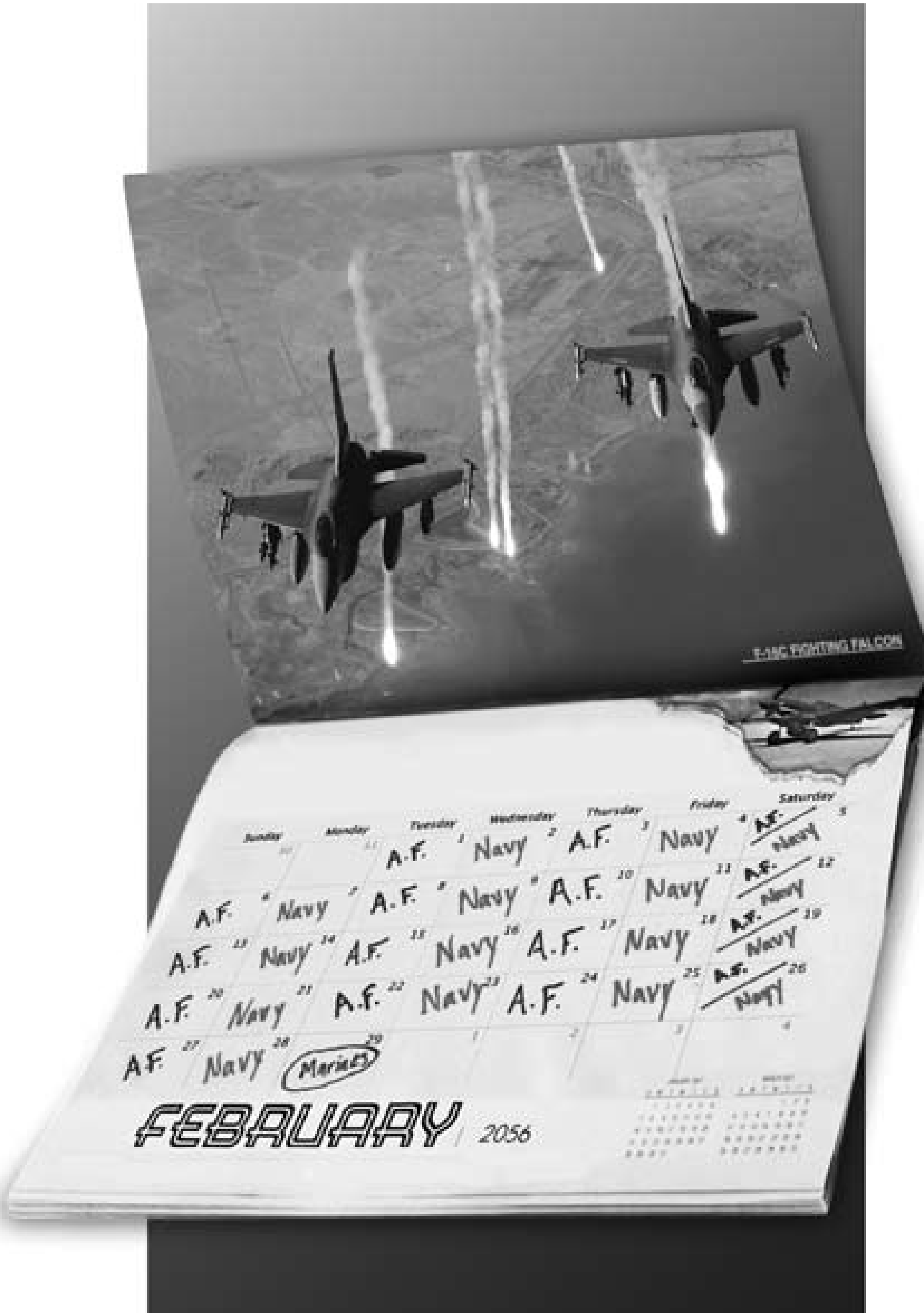

Image designed by Schatz Publishing Group

ON THE ROAD TOWARD CONFIRMING AUGUSTINE'S PREDICTIONS AND HOW TO REVERSE COURSE

Jan P. Muczyk

Military history teaches us that "wonder weapons" are not an adequate substitute for large numbers of simpler but effective counterparts. On the contrary, it teaches us that quantity has its own quality advantages. However, quantity can only be attained by short product development cycles, and that is only achievable if the Department of Defense relies wherever practicable on an evolutionary approach utilizing low-hanging fruit and off-the-shelf commercial components. This article examines not only an evolutionary approach, but also presents counterexamples relying on transformational technology. The final strategy needs to be a well-reasoned combination of both.

Norman R. Augustine, former CEO of Lockheed Martin, former Under Secretary of the Army, as well as a former executive and manager within the ranks of a number of important defense industries, half-facetiously made the following statement. If present trends continue, he predicted—

> *In the year 2054, the entire defense budget will purchase just one aircraft. This aircraft will have to be shared by the Air Force and Navy 3-½ days each per week except for leap year, when it will be made available to the Marines for the extra day.*

CAUSES OF AUGUSTINE'S CONCERNS

The causes of the trends leading to Augustine's tongue-in-cheek hyperbole are manifold, but easily understood. First, flag officers want their weapon systems to do everything. Second, they wish to make changes throughout the development cycle of the weapon system. To avoid cost escalation resulting from change orders, a “drop dead” date for change orders must be established and rigorously enforced. Third, the federal bureaucracy guarantees inefficiencies. For example, Inspectors General of the DoD routinely conclude that the DoD’s books are un-auditable and that the DoD cannot account for billions of dollars of assets. One estimate actually exceeds a trillion dollars (http://www.hiddenmysteries.org/news/america/usa/091501g.html). Fourth, there is a reluctance to purchase extant systems developed by other nations. For example, the Army was reluctant to purchase rocket-propelled grenade (RPG) countermeasures—for example, the Trophy Active Protection System developed by the Israelis—until pressured to do so.

All four reasons escalate the cost of a weapon system, compelling Congress to limit the budget for these expensive systems. As a result, the Defense Department reduces the number of units that it intends to buy to stay within the budget, thereby inflating the cost on a per-unit basis to astronomical proportions. The entire situation is exacerbated by the consolidation of defense contractors and Congressional pressure to buy American, both of which restrict competition. Little wonder then that DoD contract overruns are routine and of epidemic proportions (Rothenflue & Kwolek, 2006).

COLD WAR MENTALITY DIES HARD

Despite the end of the Cold War in 1991, the reason flag officers desire their weapon systems to do everything is because of the persistent Cold War mentality. Even today, the Cold War mentality, with its emphasis on traditional big-ticket items such as combat planes, aircraft carriers, submarines, main battle tanks, and a long, impressive logistics chain, continues to drive defense policies and weapon acquisition strategies. For example, the DoD is spending more money on fighter aircraft (F/A-18E/F, F-22A, and F-35) than at any other time in the nation’s history. The cancellation of the Crusader artillery and the Comanche helicopter, and the development of the Stryker combat vehicle are examples to the contrary. When flag officers are reminded of the end of the Cold War, they bring up China’s potential as a military adversary for which the United States needs to be ready.

STAGGERING COST OF TRANSFORMATIONAL TECHNOLOGY

The B-2 bomber was designed to loiter undetected over Soviet territory in order to locate and destroy mobile multiple independently targetable reentry vehicle (MIRV) missiles. While the B-2 bomber never possessed that capability, it was built nonetheless at a price tag of approximately $2 billion per aircraft, which resulted in a fleet of 21 planes, and required retaining the B1B and the B-52 fleets. Clearly, maintaining three small bomber fleets of different planes is more expensive than one larger fleet of the same plane. The bomber attrition from one raid over Germany during World War II (WW II) was considerably greater than the entire B-2 fleet. The fact that the B-2 is much more capable than the B-17, B-24, or B-29 is duly noted by the author. The irony, however, is that of the three bomber fleets, given contemporary threats, the B-52 is the most cost-effective to operate, and its standoff weapons probably the most versatile.

Had the U.S. Air Force upgraded the B1B in an evolutionary manner much the same way it modernized the B-52, it would have produced a much larger and less expensive bomber fleet. Both the B-52 and the B1B were initially designed to carry only thermonuclear weapons. To the Air Force's credit, both bombers were later modified to carry conventional weapons as well, thereby making them more utilitarian in conventional conflicts. Hopefully, when the Air Force needs a better bomber than the B-2, it will improve the B-2 with an evolutionary strategy rather than designing a new bomber with expensive and untested transformational technology.

The F-22A is another excellent example of Cold War mentality and buttresses Augustine's point. It was intended to neutralize the fifth generation Soviet air superiority fighter, which will never see the light of day because of the disintegration of the Soviet Union and the resulting inability of Russia to fund it. Pentagon folklore

Increasing cost estimates, in all likelihood, will compel Congress to limit its budgets . . .

has it that the 22 stands for the number of years that it took to develop the plane. The Raptor's budget is $65 billion, and that will buy 183 planes. That equates to $355 million per aircraft. Yes, it can go supersonic without afterburners, but that requires two very powerful engines to take supersonic something as large and heavy as the F-22A. Consequently, those engines consume vast quantities of fuel, thereby negating much of the savings resulting from avoidance of afterburners. Its 360-degree low observable characteristics are indisputable, but they come at a staggering price.

During the Cold War, wargaming indicated that the Warsaw Pact numerical superiority would destroy NATO's air capability in about one month. Since NATO was unwilling to match the Warsaw Pact plane for plane, the U.S. Air Force bought into the Rand Corporation recommendation of low observable technology—hence the F-22A as a solution. Again we have the "technology complex" raising its expensive head.

The F-35 Joint Strike Fighter, another example of the "technology complex," was projected to be cost-effective compared to the F-22A; but, with regard to cost, the F-35 is on the same glide path as the F-22A, notwithstanding the fact that 360-degree low observable capability was sacrificed in order to keep the cost down. Increasing cost estimates, in all likelihood, will compel Congress to limit its budgets, thereby forcing the DoD to reduce the number that it intends to purchase. All that will dramatically increase unit costs, leading to an inevitable sense of déjà vu among the DoD's budget planners.

Moreover, will the latest technological developments prevent the same problems that confronted the tactical fighter experimental (TFX) when an attempt was made to serve everyone's needs with variants of one basic airplane? Furthermore, the possibility always exists that the enemy or potential enemy will develop technology that will negate the advantage currently enjoyed by low observables. In addition, many weapon systems rely on satellite-based sensors, and these satellites revolve the earth completely naked. Perhaps the greatest danger associated with lengthy product development cycles is the mission obsolescence of the weapon system before it's even fielded because the facts on the ground change so fast. While a number of expensive high-tech weapons are suspect, only the Comanche helicopter has been axed for that reason.

The most thought-provoking question, however, is: Compared to the A-10 Thunderbolt II, how useful are these weapon systems when it comes to killing terrorists and fighting counterinsurgencies—today's dominant contemporary and near-term threats? Undeniably, the Department needs to increase the end strength of the Army and Marine Corps, equip warfighters with proper equipment to wage counterinsurgency wars, and train them to do the same—an expensive proposition indeed. Yet, these very expensive weapon systems must compete for the budget to do just that.

Other examples of Augustine's concerns are the V-22 Osprey, the Strategic Defense Initiative, otherwise known as Ballistic Missile Defense (BMD), and the Airborne Laser System. All three systems are taking a long time to develop, experiencing numerous failures, and having their value questioned by critics. For example, the Ballistic Missile Defense was initiated in 1983, and as of mid-2006 has cost the taxpayer over $100 billion, with each test costing between $80-$100 million (*Dayton Daily News*, 2006). Insofar as the Space Based Infrared System is concerned, the unit cost has escalated from $4.1 billion to $10.2 billion (315%). The Air Force could have procured many more Boeing 747 freighters for the amount that it paid for its C-17 fleet. Again, the question arises: just how much value do the additional capabilities of the C-17 provide in today's combat environment? While the V-22 Osprey ($54.6 billion budget or $80 million per aircraft) is being sent to Iraq to be "battle tested," the operational restrictions imposed on it are so limiting that they could prevent the V-22 from fulfilling the longstanding mission and performance the Marines will need and expect of the Osprey (Wayne, 2007).

THE LAW OF UNINTENDED CONSEQUENCES

A number of the Cold War weapon systems, such as the B-2, F-22A, and the Ballistic Missile Defense (BMD), were built as much to demonstrate the superiority of free-market democracies over totalitarian command economies as for their military advantage. However, in an attempt to keep up, the Soviet economy crashed, bringing down the Soviet empire without a shot being fired. From that perspective, these exorbitantly expensive weapon systems did their job quite well.

THE SIMPLISTIC TESTING CAVEAT

When it comes to high-tech weaponry, the DoD has a habit of manufacturing simplistic testing to lock in the weapon system, anticipating that technological advancements will eventually make the weapon system viable. A string of examples can be pinpointed starting with the Bradley Fighting Vehicle. So far, the BMD tests have been equally unrealistic as well. The V-22 Osprey's performance is compared to the performance of outdated helicopters in order to make it look like the "smart" buy. The combat exercises between F-15s flown by U.S. Air Force pilots and MiG and Sukhoi aircraft flown by Indian Air Force Pilots were rigged to show the F-15 as demonstrating significant vulnerability, thereby further justifying the F-22A, which has been under continuous scrutiny for possible termination because of its exorbitant cost and nagging problems associated with its development (http://kuku.sawf.org/articles//139.aspx).

Another example of a deceptive test is simulated combat by the F-22A against existing F-15s. A much more meaningful test would be against F-15s upgraded with more powerful engines with thrust vectoring capability, more powerful radar, integrated avionics, air intakes that conceal turbofan blades from radar (of the trapezoidal variety found on the F-18E/F), and coated with the same radar absorbing material as used on the F-22A. Sometimes the "simplistic testing approach" works and sometimes it doesn't. In either case, such a simplistic approach is an expensive way to do business.

Sometimes the "simplistic testing approach" works and sometimes it doesn't.

We must remind ourselves that Pentagon secrecy serves two purposes. At times, it keeps important information out of the hands of enemies and potential enemies. In other instances, it serves as an effective cover for incompetence.

Also, one can only wonder how much better the F-35 Joint Strike Fighter would perform if it had to compete against F-16s upgraded with a more powerful engine with thrust vectoring, a more powerful radar, integrated avionics, air intakes that hide the turbofan blades from radar (of the trapezoidal variety found on the F-18E/F), and covered with radar absorbing coating, as opposed to competing with extant F-16s.

SPURIOUS ARGUMENTS TO JUSTIFY NEXT GENERATION OF HIGH-TECH WEAPONS

The DoD points to countries that now possess aircraft that can challenge the F-15 and the F-16 in order to justify high-tech fifth generation aircraft. The reality, however, is revealing: If one were to place pins on a map of those countries DoD cites in justifying high-tech fifth generation aircraft, it becomes readily apparent that most of them are flying F-15s, F-16s, and F-18s *that the United States sold to them.* The Eurofighter and the Rafael are also used as examples, but they are produced by our allies. Keep in mind that friendly nations (India as an example) fly MiGs and Sukhoi aircraft, as do NATO allies (Poland for example). And Russia itself, while a competitor, is no longer viewed as a strategic enemy.

WORLD WAR II LESSONS UNLEARNED

Since the beginning of the Cold War, the DoD has counted on a smaller number of weapons built with transformational technology to neutralize the numeric superiority of the weapons inventory possessed by the Warsaw Pact. Yet, the WW II experience does not justify the childlike faith in technology with which some of our defense planners are imbued. Soviet military planners understood clearly the perspicuous lessons learned on the battlefield: *that quantity has its own quality advantage,* both in military as well as economic terms.

We should not be reluctant to take seriously Russian military lessons from a nation that defeated the Tartars, Charles XII of Sweden, Frederick the Great of Prussia, Napoleon Bonaparte, as well as the German army and air force during WW II. Indisputably, this is certainly an impressive array of vanquished adversaries.

We should not be reluctant to take seriously Russian military lessons.

Tank warfare during WW II constitutes a good example. While the Soviet T-34 was the best tank during that war until the German Tiger and King Tiger tanks came on the scene, the Soviets still needed prodigious numbers of that tank to defeat German armor. The U.S. Sherman tank was inferior in most respects to the German counterparts, but we prevailed with it because we possessed it in massive numbers.

Air warfare supports the tank warfare example. The German Me-262 jet fighter, even with its considerable speed advantage, had little bearing on the air war because of its limited numbers. The United States, however, prevailed in the air in Europe and in the Pacific because it possessed massive bomber and fighter fleets. Of course, this includes the many aircraft carriers with their air wings. A fact not widely appreciated in the West is that the largest air battles took place on the eastern front, and the Soviets prevailed because they possessed effective aircraft in vast quantities.

In like manner, the German advantage in rocket technology did little to influence the outcome of the war. The much simpler Soviet Katyusha rocket had a much greater impact, in part due to its ubiquitous presence on the battlefield. The Germans feared the Katyusha rockets to the point that captured Soviet prisoners who operated the Katyushas were executed on the spot. A recent interesting parallel is Hezbollah, which relied heavily on the shock effect of Katyusha rockets in the latest conflict with the Israelis.

Another little-known fact is that the Japanese, with the assistance of their German ally, also spent a fortune on "wonder" weapons during WW II to no avail. Expending that money on conventional weapons would have made the Japanese and the Germans more potent adversaries. However, transformational technologies such as thermonuclear weapons, intercontinental ballistic missiles, low observables, computers (hardware and software), and precision guided munitions serve as excellent counterexamples.

WRONG LESSONS LEARNED TOO WELL

Both Persian Gulf wars and the temporary defeat of the Taliban provide U.S. military planners with rather trivial lessons. High-tech weapons can defeat third-rate armies rather quickly in a conventional force-on-force encounter. Those who trumpet the Iraqi military and the Taliban forces as worthwhile adversaries should remind themselves "little" Israel defeated much of the Arab world over and over again, and in short order. World War II, the Korean conflict, the Vietnam War, and the Iraqi and the Taliban insurgencies offer much more important lessons.

BUILDING WEAPON SYSTEMS FROM LOW-HANGING FRUIT

CRITICAL NATURE OF SHORT CYCLE TIMES

Even without the threats posed by the Soviet Union, the world remains not only dangerous, but seemingly even more so. Future threats will be far less predictable than those during the Cold War era. Consequently, future DoD leaders will have to name that tune after hearing just a few notes, and short cycle times will give them the ability to fashion appropriate and affordable technological responses. Since our enemies and potential enemies will have access to much the same technology as we possess, we must acquire dominance of product development cycle time in order to maintain our competitive edge on future battlefields.

Furthermore, time is money, and in a resource-constrained environment, reducing cost by reducing cycle time is critical. On the one hand, relying on transformational technology is tantamount to a long, expensive product development cycle. On the other hand, developing weapons systems from low-hanging fruit pretty much guarantees short, less expensive product development cycles.

Of course, shorter product development cycle times are every bit as important in the commercial as in the military sectors (Muczyk, 1997). Relying on off-the-shelf commercial components rather than on military specifications is vital when it comes to reducing product development cycle time and cost. A case in point is the Gyrocam Triple Camera system, which mounts on armored vehicles, helps ferret out roadside bombs, allows troops to see over berms to watch for ambushes, and has proven invaluable during darkness. The system was first developed for TV news helicopters (Bayles, 2007). Undeniably, in the field of electronics, on which practically all military systems depend, technology is developed for commercial applications. Clearly, the product development cycle is not the only element of efficiency and/or effectiveness. For more complete expositions, see Muczyk (1997, 1998).

THE MOST VITAL PHASE OF ANY WEAPON SYSTEM

The "make or break" phase of any weapon system insofar as completing it on time, on cost, and within performance specifications is the planning phase because it is through this phase that the technical and economic viability of the weapon system is established, and a prudent timeline assured. For these reasons, this phase must be managed with the greatest care. During this phase, there must be intense oversight not only by the highest levels of the DoD, but also by the appropriate committees and sub-committees of Congress. The individuals engaged in the oversight must ensure that whenever possible low-hanging technological fruit and off-the-shelf components are incorporated into the weapon system, and firms with a proven track record are awarded the contracts. Once oversight and contract award are managed properly, supervision could be minimized so long as the final product is properly tested, and payments are made contingent on meeting specifications. If this is left undone, the weapon system is likely to share the same fate as the F-22A and the other weapon systems that experienced unconscionable overruns with respect to time and cost and serious performance deficiencies.

EXAMPLES OF WEAPON SYSTEMS DEVELOPED FROM LOW-HANGING FRUIT—THE EVOLUTIONARY APPROACH

WORLD WAR II

The Grumman F6F Hellcat fighter shared a heritage with the ineffective F4F Wildcat. But evolutionary improvements, principally the Pratt &Whitney R-2800 Double Wasp engine, made it the best U.S Navy fighter plane during WW II. It was credited with destroying 5,163 enemy aircraft (http://en.wikipedia.org/wiki/F6F_Hellcat).

The P-51 Mustang was an ordinary plane until it was upgraded with the Packard-built Rolls-Royce Merlin engine and the "bubble" canopy, at which time it became the premier fighter of WW II (http://en.wikipedia.org/wiki/P-51_Mustang).

COLD WAR

U.S. Air Force. The F-117 Nighthawk was constructed with off-the-shelf parts 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 the wisdom of matching maturing technologies with warfighter needs. The U.S. Air Force began taking deliveries of an upgraded RQ-1B less than 5 years from program inception (Rothenflue & Kwolek, 2006).

The GBU-28 Bunker Buster was developed from off-the-shelf parts, tested, and deployed in 28 days during Operation Desert Storm and proved extremely useful (Muczyk, 1997). Joint Direct Attack Munitions (JDAM) also provide impressive results for a modest investment. Upgrading B-52s with better engines, better avionics, and more capable weapon systems is perhaps the most telling case in point. The modernized KC-135 tanker ranks a close second to the B-52 as a success story of the evolutionary strategy.

In 1999, the F-18E/F program team was awarded the prestigious Collier Trophy, and in 2005 the same team won the Aviation Week Program Excellence Award.

U.S. Navy. The F-18E/F Super Hornet is the evolutionary progeny of earlier F-18 models. As the result of this approach, the U.S. Navy was able to field what it considers to be the most advanced multi-role strike fighter available today and for the foreseeable future. This was accomplished on budget, on time, and on weight. Variants of this plane will replace most of the airframes found on the deck of an aircraft carrier, thereby minimizing production, maintenance, and training costs. In 1999, the F-18E/F program team was awarded the prestigious Collier Trophy, and in 2005, the same team won the *Aviation Week* Program Excellence Award.

The U.S. Navy opted for this evolutionary approach after its transformational A-12 Avenger II was canceled because it proved to be a disaster in every way, but not until a king's ransom was spent on its development. Its cancellation, incidentally, was also quite expensive (http://www.aerospaceweb.org/aircraft/fighter/f18ef/).

The Trident II D-5 is the sixth generation member of the U.S. Navy's Fleet Ballistic Missile (FBM) program, which began with the Polaris (A1) in 1956. Clearly, the added capabilities of the Trident II D-5—and they are substantial—were provided in an incremental or evolutionary manner (http://www.fas.org/nuke/guide/usa/slbm/d-5.htm).

An excellent example of converting a strategic weapon designed for a World War III thermonuclear exchange into a tactical weapon designed for a localized conventional conflict is the Navy program to convert four Trident ballistic missile submarines (SSBNs) into cruise missile-carrying and special operations forces (SOF) support submarines (SSGNs). While still an expensive proposition with escalating cost, conversion is still cheaper than building such littoral warfighting assets from scratch (http://www.history.navy.mil/library/online/trident_conversion.htm).

U.S. Army. The Patriot Advanced Capability (PAC)-3 terminal phase missile interceptor started out as a surface-to-air aircraft interceptor before the first Gulf War. However, a pressing need quickly prompted its conversion to an anti-missile system whose effectiveness has been increased continuously through the evolutionary process.

Russia. With the collapse of the Soviet Union, Russia was left with no alternative but to upgrade its existing fighter planes. The process began with the addition of thrust vectoring in the Sukhoi (SU)-27 model, which became the SU-37 (Johnson, 1997). Similar evolutionary improvements have been made to the very maneuverable MiG-29.

Clearly, had Russia possessed the financial resources, it would have developed a fifth generation fighter intended to counter the F-22A. One can only speculate how much better it would have been compared to the SU-37 and/or the improved MiG-29. Most certainly, it would have been much more expensive. It appears that a constrained budgetary environment is the mother of the evolutionary approach.

NEW MISSIONS FOR EXISTING TECHNOLOGY

Clearly, there can be no substitute for creativity. When the P-51 replaced the P-47 as the premier air-to-air fighter in the European theater, the P-47, rather than being retired, was converted to the close ground support mission with brilliant success. While the U.S. Army has used “fixed fire bases” in the past to good advantage, the U.S. Air Force, however, has invented the “mobile fire base” by marrying Army fire power with its C-130 aircraft to create the AC-130 H/U. This mobile fire base has provided a great deal of value-added on the battlefield at a very modest cost since the Vietnam War (http://www.af.mil/factsheet.asp?fsID=71). Similar creative solutions are desperately needed if we are to arrest the rapid increases in the cost of weapon systems.

KNOWING WHAT PRODUCES THE GREATEST RATE OF RETURN

Most of us recognize that exceptional leadership and capable warriors are still the most important elements of warfare. However, insofar as hardware is concerned, we need to develop an appreciation for those improvements that show promise of providing the biggest bang for the buck. It isn’t the improvements in the airframe or the engines of the B-52H that make it such a versatile and effective bomber. Neither is it the advanced avionics. It is the improved suite of weapons—precision guided munitions and air launched cruise missiles (ALCMs)—that the B-52H carries. The same argument can be made for fighter planes. A comparison of the effectiveness of Vietnam-era air-to-air missiles with the effectiveness of today’s air-to-air missiles highlights the advantages of today’s improved suite of precision weapons. Ditto for the air-to-ground munitions. Navy cruise missiles have immeasurably enhanced the U.S. Navy’s surface ships as well as submarines. Much the same can be said for ship-to-ship and ship-to-air missiles.

GROWING THE TECHNOLOGY FRUIT TREE

For there to be a technology tree with important and useful low-hanging fruit, the DoD and the branches of the military must adequately fund 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. Toward that end, DoD must resist the temptation to shortchange basic and applied research so vital to our nation's warfighting technology solutions.

Technological fruit must be grafted onto the tree by the private sector and research universities as well. Incentives should be provided to the private sector so that it would invest some of its own capital to grow the technological fruit tree. For example, a company contributing to the technological fruit tree should have assurances that it will recoup its investment through award of government contracts associated with its contribution to the development of a weapon system.

Lastly, the DoD, in conjunction with its military branches, must scan the international environment for technological fruit to be grafted onto the tree. Collaborating with allies in promising joint ventures is also a viable strategy. The Harrier Jump Jet used by the U.S. Marine Corps and the British Navy is instructive. The original version was developed by the British and the advanced AV-8B version by the Americans. Finally, as technologies mature, they should be incorporated into weapon systems.

LINING UP EXAMPLES WITH CONCLUSIONS

WHEN TRANSFORMATIONAL TECHNOLOGY IS CALLED FOR

When there is an ideological conflict on a world stage between two or three technological superpowers, even though the contest does not erupt into global armed conflict, the superpowers cannot take a chance on being bested by their adversary (ies) because so much is at stake. Therefore, they believe they must pursue transformational breakthroughs as well as evolutionary improvements in existing weaponry. World War II and the Cold War are excellent examples. During the former, the contest was between fascism and democracy (the Soviet Union being an exception), and during the latter the conflict was between democracies and communism.

When a nation's survival is at stake, even without a global ideological struggle as is the case with Israel, transformational technology will be employed as the last resort. The examples presented here are patently obvious: nuclear weapons; intercontinental ballistic missiles; cruise missiles; stealth technologies, especially in aircraft; submarines capable of launching strategic missiles; ballistic missile defense; space-based assets; and biological and chemical weapons as well.

Possession of these transformational weapons by all of the global adversaries predictably leads to a great reluctance to use them because of their destructive power—hence mutually assured destruction or MAD. The prospect of mutual destruction constitutes a major reason why the world has seen regional conventional conflicts during the Cold War but not a global conflagration.

ACQUISITION STRATEGIES FOR REGIONAL CONVENTIONAL CONFLICTS

Korea, Vietnam, both Iraq wars, and Afghanistan have demonstrated the limited value of transformational technology. These conflicts are about adapting existing weapons to an appropriate strategy in an evolutionary manner if for no other reason than counterinsurgency wars are quite long, and cost is a vital consideration. Unlike WW II and the Cold War, where a large, modern Air Force and Navy were crucial, the regional conventional engagements against terrorists are an Army and a Marine Corps operation that requires large numbers of boots on the ground. Effective body armor; vehicles that can withstand improvised explosive devices and shaped charges; effective intelligence, which requires cooperation from locals; and real-time communications are vital—as is knowing and honoring local customs. While conversion of transformational weapons to fight the Global War On Terrorism (GWOT) is possible—as the B-1B, B-2, and SSGNs so clearly demonstrate—its prohibitive expense cannot be borne indefinitely by this nation as a way to fight the GWOT, which in all likelihood will be intergenerational. The A-10 Thunderbolt II, AC-130 H/U, the RQ-1B Predator, and the Gyrocam Triple Camera systems are much more cost-effective.

While the military may not like fighting counterinsurgency conflicts as a result of the Vietnam experience, it still must be prepared to do so since its civilian leadership may continue to involve the United States in these types of conflicts in the future.

CONCLUSION

The belief by our civilian and military leaders 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. This approach perforce mandated small quantities of weapon systems at outlandish unit costs. Unless this situation is reversed, the military will bankrupt itself with little in return, since these systems lend little to asymmetric warfare such as fighting terrorists and waging counterinsurgency conflicts—today's contemporary and near-term threats. According to some estimates, the U.S defense budget exceeds the defense budgets of all of our allies combined and some of our adversaries. Critics maintain that such a situation cannot be sustained indefinitely, especially if a serious attempt is made to balance the federal budget.

Short product development cycles are the key to large numbers of affordable weapon systems. Toward that end, recommendations have been proffered to redress the problem of long product development cycles by relying on the development of weapon systems from low-hanging fruit and off-the-shelf commercial components instead of military specifications.

Learning from historical and contemporary lessons that quantity has its own quality advantages, both military and economic, in recent years the DoD has made a case for the implementation of acquisition policies calling for the development of more weapons using an evolutionary approach rather than through transformational technology.

For this evolutionary approach to be viable, the United States must continuously grow a robust technological fruit tree by adequately funding the research and development community, and relying on technology developed by our allies through joint ventures and other mutual defense-industry partnerships.

Examples were also identified whereby transformational technology created a sea change in military affairs. An attribution to Gen. Dwight Eisenhower (probably apocryphal) theorized that the following four assets played the greatest role in winning WW II: C-47, bazooka, Jeep, and the atomic bomb (http://en.wikipedia.org/wiki/Bazooka).

Whoever made this observation had a deep insight into large-scale warfare. Consequently, the end result must be a well-reasoned balance between evolutionary and transformational technologies.

Dr. Jan P. Muczyk (DBA, MBA, BS, University of Maryland) is Professor Emeritus of Management, Graduate School of Engineering and Management, Air Force Institute of Technology (AFIT). He is the former dean of the Graduate School of Logistics and Acquisition Management and the former chair of Executive Education, AFIT. Dr. Muczyk has spent 30 years in civilian universities in the United States and abroad. His publications are widely cited.

(E-mail address: jan@muczyk.com)

AUTHOR **BIOGRAPHY**

REFERENCES

Bayles, T. (2007, August 30). Military snaps up camera system. *Herald Tribune*, p. 1D.

Dayton Daily News. (2006, September 2). *11*(2), 45–57. p. A14.

Johnson, D. R. (1997, Summer). Russia's military aviation industry: A strategy for survival. *Air Power Journal*, *11*(2), 45–57.

Muczyk, J. P. (1998, Summer). Generating needed modernization funds: Streamlining the bureaucracy—not outsourcing and privatizing—is the best solution. *Acquisition Review Quarterly, 5*(3), 317–332.

Muczyk, J. P. (1997, Summer). The changing nature of external threats, economic and political imperatives, and seamless logistics. *Airpower Journal*, *11*(2), 81–92.

Rothenflue, J. R., & Kwolek, M. J. (Eds). (2006, September). Streamlining DoD acquisition: Balancing schedule with complexity. Retrieved December 7, 2007 from http://www.au.af.mil/au/awc/awcgate/cst/streamlining_acq.pdf

Wayne, L. (2007, April 14). Marines to deploy V-22 Ospreys to western Iraq. *Herald Tribune*, p. 4A.