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**CREATING A 21<sup>ST</sup> CENTURY DEFENSE INDUSTRIAL BASE**

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The National Security environment of the 21<sup>st</sup> Century has totally changed from that of the 20<sup>th</sup> Century—as shown by the many areas listed in Table 1. However, the major supply-base change has simply been consolidation (from around 50 major suppliers to a half dozen). As a 2008 Defense Science Board Task Force (which I chaired) concluded, **“the nation currently has a consolidated 20<sup>th</sup> century defense industry, not the required and transformed 21<sup>st</sup> Century National Security Industrial Base it needs for the future.”** (reference 1)

Unfortunately, in the three years since that report, there has not been a noticeable improvement. In fact, in many areas the trends are adverse to the need—with rising costs for equipment and services; stretched out schedules; and undesirable shifts in acquisition and procurement practices (as discussed below).

To meet the 21<sup>st</sup> Century National Security environment, the industrial base must be **flexible, adaptable, agile, responsive, and innovative; and it must provide high-quality goods and services at affordable prices, in the quantities required. To achieve this, requires the government to change the way it does its business,** i.e. reform its laws, regulations, policies and acquisition/procurement practices. It must remove the current barriers—created through overregulation and detailed “input” specifications—and shift to an emphasis on creating incentives for industry to achieve the desired output results.

<b>TABLE 1: CHANGES DRIVING NATIONAL SECURITY TRANSFORMATION</b>	
1. <b>Holistic View of Security:</b>	Characterized by world-wide terrorism; pandemics; weapons proliferation; rogue nuclear states; energy dependence; insurgencies; environment; mass migration; regional conflicts; transnational threats; resource access (i.e., water, oil, critical materials); combining “soft” power and “hard” power for results.
2. <b>Domestic Economics:</b>	In a constrained resource environment, with likely reductions in defense spending (including reduced or eliminated Supplementals), trades between national security and other programs must be considered, including universal health care, Medicaid, Medicare, Social Security, and budget and trade deficits.
3. <b>Warfighting Changes:</b>	From Cold War operations to “net-centric” Warfare; Asymmetric warfare (biological, cyber, Improvised Explosive Devices [IEDs]); “war among the people” (hiding among the civilians); Joint and coalition operations; evolving doctrine requiring frontline decision-making; Systems-of-Systems (vs. autonomous platforms); “mixed force” (of contractors and military).
4. <b>Industrial Sector Changes:</b>	All sectors impacted by horizontal and vertical integration; commercial and foreign high-tech advances; open-network innovation; off-shore engineering and manufacturing; changing capital markets.
5. <b>Globalization:</b>	Technology and industry are globalized; geo-politics and scope of threats requires security coalitions; DoD no longer the leader in all military technologies; global financial markets enable borderless investing.
6. <b>Technology Changes:</b>	Including information technology, biological technology, nanotechnology, robotics, high-energy lasers, etc.; and evolutionary cycles, often measured in months rather than years. This requires not only a more responsive defense industry, but one capable of drawing on both the commercial and the global markets.
7. <b>New Missions:</b>	New DoD tasks include support of homeland security; missile defense; counterinsurgency; stability and reconstruction; cybersecurity; biodefense; non-kinetic situational influence of operations.
8. <b>Unpredictability:</b>	Today’s world requires agility, rapid responsiveness, and broad-based capabilities.
9. <b>Intelligence Changes:</b>	Intelligence is focused on integrated data, open-sources, language, and cultural understanding, as well as real-time intelligence flow between soldiers, sensors and command structure.
10. <b>Government and Industry Workforce Changes:</b>	The government workforce is aging; skill mix imbalance; rules vs. judgment; “managers” vs. “doers”; difficult to attract and retain top people. The industry workforce is also aging; eroded systems engineering skills; difficult to attract and retain top Science and Technology (S&T) people.
11. <b>Defense Budget Changes:</b>	Resource shifts from Equipment to Personnel, O&M and Homeland Security; major emphasis on services (vs. goods) e.g., 57% of acquisition dollars in FY09; frequent changes cloud spending outlook and planning (e.g., 50% procurement drop in 1990s, then doubling in 2000s).
12. <b>Isolationist/Protectionist Constraints:</b>	U.S. policy continues to inhibit the nation from gaining the security and economic benefits that could be realized from the global marketplace by, instead, focusing on “Buy American;” the Berry Amendment; obsolete International Traffic in Arms Regulations (ITAR) and export controls; and restrictions on foreign scholars, students, and S&T workers; all of which limit flexibility in acquisition options and cost savings.
13. <b>Uncertainties regarding China and Russia:</b>	With their large nuclear and conventional forces, and their internal changes, will they be integrated into the new global security environment.

Modified from DSB 2008

Let me cite a few of the recent acquisition/procurement adverse trends:

- A significant shift from contracts awarded on the basis of “best value” (i.e. a combination of risk [based on prior performance and technology status], proposed performance, schedule, and costs) to awards based on “Low Bid, Technically Acceptable”—which is an invitation to “buy in;” wait for directed contract changes (to be quoted high, in a sole-source environment); and not focus on quality, cost or schedule control, or “past performance” evaluation.
- A “requirement” to recompetete all service contracts every three years (independent of performance and costs achieved)—which is a disincentive; compared to the incentive-based requirement to recompetete every three years unless the supplier is getting higher and higher performance at lower and lower costs (in which case they deserve to receive the follow-on award).
- Not recognizing that “competition for an award” is dramatically different than “competition during execution”—where the former results in a monopoly supplier and large cost growth (from the many changes that came along—from technology changes, mission changes, interface changes, etc.); and the latter results in competitive efforts to continuously improve performance and reliability, and continuously lower costs (in order to get a larger share of each “best value” award). A current example would be the second engine for the F-35 fighter. Here, there never was a competition for the engine (only for the prime contract); and the history (from the “Great Engine War,” for the engines for the F-15 and F-16) is clear—the Air Force ran a continuous competition between Pratt and Whitney’s engine and GE’s; and they got higher and higher performance and increased reliability, at lower and lower costs, from both engines (saving over four billion dollars—

net). Since the F-35 is the largest program in history (with 11 nations participating) and since engine maintenance is the highest cost element of DoD support; and since the same two companies have both developed engines for this aircraft; instead of just giving speeches about “competition,” why not do it? And, simultaneously, maintain the only two U.S. suppliers, and their lower-tier suppliers, for the future, competitive industrial base of military jet engines.

- Another barrier to competition—this time put in place by Congress—is the passing of laws inhibiting public/private competitions (via OMB Circular A-76 rules) for work currently being done by government workers, but which is *not* inherently-governmental work. The hundreds of cases in the past have shown savings of over 30%--no matter whether the winner is the public or private sector!
- Similarly, the current Administration push for “insourcing” of work—without specifying that it is intended only for inherently-governmental work—is actually raising costs. (For example, the Air Force said they would save 40% by bringing equipment maintenance in-house; but the Congressional Budget Office (in October 2005) had stated “over a 20 year period, using military units would cost roughly 90% more than using contractors”—and “wrench-turning” is certainly not inherently-governmental (only the management and contracting for it is inherently governmental).
- Finally, some of the greatest, and most innovative, ideas in the past came from unsolicited proposals from industry (which then received an award for a “demonstration”). However, these unsolicited proposals are now being greatly discouraged, because they are getting a response that says, “Thank you for the idea, we will now put it out for competition—or otherwise it will hurt our competition scorecard.”

I could go on with the examples; but, instead, let me briefly note the four critical “*findings*” of the above-noted DSB Task Force (on achieving a 21<sup>st</sup> century industrial base):

- 1. Current trends/policies will not result in an effective industrial base.**
- 2. DoD must drive transformation to support a 21<sup>st</sup> Century military.**
- 3. Government must change to facilitate the rapid and affordable acquisition of needed weapons, systems, and services.**
- 4. A weakened DoD acquisition workforce impedes the acquisition of military capability and government oversight.**

Since “changing the way the government does its business” and, correspondingly, “transforming the National Security industrial base for 21<sup>st</sup> century needs,” is basically a “*cultural change*,” the literature is clear— for successful implementation of a cultural change it requires *leadership* (with a *vision*, a *strategy*, a *set of actions*, and a *set of metrics*).

Let me draw on (and add to) the “*recommendations*” of the DSB Task Force, in order to address the above-noted four findings:

- 1. Articulate a National Security Industrial Vision; adopt government policies to implement the Vision; structure incentives for industry to achieve the Vision; and monitor ongoing industrial dynamics to ensure its realization.**

Critically important is that this vision includes the incorporation of the high-tech, high-quality goods and services available in the competitive *commercial* market. A recent report from

the National Defense Industrial Association (NDIA, February 2011; reference 2) stated “there are many capable U.S. manufacturers that simply choose not to work in the aerospace and defense industries.” They went on to observe the many barriers (legislative, regulatory, etc.) that “prevent new suppliers from entering the aerospace and defense industries, and previous suppliers from returning (these “barriers” include: specialize cost accounting rules; export controls; intellectual property rights; government-unique “flow down” requirements to lower-tier suppliers; etc.). Finally, this group of defense industry executives concluded that “the existing suppliers base may not be the most conducive to helping the industry meet expanding requirements for improved security, higher levels of innovation and greater responsiveness.”

As I, and others, have written (in numerous articles and books), it makes economic and strategic sense (in terms of low cost, high quality, rapid response, surge capability, reduced overheads, etc.) to combine commercial and military engineering, production, and support in the same industrial operations. But to do so requires the removal of the above-noted barriers. It should be observed that other countries clearly recognize these benefits (of “dual-use” operations); and, in fact, the recently-released “Chinese defense industrial policy” explicitly advocates the use of “dual-use” (civil and military) industrial operations.

- 2. In the weapons’ “requirements process,” focus on interoperable, Net-Centric Systems-of-Systems (with independent “architects,” and enhanced government management and systems engineering, capability).**

Here, it is particularly important, in order to gain the *force-multiplier* effect of distributed sensors and shooters, in a “net-centric” model (vs. the prior, “platform centric” model), that we pay close attention to *cyber security*—in our design, development and testing.

**3. Achieve lower costs and faster-to-field capabilities, while still achieving better performance.**

As the computer world has demonstrated—with higher and higher performance, at lower and lower costs, with each new generation of systems; and with new systems coming out on 18 month cycles—it is clearly possible, using product and process technology evolution, to simultaneously realize the dual objectives, of lower cost and higher performance. However, this *requires changing the DoD “requirements” process, to include cost and schedule*; and to fully-utilize a “Block upgrade” process—beginning with proven technology (for “Block I”), in order to get it out into the field rapidly. Then, continue with R&D, to prove out the technology for future “Blocks”. (This is a common commercial practice, known as “spiral development.”) It also requires a change in the DoD “requirements process” itself (as General Cartwright, Vice Chairman of the Joint Chief’s, has recently advocated) in order for the system to respond faster to the changing “urgent needs” of the Combatant Commanders; and to be able to make faster decisions, while trading off performance, schedule and cost, in early “blocks” of the equipment, as it evolves (see reference 3).

**4. Train as we fight: Recognize the role of “contractors on the battlefield.”**

Today’s military operations involve a “mixed force” of military, government civilians, and many contractors (e.g. in Iraq and Afghanistan, around 270,000 contractors—even more than the

military). They are performing non-inherently governmental functions (with pre-training, and at low cost) but they must be government-managed; and there has been inadequate staffing, as well as inadequate planning, training, educating, and exercises in preparation for this “mixed force.”

##### **5. Focus on “staying ahead” by adequately resourcing “Engines of Innovation.”**

Historically, whenever there are shrinking budgets, the first things to be cut are research, training, and travel. With the need to “stay ahead” (i.e. to maintain technological superiority—which has been the U.S. security strategy for the past half century), we must make sure we don’t “eat our seed corn.” We must not allow our industry and university research budgets to shrink—especially in these areas: 1) for small businesses (e.g. via the “Small Business Innovative Research Program”); 2) in the Industry’s “Independent Research and Development” (which must remain “independent”—and which recently has been drifting toward efforts to support near-term “bid and proposal” efforts); and 3) in the important “manufacturing technology” effort (which must be geared to a focus on lower cost, but high quality, manufacturing processes—even when producing an item in relatively small quantities).

Finally, there are times when an R&D award (at the prime contractor level, or in a critical subsystem or part) may be the only way to maintain a competitive, potential second source in a key industrial-base area (and this award also serves to keep pressure on the current source, to continue to innovate—in order to remain competitive). Thus, there is a need for a strong link between the R&D organizations and those doing industrial base analyses.

## **6. Understand and realize the benefits of globalization while mitigating risk.**

As I wrote in “Foreign Policy” (March, 2009, reference 4), “The United States must face the fact that it no longer has a monopoly on the world's best military technology. America's path toward future security involves cooperating with allies and taking advantage of the best they have to offer, not cutting itself off and watching as its military superiority slips away.”

Given that one purpose of military procurements is to ensure competitive advantage over the other countries’ technological arsenals, the idea of depending on foreign sources for military equipment might seem ill-advised, even dangerous. But, in fact, virtually every weapons system used by the U.S. military today contains components that were manufactured or designed somewhere else—and their selection was based on higher performance; not on lower costs. Take, for example, the Army’s new mine-resistant, ambush-protected (MRAP) vehicles. Designed to protect soldiers in Afghanistan and Iraq, they have a V-shaped hull that was originally developed and refined in South Africa, along with armor that was designed in Israel, robust axles from Europe, and electronics from Asia.

Of course, critics argue that these arrangements are incredibly dangerous. After all, couldn't the U.S. weapons supply be cut off during wartime if the country were too reliant on foreign parts? Most of these foreign sources, however, are from NATO nations or other countries with which the United States has had enduring military and commercial relationships. For example, despite very public opposition in some of these countries to U.S. actions in Afghanistan or Iraq, at no time did foreign suppliers (including 20 German and two French suppliers) restrict the provision or sale of components.

Skeptics also worry about “Trojan horses” built into foreign-supplied systems, particularly in the case of software. But this potential threat can be addressed through extensive and rigorous testing and reverse engineering; just as required in the financial and medical communities. Still others raise serious and legitimate concerns about military technology leaking into the hands of rogue regimes or terrorists, or being sold to third parties without U.S. knowledge. These are certainly excellent arguments for international arms-control treaties. But there's no reason why such treaties need preclude legal arms trade among allies, along with mutually-agreed-to verification techniques.

More commonly, opponents emphasize the potential loss of jobs that might occur as a result of buying equipment from offshore firms. This was the argument critics in the U.S. Congress fell back on in March 2008 when the U.S. Air Force awarded a contract to build an airborne refueling tanker to Northrop Grumman, over rival Boeing. What made Northrop's bid controversial was that it planned to convert commercial aircraft built by the European conglomerate EADS (using Airbus aircraft) for military use. Some parts would be built in Europe and then shipped to the United States for assembly in Alabama. The response from Congress was as predictable, as it was wrongheaded. Members from both parties swiftly denounced the decision to reward the lucrative contract to a “foreign firm” (even though it was to be built in Alabama).

The Defense Department should not become a social welfare organization; and its sole responsibility should be to supply U.S. war fighters with the best equipment at the best price. Luckily, though, these two goals aren't mutually exclusive: in fact, the Air Force found that the presence of the Northrop/Airbus bid resulted in a dramatic reduction in the Boeing bid (as the eventual winner).

The United States is still the world's largest military customer (in fact, larger than all the others combined), and it's in the interest of international weapons manufacturers to do business where the buyers are. In the past decade, a number of major international firms have set up shop in the United States (bringing money and jobs to the U.S., along with their technology; and even increasing U.S. trade exports). Alone, the Northrop deal would have created tens of thousands of U.S. jobs.

It is also inconceivable that the United States would be involved in any future military operation without being in some form of international coalition. This is primarily for geopolitical reasons (rather than simply military ones), but its importance cannot be underestimated. When operating in a coalition environment, the United States must be able to fully operate in an integrated fashion with its allies; and they all must have the best possible equipment.

Despite the benefits that military globalization has already brought, Congress continues to pass laws blocking its expansion. And these laws can sometimes be directly detrimental to military operations. In 1998, export controls held up the production of a U.S. fighter plane for seven months while a U.S. company waited for an export license to supply technical data to a Dutch company that was building parts for it. These U.S. export controls even prompted one major German defense contractor to instruct its employees to “avoid U.S. defense goods at all costs.”

In addition, the export control laws also create a significant barrier to commercial firms doing defense business. For example, when a commercial electronic part was used in a “Maverick” missile (and, therefore, under export control), it also was being used in a Boeing 737 aircraft, being sold (commercially) offshore. This resulted in an export violation; and caused

Boeing a \$15 million fine. (See reference 8) Clearly, the commercial world market for electronic parts is far larger than the DoD's, so such restrictions greatly discourage commercial firms from offering their high-performance, low-cost parts to the DoD. Obviously, this leads to *specialized* DoD parts (at low volume and high cost); and to reduced exports of any parts or equipment (including commercial) that are used in DoD systems. Neither of which results is desirable.

On the import side, the 1993 "Buy American Act" requires that 51 percent of all purchases by the Pentagon be produced in the United States. This often results in foreign-designed weapons systems being transferred to the United States for production at a significant increase in cost to the American taxpayer. Congress has occasionally flirted with expanding the act to cover all military purchases. (In fact, in 2004, the House of Representatives passed a law stating that all parts of all weapon systems must be made in the U.S.; on U.S. machine tools.) This requirement would have had disastrous consequences for military procurements (i.e. lower performance and higher costs); and in some cases would have required the government to create entirely new (subsidized) industries. (Fortunately, the Senate did not concur; so it did not become law.)

It is clear that, today, technology and industry are globalized; and for the U.S. to gain the advantages of this (for economic and military benefits) it is time to revise the nation's export and import control laws! The President currently has a Task Force addressing this issue.

**7. Achieve far greater use of "best value" competitions, and foster long-term competitive dynamics.**

I have written and testified frequently about the benefits (in cost and performance) of competition. But, there are (as described above) right and wrong ways to perform a competitive acquisition (see reference 5). Weapon systems are not interchangeable commodities (so you can not just “open the envelope” and pick the low bidder) the decision must be based on a combination of *risk* (based on “past performance” of the firm and current status of the proposed technology) and the proposed performance, cost, and delivery (i.e. “best value”); as well as the probability of maintaining these “promises” in the presence of the large number of future changes (that are unavoidable in this rapidly-changing world).

So, *incentives* are required (to achieve high performance at low cost); and the best one (over the long run) is the presence of, or a credible option for, continuous competition among two sources (known as “competitive dual-sourcing”).

The usual counterargument is that “we can’t afford the second-source start-up costs;” and “this time will be different”—“We will manage the sole-source contractor, and allow no government-imposed changes.” But this just doesn’t have any credibility!

#### **8. Transform the DoD logistics system into a world-class, data-centric logistics system.**

The DoD Logistics system is, by far, the most expensive of its overall acquisition phases (in FY09 it cost over \$270 billion, and the DoD also carried an inventory of over \$90 billion); and yet, it is *not world class* (by any measure—responsiveness; reliability; asset visibility; cost; etc.). However, for warfighting, it is absolutely critical that “the right part gets to the right place, in the required time.” A comparison with the logistics systems of Walmark, UPS, Fed Ex, Caterpillar,

etc. shows that it can be done; and that the DoD has no choice but to modernize its logistics systems—both for higher performance and for significant cost savings!

The only way to achieve this is to spend some R&D money on modernizing the existing DoD's, 20<sup>th</sup> century, logistics systems (of which there are over a thousand relevant I.T. systems alone), and to continue its recent emphasis on “Performance Based (i.e. results-based) Logistics.”

**9. Recognize that, while over half of DoD's acquisitions are for services, all of the current regulations, policies, practices, education, etc. are based on acquiring goods; and this must change.**

I recently chaired a congressionally-mandated Defense Science Board Task Force on “Improvements to Services Contracting” (reference 6, May 2011), and found that, in FY09, 57% of all DoD acquisition dollars went to buying services. Of course, the boundary between hardware and services is increasingly blurred (i.e. buying transportation services as opposed to buying trucks). And, while specifying the requirements for the services, and effectively managing them, (often without clear metrics for performance) is extremely difficult, and requires extensive training and experience, this is not recognized or appreciated in current DoD policies, practices, training, education, and (particularly) in hiring and promotions. When it is realized that essentially all of the contractors in Iraq and Afghanistan are performing “services” (of an extremely wide variety), the importance of this area (to the military mission) should become clear. Additionally, when one thinks of “the defense industrial base” they tend to think of the firms building “ships, planes, and tanks;” and yet, they also need to consider those firms providing services (and receiving over half of the acquisition dollars)—and often providing these

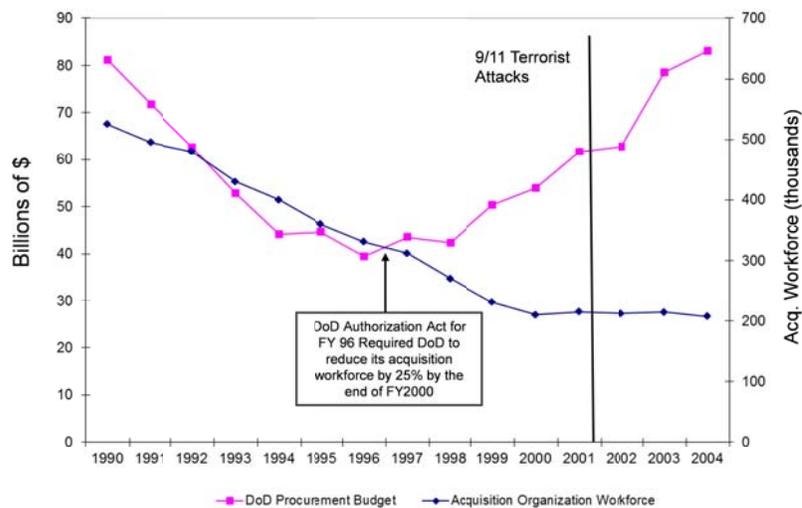
services “in harm’s way” (in fact, the dead and wounded from industry have recently been exceeding those in uniform).

It is time for policies, organizations, personnel activities, etc. to recognize that (like the U.S. economy) services are, and will continue to be, a big part of doing business in the National Security arena. This change must take place!

**10. Move aggressively to strengthen the future, high-quality, high-skill, Government Acquisition Workforce.**

When I chaired an independent Commission for the DoD on “Army Acquisition and Program Management in Expeditionary Operations” (reference 7; October 31, 2007), we were shocked to find how much the DoD acquisition workforce (particularly at the senior levels) had been *undervalued*. This is shown clearly by the data in Figure 1.

**Figure 1: Overall DoD Acquisition Workforce Declined Even as Procurement Budgets Increased**



Source of workforce data: DoD IG Report D-2000-088 Feb 29, 2000 & DoD IG Report D-2006-073 April 17, 2006  
 Source of Budget data: Annual Defense Reports, available at [http://www.dod.mil/execsec/adr\\_intro.html](http://www.dod.mil/execsec/adr_intro.html)

Since the mid-90s, as the dollars and actions for DoD acquisitions were rising dramatically, the acquisition workforce was being cut. (Twenty-five percent of this was by Congressional mandate.) Even more critical than the numbers being cut, were the senior positions. For example, in 1990 the Army had five General Offices with Contracting experience; in 2007 they had none. In this same time period, the Defense Contract Management Agency went from four General Officers to none (while their workforce went from 25,000 to 10,000). And the Air Force had cut both their acquisition General Officers and their SES acquisition personnel in half.

Without smart, well-trained, experienced acquisition buyers and managers, making the required changes in DoD buying practices, and achieving the required transformation of the industrial base (for 21<sup>st</sup> century National Security) will simply be unachievable. Fortunately, Congress has recognized this need with some important acquisition workforce legislation. Also, the Army has established the “Army Contracting Command;” while Senator Collins and Representative Connelly have recently introduced a very positive set of bills to address acquisition workforce education and training. But progress is moving slowly—and (as described above) there have been many actions (by both the Congress and the Administration) that are more focused on “rule compliance” than on “results achieved.”

One final personnel issue which must be addressed is the science and technology (S&T) workforce (in government and industry). It has been increasingly difficult to get U.S. students (in general) to go into S&T; and those that do, prefer to work in Hollywood animation, Wall Street computer modeling, or biotech; to working in aerospace and defense (the greater money, more work freedom, and greater job stability appear to be better). And one of the unique government requirements (that is requested to be “flowed down”—even to university researchers and lower-tier defense workers) is that the workers must be *U.S. citizens*. (This is in spite of the

fact that we allow 3% of the U.S. military to not be U.S. citizens.) Importantly, in 2006 the National Science Foundation reported that **“35% of those obtaining graduate degrees in science and engineering, in U.S. universities, held Temporary Visas”**—and they were even required to sign an agreement that they would leave the U.S. when their studies were completed. Given America’s history as an “immigrant nation,” and the number and quality of these foreign S&T graduate students, I would think that, after an appropriate security check, we should “staple a green card to their graduate degree;” and encourage them, along with their U.S. counterparts, to seek work in fields related to National Security. (Realizing that Enrico Fermi was not a U.S. citizen when he worked on the Manhattan Project for us; and that many of the founders of Silicon Valley were not U.S. citizens; it only makes sense to consider them.)

In summary, it is critical that the government changes the way it does its business (i.e. implement real acquisition reform); and, as a result, that the National Security Industrial base is transformed into a flexible, adaptable, agile, responsive, innovative, structure that provides high-quality goods and services (for 21<sup>st</sup> century military needs) at affordable prices and in the quantities required.

The men and women of our Armed Services deserve nothing less!

Thank you.

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