

Testimony of

Norman R. Augustine

before the

Emerging Threats and Capabilities Subcommittee

of the

Committee on Armed Services

United States Senate

*** * ***

Washington, DC

May 3, 2011

STATE OF THE DEFENSE INDUSTRIAL BASE

Introduction

Sen. Hagan, Sen. Portman, members of the Subcommittee, thank you for this opportunity to share my views regarding the state of our nation's defense industrial base. It is a particular privilege to sit alongside such distinguished colleagues and long-time friends as the other members of these panels.

In the way of background as to my perspective, I should note that my career has included ten years' service in the Department of Defense, thirty years in the aerospace industry, a few years in academia, and participation in over 500 board meetings of commercially-oriented Fortune 100 companies.

Hopefully, my "retired" status permits me to take a somewhat detached, yet informed, view of the challenges confronting the nation's defense industrial base. I should emphasize that I appear before you as a private citizen and that the opinions I will express are entirely my own and do not necessarily reflect those of any organization with which I have been affiliated.

Following a few introductory remarks, I would like to address five specific categories of issues and then offer a few suggestions regarding the path forward. The categories I will consider are Financial Capital, Human Capital, Knowledge Capital, Manufacturing Capability and the Defense Industrial Ecosphere.

Perspective

In our nation's early years, defense needs were primarily satisfied by what has generally been referred to as the arsenal system. Government-owned and operated engineering and manufacturing facilities fulfilled the relatively limited categories of needs of our armed forces. This is in fact the system that was employed by the Soviet Union throughout the Cold War and is still employed by the U.S. for a few items of uniquely military equipment.

As America began to build a broader and stronger commercial manufacturing capability and as military equipment became increasingly diverse, the nation moved away from what was in essence a socialist system towards a free-enterprise approach to provisioning our armed forces—and in my opinion realized many of the same benefits following that transition that have been realized by the economy as a whole.

Following the collapse of the Warsaw Pact, leaders in our government concluded that there were too many firms supplying America's defense needs and that paying the overhead costs associated with such a structure was not in the nation's best interest. This led to a dinner meeting in the Pentagon involving the senior leadership of both the Defense Department and major defense firms. The following day, in response to a

reporter's question, I referred to the event as "The Last Supper"—a sobriquet that has stuck over the years.

During that meeting Secretary Les Aspin, Secretary Bill Perry and Director of Defense Research & Engineering John Deutch made unmistakably clear to those of us present from industry that there were more firms supplying the nation's defense needs than the nation could afford, and that it would be up to the industry to solve that problem...and this would be done with the government's support but not its direct involvement. At the meeting a chart was shown—a copy of which I have retained to this day—which indicated that a massive downsizing of the industry and a concurrent increase in efficiency was expected. Interestingly, in the case of six of the sixteen equipment categories cited in the chart, the Department of Defense said it could support only *one* industrial participant. In five other categories it indicated it was prepared to support only two suppliers.

As you know, a massive structural reengineering of the defense industrial base soon began. It ended about five years later with 70 percent of the companies or major elements of companies that supported national defense no longer in business ... along with fully half of their workers no longer employed in the industry. I am unaware of any other industry in our nation's history that has undergone such a massive change in so short a period of time—and done so with as limited disruption as occurred. Literally billions of dollars were saved by the Department of Defense, savings that continue to this day, according to the government's own independent audits.

But, all things considered, was the downsizing a good thing? In my opinion, as painful as it was to implement, it was the *only* thing to do. Would I prefer an industry with a dozen strong competitors to one with only two or three? Of course. But that was never the choice. The choice was between an industry sector composed of a dozen weak competitors with high overheads and largely unused factories and little money to invest in research or talent on the one hand, or an industry consisting of two or three strong competitors operating efficiently on the other. In perhaps familiar words, what resulted was not the best of all worlds...it was merely the best of all *possible* worlds.

I would hasten to add that I believe there is a major discontinuity that appears when one drops below two suppliers for a given category of equipment. I believe strongly in competition whenever it can be made to make sense—which is usually but, unfortunately, not always the case. With but one supplier, nationalization of an industry cannot be far behind...and with that the loss of free-enterprise market pressures in favor of a demonstrably less effective socialistic approach that has failed throughout much of the world in the commercial sphere. As capable participants are added, competitive pressures grow—but this is governed by the law of diminishing returns. In short, there is a level of defense spending within any category of equipment below which competition simply cannot be sustained. Even in this case it may be possible to maintain competition at the lower supplier-tiers which represent roughly half of defense procurement dollars.

It also needs to be recognized that the defense industry operates in a strange sort of free-enterprise system: a monopsony with occasional monopolies embedded within it. Further, it must be recognized that for so-called “defense firms” to raise the capital, both human and financial, needed for their continued survival and contribution to the nation, they must compete with every other firm in the country—not just other so-called “defense firms.” The rating agencies and equity markets make no concessions because a firm is in a business that happens to be critical to our national interests. Thus, defense suppliers, if they are to survive, must earn—and I do mean *earn*, as in *deserve*—returns commensurate with the firms with whom they compete in the financial and talent markets.

With this as background, it is particularly important to note that America can no more conduct a 21st century military operation without a viable defense industrial capability than it could without a viable Army, Navy, Air Force, Marine Corps or Coast Guard. Indeed, the “defense industrial base,” as diffuse as it may be, is in effect one more “branch” of our nation’s armed forces.

I would now like to turn to the five categories of issues that I mentioned in my introductory comments.

Financial Capital

If defense-oriented firms are to modernize their factories and expand their capabilities when called upon to do so, those firms must have access to financial capital. This in turn implies that the firms must generate a risk-adjusted total shareholder return that is competitive not simply in comparison with other defense firms but in comparison with *all* firms, both domestic and abroad. In today’s financial markets money moves literally at the speed of light as it seeks opportunity—with little regard for geopolitical borders or government needs.

Thus, firms engaged in defense procurement are a microcosm of U.S. industry as a whole—and face many of the same challenges that are encountered by other U.S. firms, plus some that are unique to their activities.

Human Capital

Throughout the Cold War the most attractive option for a scientist or engineer who wanted to work at the leading edge of science and technology was to work either in national defense or in the nation’s space program. Defense companies at that time had no difficulty attracting their share of our nation’s best and brightest. Today, young people aspiring to that same goal have far more options available to them, ranging from the biosciences to info-sciences to nano-sciences and more. In recent years one-fourth of the graduates of MIT are said to have opted to go to work for financial firms on Wall Street. Many others find their way to Silicon Valley or to the nation’s great biological research laboratories.

America's science and engineering enterprise would barely function today were it not for foreign-born individuals who came to our country to attend our world-class colleges and universities and remained here to build careers. Fully three-fourths of the PhD's in engineering granted by *U.S. universities* are awarded to non-U.S. citizens—a group that is increasingly returning home a few years after acquiring their degrees. The implications of this for the defense industry, with its dependence upon clearable employees, is evident.

Further, the Defense Department and its suppliers are not immune to the near-disastrous situation prevailing in our nation's 14,000 K-12 public school systems—particularly with regard to STEM education. The U.S. status in this regard has been thoroughly documented in a number of reports including the “Gathering Storm” series prepared by the National Academies.

In short, in seeking and retaining talent, defense suppliers face many of the same challenges as the nation's industrial firms as a whole—but to a magnified extent. This is not to suggest that there are not many highly capable and dedicated individuals serving within the defense industry today; indeed there are. But this group is increasingly narrowing itself to those individuals who just happen to have a special commitment to national security or a particular excitement for state-of-the-art rockets, aircraft, ships, and the likes.

Knowledge Capital

New knowledge capital is largely derived from basic research. Ironically, the ultimate applicability of that research is often not evident, even to those who pursue it. It is doubtful, for example, that those working in solid state physics many decades ago had in mind building iPods, iPhones, iPads, GPS, precision-guided ordnance or night vision devices. Nor is it likely that the Russian mathematician working during the Cold War on equations characterizing the reflection of electromagnetic waves realized that his work would give America the key to building stealth aircraft.

Throughout history the course of conflicts has been tipped by technological breakthroughs—from the stirrup to the long-bow to gunpowder to the rifle to the machine gun to the tank to the aircraft to the ballistic missile to the nuclear weapon to spacecraft to night vision to precision guidance ... and more.

Unfortunately, America is losing its lead in science and technology. A recent report by the U.K. Royal Society projects quite convincingly that China will overtake the U.S. in science articles published in respected journals just two years from now. This relative decline of the U.S. position impacts firms supplying defense materiel to the U.S. government just as it impacts every other U.S. firm competing in the high-tech arena. Further, U.S. industry as a whole, responding to the pressures of the financial marketplace, has largely abandoned its efforts in basic research in favor of development, and especially systems integration.

With respect to the state of *applied* technology, perhaps there is no better indicator of health than the number of new aircraft types that have been developed each decade since the 1940's. Those figures have continued to drop precipitously until today an engineer would be fortunate to work on two new aircraft types in his or her career. I once asked Kelly Johnson, head of the iconic Skunk Works, how many different aircraft he had worked on during his career and as I recall he said "thirty-two." The implications of this shrinkage with regard to the experience level achieved by today's engineers as they pass through their careers can be profound. Add to this that China is now graduating half the world's new engineers *vs.* the U.S.'s five percent and it is not difficult to see where current practices are leading.

Manufacturing Strength

The U.S. economy is now 11 percent manufacturing and nearly 80 percent services. While it is arguably possible to prosper economically with a pure service economy, the likelihood of winning major wars with a service economy seems remote. When U.S. firms weigh the benefits and liabilities of expanding their activities in research and development as well as in manufacturing, either in the U.S. or abroad, the answer is increasingly becoming to move abroad. It is generally considered that the more critical elements of those firms that serve in national defense must remain in the U.S.—for reasons that are presumably evident. This pressure does not, however, apply to the component suppliers who, though not generally considered a part of the "defense industrial base," are indispensable to it. A consequence is that the manufacturing surge capacity that the nation has available with which to quickly expand its armed forces is rapidly diminishing.

To its credit, the U.S. has sought to reduce the loss of life among those serving in our military focus by placing increasing dependence on technological capability. Unfortunately, along with the latter have come increased unit costs...and further declining production volumes ... still further exacerbating the industry's dilemma.

While such topics as contract-type and the preservation of competition deservedly receive a great deal of discussion in the manufacture of defense systems, other often overlooked factors can swamp the above issues in terms of impact. Prominent among the latter are:

- Unrealistic initial estimates of the size of the total production buys and production rates—which lead to excessive tooling costs and amortization penalties.
- Cutbacks in planned annual purchases—which diminish the significant gains that can otherwise be realized by moving down the learning curve.
- Uncertainty in year-to-year funding—which precludes efficient purchasing-quantities, discourages contractor investment in productivity measures, and leads to cancellation or renegotiation of sometimes thousands of subcontracts.
- Failure to discount future cash flows—something that would never be permitted in the private sector.

- Failure to provide reserves in proportion to the risk entailed in a task—again, something that could never be tolerated in the private sector.

Defense Industry Ecosystem

National defense today depends not only on companies generally associated with national security but also on the thousands of sub-contractors and suppliers who provide the larger firms with everything from castings and forgings to microchips and lasers. Many of these smaller firms do not possess the financial staying-power or resiliency of the larger firms and are thus even more vulnerable to turbulence in the procurement process.

Viewing the environment in which both large and small U.S. firms operate today, the outlook for our nation's security, let alone the economy as a whole, is not reassuring. American firms spend over twice as much on litigation as on research. They commonly spend more on healthcare for their employees and retirees than on the basic material that go into their products. They are subject to the second-highest corporate tax rate in the world. They are motivated by the tax laws not to return foreign earnings to be reinvested in the U.S. The patent system is ponderous and the export laws were designed for another era. The immigration laws discourage much-needed talent from remaining in our country. The prevailing tax and market structure encourages a short-term outlook and disincentivizes long-term investment—for example, research. The demise of the iconic Bell Laboratory, home of the laser, transistor and many Nobel Laureates, is but one example of the latter. If current plans are carried out the government will soon have the equivalent of two Army divisions overseeing defense procurement. While oversight is indispensable, the question of balance is nonetheless present—particularly when industry's response is likely to be to match that number of overseers within its own firms as a defensive measure.

The Way Forward

The first step in assuring a strong and efficient industrial capability with which to supply our armed forces is to take steps that will make American industry as a whole competitive. These include repairing our public schools; particularly in math and science; investing more in scientific research; controlling healthcare costs; reshaping our tax structure and encouraging; not discouraging, immigration of talented individuals in fields where America has legitimate needs.

Within the defense arena, useful steps include:

- Return to the practice of the 1960's, promoted by Dave Packard, to build prototypes of advanced systems—even though most of them may never be procured for operational use. This preserves the nation's critical engineering design teams and advances the state of the art at a relatively low cost.
- Make it extremely demanding to begin new engineering development programs—and equally demanding to change or stop them, eliminating a primary contributor to waste.

- Invest in manufacturing *process* technology, much as manufacturing *product* technology has been supported in the past, with a focus on flexible, low-rate production.
- Establish practices that enable the Department of Defense to fulfill some of its needs by drawing upon the capabilities of commercial producers. An example from the past was paying commercial airlines the marginal cost of incorporating extra-wide doors in passenger aircraft that could then accommodate military materiel, if that should be needed.
- Make it practicable once again for people with industrial experience to serve in senior positions in government functions that require a knowledge of industrial practices.
- Seek to maintain competition in development and procurement to the maximum extent practicable.
- Rewrite the export laws, including those applicable to deemed exports, to reflect the global economy as it exists today, not 25 years ago.
- Standardize equipment across the Services and our allies wherever practicable so as to permit manufacturers to exploit the benefits of higher volumes further down the learning curve.
- Continue to purchase in very limited quantities those few truly critical items that are required to sustain key elements of the defense industrial capability—even if their immediate operational need may be questionable. This is akin to paying the premium on an insurance policy.
- Utilize multi-year procurements or unit buys whenever needs are clear.
- Continue efforts to fix the defense procurement system by repairing the requirements process; providing program stability; including reserves in budgeting; and more.
- Strengthen the government's ability to serve as an intelligent buyer...but have the government itself engineer or manufacture only those items that the private sector is incapable of—or unwilling to—provide. This is, of course, the basis of the free enterprise system, a system that has shown a strength vastly exceeding that of any other systems yet conceived.

The above is a long and demanding list, yet it is only a partial list.

Nonetheless, the task to be accomplished is critically important.

Thank you for affording me this opportunity to share my concerns regarding the defense industrial base. I will of course be pleased to address any questions you might have.

NORMAN R. AUGUSTINE was raised in Colorado and attended Princeton University where he graduated with a BSE in Aeronautical Engineering, magna cum laude, and an MSE. He was elected to Phi Beta Kappa, Tau Beta Pi and Sigma Xi.

In 1958 he joined the Douglas Aircraft Company in California where he worked as a Research Engineer, Program Manager and Chief Engineer. Beginning in 1965, he served in the Office of the Secretary of Defense as Assistant Director of Defense Research and Engineering. He joined LTV Missiles and Space Company in 1970, serving as Vice President, Advanced Programs and Marketing. In 1973 he returned to the government as Assistant Secretary of the Army and in 1975 became Under Secretary of the Army, and later Acting Secretary of the Army. Joining Martin Marietta Corporation in 1977 as Vice President of Technical Operations, he was elected as CEO in 1987 and chairman in 1988, having previously been President and COO. He served as president of Lockheed Martin Corporation upon the formation of that company in 1995, and became CEO later that year. He retired as chairman and CEO of Lockheed Martin in August 1997, at which time he became a Lecturer with the Rank of Professor on the faculty of Princeton University where he served until July 1999.

Mr. Augustine was Chairman and Principal Officer of the American Red Cross for nine years, Chairman of the Council of the National Academy of Engineering, President and Chairman of the Association of the United States Army, Chairman of the Aerospace Industries Association, and Chairman of the Defense Science Board. He is a former President of the American Institute of Aeronautics and Astronautics and the Boy Scouts of America. He is a former member of the Board of Directors of ConocoPhillips, Black & Decker, Proctor & Gamble and Lockheed Martin, and was a member of the Board of Trustees of Colonial Williamsburg. He is a Regent of the University System of Maryland, Trustee Emeritus of Johns Hopkins and a former member of the Board of Trustees of Princeton and MIT. He is a member of the Advisory Board of the Department of Homeland Security and the Department of Energy, was a member of the Hart/Rudman Commission on National Security, and served for sixteen years on the President's Council of Advisors on Science and Technology. He is a member of the American Philosophical Society, the National Academy of Sciences and the Council on Foreign Affairs, and is a Fellow of the National Academy of Arts and Sciences and the Explorers Club.

Mr. Augustine has been presented the National Medal of Technology by the President of the United States and received the Joint Chiefs of Staff Distinguished Public Service Award. He has five times received the Department of Defense's highest civilian decoration, the Distinguished Service Medal. He is co-author of *The Defense Revolution* and *Shakespeare In Charge* and author of *Augustine's Laws* and *Augustine's Travels*. He holds 26 honorary degrees and was selected by Who's Who in America and the Library of Congress as one of "Fifty Great Americans" on the occasion of Who's Who's fiftieth anniversary. He has traveled in 109 countries and stood on both the North and South Poles of the earth.

(Rev: April 2011)