# Cooking Shows, Corollas, and Innovation on a Budget

By Mike Jernigan and Jason Cooper

*If we do not free ourselves from the ever-expanding, ever-tightening coils of bureaucracy, if we do not set the pace on adopting change, if we continue to think and do in the same ways we have for so long, then our days as the world's preeminent maritime force are sure numbered—and that number is small and shrinking.*

—Former Secretary of the Navy Ray Mabus, April 15, 2015

n the television show *Cutthroat Kitchen*, chefs compete against one another on a fixed budget where they can buy advantages for themselves or disadvantages for their adversary. In the end, the winning chef shows more creativity and innovation in developing a recipe while under challenges and budgetary constraints. The Department of Defense (DOD) finds itself in a similar predicament—developing a recipe that ensures strategic and operational advantage in a time of rapid technological advancement and decreasing budgets.

The reality is that rapid advancements in military technology and the introduction of hybrid threat capabilities obscure the traditional categories of warfare and increase the difficulty of matching capabilities to meet complex 21st-century challenges. Scholars argue

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the long record of U.S. military success "masks major geopolitical and technological trends that are rapidly eroding the advantages the U.S. military has long enjoyed."[1] The geopolitical factors of globalization, a weakened U.S. economy, and $19 trillion of national debt lead many to question how the United States will maintain military superiority while balancing the promise of new technologies under current budget constraints.

Relatively inexpensive intangibles related to innovation exist and are critically important to resolving this dilemma. DOD can maintain strategic and operational advantages through innovation in the future but must avoid the misperception that success will come from a single game-changing technology. Rather, success in the future will come from following an innovative recipe that includes four critical ingredients: research and development across the science and technology spectrum, the military divorcing itself from a fixation on owning technology and hardware versus leasing it, key organizational changes, and creating adaptive leaders who can react to the pace of 21st-century change.

## Investment in Science and Technology

It is appealing to believe superior technology wins wars and difficult to argue against the notion of game-changing technologies, such as the atomic weapon. However, an overreliance on technology is dangerous for two reasons. First, U.S. military excellence is not guaranteed as a birthright and the "sizeable margin of conventional technology superiority the United States has enjoyed for the last 25 years has eroded."[2] Second, it encourages tunnel vision and an ignorance of the value of smaller, incremental innovation. Too frequently, U.S. military innovation tends to focus on the "next big thing." *Transformation* and *innovation* are buzzwords frequently used in policy circles pointing to a specific technology or doctrinal change as the next revolution in military affairs (RMA) that will ensure future U.S. superiority. The problem with this silver bullet approach

and imprudent view of innovation is that it presumes a distinct separation between the future and current plans "as if we could somehow separate the future from our current agendas" and only have a single future for which to prepare.[3] The reality is that the U.S. military will not maintain strategic advantage by focusing on a single technology, weapon, platform, or doctrine, as solitary ingredients do not complete the recipe for advantageous transformation. Just as a cake is not made solely from flour, no matter how fancy the flour is, "technology-driven RMAs are usually brought about by combinations of technologies," not a lone source or concept.[4] For example, Blitzkrieg was a product of innovation in three technologies: the tank, the two-way tactical radio, and the dive bomber, while the creation of intercontinental ballistic missiles was enabled by long-range ballistic missiles, lightweight fusion warheads, and highly accurate inertial guidance.[5] Stealth and precision munitions provide other examples derived from investment across a wide spectrum of technologies fused with adaptive operational doctrine and concepts.

In December 2015, then–Undersecretary of Defense Robert Work described the effects of precision-guided munitions as the Second Offset Strategy. Speaking at the Center for New American Security, Mr. Work explained that the United States has a history of strengthening "conventional deterrence by offsetting or pursuing a combination of superior technological capabilities and innovative operational and organizational constructs that offset the strengths of our potential adversaries."[6] He described the First Offset Strategy as the development of tactical nuclear capabilities and the Second Offset Strategy as the development and advancement of precision-targeting capabilities. He goes on to argue that the rapid advancements in antiaccess/area-denial tactics create the need for a Third Offset Strategy, which is required in order for the United States to maintain a strategic advantage in the future. Furthermore, this strategy is actually a combination of five components:

"learning machines, human-machine collaboration, assisted human operations, human-machine combat teaming, and autonomous weapons."[7] Creating the ability and capacity to achieve this strategy requires multiple resources from various technology and science fields in order to provide the superior technology offset needed to maintain strategic dominance in the future. Thus, the first ingredient required to achieve 21st-century transformation is science and technology investment across the whole of the scientific and military enterprise.[8]

Silver bullet technologies such as nanotechnology, neurotechnology, robotics, or hypervelocity weapons predict a military advantage in the future because they have the potential to deliver game-changing results. This is true to the extent that a country can maintain a comparative advantage until a counter-technology or defense is created to mitigate it. Technology is expanding rapidly and can quickly become obsolete or countered. For example, rapid advancements have allowed countries like China to develop high-end asymmetric capabilities in order to employ area-denial tactics and restrict U.S. power projection and freedom of movement within the global commons.[9]

The U.S. Air Force further demonstrated the need for investment across the entire science and technology spectrum when it completed a 3-year study in 2010. In Blue Horizons II, researchers were "tasked to evaluate the effectiveness of 58 future weapons systems in 2030 and to examine the underlying 172 technologies necessary to bring those systems to fruition."[10] Over the course of their research, these scientists discovered it was impossible to prioritize one technology over the next because of the synergistic and congruous effect one had on the development and maturation of another. They learned "the effect of nanotechnology, computational power, biotechnology, chemistry, and physics were so interwoven that a lack of research in any one area would disable the fielding of a large number of future systems or concepts."[11] In other words, Blue Horizons II provided evidence that future investment cannot be focused on any

singular technology but must be invested "across the whole of the science and technology enterprise" if DOD wants innovative and transformative concepts in the future.[12]

If the first ingredient of the recipe of transformative innovation is investment across the whole of the science and technology spectrum, it would be remiss not to address how DOD can accomplish this effort within the context of a budget-constrained environment. Innovative technology investment can be accomplished in several ways. A recent example comes from former Secretary of Defense Ashton Carter, who directed the Pentagon to "team with Apple, Boeing, Harvard, and others to develop high-tech sensory gear."[13] The goal of this program is to "use high-end printing technologies to create stretchable electronics that could be embedded with sensors and worn by soldiers . . . and ultimately be used on ships or warplanes for real-time monitoring of their structural integrity."[14] While focused on expanding multiple emergent technologies, the brilliance of this program is found in the funding. The U.S. Government is contributing $75 million while "companies, managed by the U.S. Air Force Research Laboratory, will add $90 million with local governments chipping in more to take the total to $171 million."[15] The reality is that the government "is now a relatively small player in the science and technology world . . . [with] over 70 percent of U.S. investment in basic research . . . now in the hands of industry and academia."[16]

## Leasing vs. Owning

This fact reveals the second ingredient of the innovation recipe: DOD must divorce itself from the notion that it must own and control enterprises, such as technology, which appear to be game-changing today but can become antiquated tomorrow. For example, a driver who leases a Lexus can get a new, improved car every few years, while the one driving a 1987 Corolla pays to keep it running with a limited ability to improve its function. Similarly, DOD must explore the idea of becoming more of a lessee of technology rather than an owner. By doing so, DOD will increase its relative flexibility to react to significant changes as rapid advancements occur. Contracts must be structured for the short term and leasing may provide a way for the Defense Department to ensure it is adaptable for future changes.

The lessee-versus-owner mentality can be applied across multiple aspects of DOD. One simple way that could create cost savings across all the Services would be leasing instead of buying baseline technical equipment, network platforms, desktop computers, and other "low level" technology types. There are several benefits to leasing low-tech equipment in the 21st century, where the computer purchased today can be outpaced by processing and software development in a matter of months. Leasing can keep the user's equipment up to date, and, in the long run, the financial burden of obsolescence is passed to the equipment leasing company.[17] In most situations with leasing equipment, the user pays little to nothing upfront and has an ability to maintain predictability in monthly costs.[18] Leasing provides stability that could prove valuable in the age of sequestration. Depending on how the lease is structured, downsides include losing flexibility regarding maintenance of a given system, and, in some cases, leasing can cost more in the long run. That said, the Defense Department could work with Congress to pass legislation to provide tax incentives to companies that work with DOD on programs to provide low-tech leased equipment, making it more palatable for companies to accept the short-term risk with the benefit that the leasing company can return fairly new equipment back to a large consumer market at a reduced price to recapture their profit dividend when the lease is up.

Another area worth evaluating the long-term cost benefit analysis of leasing versus owning is with aircraft. One of the largest issues facing the Air Force is recapitalization of a significantly aging aircraft fleet. This issue ranges from finding replacements for training aircraft to developing a new long-range bomber. The Air Force has been flying the T-38 as its advanced jet trainer since the early 1960s and continues to use an aging commercial fleet for distinguished visitor transportation, while the F-35 and Long Range Strike Bomber (LRS-B) programs are in response to the aged platforms in the fighter and bomber communities. Large and complex acquisition items, like the F-35 and LRS-B, which have secretive technologies with limited transferability to the civilian sector, most likely are not good fits for the lessee category due to the extreme technical specialization and little commercial application for advanced weapon systems.

In the training and commercial realms, however, leasing could be a viable possibility. Much like the Air Force, "airlines lack cash to finance their big plans for fleet renewal, and they cannot borrow cheaply" to make the recapitalization of their fleet cost-effective.[19] Thus, the airline industry is increasingly turning toward "operating leases, in which they really are renting the planes for a few years at a time with a leasing company bearing the risk of any slump in their secondhand values."[20] In order for leasing to be cost-effective for the leasing company, the secondary market for used aircraft must be viable enough to ensure a legitimate profit margin over time. Research suggests this is the case because "since the mid-1980s, trades in the secondary market for aircraft have grown steadily, and the number of transactions on used markets today is about three times the number of purchases of new aircraft."[21] Coupled with the fact that "over a third of the world's airline fleet is now rented and the proportion is likely to keep growing," leasing in the realm of training and commercial platforms across the military Services could be a way to negate large purchase costs up front, reduce operational and maintenance costs over time by operating relatively new aircraft, and rapidly recapitalize large portions of an increasingly aging fleet.[22]

That said, this shift in mentality and eventual execution is not without challenges, and the structuring of leasing contracts and nuances between operating and capital leases are beyond the scope of this discussion. However, with the rate at

Marine with 3rd Battalion, 4th Marines, Kilo Company, uses weapon that has capabilities to shoot down drones with net during Urban Advanced Naval Technology Exercise 2018, Camp Pendleton, California, March 20, 2018 (U.S. Marine Corps/Laiqa Hitt)

which technology is advancing, examining areas where leasing versus owning is a realistic possibility will become a necessary ingredient for innovation and transformation if the United States wants to stay ahead of its potential adversaries. At a minimum, the leasing-versus-owning mentality for certain aspects of the military inventory warrants further evaluations and may provide greater flexibility and options for DOD in the future.

## Creating Flexible and Adaptive Organizations

The third ingredient necessary to achieve innovative transformation and maintain U.S. strategic and military advantage requires creating flexible and adaptive organizations. The effects of globalization and rapid advancements in technology, coupled with the speed at which information can travel around the globe, create new stressors and requirements for resiliency in order for

organizations and leaders to be able to react to change. There exists today "more change to contend with than ever before" and its volume, momentum, and complexity are accelerating at increasing rates.[23] Organizations must adapt to this environment. Essentially, "organizations, like individuals, have a speed of change at which they operate best. This speed reflects the degree to which the organization can absorb major change while minimizing dysfunctional behavior."[24] While the U.S. military has proved its ability to remain tactically flexible, DOD is still organizationally challenged. The reality is the current institutional structure of the Services is archaic and will have difficulty facilitating the type of rapid flexibility and decisionmaking required to be effective. An examination of any military Service organizational diagram reveals a cumbersome institutional framework more closely resembling the

architecture of a large organization in the 1950s, like General Motors, rather than the Microsoft, Amazon, or Starbucks of today.[25]

One way to structure an effective organization can be found in the Third Offset Strategy discussion from Robert Work. Two of the five components required to achieve the strategy relate to shrinking the decisionmaking timeline and, in some cases, developing systems capable of quickly making decisions for senior leaders. Before discussing these components, it is important to note that development of these core capabilities will not be possible without the application of the first ingredient of transformation: research and development across the whole of the science and technology spectrum. The first component is the creation of autonomous deep learning systems. In essence, these systems can rapidly analyze multiple data inputs, learning through an iterative process in order to enhance their

predictive capability and shorten the early warning indications for senior leaders. These deep learning systems are also applicable to the realm of cyber and missile defense where systems can be developed to react automatically in order to protect critical infrastructure—both cyber and real, as well as civilian populations—in the event of a massive attack that would overwhelm the human decisionmaking cycle.[26]

The second component is what Secretary Work describes as human-machine collaboration. As he states, "human-machine collaboration is using machines to help decisionmakers make better decisions."[27] One could argue that through the use of wargaming exercises, DOD has been executing human-machine collaboration for some time. The advantage of wargaming exercises is that they can be used to "explore a range of possible warfighting futures; generate innovative ideas; and consider how to integrate new technologies into doctrine, operations, and force structure," as well as test senior leader decisions in certain scenarios and their possible outcomes.[28] In the past, "wargames were an inexpensive tool during a period of suppressed defense spending to help planners cope with the high degree of contemporary technological and operational uncertainty."[29] This is the scenario and challenge DOD currently finds itself facing. In their plan to revitalize wargaming for DOD, Secretary Work and Vice Chairman of the Joint Chiefs of Staff General Paul Selva recommended another organizational change necessary for success in the future. In their research, they discovered

*a lack of coordination within the wargaming community and the absence of any direct link between the insights gained from wargaming and the department's programmatic action. Wargame results are neither shared laterally across the defense enterprise nor up the chain to influence senior-level decisionmaking.*[30]

Thus, applying the first ingredient of wide technical research will allow the development of future systems to make the possibility of a Third Offset Strategy a reality, and developing an organization that facilitates this technology into the decisionmaking cycle is a step in the right direction. Furthermore, wargaming needs to become a collaborative effort where results are reported both vertically and horizontally in order to prevent the institutionalization of faddish assumptions and to better inform senior decisionmakers.

While it is impossible to guess what the future holds, it is safe to say rapid advancements in technology will change the character and nature of war. In the future, military expertise may reside in individuals who can manage multiple hypersonic reentry vehicles from a computer console as they strike an array of enemy targets. Furthermore, "new technologies will increasingly bring to the fore the expert in missile operations, the space general, and the electronic warfare wizard—none of them a combat specialist in the old sense."[31] The question then becomes: in the future will distinct branches of the military, which often force thinking into the pigeonholes of Soldiers, Marines, Sailors, and Airmen, be needed? Should the evolution of joint warfighting be taken to the next level, a true joint force of American warfighters? In a broader qualitative context, DOD must address the question as to whether the current organizational structure of the military Services provides incentives for sustaining organizational change. For this discussion, *sustaining organizational change* is defined as "the continuous, anticipative, and adaptive movement (thinking and actions) taken by organizational members to achieve a desired future."[32]

The first requirement to achieve the level of congruence and unity required by military members to achieve a desired endstate begins with senior leader messaging. Too often different Services stress competing messages because each branch is in competition with the others for valuable and limited resources. The second requirement is to develop continuous improvement processes Service-wide, which allow all to evolve and synchronize efforts with the senior leader messaging over time. Organizations often overcome obstacles purely based on the talent of the individuals present, finding short-term fixes but often no long-term solutions. In fact, "many organizations rely on a planned change, classical approach to organizations change" implemented through a linear methodology.[33] Unfortunately, these linear methods often leave the misperception that a single solution can be found that will permanently solve a given issue. The focus must be on continuous process improvement programs that are iterative and evolutionary, like the Define, Measure, Analyze, Improve, and Control (DMAIC) process. DMAIC is data-driven and requires organizations to define key value measures and key performance indicators that validate and verify the effectiveness of meeting organizational objectives and priorities. In turn, this allows organizations to identify and create processes that synchronize unity of effort and increase efficiency in achieving the strategic objectives of the organization. Methods, such as DMAIC, will be necessary in order to create efficiencies and the requisite organizational flexibility to adapt to the current pace of change.

At the macro level, the question becomes do U.S. military organizations provide latitude for risk-taking and, as a by-product of innovation, to flourish. While courage on the battlefield is rewarded, courage to take risk at the operational and strategic levels organizationally is widely unacceptable: "A large body of scholarship within strategic studies attributes innovation failure to the hierarchical, inflexible, and rigid nature of military organizations."[34] The military creates a linear environment with rules and structures that promote black-and-white thinking. Unfortunately, "people who adapt more slowly than the pace of the changes occurring around them do so partly because they have a low tolerance for ambiguity and therefore they generally perceive life in binary terms—yes or no, black or white."[35] It is time for the Services to take a hard look at organizational structure and determine if it provides the level of resiliency and flexibility that will be required for success in the future. Today's modern corporations have removed multiple layers of middle

management, promoted risk-taking and innovative thinking, and have "even eliminated many of the functional and social distinctions between management and labor that dominated industrial organizations."[36]

Secretary Carter took steps in the right direction to address this issue. He examined private industry and academia for ways to increase efficiencies as a military. Furthermore, he "[built] bridges with every sector in America from corporation to academia" in order to facilitate new thinking and innovative ways to solve institutional problems.[37] Secretary Carter doubled the Secretary of Defense Corporate Fellowship program and opened the program up to the noncommissioned officer ranks.[38] This program allows military members to work in private industry for a year at organizations such as Google, Intel, Amazon, and others.[39] Programs like this afford U.S. military members an exceptional opportunity to learn best practices from industry and an ability to view problems through varying lenses, especially from a change management perspective. Opening this program up to noncommissioned officer ranks is definitely a step in the right direction, as innovative thinking and newly learned processes can be applied across multiple echelons of the Services. As Secretary Carter deftly put it, "throughout this process, we've always been mindful that the military is a profession of arms . . . it's not a business. The key to doing this successfully is to leverage both tradition and change."[40]

Traditions are important but so is creating an organizational structure and climate that facilitate resiliency and flexibility. Change is essential for strategic and operational advantage in the future, and these programs are a step in the right direction. Otherwise, the U.S. military may find itself in a situation where the enemy is able to react to the pace of change faster than U.S. forces, thereby putting enemy actions inside the strategic- and operational-level decisionmaking cycle. "[S]hifting our perceptions toward change and how it is managed" requires a new vision for the organizational framework of the military Services, one that

empowers action, encourages risk and—as a byproduct—innovative thinking and that maintains the requisite flexibility to maneuver with the speed of a rapidly changing environment.[41]

## Overcoming Complacency and Fear of Risk

The final ingredient for effective innovation is people. Leaders at all levels need to be trained to support innovation and overcome its two nemeses: complacency and risk. Complacency is the antithesis of innovation: things are good now, why change? Agility is the antidote to complacency and must be applied to innovation to be effective. Unfortunately, the U.S. military operates "at a level of agility better suited for a less-demanding era."[42] To encourage innovation, DOD needs "agile leaders and a leadership culture [to] model and support agility across the enterprise."[43] Scientists have determined that several types of agility exist. One required for innovation is creative agility, which

*transform*[s] *complex, novel problems and opportunities into desired results. As leaders increase their agility, they become more comfortable with novelty and uncertainty. Because they clearly understand the limitations of any single perspective, they encourage the expression of multiple viewpoints and the questioning of underlying assumptions.*[44]

This statement is exactly counter to the silver bullet technology approach that floods innovative thinking.

In addition to operating with greater agility, leaders who desire to encourage innovation must learn to be comfortable with risk. Innovation requires both a willingness to act and to create a safe environment that allows it to flourish. But to create this innovation safe space, risk must be overcome. People have three fears regarding risk: fear of failure, fear of success, and fear of what others think.[45] Since risk is foundational to doing new things or doing things in new ways, leaders need to understand which of these fears they are most vulnerable to and work to mitigate them. Risk tolerance

can be managed in a variety of ways. One example is enabling leaders to make smaller, more frequent decisions rather than letting things build up to the point where single decisions have enormous consequences.[46] This technique makes risk more tolerable since only a little is risked with each decision.

DOD needs risk-tolerant leaders who are comfortable in chaos, are effective decisionmakers, have freedom to act and create, and, more importantly, allow their subordinates room to do the same. These facets of professional maturation can be inserted into curriculums at formal schools, enhanced by operational and joint experiences and modeled by leaders.

The recipe to ensure innovation and, as a byproduct, preserve strategic and operational advantages in the future does exist. Innovation can be created incrementally and relatively inexpensively by adhering to the following ingredients: a general investment over a wide field of technology and science by relinquishing an outdated requirement to own the technology or hardware, a reformation of organizational limitations, and a liberal salting of leaders prepared to innovate and accept new ideas. A winning recipe for innovation is not to take two cups of stealth, throw in a handful of nanobots, and mix with a giant robot dog. Ralph Peters warns against an over-fascination with technologic solutions at the risk of not investing in other aspects of innovation. He reminds strategists that potential enemies are innovating, while the United States "tends to fall in love with the means . . . and be seduced by what we do; our enemies focus on what they must do."[47] The effects of globalization and rapid advancements in technology have begun a shift in the geopolitical power balance. Maintaining U.S. preeminence in innovation will require changing perceptions, organizations, and leadership styles to a "magnitude that military people still do not completely grasp and political leaders do not fully imagine."[48] However, the recipe for innovation argued herein is definitely a step in the right direction and need not come with the drama of a celebrity cooking show. **JFQ**

## Notes

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