

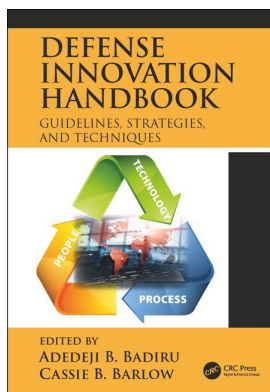
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Prescription for an affordable full spectrum defense and innovation policy

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chapter eighteen

Prescription for an affordable full spectrum defense and innovation policy

Jan P. Muczyk

Contents

Introduction 335
Economic limitations to the arms race 335
Lessons learned from the arms race 336
Does the US get good value for its huge expenditures? 337
How to make the arms race more affordable? 337
Relying on the intelligence community 337
Vital nature of total asset visibility 338
Look in the right places 338
Reducing the size of the federal defense bureaucracy 338
Building weapon systems from low-hanging fruit 339
WWII examples 339
Cold War examples 340
Appreciating the significance of economies of scale 340
The most meaningful force multiplier 341
Growing the technological fruit tree 341
Conclusion 341
References 342

Introduction

Persons knowledgeable in international relations consider the US an indispensable nation. Hence, the US needs to pursue a full spectrum defense policy, according to [1], Muczyk (2017). However, a full spectrum defense policy is expensive indeed and must compete with pressing domestic priorities. Therefore, viable ways of making it more affordable have been presented. They include: total asset viability; looking in the right places; reducing federal bureaucracy; building weapons from low-hanging fruit; exploiting economies of scale; lesser reliance on military specifications, focused leadership education; and growing the technological fruit tree.

Economic limitations to the arms race

The belief by many of our civilian and military leaders based on outdated formulas developed by Frederick Lanchester at the height of WWI that technology will negate numerical superiority has led to a reliance on transformational technology which, in turn, has resulted in staggering product development costs and unprecedented product development life

cycles. The cost of one B-2 bomber is \$2 billion, which compelled Congress to limit its volume to 21 aircraft; and one has already been lost in an accident. The cost of one F-22A is \$355 million (\$420 million with retrofit items), and it took 22 years to field the F-22A. If it were being developed for WWII, it would not have seen service until the Vietnam conflict. The joke in the Pentagon has it that the 22 stands for the number of years it took to develop this plane. The F-35 is on the same glide path as the F-22A with respect to cost and product development time [2].

Since insurgencies, the existential and near-term threats, lack air forces and navies, the US can fight them without the so-called fifth generation platforms. However, insurgencies last a long time and are expensive, and the US cannot afford to bankrupt itself with prohibitively expensive high-tech weapon systems with dubious military advantages for fighting insurgencies. Former Congressman Barney Frank, D-Mass., speaks for many legislatures: “The math is compelling: If we do not make reductions approximating 25 percent of the military budget starting fairly soon, it will be impossible to continue to fund an adequate level of domestic activity ever, with a repeal of Bush’s tax cuts for the very wealthy. American well-being is far more endangered by a proposal for substantial reductions in Medicare, Medicaid, Social Security or other important domestic areas than it would be by cancelling weapon systems that have no justification from any threat we are likely to face.”

Indeed, the opportunity costs of a large defense budget are considerable. Conservative historian Robert Kagan offers a rebuttal: “2009 is not the time to cut defense spending. A reduction in defense spending this year would unnerve American allies and undercut efforts to gain greater cooperation. There is already a sense around the world that the United States is in terminal decline. Many fear that the economic crisis will cause the United States to pull back from overseas commitments. The announcement of a defense cutback would be taken by the world as evidence that the American retreat has begun.” What Robert Kagan overlooks is the fact that our allies have not paid their fair share of their own defense since the end of WWII, and it is about time that they become unnerved [2].

Historically, the US has contributed 50 percent of NATO’s budget. Recently, the US share has jumped to 75 percent with Europeans using their economic woes as an excuse for not doing more. In light of the population size of the European Union and its combined GDP, this is inexcusable. Europe should heed the warning issued by former Secretary of Defense, Robert Gates, in his NATO valedictory address to contribute much more to its own defense because the US can easily lose the appetite to do so. A more recent Secretary of Defense, Ashton Carter, echoes Robert Gates. These gentlemen were not just crying “wolf.” With the inauguration of Donald Trump as president, the time has actually arrived. There is some talk that the European Union should have its own unified military. This notion should receive full support from the United States [2].

Lessons learned from the arms race

Nations should learn lessons not only from their war experiences but from arms races as well. As the Soviets realized, quantity has its own quality advantages, even with superior equipment. Wonder weapons, with the exemption of nuclear warheads, are not a substitute for simpler but effective counterparts available in large numbers. When Soviet Field Marshal Gregory Zhukov, who knew more about large scale warfare than anyone, with the possible exception of Napoleon, was asked at the end of WWII what it took to win a large scale military conflict, he responded: “More—more troops, more tanks, more planes, more ships, more artillery, etc.” The US WWII experience mirrors Marshal Zhukov’s advice [2].

Does the US get good value for its huge expenditures?

There is an old British saying: “When you run out of money, you must begin thinking.” It appears as though exotic weapon systems expand to exhaust the money available in the Defense Department (DoD) budget. As a result, fiscal austerity becomes the mother of an efficient and effective military. The size of the US defense budget should not be confused with national security. It took a former general, President Eisenhower, to alert the nation to the military/industrial/congressional complex, but we did not listen. Eisenhower was convinced that the “Pentagon Boys” exaggerated threats in order to get larger military budgets. The politicians went along because jobs in my district get me elected and reelected, and that is what matters. Lockheed/Martin has subcontractors for the F-35 in 47 states to gain maximum political support. And this is not an isolated exception. The Navy F-18E/F has subcontractors in 44 states.

A report by the Government Accountability Office meticulously documented in 2012 that the Pentagon’s 95 largest weapon systems were nearly \$300 billion over budget. Deloitte Consulting LLP concluded that cost overruns have steadily worsened. Technical complexity accounts for an ever-increasing percentage of weapon’s cost overruns. Complexity is also the enemy of reliability and meeting deadlines. The F-35 is so computer code dependent that writing and debugging the code has become the “long pole in the tent.” The F-35 is not only over budget and behind schedule, but the critics of the F-35, the most expensive weapon system of all time, make a compelling case that the plane can’t climb, and can’t run, and is no match for the top of the line Russian fighters if it is thrust into aerial combat. Quite frankly, the US taxpayer and our allies who are counting on this plane to be the backbone of their future air fleets deserve better. In time, the F-35 may become a viable platform since complex weapon systems experience lengthy teething problems. But that will not happen anytime soon [2].

Flawed funding processes based on unrealistic cost estimates are an integral part of the problem. Realistic cost estimates frequently are unavailable because most programs are funded and launched while there is still significant uncertainty about most everything. Hence, only fixed cost contracts should be negotiated by the DoD so that contractors also incur the risk associated with cost overruns.

How to make the arms race more affordable?

How much a nation spends on its national defense is a necessary condition, but the sufficient condition is how wisely the money is spent. We cannot risk unilateral disarmament because we no longer can count on two oceans for creating lead-time to rearm, as was the case in the past. Intercontinental ballistic missiles have seen to that. However, potential enemies continue to exist. Yet, we have pressing domestic priorities that compete with the defense budget. Hence, we must make a realistic defense policy more affordable. The ways exist. All we need is the will. First, we must guarantee that the books of the Pentagon and all the military branches are auditable. Until that is done, we cannot know what we need because we have no way of knowing what we have [3].

Relying on the intelligence community

The US has a robust Intelligence Community—both human intelligence as well as signals intelligence [4]. The information that it possesses should be the starting point with regard to identifying the assets needed to neutralize current and potential threats. Relying on

government contractors may result in the procurement of inordinately expensive systems of dubious military value. Moreover, such systems could unnecessarily fuel the arms race.

Vital nature of total asset visibility

The United States sent twice as much material to the Persian Gulf as was required, and our troops did not know where half of it was at any given moment. Half of the 40,000 bulk containers shipped into the theater has to be opened in order to identify their contents, and most of it failed to contribute in any way to our success on the battlefield. If we recognize the coalition nature of present and future conflicts, then it becomes obvious that there is a big payoff associated with integrating our asset visibility system with those of our allies.

Look in the right places

The largest savings potential rests in the mission and roles category. For example, not only does the Navy have its own Air Force and an army (the Marines), the Navy's army has its own air force as well. Incidentally, the Army has its air force (and a large one at that when rotary aircraft are included) and a navy (Corps of Engineers) too. The Air Force is anxious to rid itself of the A-10 close air support aircraft, and the best one available; which leads the ground forces to question its commitment to close air support. Little wonder that the Marines insist on providing their own close air support. Perhaps, given the fact that Air Force generals appear to be ensorcelled by high tech wizardry, the close air support mission and the A-10 should be assigned to the Army [5].

Reducing the size of the federal defense bureaucracy

The US force structure and budget have declined by about one-third from their 1985 peak levels. The infrastructure, however, has declined about 18 percent [3]. Therefore, the two should be brought into balance before reducing the end strength of combat forces, and it should be done by proven re-engineering methods instead of for political reasons. After all, the WWII experience reveals that lean organizations produced the most impressive results [6].

Re-engineering means excising those activities that are either unrelated or marginally related to the central mission (occupational hobbies), removing redundancies, and creating or refining processes through which mission relevant goals and objectives are attained in an efficient and effective manner. Re-engineering requires evaluating the value chain and eliminating or reducing components that either add no value or very little, while retaining and even enhancing those that add considerable value.

A good place to begin re-engineering efforts is activity-based accounting (ABS), a systematic method for assigning costs to business activities. First, a reasonable number of business activities need to be defined, and all costs associated with each activity need to be assigned to the appropriate activity. Once this much has been accomplished, the activities with their associated costs can be allocated to products, processes, customers, or vendors. Next, activities need to be assigned priority on the basis of cost, with the most expensive activity receiving top priority for scrutiny with respect to redundancy, relevancy, and criticality. Last, whenever appropriate, the unnecessary or marginal activities are eliminated. Whenever practicable we must insist that all technology, processes, and procedures "buy" their way into the organization in terms of reducing the total cost of doing business [7].

We need to abandon practices that have been tried and found wanting. I have in mind trying to meet the needs of all the military branches with variants of one aircraft. That was tried in the past with the tactical fighter experimental (TFX) without success. Now the DoD is trying the same things with the F-35. To meet the Marine Corps requirements for Short Takeoff Vertical Landing (STOVL) aircraft, serious design compromises were made to the Air Force and Navy variants. The McDonnell Douglas F-4 Phantom II was first built for the US Navy and was later adopted by the US Air Force and the US Marine Corps with minor modifications. Also, a number of allied countries brought the aircraft. This airplane is considered among the best multi-mission aircraft ever to see service. This strategy, however, is not to be confused with building variants of a “joint strike fighter.”

The concurrency doctrine of beginning production before testing is completed needs to be jettisoned as well. Testing reveals many problems that can only be fixed with redesign and major modification. Retrofitting is too time consuming, expensive, and often inadequate.

Economists agree that there are more cost efficient and socially beneficial job creation programs than building weapon systems. Military weapons should be justified on the basis of military necessities alone. While the author does not subscribe to the notion that national defense is too important to leave to generals (admirals), he is a strong supporter of vigilant oversight by Congressional committees and subcommittees.

Building weapon systems from low-hanging fruit

This effort demonstrates that being first with new technology provides a military advantage for a while. The length of time depends on how adversaries perceive the value of the weapon system in question. If considered critical, they will devote the necessary resources to minimize or eliminate the lead, providing they possess the economic and technical capacity to do so. Otherwise, they will either get around to it eventually or elect not to compete. The lead is important if a nation intends to start a war, and can serve as a deterrent for nations that wish to preserve the peace. Also, it is a military advantage if a nation is attacked. Simply getting the lead to demonstrate the political and economic superiority of the system a nation is committed to is of dubious military value.

Since a superpower needs to prepare for practically any contingency, and the US is indubitably such a superpower, it needs to design versatile weapon systems from low-hanging technological fruit with the capacity of being upgraded. Also, the reliance on military specifications should be restricted to areas where they are absolutely necessary. Modern weapon systems rely heavily on electronics, and electronic advances typically originate in consumer sectors of Information Technology such as computers and video games.

Also, in the interest of minimizing cost overruns change orders should be discouraged by setting “drop dead” deadlines for modifying requirements. Often, military leaders wish that a new defense system should do just about everything. Yet, typically it is the last 20 percent the accounts for a disproportionate amount of the cost. Hence, encouraging the 80 percent solution when viable should receive serious consideration from the defense acquisition community.

WWII examples

The Grumman F6F shared a heritage with the ineffective F4F. But evolutionary improvement, principally the Pratt and Whitney R-2800 double Wasp engine, made it the best Navy fighter plane during WWII, and is credited with destroying 5,163 Japanese planes.

The P-51; was an ordinary plane until it was upgraded with the Packard built Rolls-Royce Merlin engine and the bubble canopy, which made it the best fighter of WWII.

Cold War examples

The F-117 was constructed with off-the-shelf components with the exception of the foil and coating. As a result, its product development cycle and cost were uncommonly short and reasonable (schedule slippage of 13 months and cost overrun of merely 3 percent). The RQ-1A Predator is another example of matching maturing technologies with warfighter needs. The Air Force began taking deliveries of an upgraded RQ-1B less than 5 years from program inception. The best examples of upgrading weapon systems are the B-52 heavy bomber and the KC-135 aerial tanker. Both are still service. The GBU-28 Bunker Buster was developed from off-the-shelf parts, tested, and deployed in 28 days during Operation Desert Storm.

The F-18E/F Super Hornet is the evolutionary progeny of earlier F-18 models, which were designed to be upgraded. As a result of this approach, the Navy was able to field what it considers to be the most advanced multi-role strike fighter available today and for the foreseeable future. Other examples of the evolutionary approach are: The Trident II D-5, which is the sixth generation member of the navy Fleet Ballistic Missile Defense, and the Patriot Advanced Capability (PAC)-3, which was introduced during the first Gulf War [5]. The Soviet Union, now the Russian Federation, amplify the point with upgrades of the SU-27 and the MIG-29. The current US F-16s, F-15s, and F-18s are much superior platforms than the original versions as well, especially the F-15SE and F-16V. Ascertaining which upgrades provide the biggest bang for the buck is vital to this strategy. For example, while the F-22A and F-35B have limited thrust vectoring capability, providing robust thrust vectoring for all fighters and fighter bombers merits serious consideration. After all, if we accept the proposition that stealth is an asset of declining value, then eventually agility and speed will regain their historic preeminence. The US Air Force is getting ready to select a prime contractor for its next generation heavy bomber. Let us hope that it elects to upgrade the B-2 rather than rely on transformational technology to build a new one from a blank sheet. The DoD should learn from failed efforts to field weapon systems developed from transformational technology. Examples are: The Navy A-12 Avenger II; the Crusader mobile artillery; Comanche helicopter; the Army Future Combat Systems; and the Marine Corps Expeditionary Fighting Vehicle. Not only was a king's ransom spent developing these failed systems, but canceling them proved inordinately expensive as well.

Appreciating the significance of economies of scale

It is not unusual for the R&D phase of a complex weapon system to amount to as much as 50 percent of the production cost of the system. Ipso facto, purchasing such a system in small numbers drives up the cost to staggering proportions. Restricting the number of F-22A fighters to 187 was a serious blunder. The DoD could have purchased the F-22A, a superior plane to the F-35, at about the same price had it procured the required number. Now Congress has instructed the US Air Force to examine the feasibility of reopening the F-22A production line. Acquiring only 21 B2s was also a mistake that necessitated retaining three heavy bomber fleets, two of which are obsolete. Now the Air Force is compelled to launch a new heavy bomber program. Increasing joint ventures with allies and partners likewise will assist in securing the benefits of economies of scale [2].

Congress is also culpable when it comes to ignoring the benefits of economies of scale. When the DoD proposes a very expensive weapons system, rather than sending the DoD back to the drawing board to design a more affordable aircraft, it reduces the number of units, thereby driving up unit cost. Of course, producing an ineffective aircraft in large quantities is even a greater blunder.

The most meaningful force multiplier

Let us not forget that the most significant force multiplier is leadership. However, the most common degrees offered on military installations are business administration degrees, which prepare service members for post-retirement occupations. The military would get greater returns on its education dollars if it followed the example of the Air Force Institute of Technology (AFIT) and offered focused education. Approximately one-half of the AFIT faculty are civilians who see to it that best practices, even though they are derived from civilian organizations, are incorporated into the curriculum. “Little Israel” offers the best example of the multiplier effect of quality leadership with its repeated victories over the entire Arab world. In fairness, being supplied at first with modern French weapons and later with advanced US weapons helps the Israelis immensely [8].

Growing the technological fruit tree

When the Soviet Empire collapsed, the Russian Federation had to choose what parts of its defense establishment it would preserve. It elected to preserve its design bureaus rather than place orders for additional aircraft. That is to say, it chose the future over the present. Hence, the US should continue to grow the technological fruit tree by adequately funding basic as well as applied research. The Defense Advanced Research Projects Agency (DARPA), The Air Force Research Laboratory (AFRL), especially through its Air Force Office of Scientific Research Directorate (AFOSR), Air Force Institute of Technology (Graduate School of Engineering and Management), and the counterparts of the Navy, Army and Marine Corps should be funded in accordance with the high priority given pressing warfighter needs. Incentives should be provided to the private sector so that it would invest some of its capital to grow the technological fruit tree [5].

For example, Pratt and Whitney, the manufacturer of the F-135 engine that powers the Lockheed Martin F-35 fighter bomber, has upgraded the engine to produce a 6–10 percent thrust increase and a 5–6 percent fuel burn reduction by relying on the Navy sponsored Fuel Burn Reduction program and the Air Force Sponsored Component and Engine Structural Assessment Research Technology Maturation effort at no additional cost.

Conclusion

The Cold War left the US as the de facto leader of the free world with the obligation to create a defense policy capable of fighting regional conventional military engagements, counter insurgencies, as well as deterring major conflicts with the Russian Federation and China that could escalate into thermonuclear exchanges. All this created an unprecedented arms race between the US and the Soviet Union and their respective alliances, NATO and Warsaw Pact.

Since the US exited WWII with its economy unscathed by the war, it could afford guns and butter for the duration of the Cold War. Now, pressing domestic needs create serious competition for the federal dollar, and potential enemies, reverting to historical

tendencies, refuse to go away. While arms limitation treaties have slowed the arms race, the US still needs to fashion an affordable defense policy. Toward that end recommendations have been made that include: Rationalizing missions and roles, streamlining the federal defense bureaucracy, discontinuing failed practices, exploiting economies of scale, lesser reliance on military specifications, setting “drop dead” deadlines on change orders, giving serious consideration to 80 percent solutions, integrating US asset visibility with that of our allies, increasing joint ventures with allies and partners, providing focused education, and building weapon systems through an evolutionary process rather than through transformational technology in case diplomatic strategies fail.

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