologies which can assist the procurement workforce in spotting and rejecting counterfeits.

Similarly, there are a growing number of environmental regulations establishing de-facto global restrictions on critical manufacturing materials. An NDIA White Paper, "Maintaining a Viable Defense Industrial Base," lays out the dangers of global manufacturing standards, such as the elimination of lead-based solder and hexavalent chromium corrosion coatings. In the case of solder, the substitute lead-free solders are much less reliable than traditional



tin-lead solders for aerospace and defense applications that involve harsh operating environments and long operating lives. Also, the United States is increasingly unable to obtain Commercial-Off-the-Shelf (COTS) electronics that contain tin-lead solders and finishes. Further, pure tin finishes being increasingly used by COTS electronics suppliers as a low-cost approach to avoid the use of lead are prone to the random growth of “tin whiskers” that can lead to unpredictable short circuit failures. The solution demands focused investment in the development of alternative materials that offer performance equal to or better than the ones replaced, and a clear DoD policy determining how to identify and apply alternatives.

Finally, a crucial tool for assessing the U.S. defense industrial base is visibility into the lower levels of the supply chain, at the second and third tier. Traditionally, DoD takes the responsibility for monitoring the capabilities and competitive viability of prime contractors, OEMs, and key first tier suppliers. The capabilities and viability of lower tier suppliers is monitored by the primes and OEMS, which have access to and contracts with these suppliers. The recent economic challenges have highlighted the dangers in not understanding these lower tiers, which are predominately small businesses and most at risk for failure from demand volatility or access to capital. This situation must change and DoD policy should specifically state that the DoD is responsible for monitoring and stress-testing the industrial base to the lowest levels. Technology advances should help these assessments, with newer modeling of supply chain networks able to stress-test the vendor networks and highlight risk.

### **Manufacturing Workforce and Infrastructure**

The manufacturing workforce has been shrinking over the past 40 years, as productivity increases have allowed manufacturing output to remain steady using fewer labor hours. However, in the past two recessions (2001, 2008), the drop in employment has been precipitous, with over 4.5 millions manufacturing jobs lost in the past 10 years. The reason for this large decrease has been the reinforcing interaction of three forces: offshore manufacturing, increased productivity and a decline in manufactured goods demand during the recessions. Offshoring is a response to lower foreign structure costs, and

increased productivity is the natural competitive reaction to those costs. The only method of increasing employment in the manufacturing sector is to increase the demand, either domestically or through exports, and this requires new technology, either in terms of new products or, more often, advanced manufacturing. Advanced manufacturing technologies, particularly at the enterprise level, requires a workforce with special skills, such as familiarization with 3-D models, distributed supply chain interaction and digital work instructions. These skills will be required in the near future in order for the U.S. to compete in either the domestic or export markets, and there are no current government programs or leadership to drive this innovation into the workforce. Unfortunately, many sectors of the workforce in China already have developed these skills (for example, in CNC machinery).

Moreover, our industrial infrastructure, and particularly that which supports defense manufacturing, has to be updated into a highly connected enterprise in order to enable the most advanced manufacturing practices. The use of Service Oriented Architectures and Model Based Engineering requires substantial infrastructure investments, and policies are needed to incentivize these capital improvements within both the nation's industrial base and the government organic base. An effective role for the DoD would be as a first adopter for many of these enterprise- level advanced manufacturing models. This would inevitably lead to a standards-based U.S. lead in these techniques and practices, which would transition to the domestic manufacturing base, create significant growth potential for new, cutting-edge U.S. manufacturing jobs, and help strategically position the defense industrial base in the increasingly hypercompetitive global economy.

Chairman Tierney and members of the Committee, I'm honored to have had this opportunity to provide you an industry perspective on the critical nature of Manufacturing to our nation. I believe that focusing on the four themes which I have covered, in addition to the on-going structural cost issues, will enable the U.S. manufacturing industries to stabilize and regain strength to provide for our economic and national security. Speaking

for the NDIA membership, I thank you all for pursuing valuable additions to U.S. Manufacturing Policies.

References:

*Maintaining a Viable Defense Industrial Base*, NDIA White paper, August, 2008

*The DoD Manufacturing Technology Program Strategic Plan (Executive Summary)*, March, 2009