



Defense **AT&L**



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Acquisition Excellence Delivered to the Point of the Spear

Defense AT&L interviews
Dr. Ashton B. Carter
**Under Secretary of Defense
for Acquisition, Technology and Logistics**

ALSO

**Business Process Reengineering
with COTS Software**

**Improved End-of-Life Cycle
Management**

**Investigating Concurrency in
Weapons Programs**

Your TV Just Died

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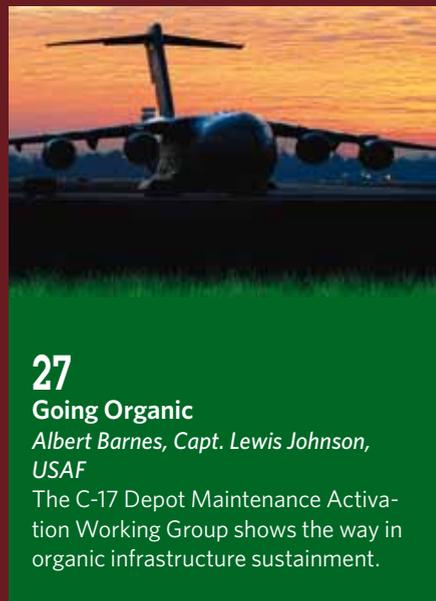


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**Under Secretary of Defense
(Acquisition, Technology and Logistics)**
Dr. Ashton B. Carter

**Deputy Under Secretary of Defense
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Acquisition Excellence Delivered to the Point of the Spear

*Dr. Ashton B. Carter
Under Secretary of Defense for Acquisition,
Technology and Logistics*

Dr. Ashton B. Carter has been serving as under secretary of defense for acquisition, technology and logistics (AT&L) since April 27, 2009. His tenure has been marked by a distinct focus on supporting the warfighter as directly and immediately as possible; handling increasingly challenging logistics issues and the complex integration of science and technology; maintaining a top-quality acquisition workforce; and, above all, maintaining a laser focus on improving the value received for every dollar spent. This interview will provide some insight leading to the precedent-setting announcement by Carter on June 28, 2010, now referred to as the “Carter mandate for better buying power.” Then-Defense Acquisition University President Frank Anderson sat down with the under secretary in April to discuss his outlook for the defense acquisition workforce and his priorities and vision for the future.

Q
You've been in your position as the under secretary of defense for acquisition, technology and logistics for almost a year now. Can you discuss your general perceptions of how things are going?

A
It is a wonderful organization filled with an enormous number of highly dedicated people. It is a pleasure to be part of the AT&L team. I would say that the top priority for me in AT&L is one that I was given by the secretary of defense [Robert Gates] back on Jan. 5, 2009, when he offered me this job. He said, "AT&L has a tremendous number of things to do, a huge portfolio, but I've noticed the troops are at war and the Pentagon is not, including AT&L." He said that he wanted to make sure that AT&L, in addition to doing all the other things we do in this fabulous organization, is very attentive to supporting the warfighter. I've been very diligent, as have all of the staff, in pursuing that guidance from Secretary Gates.

Q
An emphasis on the current war has been a theme of yours from day one. You have placed great emphasis on getting the right balance. Would you expand on that a little bit?

A
There are several different dimensions to it. The first, of course, is responsive acquisition—making sure that we can turn inside the loop of real-world unfolding events; not just have programs that are on the 10- and 15-year program of records schedule, but have those that are on the 10-month or 10-week response schedule. We've had a lot of success in that area in a wide range of fields: vehicles, ISR [intelligence, surveillance, and reconnaissance], counter-IEDs [improvised explosive devices], and so forth.

Another big area, tremendously important, that AT&L is involved with is the management of contractors on the battlefield. I don't think most of our citizens know this, but most of our workforce know that for every soldier we field today, at least one contractor is also engaged in the same theater in necessary support functions to the warfighter. Managing that effort means trying to strike a balance between being efficient and responsive to the contingencies of war on the one hand, and on the other hand, being good stewards of the taxpayers' money. Striking that balance is the second important thing.

A third is logistics. There are logistics wars right now. In Iraq, it is getting stuff out on a prescribed timetable established by the president in circumstances in which hostilities are still ongoing. In Afghanistan, it is getting the surge and all the rotations into Afghanistan this summer, and also all the things that might have gone into Afghanistan in the past few years had Afghanistan been the central priority. Now Afghanistan is the main effort, as Gen. [David H.] Petraeus [commander, U.S. Central Command, at the time of this interview] says, so there is a tremendous amount of capability, personnel, and construction and so forth that needs to go on in Afghanistan. And Afghanistan is just about the most demanding logistics environment you can possibly imagine. We don't have many months to do it, and people involved in this are just amazing, starting with our own people here in the Pentagon; though of course, the real action is done in the field.

A last area that has been of particular concern to me, and that the secretary has given us some responsibility for, is the counter-IED fight—equipment, training, and so forth. Those are all the areas of the current war that AT&L is involved in, and I think it is something new for our organization to be that involved. The secretary wants it, and the country needs it.



The acquisition executive always has to be looking to joint acquisition and the acquisition of inherently joint capabilities.

Q You mentioned the counter-IED fight. I know that you are co-chairing a group looking at initiatives and things that can be done now. Would you expand on some of the things that are coming out of this review? How are we looking to defeat IEDs?

A The IED problem, first of all, can't be disentangled from the war as a whole. IEDs are obviously a threat to life and limb. Also, unless we defeat the IED, we can't pursue the COIN [counterinsurgency] objectives because if the troops and—above all—the civilians can't be out and about amongst the people, the whole strategy doesn't work.

Countering the IED is essential to retaining the support of the Afghans, of the coalition partners, and of the American people. It is a central part of the overall objective in the CSIG [Counter-IED Senior Integration Group] that the secretary set up to coordinate and accelerate our near-term efforts. We have been focused on such things as widening

I expect that our acquisition officials all the way down the chain are doing the same thing: being disciplined; being rigorous; being open when things are not going well; and confronting things as they arise, as things do in any program.

the delivery pipe for MRAPs [mine resistant ambush protected vehicles] so that we can get the MRAPs that we are producing here in the United States in the hands of soldiers as quickly as possible. We are getting more of the coveted ISR, particularly full-motion video, that is so helpful and comforting to people conducting operations, and we are doing that with fixed-wing aircraft, traditional unmanned aerial systems, tethered aerostats, and other elevated line-of-sight systems and trying to push them into country as quickly as possible.

The other thing we are working on is the unique problems associated with homemade explosives based upon the use of fertilizers like ammonium nitrate. That turns out to be not just an Afghanistan problem but one that leaks into Pakistan and other nearby countries. It is not purely a military problem, but a diplomatic and economic problem as well.

Wherever the counter-IED fight takes us, we are going. And it is not just the equipment; it is the training. It is critical that the people who are going into Afghanistan in the next few months have specialized training in counter-IED and that they have the equipment and the expertise required to defeat this threat.

Q During my interview with Gen. Petraeus in September 2009, the general had high praise for you as the under secretary, and he really complimented you for your aggressive move to get things in theater. He thought that was a reflection of your leadership. Would you share a little bit regarding your emphasis on the need to provide timely support to the warfighter in theater?

A He is the customer. He is the boss, as far as I am concerned. He says jump, we should say how high. Gen. Petraeus, Gen. [Raymond T.] Odierno [commanding general, U.S. Forces-Iraq], and their staffs—they are the people out there at the point of the spear. What we try to do in all of our war support efforts is to listen very carefully to what they want. They sometimes don't have the time to tell us what to do, so we have to figure that out. They sometimes don't have the means to tell us exactly what they want. We need to understand their situation well enough to serve them.

I always say to the people in theater, you call the meeting when you want; we are not going to call it on Washington time and make you stay up at night; you make us get up early in the morning. It is all about you.

Q We've talked about warfighter support. I'd like to move to science and technology, another area upon which you have placed great emphasis. Can you share with us the important role of S&T, especially in terms of innovation for the acquisition community?

A Science and technology has been one of the strong areas of advantage for the United States in waging war. Our people are our best asset; after that is science and technology. And over many decades, that has been a distinctive enabler for the American way of waging war. It is our responsibility in AT&L—namely the "T" part of AT&L—to make sure we hand off to our successors and their successors in the decades ahead the technologies that will make our military superior. We have to do that in a changing technological environment. It used to be, 50 years ago, that most technologies of military importance originated in the military technology base. We

sponsored them, we gave birth to them. Today, many important technologies are developed outside the Department of Defense's walls, and we need to be able to reach out and get them. The other thing that is true is that 50 years ago, most important technological advances were made within the United States. Now there is a global technology base of importance. We have an excellent leader in Zachary Lemnios [director, Defense Research and Engineering] and his great organization. It remains of central importance for the future of the Department of Defense.

Q *In our staff meetings, you have pushed for holding contractors and acquisition teams accountable for positive results. Given the environment we are in and the tradeoffs that teams have to make, how do we keep the right balance between accountability and delivering products on time?*

A Acquisition excellence is a big theme, not only for Secretary Gates, but for President Obama also. He has emphasized the need to change the way we do business and get better value for the taxpayers. As Secretary Gates says, there is no silver bullet in doing that. It begins with good people in our acquisition workforce and then daily diligence. It is true that in some cases, we are not getting the value that the taxpayers deserve. In some cases, the programs need to be reviewed, and all issues associated with them surfaced and dealt with.

I believe in very vigorous "digging into" each of our programs. It is not a matter of making a perfect system and jumping

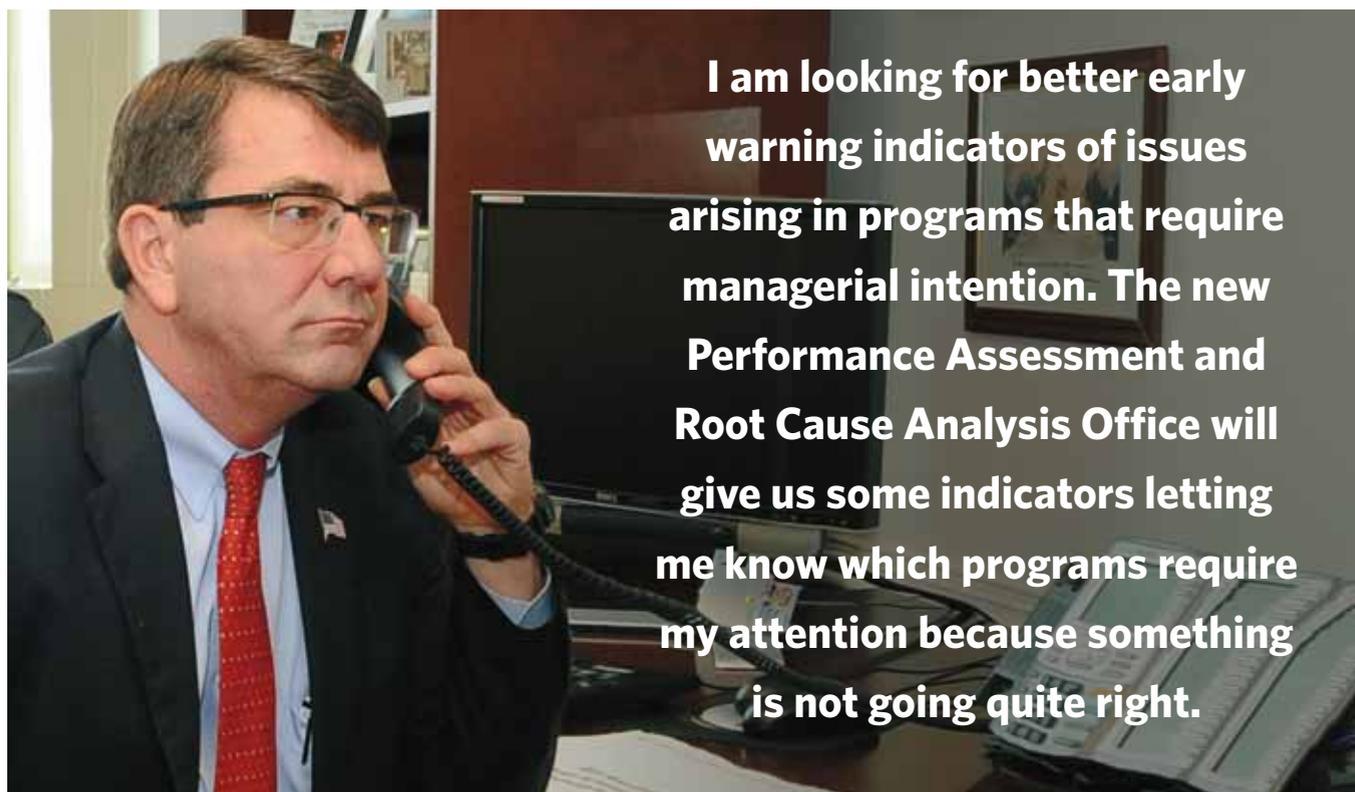
through hoops or fitting into boxes. Each program is different and distinctive. I likewise expect that our acquisition officials all the way down the chain are doing the same thing: being disciplined; being rigorous; being open when things are not going well; and confronting things as they arise, as things do in any program.

Q *One of acquisition's challenges is having the resources we need to acquire all of the equipment we feel is important. That obviously drives tradeoffs. Do you have any thoughts to share relative to the trades we need to make to provide the right national security formula?*

A I don't expect the investment part of the defense budget to go down, but it is not going to be growing the double-digit way it has over the last decade and the way we've become used to. We are going to have to manage more rigorously, and there are two senses in which that needs to be done.

The first: program by program, contract by contract, facility by facility, driving down costs and making sure we are getting the best value for the taxpayer. I can tell you in many cases, in many contracts, we are not yet there. We can do a lot better in getting more value for the taxpayer.

The second is something that Secretary Gates has emphasized very strongly, and that is having the discipline to stop doing things that aren't working: programs that aren't performing; programs whose time has passed—ones that may



have seemed like a good idea when they were started but we now realize are not needed; or programs that we have enough of and we don't need to buy any more. This is very difficult discipline, and we need to recognize that spending more than we need or buying something that is no longer required is taking away from our ability to buy the things that we *do* need. Within that sense, it will always be a zero-sum game, and we have to show that kind of discipline. Secretary Gates has shown the strength and courage to do that when it is warranted. He has given every indication that he will continue, and it is the right thing to do for the taxpayer and the warfighter.

Q *A theme of acquisition reform has been the idea of improving what and how we buy. Can you comment a little on this?*

A Again, there is no substitute for program-by-program discipline. We are, however—and some of this comes out of the Weapon Systems Acquisition Reform Act passed last year unanimously by both houses of Congress—making some specific innovations that go beyond the improvement of the workforce and the instilling of discipline, which are the two key things.

But the Weapon Systems Acquisition Reform Act made a few recommendations to us. I'll just give you one example of that, and that was the use of independent cost estimates. We've had an example of the use of independent cost estimates in our largest program, the Joint Strike Fighter program, the last four or five months; and we used it in the way it should be used—namely, to challenge the program office's and the contractor's view of the status of the program with an independent set of eyes. At that point, the managers—the secretary and I—can compare the independent estimate to the program office estimate. In this case, they were dramatically different. We asked what accounted for the difference. By focusing on those discrepancies, we could see the parts of the program that weren't quite focused and needed to be managed differently. We will be able to restructure the Joint Strike Fighter program as a result of that independent cost estimate and then lay out a budget for the restructured program that was the first look neither of the independent cost estimators nor of the program offices; it was something in between. Now we are managing that independent cost estimate.

Q *From listening to your comments, it can be assumed you have a positive view of acquisition reform initiatives that are ongoing. Have you started to evolve a set of metrics for how you will assess programs?*

A That is a very important thing because there are so many programs that I can't do for each and every one of them what I did for the Joint Strike Fighter program—which is spend day after day and weekends delving into every detail. That was an important thing to do because of the significance of the Joint Strike Fighter program. I also wanted to set an example of how I thought program review should be conducted. But I can't review every program at that level of depth.

Therefore, I am looking for better early warning indicators of issues arising in programs that require managerial intervention. The new Performance Assessment and Root Cause Analysis Office, which grew out of the Weapon Systems Acquisition Reform Act, will give us some indicators letting me know which programs require my attention because something is not going quite right. What I don't want to do is have to wait until they hit serious trouble, for example, by having a Nunn-McCurdy breach. When Nunn-McCurdy breaches come along, the program has generally either gotten so far off the rails that it is very difficult to get it back on track, or the Nunn-McCurdy bell has rung for some other reason—for example, the unit cost has gone up because the number of units we are buying has gone down. Nunn-McCurdy comes along too late and has a high false-alarm rate. I am looking for indicators and metrics that direct managerial attention early and don't have the high false-alarm rate.



Q *You spoke of the Weapon Systems Acquisition Reform Act. One part of that is an emphasis on people, which is another priority area in which you have invested time. Most people hear about the 20,000 people that we're hiring. Your emphasis has been that size is one factor; your drive has been quality of people. Can you talk about that?*

A Quantity is important, but quality is paramount. Of all our programs in AT&L, the most important is to increase the competence, quality, and performance of the acquisition workforce. That matters more than any organizational reform. There are several different dimensions to this.

One is making sure that as we add civilians to the workforce, they are in the skill sets we most lack, and that the people we are hiring are highly competent. I must say that so far, this has been the case, but we need to keep pushing as the years go by and we hire more people.

Second, I have been pressing the Services to pay attention—more attention than they have in recent decades—to the uniformed acquisition workforce, as it is critically important that there be a core within each Service so that junior officers with acquisition acumen can aspire to promotion.

Last, we have to look outside government to our supporting institutions. We have an acquisition support structure in industry, but we have a unique and uniquely valuable structure in the FFRDCs [*Federally Funded Research and Development Centers*] and UARCs [*University-Affiliated Research Centers*]. These are immensely valuable institutions, and I am looking for ways to support and strengthen them.

The quality of people is the most important variable we can change to alter acquisition outcomes.

Q *Most of the people know that you conduct reviews to look at programs, but a lot of people don't know that you have also set up a structure to review people. You've talked about this being a program, and you have set up systematic reviews where everyone comes together to go through all of the details. Will you talk a little bit about your focus on engaging all of the senior leadership?*

A We had a meeting just last week, where we gathered all the Services and field agencies that are doing in-sourcing and new hiring and asked them exactly what specialties they are seeking; why; how many in each category; and how they are going about ensuring that not only do they have quantitative targets, but that they have the quality also. There is no alternative to going through those organizations

one by one and those personnel categories one by one. As I said, it is our most important program.

Q *Do you have any other thoughts or themes that you would like to share with the community?*

A There are several frontiers out there for us in the acquisition community.

One is sustainment. There are a lot of dollars in sustainment. We all talk about the need to pay attention to how much it is going to cost to sustain a weapons system that we are acquiring, but I think we really need to make good on that determination, and we need to also look at the current sustainment costs we are paying for programs that we've bought in the past. There is a lot of money there that I believe we can manage better.

Second, when people talk about acquisition, they tend to talk about the acquisition of weapons systems, but the other half of the money we spend in the department is on services. How well are doing in services? How good is our performance in acquiring services?

A third frontier is, of course, information technology—again, something you have to buy differently from the way you buy traditional weapon systems.

The last I'll mention is an issue that has been with us since Goldwater-Nichols [*the Department of Defense Reorganization Act of 1986*] and remains with us and will continue as long as we have the structure we have, which is that we fight jointly but we still acquire separately. Any system will have its seams. That is the seam in our system. The acquisition executive always has to be looking to joint acquisition and the acquisition of inherently joint capabilities like ISR, because if we don't pay attention to filling those seams, they will spread, and there will be important deficiencies.

I also want to express my appreciation to the readers of *Defense AT&L* and everyone in the acquisition workforce. It becomes very apparent when we are trying to hire people into the acquisition workforce that we have one great trump card that no other employer has. We don't always pay as well, we don't always have the benefits of other employers, but we have the mission of patriotism and duty. I want to thank those in AT&L who have answered the call already, and that is my great hope for ensuring that tomorrow's acquisition workforce is even better.

Q *Dr. Carter, thank you very much for taking the time to share with this magazine your thoughts for the acquisition community.*



Department of Defense acquisition practices are conceptually structured to decrease overhead costs while continuing to improve capabilities and interoperability. These practices mandate build versus buy solutions, with more emphasis on buying pre-built applications. Buying commercial off-the-shelf software—COTS—can be a very efficient and effective solution, if the context of the life cycle is considered in all customization decisions. If we are to achieve the expected gains from purchasing software versus building it ourselves, then for the entire life cycle of the product, we cannot allow any modifications. That is

Shelton is a program manager for the Air Force Services Agency, Headquarters. She is a certified Project Management Professional, an agile coach, and a Six Sigma master black belt.

easily obtained in many small systems with a little discipline; however, large enterprise resource planning (ERP) solutions will encounter problems if not approached correctly from its initial acquisition phase. This article discusses the issues around COTS and business process reengineering, and improvements we can make to the acquisition process. First, let's examine the reasons a COTS purchase is usually a good choice by taking a look at the total cost of ownership and configuration control.

Total Cost of Ownership Advantage

The total cost of ownership begins with an estimate of all direct and indirect costs that might be associated with the acquisition life cycle. That involves making some assumptions about the future and then simulating various scenarios to arrive at alternative cost estimates. The goal of calculating the total cost of ownership is to support wise decisions about all the costs in the beginning and then anticipate and manage those costs during the life cycle. Changing to look at software acquisitions from a tactical view of the upfront and direct project costs to a total cost of ownership is a significant paradigm shift for DoD. The department must estimate the total cost of ownership against its strategic objectives—not from a budget concept. Many of the resources expended during a project are internal costs, so they are invisible in the budgeting process. The total cost of ownership for an unmodified ERP application versus a homegrown variety for a complex organization such as DoD is about 45 percent less than developing custom code. The greatest variances are in the time spent to upgrade and test the new modifications, and much of this is done by the software company in an unmodified ERP system scenario.

Each change, no matter how seemingly small, affects the ability to test and adapt future updates and software changes efficiently. Customizations are unique to the location. Quite often, this complicates the troubleshooting of a real bug in the software, as it is time-consuming to separate the real bug from the custom code. There are processes and procedures to address such a scenario, but they add additional time and cost that should be factored into the total cost of ownership. That's one reason why ERP systems rarely meet their scheduled delivery dates and never meet their expected return-on-investment objectives.

The figure "Cost of Change: Return on Investment" balances the number of features (software changes) against the anticipated return of that investment. As the number of changes in code increases, the increase is exponential and quickly erodes the return on investment. The cost of changing software is not linear, but exponential. Frederick Brooks, author of *The Mythical Man Month: Essays on Software Engineering*, attributes the exponential rise in costs of software changes to the cost of communication—costs to understand the software to be changed, the cost to understand what actually needs to be changed, the cost to com-

municate what needs to be tested, the cost to communicate what didn't work the way it was tested, and so on.

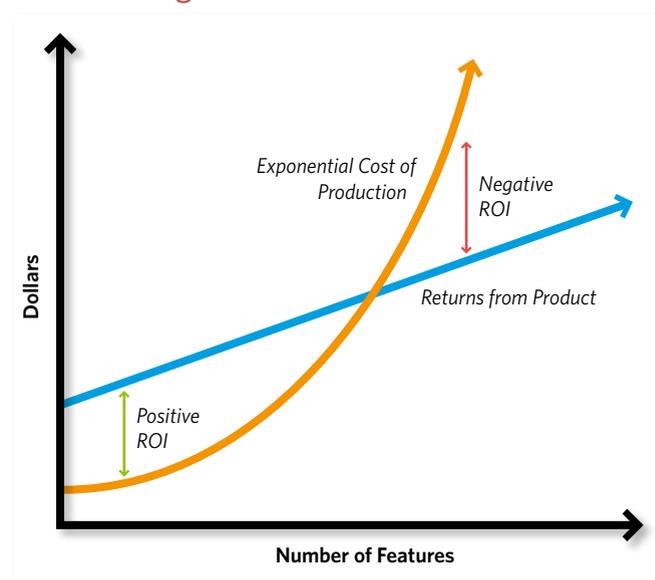
When the total cost of ownership is considered, the cost of a modified COTS can easily absorb any expected benefits or return on investment. In addition to the time (money) spent in modifying the software, the number of personnel saved by applying consolidated functionality via an ERP simply translates into more technical resources to maintain the software. Technical resources generally have higher costs because of the need to analyze, modify, and manage the software architecture.

Configuration and Change Control

The chief means for controlling the total cost of ownership is to minimize the number and degree of changes permitted to the baseline software. ERP packages are designed for a large audience of companies looking to achieve success by following a template of best business practices; however, software often fails to achieve its promise because of people's reluctance to change and their adherence to old processes. That leads to costly program modifications to replicate the old processes. That, in turn, can result in unnecessary manual tasks and software maintenance issues, which neutralize the original benefits of the software. Customization and subsequent upgrades are costly, and the decision to hold the line should be made at the beginning of the acquisition and revisited only under the most extreme circumstances.

According to Donald Bureson in his article "Selecting an ERP system: Build or buy?" (<http://articles.techrepublic.com.com/5100-10878_11-1040167.html>), "If your organization does not have a clear competitive advantage from your ordinary business systems, an off-the-shelf solution can offer the greatest benefit because a packaged solution can be used right out of the box and requires very little IT overhead."

Cost of Change: Return on Investment



In a keynote address in 2002 to the Third International Conference on Extreme Programming, Jim Johnson, chief executive office of the Standish Group, quoted a DuPont study that showed only 25 percent of systems features were really needed. "On average, 45 percent of software features are never used, and only 20 percent of features are used always or often," he said, giving us a frank reminder that we need to ensure the requirement meets a strategic need and doesn't simply pave an existing cowpath in the organization's processes.

ERP solutions are modular and flexible, and thus can be customized to a certain degree; however, major modifications are complex and extremely costly. Software packages—especially ERP software packages—have processes encoded into their click trails and transactions that will never do everything a customer wants. It is important to remind the integrated product team and those who are customizing software to modify the COTS package only where it is a strategic advantage. With that in mind, DoD would make very few customizations to an ERP system.

The trap for program managers is easy to fall into, though. Software companies, sponsors, and implementation teams are very willing to justify customization at what initially seems like a very low price to pay in comparison with the angst incurred when the program manager asks the organization to change. Regardless, it is still imperative for the organization to change its business processes to meet the COTS-embedded processes rather than customize the COTS to meet the organization's process.

Business Process Reengineering

According to a Feb. 12, 2010, memorandum from the Office of the Deputy Chief Management Officer and the Fiscal Year 2010 National Defense Authorization Act: "Section 1072 does not allow funds to be obligated for a defense business system modernization that will have a total cost in excess of \$1,000,000 unless appropriate BPR efforts have been undertaken. The business process to be supported by the defense business system modernization will be as streamlined and efficient as practicable."

A memorandum providing guidance on implementing the 2010 National Defense Authorization Act update to U.S. Code 222v4, "Implementation of Section 1072 of the Fiscal Year (FY) 2010 National Defense Authorization Act (NDAA)—Business Process Reengineering (BPR) Assertion," specifically states the BPR will be done during the requirements generation, which for most software development and acquisition life cycles is *before* the request for proposal is released. Implementing COTS business products, specifically ERPs, significantly affects the organization's culture, structure, and business processes in addition to its procedures and rules. Documenting business processes that you know will need to be modified significantly in the near future is not an effective use of one's resources. An efficient busi-

Customization and subsequent upgrades are costly, and the decision to hold the line should be made at the beginning of the acquisition and revisited only under the most extreme circumstances.

ness process is one where the organization, process flow, and the configuration of the COTS system are done concurrently; and you can't do that until you know what software you are purchasing. V. Koch's article, "BPR and ERP: realizing a vision of process with IT," published in a 2001 edition of the *Journal of Computing and Information Technology*, further pressed the need to combine ERP implementations with BPR:

The implementation delays and ERP product modifications could result in exponential growth in both direct and indirect costs. ... It would always be better to complete the BPR project prior to information system modeling and ERP system development. Since the implementation of large information systems is not possible without first altering business processes, reengineering is essential in order to extract maximum benefit out of the ERP products. However, analysis of business practices shows a different approach. Initiating BPR projects prior to ERP means that the companies must provide resources for two successive projects. The reason why many companies chose to conduct ERP system development was to attempt to solve all their organizational problems without reengineering business processes first. ERP applications integrate many best business practices and much knowledge that could be worthwhile if included as a part of BPR projects. By taking the best practices inherent in ERP applications, companies can change their processes simultaneously with technological change. As a result, many companies changed their business processes to fit the ERP system requirements, and the possibilities of ERP systems have been used to underpin BPR.

Koch and the National Defense Authorization Act are accurate in stipulating BPR, but it should only occur in conjunction with the COTS implementation and not before it. If BPR is

not approached in this manner, the new business processes will require rework and will erode the cost benefits expected from the initial BPR.

Fine-Tuning the Program Strategy

Executive leadership must be visibly involved in executing strategy, and software implementation is no exception. Only leadership can quickly address the disagreements that arise in the process of transforming through BPR and an ERP implementation.

Rules need to be modified to take advantage of the evolutionary strategy an integrated BPR and COTS implementation requires. While it is very difficult for an integrated product team of subject matter experts familiar with their own processes to remain disassociated enough to effectively determine what needs to be changed, organizations can establish rules to evaluate each change to ensure it meets a strategic or competitive need.

ERP systems and implementation teams are experienced in delivering software all at once versus an incremental delivery; however, BPR and ERP can be delivered incrementally, prioritizing process and technical improvements by need, value, or other criteria. Such agile principles applied to an integrated BPR and ERP yield significant and early results.

So while we can decrease our long-term sustainment costs through the use of COTS purchases, we can do so only if we modify our processes to match those inherent in the software system. If we intend to do our part to decrease the deficient, our acquisition strategy and program management plan must incorporate that approach from initiation to better prepare the end users for the paradigm shift they will encounter. Furthermore, we need to market organizational change for the positive it is—the embracing of the software’s processes and the resultant significant saving in sustainment costs. To do so, we need to close the gaps in our acquisition skill sets—specifically our skills in process engineering.

Incorporate DFSS into the Guidebook

The Defense Acquisition University *Defense Acquisition Guidebook* does not currently address the need to modify business

processes while implementing enterprise solutions. Its software engineering waterfall-esque approach to enterprise software acquisition needs to include the tasks related to assessing the organization and adapting the organization to the inherent software processes. Nor does the *Defense Acquisition Guidebook* address the need for business process reengineering in parallel with COTS implementation.

Once implemented, the value of ERP initiatives becomes embedded in processes that are difficult to quantify. COTS business software has embedded processes; therefore, if we do business process reengineering before purchasing software, we will have to redesign those processes to the ones inherent in the software functionality, and that can easily negate any gains resulting from reengineering or a COTS purchase. Merging BPR with agile principles of an iterative delivery and a trained team of technical and business experts will result in a program that is truly performance- and results-based.

Bring in Lean

In his book *Design for Six Sigma*, Subir Chowdhury states that changing a design after a product launch and not during the development state can cost a company a

thousand times more. Extending this understanding that systems design includes human factors and processes, it is clear that our teams need the necessary skills to design these processes in their BPR efforts and major defense acquisition programs to be effective. One of the optional continuing education courses offered by DAU is Lean Manufacturing (CLB 007). The course touches on Six Sigma and provides familiarity with the terms. For more in-depth training, DoD has adopted Lean Six Sigma green and black belt certification programs. We need to add Lean Six Sigma certification to the current Defense Acquisition Workforce Improvement Act certifications for informa-

tion technology and program management.

DoD 50000.01 requires acquisition teams to adopt innovative practices to reduce time, assuming that the teams have the skill sets in process improvement and transformation. It also drives program managers to reduce technology risk and states that the “acquisition of software

We need to add Lean Six Sigma certification to the current Defense Acquisition Workforce Improvement Act certifications for information technology and program management.

intensive systems shall use process improvement and performance measures.” But how many program managers and integrated product teams have the skills to frame their programs to maximize the benefits of adopting iterative delivery practices and process reengineering?

Sponsors, program managers, and the integrated product team members must be able to assess the technological and business process issues involved with specific ERP applications. It must be stressed that failing to match business processes with a company’s ERP system can derail even the best-run organizations. Managers and employees must be able to assess the technological and business process issues involved with specific ERP applications.

The military services’ Lean Six Sigma initiatives are perfectly aligned to be merged with our acquisition framework, with a few subtle tweaks. These initiatives embrace the classic DMAIC process—or define, measure, analyze, implement, and control phases—typically applied to continuous improvement. This view attacks root causes of existing processes. Design for Six Sigma (DFSS) attacks a company’s problems during the product and process development state. While the tools and order used in Six Sigma require a process to be in place and functioning, DFSS has the objective of determining the needs of customers and business, and driving those needs into the product solution so created. DFSS is relevant to the complex system/product development phase, especially in the context of a new system. It is process generation in contrast with process improvement. DFSS strives to generate a new process where none existed or where an existing process is deemed to be inadequate and in need of replacement. DFSS aims to create a process with the end in mind of optimally building the efficiencies of Six Sigma methodology into the process before implementation; traditional Six Sigma seeks for continuous improvement after a process already exists.

In conclusion, DoD 5000.01 and the Fiscal Year 2010 National Defense Authorization Act require process improvement and performance measures in concert with industry best practices, but stop short of delivering the value envisioned as they require business processes to be reengineered prior to the selection and purchase of a COTS business solution. The COTS technical solution will have built-in processes that will be expensive if not impossible to change. We must build business processes around the capabilities of the technology and not modify the technology. We must also train our program managers in Lean Six Sigma practices so they can effectively lead the team to achieve the most efficient and effective balance to execute our agency of tax payer dollars.

The author welcomes comments and questions and can be contacted at cindy.shelton.1@us.af.mil.

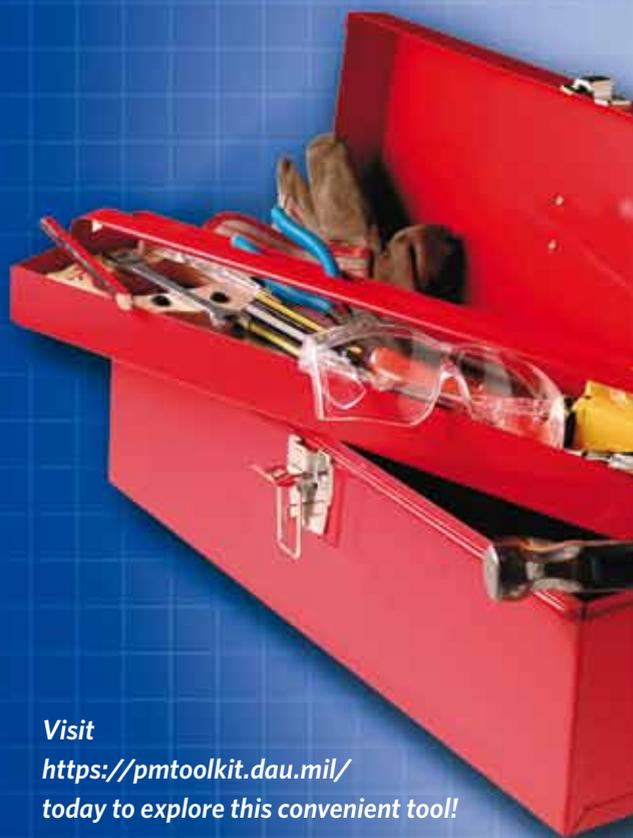
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Improved End-of-Life Cycle Management

Yesterday's Equipment Conserving Today's Dollars

David Oaks



A visitor to Sierra Army Depot in the summer of 2003 would have been witness to an impressive sight: more than 1,000 ground combat and tactical vehicles neatly parked in the high desert heat. Seven years later, the scene is even more impressive, as the number of vehicles—in various states of readiness—has grown more than eightfold. But the question isn't how did the Army get into this extraordinary situation? The question is how will it get out?

The Army has a range of options for disposing of this equipment in ways that could increase readiness to the current warfighting fleets; enhance support to allied and coalition forces; reduce the burden of corrosion, obsolescence, and storage costs; and return some of the investment funds to the public treasury.

Oaks earned a doctorate in public policy from the RAND Graduate School and is a colonel in the Army Reserve. He works at LMI in McLean, Va.

The combined effects of Army transformation, global repositioning and restationing, modernization, and modularity have displaced significant quantities of tanks, fighting vehicles, artillery systems, tactical trucks, and miscellaneous support equipment from operational forces. Beginning with the drawdown in Europe in the mid-1990s and extending through the current Army modularity efforts and the drawdown from Southwest Asia, many weapons systems have been diverted from operational units.

Without the resources to properly execute demilitarization and disposal, this materiel has made its way into temporary—albeit long-term—storage around the globe (Anniston Army Depot, Red River Army Depot, Kaiserslautern Storage Activity, and Taegu Storage Area), with the most conspicuous collection in California’s high desert at Sierra Army Depot.

Much of this materiel is excess to the needs of the Army but not necessarily excess to inventory levels that are driven by authorization formulas and policy mandates. There are procedures for demilitarizing and disposing of equipment through the Defense Logistics Agency’s Defense Reutilization and Marketing Service (DRMS).

Unfortunately, Army program managers do not have access to the necessary funding, manpower, policy, or authority to deal with this magnitude of equipment. That leaves the Army without a viable strategy to dispose of its excess displaced materiel—a dilemma that leaders at the highest levels of the Army know they must address.

The U.S. Army TACOM Life Cycle Management Command (formerly Tank-Automotive and Armament Command), the owner of much of the excess equipment, is developing and beginning to implement a strategy that will not only ensure proper disposition, but could also generate revenue to cover the overhead and operational costs.

TACOM-LCMC and Army program managers are partnering to assemble a disposal strategy that is both effective and sustainable. The best approach will most likely come from a tiered strategy that uses several integrated concepts:

- Retention of a “golden fleet”
- Retention of some quantity of platforms that are in a planned state of unreadiness
- Candidates for foreign military sales
- Candidates for disassembly to feed a secondary supply chain
- Residual sales.

This strategy is analogous to how the U.S. Air Force disposes of its displaced aircraft and how commercial enterprises meet their reclamation targets.

Air Force’s AMARG

The Air Force’s Aerospace Maintenance and Regeneration Group is a good example of an end-of-life-cycle management operation. The AMARG manages more than 4,000 aircraft for joint and allied customers at the Davis-Monthan Air Force Base in the Arizona desert—often referred to as the “Boneyard.” While storage is its most publicized activity, AMARG also has three other product divisions: aircraft, commodities, and disposal.

The aircraft division restores airplanes to flying condition for foreign military sales or use as target drones—this is the AMARG’s “golden fleet.” The aircraft division also feeds parts back to service life extension programs by harvesting significant portions of aircraft, such as a recent effort to recover the center wing boxes of A-10 attack aircraft. The AMARG commodities division salvages, inspects,

and ships aircraft parts. This activity alone generates hundreds of millions of dollars of revenue each year. The disposal division oversees the scrapping of aircraft in excess of pro

Commercial Industry Examples

Private sector practices provide a number of examples of getting use from otherwise useless assets. These commercial innovations for better end-of-life disposal have come about because of increased pressure to recover as much value as possible while complying with environmentally focused regulations.

A recent trend in the end-of-life commercial aircraft market is the recovery of both serviceable parts and reclaimed materials to return more value than simply selling entire aircraft for scrap. Industry experience has proven that taking the time to methodically dismantle aircraft for scrap, from 5 days to about 45 days, can increase the recovery yield by 10 to 20 percent. Technical data from the original manufacturer helps in the identification of important metal alloys and other constituent parts.

The best management practices can result in a 90 to 95 percent recycling of an aircraft by weight. Some estimates put the market for the reclaimed parts (primarily engine parts) at around \$2 billion.

Another potentially lucrative area is the reuse of carbon fibers. The reclaimed fibers may not be certified for reuse in aviation components, but they do retain their value for use in less critical applications.

Automobile end-of-life considerations have been pushed by regulatory compliance with higher reclamation targets. British law, for example, mandates recovery of 85 percent of the weight of passenger cars; the European Union has passed a more rigorous law calling for 95 percent recovery of vehicles manufactured after 2015. To meet these goals, companies are designing their vehicles with greater attention to how they can later be dismantled, recycled, or reused. Principle among the design changes are reductions in the sum of hazardous substances, such as lead, cadmium, chromium, or mercury.

TACOM-LCMC and Army program managers are partnering to assemble a disposal strategy that is both effective and sustainable.

PROPOSAL REQUIRES CHANGES TO CURRENT POLICY

A centralized disposal activity can be self-sustaining, and may even generate revenue. While there are policy and regulatory hurdles that may stand in the way of the Army recovering some of the potential dollars generated, none of these hurdles are insurmountable. Further, mechanisms such as proceed-sharing with the Defense Logistic Agency's disposal and marketing service can add to the attractiveness of the Army's proposal.

Another trend in automobile dismantling is the segregation of the business into two parts: a centralized and specialized wholesale division that provides serviceable parts to repair and body shops, and a retail division from which customers retrieve the parts they need (a traditional strip lot).

Such reclamation examples from industry may help the Army and the Department of Defense further implement environmentally responsible solutions for its systems—from design to disposal.

Vision for Ground System End-of-Life Management

TACOM envisions the Army becoming a joint Service provider for ground system end-of-life-cycle management. Its strategy for end-of-life-cycle management can be self-sustaining given the right policy, authority, and resources.

Dollars could be generated from a variety of activities (including foreign military sales, reclamation of secondary items, salvage, or scrapping) and used to reimburse the Army Working Capital Fund, generating enough revenue to offset LCMC and other TACOM operating costs. Beyond these monetary benefits, there may be other gains. These could range from better equipping solutions for coalition partners and allies and the availability of materiel to support irregular warfare efforts, to a reduction in the uncertainty associated with end-of-life decisions and a flow of information back to manufacturers regarding the design of new items. As an added benefit, the Army and the other Services won't have large quantities of equipment languishing in open lots and consuming increasingly scarce funding for storage, maintenance, and corrosion control.

The starting point is to sort current (and future) items into five logical groups.

The Golden Fleet

Out of its pool of excess materiel, TACOM would identify the best available items in terms of their materiel condition and modernization. These could be restored to the Army Maintenance Standard (TM 10/20) and held at that level of readiness so they can be used for contingency purposes. Items of equipment in this golden fleet would be maintained for a variety of operational purposes—replacements for battle losses,

unforecasted training losses, operational surge requirements, and out-of-cycle equipment fieldings. The golden fleet might consist of several modernized and fully maintained M-1A2 SEP main battle tanks, a complement of M-2A3 infantry fighting vehicles, M-3A3 cavalry fighting vehicles, M-109A6 Paladin artillery systems, and other relevant combat, combat support, and combat service support equipment.

The Unready Pool

TACOM's strategy would deliberately hold a fleet of end items (similar in composition to the golden fleet) in a state of serviceability that is just below the Army's maintenance standard. This equipment would not be ready, but it would be maintained to control corrosion and held in inventory so it could be brought to an acceptable readiness level within a short period to replenish the golden fleet or to meet further contingency requirements. The unready pool might include serviceable secondary items as a hedge against unforeseen requirements.

Foreign Military Sales Candidates

A third pool of equipment would include materiel (both major end items and secondary items) that is available for military sales to qualified international partners. In the past, foreign military sales have been more or less a niche business for the Army. Given the increasing stockpile of warfighting gear, there are increased opportunities to get relevant equipment into the hands of our security partner nations. Equipment in the foreign military sales pool would be kept in an "as-is" condition (similar to the unready pool) or brought to a higher state of readiness, as determined by the requirements of the sale.

Secondary Supply Chain (Salvage)

Among the excesses is equipment that is ready to be disassembled for the value of its parts. These parts would feed numerous supply chains and repair part inventories, including the maintenance of the golden fleet, field-level and sustainment-level maintenance, and government-furnished materiel to original equipment manufacturers. The secondary supply chain would also feed foreign military sales and other governmental and non-governmental agency supply support.

Residual Sales

Whatever is left would be demilitarized and sold for its scrap value. This would include selling the residue from each of the earlier processes or properly disposing of the residue that has no further value.

A Strategic Approach

Taking a strategic approach to the end of equipment life cycle functions will benefit the Army, other Services, and DoD in many ways. The other Services can unload the materiel for which they no longer have a requirement—which, in and of itself, is worthy of a strategy.

Additional benefits range from the savings from the reutilization of repair parts, increased readiness of the systems in

The Value in Salvage.

The M113 family of vehicles has a commercially valuable engine that is used in a variety of trucks and construction equipment. Similarly, the power train components for most Army trucks, Bradley fighting vehicles, and self-propelled artillery systems have a commercial application. Other parts, including armaments, gun tubes, armor panels, suspension systems, reclaimed track, road wheels and trunion bearings can be reconditioned and sold to a variety of customers at reduced rates. While the AGT 1500 engine that powers the M-1A1/2 tank has a limited application beyond military armor, there is growing interest in using the engines in a stand-alone configuration for emergency power generation in humanitarian assistance or disaster relief operations. Undoubtedly, there are other potential applications for these systems if the price is right.

storage and in the field, increased support at lower costs for foreign military sales clients, the return of funds from residual assets to working capital funds, and a reduction in the environmental footprint.

Approximately 4,000 M113A2 armored personnel carriers currently sit at Sierra Army Depot. Each one has a Detroit diesel engine with widespread military and commercial application. Likewise, each carrier bears approximately 16,000 pounds (8 tons) of high grade aluminum alloy 7017 with a current market value of approximately 85 cents per pound. It is doubtful the Army will need to keep M113s in a golden fleet or in an as-is condition, but many countries still use M113s as their primary infantry carrier and need the spare parts to keep them running at an affordable cost. The cost for TACOM to reduce an M113A2 to piece parts would be covered in the value of its residual materials. A similar case could be made for the tanks, fighting vehicles, and artillery systems.

The current size of excess Army ground equipment is arguably a transitory rather than a permanent phenomenon. It has been driven by the coincidence of a variety of currents of the past few years: force redesign, response to war, etc. This particular sequence of events, falling so closely on one another, may not happen again soon. Nonetheless, the Army could certainly benefit from a dedicated end-of-life-cycle manager.

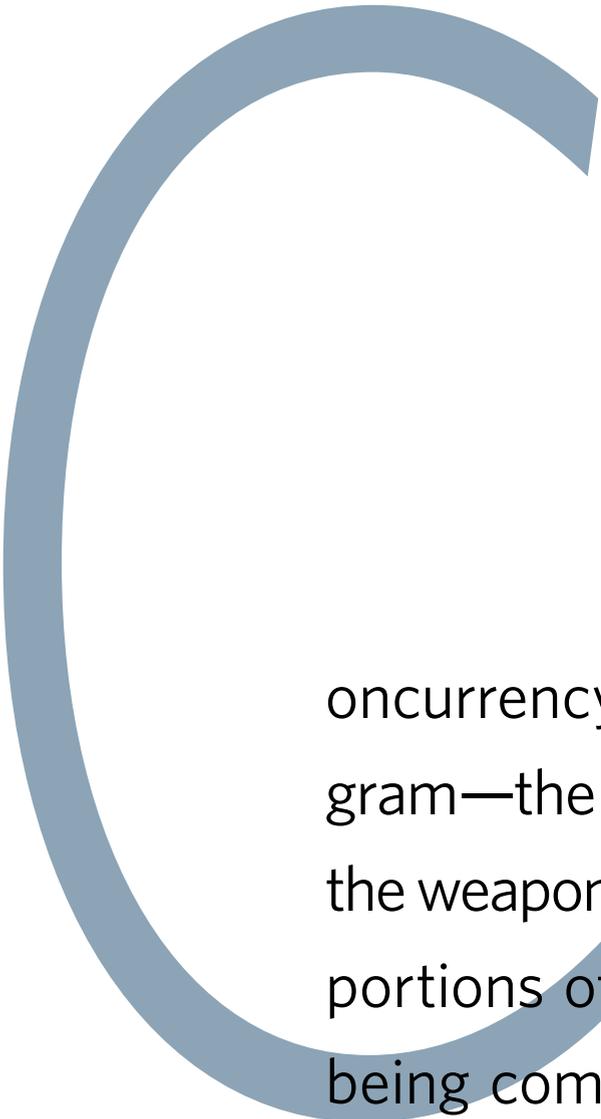
As excess inventories are drawn down from the current high levels, this end-of-life-cycle effort could be scaled back; but the enduring legacy would be processes that continue to add benefit in value recovery, expanded support of foreign military sales customers, and the incorporation of reclamation considerations in the design and fabrication of new materiel. It also sets the stage for future equipment displacements resulting from modernization.

The author welcomes comments and questions and can be contacted at doaks@lmi.org.



Investigating Concurrency in Weapons Programs

Donald Birchler ■ *Gary Christle* ■ *Eric Groo*



oncurrency in a weapons program—the actual production of the weapons system while some portions of the design are still being completed—has been a topic of debate for decades. The assistant secretary of the Navy for research, development, and

Birchler is a research analyst with the Center for Naval Analyses. He has directed several projects on Navy acquisition and manpower issues. **Christle** is a research analyst with CNA. He retired in 2000 as deputy for acquisition management, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics. **Groo** is a research specialist with CNA. He is primarily responsible for implementing technical solutions to research questions including data gathering and manipulation.

acquisition's Feb. 6, 2006, memorandum, "Design/Build Concurrency," identified the high degree of concurrency in the littoral combat ship as being a large contributor to its cost growth. More recently, in a March 2010 written testimony presented to the Senate Armed Services Committee concerning the Joint Strike Fighter, Government Accountability Office Director Michael Sullivan stated, "We have consistently reported on the elevated risk of poor program outcomes from the substantial overlap of development, test, and production activities and our concerns about the government investing in large numbers of production aircraft before variant designs are proven and performance verified in testing."

Concurrency is still commonly cited as a driver of program cost and schedule growth, and the debate on just how much concurrency a program can experience before significant cost increase is incurred rages on.

Advantages and Disadvantages

Intuitively, one can see the advantages that concurrency would bring to a program. In some cases, there is an urgent need for a weapons system, which forces a program to build certain components of the system while still developing others. In programs requiring cutting-edge technology—such as combat aircraft, missiles, or electronic countermeasures—waiting to go into production until all design and tests are completed could introduce the additional risk of obsolescence. Finally, concurrency allows a system's timeline to be significantly reduced, which lowers exposure to requirements creep and may actually save money.

On the other hand, there is the case that concurrency adds risk to a program by exposing it to expensive rework resulting from major redesign. That was essentially the argument made in the case of the littoral combat ship program. In a Feb. 8, 2007, statement to the House Armed Services Committee, representatives from Lockheed Martin, echoing much of what was argued in the 2006 Navy memorandum, stated that "these challenges forced significant program inefficiencies through out-of-sequence construction, excessive unplanned concurrency between design and production, and significant rework, all of which are still impacting the [*littoral combat ship*] cost and schedule."

History of Concurrency

The history of concurrency shows that, regardless of whether it adds risk (and cost) to a program, it has been relatively common for years. In a 1988 study entitled "Concurrent Weapons Development and Production," the Congressional Budget Office documented several examples of concurrency in weapons programs dating back to World War I. Depth charges, for example, were developed under a very short timeline that required a high level of concurrency as a result of the urgent need to defeat the German submarines. In the 1950s, in response to the Soviet's successful launching of Sputnik, concurrency was a common practice in many new missile programs. The study also found that, as one would expect, concurrency was more accepted in times of war than in peace because requirements were more urgent.

According to the Congressional Budget Office study, beginning in the 1960s, concurrency became more common under Defense Secretary Robert McNamara, who encouraged a "total package procurement" approach to weapons acquisition. But problems with some systems led the Department of Defense to restrict concurrency, which, inevitably, led to longer acquisition times that forced DoD to lower the restrictions. This back and forth in DoD acquisition policy, according to the Congressional Budget Office study, was reflected in regulations and legislation concerning weapon system procurement. For example, some DoD basic acquisition regulations encouraged concurrency. On the other hand, the 1987 Defense Authorization act forbids a program from proceeding past low-rate initial production until initial operational testing and evaluation is completed.

Does Concurrency Lead to Cost or Schedule Growth?

Clearly, from a policy point of view, the advantages and disadvantages of concurrency seem to have been acting against each other for decades. However, while there have been some studies and investigations into certain programs that point to concurrency as a possible culprit for some cost growth, there have been few systematic studies that measure how closely related the two are.

The debate on just how much concurrency a program can experience before significant cost increase is incurred rages on.

The 1988 Congressional Budget Office study is one of the few studies that we could find that actually did try to measure this relationship. In the study, the Congressional Budget Office defines concurrency as the proportion of time spent in operational test and evaluation after production begins. The logic behind this metric is that successful OT&E should always precede production of the system. Thus, if OT&E is occurring during production, then the program is experiencing some level of risk, which may lead to redesign and, ultimately, cost or schedule growth. Examining 14 major programs that were deployed in the 1970s, the Congressional Budget Office found that the statistical relationship between concurrency and cost growth was very low. The relationship was even lower for schedule slippage. Another study conducted by the RAND Corporation in 2006, using the same definition as the Congressional Budget Office study, also identified the possibility that concurrency does not have an impact on cost growth. Unfortunately, the RAND study did not pursue the finding

further, as the main thrust of their paper did not deal with concurrency.

However, it may be that the Congressional Budget Office and RAND findings are a result of how they defined concurrency. After all, many programs, especially ships, begin spending money on production much earlier than when OT&E commences. In these cases, if concurrency is an added risk, then there exists even more room for some problem to occur much earlier in a program, when research, development, test, and evaluation (RDT&E) money is being spent outside of OT&E.

Our Findings

We examined the relationship between cost growth and concurrency again in response to a request by assistant secretary of the Navy for research, development, and acquisition. In contrast to the Congressional Budget Office and RAND studies, we defined concurrency as the percentage share of RDT&E money that was being spent while procurement dollars were also being spent. The logic behind this definition was simply that any deviation from perfectly serial RDT&E/production is a potential source of risk. That is, if a program spends all of its RDT&E money prior to making a production decision, then the program should experience little or no technical risk at all. Thus, cost and schedule growth should be at a minimum. Any concurrency, under these circumstances, entails risk, which, in turn, could yield cost growth.

For our study, we considered concurrency in two ways: planned and actual concurrency. Planned concurrency was what the program envisioned when it published its first system acquisition report at milestone B. In theory, how a program plans to execute spending may impose risk at the very outset regardless of how the money is actually spent. If this were the case, then we would expect to see a relationship between the planned level of concurrency and cost growth.

Actual concurrency is what the program actually executed as reported in the last system acquisition report. The theory here is that it does not matter what program managers said they were going to do. It only matters how they actually spent their RDT&E and procurement dollars. If they actually incurred a high level of concurrency, then they increased the risk, which could have led to high levels of cost growth.

Our Results

Our results (located at <http://www.cna.org/search/node/concurrency>), based on examining 28 programs across all Services, are very similar to those of the Congressional Budget Office and RAND studies with one surprising exception: While from a purely statistical point of view we found that the relationship between both planned and actual concurrency and cost growth was very weak, in both cases, there seems to be a "sweet spot" of about 30 percent concurrency. That is, programs that plan on spending 30 percent of RDT&E funds while concurrently spending procurement funds actually experience the lowest average cost growth. Similarly,

those programs that actually do spend about 30 percent of RDT&E funds while concurrently spending procurement dollars, even when not originally planned, also experience lower cost growth. Furthermore, programs with planned or actual levels of concurrency below 30 percent experienced higher cost growth than those with higher levels of concurrency. In other words, lower levels of planned or actual concurrency were actually worse than higher levels of concurrency. This is the complete opposite of what many in the acquisition community believe. We speculate that lower levels of concurrency may expose the program to higher levels of external changes.

Finally, we calculated the difference between planned and actual concurrency and named this new metric unplanned concurrency. We then examined the relationship between unplanned concurrency and cost growth. Again, from a purely statistical point of view, unplanned concurrency is not very closely related to cost growth. However, what little relationship existed showed that deviations from planned concurrency often led to higher cost growth. Even when programs experienced less concurrency than planned for, cost growth appeared to be slightly higher.

In sum, our study suggests that programs should plan for some moderate level of concurrency (somewhere around 30 percent) and then stick to the plan. Deviating from the plan is a sign that something adverse is happening within the program.

What to Do About Concurrency?

So far, no conclusive evidence exists that concurrency (no matter how it is defined) is generally a problem. This does not mean that concurrency is never a problem. But most likely, concurrency leads to cost and schedule growth under very particular circumstances. What these circumstances are is not very clear just yet. Nor is it clear why in our study, the sweet spot for concurrency is somewhere around the 30 percent mark. What is clear is that there are definite advantages to concurrently designing and building a weapons system that most program managers take advantage of, to some extent or another.

The Congressional Budget Office study advised that "Congress may wish to take no further action regarding concurrent programs as a group," given the very weak relationship between the concurrency and cost growth. Instead, the office argued that Congress should simply ask that DoD develop a consistent measure for concurrency to be published in a program's acquisition report and then monitor programs to see how they are performing relative to their planned level of concurrency. More than 20 years later, this advice still seems to be appropriate.

The authors welcome comments and questions and can be contacted at birchled@cna.org, chrislg@cna.org, and grooe@cna.org.



An Exercise in Values Identification

Lt. Col. Dan Ward, USAF



t's 9:15 on a Saturday night. You are comfortably seated in front of your television set watching your favorite show. Without warning, the image reduces to a brilliant white line in the middle of the screen. The line quickly collapses to a shining blip, then disappears entirely.

The audio is unaffected, so for a moment or two you sit and listen as the characters continue their dialogue. Perhaps there is a problem with the cable company. Maybe the image will return. It doesn't. Gradually you

Ward is the chief of acquisition innovation in the Acquisition Chief Process Office, Office of the Deputy Assistant Secretary of the Air Force for Acquisitions Integration. He holds degrees in systems engineering, electrical engineering, and engineering management. He is Level III certified in SPRDE, Level II in PM, and Level I in T&E and IT.

realize the picture isn't coming back. Your television is broken. Are you going to repair it, or is it time to get a new TV?

If you decide to get a new set, how would you go about doing it? Would you ask friends and family for recommendations? For loaners? For donations? Would you sit down and make a rigorous list of everything you want the new device to do, or would you just run out to the store and buy one? Would your new set be just like the old one, or would it be bigger?

Imagine both your actions and the outcome. How much money would you spend, if any? How long would it take to achieve the outcome (i.e., the new or repaired TV)? How would your television-watching experience change? Would the reds be redder and the blues bluer? Would the comedies be funnier and the dramas more dramatic? Or would things be pretty much like they were before?

There is a point to all these questions. It turns out, the decisions you make in this scenario can provide insight into your values and priorities, which in turn, can be applied to acquisitions and program management.

Once we understand our values, we can understand why we make the decisions we do.

Some people's top priority is to replace the capability without delay. For them, it would be vitally important to get a new TV right away. Others may figure they don't need a new TV right away and are content to take their time in order to satisfy some other value. Some people want to make sure they spend as little money as possible, while others get excited at the prospect of spending a couple of thousand dollars. For some, the new set must be a big, shiny piece of high-definition wonder-tech. Others are content with more modest capabilities. Before we examine what these decisions say about our priorities and values (and why that matters), let me tell you what I did when I was in this situation.

The Day My TV Died

The television set that died was a 10-year-old, 27-inch cathode ray tube (CRT) set. Its picture quality had been slowly degrading for a while, so when the tube finally blew, it wasn't exactly a surprise. Right away this should tell you that having the latest and greatest technology is not a top priority in my house.

When the image disappeared, my wife and I immediately went online and start looking for information about televi-

sions. A lot had changed in the 10 years since we last bought a set. We quickly learned the difference between LED, LCD, and plasma screens; and became versed in things like 720p and 1080p. I posted a plea for advice on my Facebook page, and we quickly got recommendations from several video-phile friends. This shows, among other things, that we value being an informed consumer.

Next, we checked the websites for all the big electronics stores near us and found ourselves leaning towards a set that was much larger and more expensive than we'd originally envisioned. As sticker shock set in, we also discovered our current TV cabinet was not large enough to hold any of the sets we were considering. Replacing not only the TV set but also the furniture was going to be even more expensive and time-consuming than we'd thought. Plus, we'd have to figure out what to do with the current cabinet. Unfortunately, we'd just dropped a lot of money on some unexpected car repairs, so this was not good news. Despite my recent promotion, it was important to us to not spend too much money—yet another clue about our priorities.

Early the next morning, a new thought hit me: Craigslist! I'd never bought anything using it before, but I thought I'd check it out. To make a long story short, we ended up replacing our 27-inch set with a 35-inch CRT set for \$50 from a person who lived just a few miles away. By 4 p.m., it was plugged in and working just fine.

The new set is 8 inches larger and considerably nicer than our previous one. The picture is brighter, the audio clearer, and overall, it provides a better television-watching experience. It fits our existing cabinet with barely an inch to spare—anything larger would have required new furniture. In the end, it is exactly what we wanted, and we got it in less than a day for a mere fifty bucks. All in all, my family is very satisfied with the outcome.

Examining Our Values

I told you this story in order to illustrate the role values and priorities play in decision making. In this situation, my wife and I agreed it was important to quickly secure an inexpensive set. Ordering one online would have saved some money compared to local retailers, but would have also taken too long, so we initially limited our research to local stores. When we discovered the large price and sizes available locally, we started looking for alternatives. These decisions were direct expressions of our values.

We did not place a high value on having a top-of-the-line set. We just wanted something a little better than what we had before. Given the state of our previous TV, just about anything would have been a step up, so a small improvement shouldn't have been difficult to achieve; however, given the advances in television technology over the last decade, we found ourselves considering sets that were a lot better—more than we really needed, to be honest. So

when the nice guy in the online Consumer Reports video said we shouldn't buy anything less than a 50-inch set, it hit me that he was expressing one of his values (it's important to have a big TV), not one of mine. The 35-inch set we ended up with was perfect for us.

Now, the outcome that we found so satisfying would be entirely undesirable to people who value different things. Some readers might look at this story as a missed opportunity to get the latest technology. For people who value high-tech systems, an old set can never be as good as a new one, and a CRT is clearly inferior to a flat panel. On the other end of the spectrum, those who value thrift even more than I do might be skeptical of any outcome achieved so quickly. No doubt there was a \$35 set posted for sale on Craigslist the next day. We might have found it if we'd been patient enough to keep looking.

Examine Your Values

I hope this story does two things. First, I hope it encourages us to think about the way values shape decision making. Second, I hope it helps bring some hidden values to light. Once we understand our values, we can understand why we make the decisions we do. This is particularly important in group decision-making situations, such as defense acquisition projects.

One trick to identifying hidden values is to listen to what people brag about. In this story, I bragged about only spending \$50 on a "new" TV. I view the set's low cost as a positive attribute, so I mention it in positive terms. In contrast, people who do not value thrift might be reluctant to admit owning such a cheap TV. They might even find it embarrassing. Such people are more likely to brag about spending \$5,000 on a new set than to admit they only spent \$50.

Similarly, because I value speed, I expressed pride over how quickly I found and bought this set. Other people might reasonably take pride in how much time they spend doing thorough, in-depth research before committing to a purchase. I hope it is obvious that the way we think about cost, time and complexity will drive different decisions, which lead to different outcomes.

Fortunately, my wife and I were working from a common set of values and priorities. Imagine the friction if one of us thought it was important to spend as little money as possible, while the other one found satisfaction in spending a lot. Or imagine if one of us wanted to decide quickly while the other wanted to take plenty of time. Even worse, imagine if we thought we had the same values but actually disagreed on what attributes were most important and desirable. Entire sitcom seasons have been based on little more than that premise, but when this sort of disagreement is present in an acquisition program, it's a lot less funny. Regardless of the context, if the different parties

have different values there is sure to be friction and frustration, particularly if we've never discussed the differences in the first place.

Now, the values you use to buy a television for yourself may be different from the values you use at work. That's fine. Furthermore, the values you express on one project may be different from the values you express on a different project. That's also fine. Values are neither monolithic nor static, and any given person may use different value sets in different contexts. That is entirely appropriate because different situations present different requirements. Sometimes it really is important to act quickly. In other situations, it is wise and necessary to take our time. If I just won the lottery, even I would be unlikely to value inexpensive solutions as much as I do today. In fact, if I suddenly became a millionaire, I just might buy a \$5,000 TV after all. The key is to be aware of what our values are, understand how they influence our decisions, and, as much as possible, be deliberate in selecting them.

I suggest we all take a hard look at whether adding more time and money to a program really helps improve the outcome.

A quick side note for those who might object that there is no Craigslist equivalent for the DoD: Check out the article "Sharpening the Spear Through Innovative Acquisition," by Jay Bolles, et al. (*Defense AT&L*, May-June 2009). The article discusses how the Navy and Marine Corps Adversary Program bought inexpensive used F-5s from the Swiss Air Force to replace aging American F-5s. No, we can't do that for every need, but we can probably do something similar more often than we do.

It's FIST Time!

OK, back to the main point. Regular readers know I'm a big fan of a value set called FIST (Fast, Inexpensive, Simple, Tiny). The FIST value set basically says it is important and good to be fast, inexpensive, simple, and tiny; clearly my television-buying experience was driven by the FIST values. I am happy with my new TV because it didn't take much time or money to buy it, it didn't require any new adaptors or new furniture, and it was even small enough to fit in my existing cabinet. If I'd used another group of values, I would either be dissatisfied with the \$50 TV or would be the proud owner of something else.

The same thing can happen in an acquisition program. Our values can lead us to define success as rapidly delivering an affordable, simple system. Or our values can lead us to define success as taking our time, spending a lot of money, and delivering a highly complex, cutting-edge system. These two objectives will lead to very different behaviors and very different outcomes. Keep in mind that values have an impact across the spectrum of decision making, from requirements and technical architectures to organizational structures and processes.

While I'm not sure we can optimize our values once and for all, I contend that some value sets are more productive and appropriate for a given situation than others. As a general rule of thumb, I think FIST is a good starting place. I suggest we all take a hard look at whether adding more time and money to a program really helps improve the outcome. Furthermore, we would do well to examine the desirability of complexity in our organizations, processes, and systems; and make thoughtful assessments of complexity's costs and contributions. We also need to be aware of the difference between elegant simplicity and stupid simplisticness.

As a project begins, we should make up our minds whether it is truly good and important to be big, expensive, complex, and slow or whether, perhaps, it is more desirable to be fast, inexpensive, simple, and tiny. Deliberately assessing our values and making intentional choices is the first step

toward establishing a reliable set of values for our subsequent decisions.

So let's return to the television question. If your TV died, what would you do? Your decision reveals important clues about your values. If you were to pose the question to the people who share your television, do you see any potential values conflicts? How many of us would end up feeling bad about the money we spent on the set (either too much or too little)? How many of us would regret spending too much time or not enough time researching our options? Whether you spend \$50 and four hours or \$5,000 and four weeks, if your decisions are consistent with your values, you're much more likely to be satisfied with the outcome. If your outcome leaves you feeling doubtful, queasy, or slightly embarrassed, that might be a sign your actions were contrary to your values in some way.

This little thought experiment about a television isn't really about a television. It's actually an opportunity to reflect on values—what they are and why they matter. Having identified and examined our values in one situation, we can then apply the practice to other situations, like weapons system acquisition projects. In doing so, we just might discover decision paths that lead to better outcomes and avoid some unnecessary friction.

The author welcomes comments and questions and can be contacted at daniel.ward@pentagon.af.mil.

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Going Organic

The C-17 Depot Maintenance Activation Working Group

Albert Barnes ■ Capt. Lewis Johnson, USAF



The Globemaster III, or C-17, aircraft is capable of rapid global mobility, providing the strategic delivery of troops and various types of cargo to both main and forward operating bases. The C-17 also performs tactical airlift and airdrop missions, including the transportation of patients for aero-medical evacuations.

The C-17 provides outstanding reliability and maintainability, both of which are necessary to meet its demanding operational requirements. Those requirements include a mission success rate of 92 percent and a comparatively low ratio of 20 aircraft maintenance man-hours per flying hour. The flexibility and performance of the C-17 make it the backbone of the United States' global airlift capability, but how does the Air Force meet the high operational standards and comparatively low maintenance requirements of such an advanced piece of military hardware? Organic infrastructure sustainment, of course!

Barnes is a professor of life cycle logistics with the Defense Acquisition University. **Johnson** is the deputy chief, C-17 Partnering Flight, 564th Aircraft Sustainment Squadron, at Warner Robins Air Logistics Center, Ga.

Organic Infrastructure in DoD

Many hear the word organic and immediately picture themselves standing on the produce aisle of their favorite local supermarket looking at a vibrant selection of tomatoes and corn. In the context we are using it, however, the word organic carries a very different implication—but not necessarily a different definition. Organic logistics infrastructure refers to U.S. government entities (principally DoD organizations) such as inventory control points, maintenance depots, distribution warehouses, and transportation facilities. Like the garden variety organic farmer who uses only natural or self-produced products, organic infrastructure sustainment uses the government's ability to support a product's mechanical and structural demands, such as those seen by the C-17, over the course of its life.

The C-17 is currently maintained under a strategy of flexible sustainment in which a prime contractor (Boeing) is responsible for all system support. The strategy combines interim contractor support, contractor logistics support, and organic repair capabilities to apply the benefits of an open production line while preserving organic infrastructure. Eventually, government capabilities will oversee all repair and maintenance functions. This flexible sustainment contract provides worldwide, round-the-clock support of C-17s in the Air Force. Although C-17s and the Air Force are used as the primary example in this article, the lessons learned can apply to all military services.

Benefits of Flexible Sustainment

One of the greatest benefits derived from a flexible sustainment support strategy is often demonstrated during emergency operations, such as those exhibited when a C-17 aircraft crash-landed at Bagram Air Field in Afghanistan on Jan. 30, 2006. During the incident, the plane's nose gear collapsed and the right main landing gear was damaged. The bottom barrel of the airplane (from just behind the nose to the main landing gear) and a landing gear pod had to be replaced—and this was the first time either had to be replaced in the history of sustaining the Air Force's fleet of C-17s.

Within 24 hours, a team of more than 120 government crash recovery, emergency management, maintenance specialists, and aircraft engineers were dispatched to perform the temporary repairs needed to put the aircraft in a condition that would allow a flight crew to perform a ferry flight to receive permanent repairs. The Boeing technicians came from the company's Recovery and Modification Services team, trained to assist with rescuing damaged aircraft, while the Air Force personnel were battle damage repair specialists from Charleston, S.C., and the Warner Robins Air Logistics Center at Warner Robins, Ga.

Boeing returned a good-as-new C-17 Globemaster III cargo plane to the U.S. Air Force on Nov. 17, 2007—15 months after it was severely damaged in action. It took more than

Like the garden variety organic farmer who uses only natural or self-produced products, organic infrastructure sustainment uses the government's ability to support a product's mechanical and structural demands over the course of its life.

86,500 hours and 5,000 parts to repair the aircraft. The crash could have resulted in a \$200 million loss, but instead, there was only a total repair cost of \$25 million—a fraction of what it could have cost the Air Force to replace the entire aircraft. The original acquisition philosophy for the C-17 was to be supported by a contractor for the duration of the weapon system's existence, requiring the product support integrator—in this case, Boeing—to serve as the sole source of repair for all C-17 commodities. In the near future, the government's sustainment role will expand to include depot repair of C-17 commodities. Initially, the government will become the secondary source for depot repair of C-17 commodities. Eventually, all C-17 commodities will be repaired by one of the three air logistics centers, which is similar to the current concept the Air Force uses on other weapons systems.

Developing Depot Repair Capabilities

The C-17 system support manager's office at Warner Robins Air Logistics Center leads in the development of new C-17 depot repair capabilities as part of the Depot Maintenance Activation Working Group. The DMAWG focuses on creating new C-17 depot repair proficiencies at the three Air Force air logistics centers located at Robins, Tinker, and Hill Air Force bases. The goal of the group is to establish effective, affordable, and innovative long-term organic depot capabilities for all C-17 operations.

Critical to the C-17 depot activation process is the Gatekeeper Program, which is an executive steering group that reviews progress and modifies the activation program accordingly. The group is chaired by representatives of the

The gatekeepers help determine the best integrated life cycle management strategy according to statutory and regulatory guidance.

Air Force Systems Program Office, Air Mobility Command, the U.S. Department of Defense, and Boeing's president for integrated systems.

The group's mission is to provide executive oversight related to key strategic issues impacting the C-17 depot sustainment activities and product support. The gatekeepers help determine the best integrated life cycle management strategy according to statutory and regulatory guidance. In addition, they provide strategic direction to establish effective, affordable, and innovative strategies focused on C-17 sustainment.

Maintenance activation planning teams exist at each of the three Air Force air logistics centers. These teams represent the working level of the C-17 DMAWG that is closest to executing requirements, and they enable the depots to "bend metal" [*a slang expression that denotes the actual work being performed*]. The teams also coordinate, facilitate, and track C-17 depot activation requirements and plans at the air logistics centers and report the status to the DMAWG. The teams are also directly responsible for opening the technology repair centers, each of which is categorized by a particular C-17 system or type of commodity with a letter designation. Those repair centers, upon being activated, are the actual shops that repair aircraft commodities to serviceable condition.

Federal Guidance

There are two public laws that impact the depot activation community. They are commonly known as "core" and "50/50." These requirements establish the limits to which the government may contract depot repair to commercial sources. Title 10 U.S. Code, Section 2464, Core Logistics Capability, requires that DoD "maintain a core logistics capability that is Government-owned and Government-operated ... to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to mobilization, national defense contingency situations, and other emergency requirements."

Core capability is composed of all the equipment, facilities, personnel, data, and skill sets necessary to sustain a weapons system vital to national security. Each DoD component is responsible for identifying and reporting core capabilities to the Office of the Secretary of Defense.

Title 10 U.S. Code, Section 2466, Limitations on the Performance of Depot-Level Maintenance of Materiel, mandates that "no more than 50 percent of the funds available in a fiscal year for depot-level maintenance and repair workload may be used to contract for depot maintenance." The percentage was originally 60/40 until Congress increased the spending threshold in 1998. Compliance with 50/50 has been a challenge for the Air Force because of the increase in contract depot maintenance and the retirement of several organically maintained major weapons systems, such as the F-117. In fact, the Air Force required waivers to Title 10, Section 2466 compliance in fiscal years 2000 and 2001 because contract depot maintenance exceeded the 50 percent ceiling. The Air Force is exploring various options to ensure adequate budgeting in the future. C-17 depot maintenance by the government has increased to approximately \$68 million over the last two years. This increase represents depot maintenance dollars used by contractors.

C-17 Challenges

Aircraft depot maintenance activation is already a daunting task when the government is the lead integrator for the effort. Because DoD favors modifying old weapons systems instead of procuring new ones, its acquisition workforce frequently has to develop an entirely new support line for the Air Force. Also, because it is not cost effective to maintain a permanent workforce and skill set dedicated to depot activation, new teams must be created on an as-needed basis. The application of a unique sustainment strategy in addition to existing challenges creates unique issues: data disconnects; consistency with the repairs made by the original equipment manufacturer; and lost damage or destruction that the government does not ordinarily face. Those issues, in effect, make the C-17 a test case for depot activation efforts that involve a contractor in a role for total system support responsibility.

One of the biggest issues the C-17 DMAWG faces is limited data rights. In the 1980s, C-17 program officials, faced with significant schedule delays and budget overruns, decided not to purchase data rights because of the substantial additional cost. That was perhaps a necessary and effective decision at the time. Today, however, the lack of data rights consistently prevents the government from developing maintenance procedures and performing its own repairs on select C-17 components. Acquiring unique repair data may now require paying a premium for unlimited rights or using a turnkey activation process to progressively attain such rights project by project.

Another challenge facing C-17 depot activation is the unique role government air logistics centers play as subcontractors to Boeing. Under its flexible sustainment strategy, Boeing uses a best-value approach for routing repairable items to its suppliers. As a Boeing supplier, each air logistics center competes with commercial industry, forcing it to streamline organic repair processes and business practices in order to offer competitive rates. If a government repair estimate is priced too high, it could be declared beyond economical repair, in which case Boeing would redirect the repairable item to a more cost-effective commercial source of repair. The air logistics centers must effectively earn their share of C-17 commodities workload with capability that meets or exceeds the industry standard.

Finally, flexible sustainment also creates added difficulties for configuration management. Effective configuration control requires constant communication between the government, Boeing, and Boeing's suppliers. In some cases, an air logistics center and an original equipment manufacturer may share configuration changes through a direct partnership. The partnership provides unobstructed channels of communication between the government and its commercial suppliers. However, in those instances where there is no existing partnership or contractual agreement, an original equipment manufacturer may not readily provide product configuration data for fear of losing business. The government must then work through its relationship with Boeing to garner manufacturer cooperation. Without effective configuration management, an organic source of repair is unable to identify potentially obsolete commodity items prior to activation and risks wasting time and dollars on outdated capabilities.

A Model for the Future

The C-17 DMAWG is a highly diverse community composed of multiple government organizations across different major commands and various Boeing representatives. It manages the C-17 depot activation effort, which is unique as a result of the incorporation of flexible sustainment.

Organic sources of repair for the C-17 face unique challenges not ordinarily confronted in a defense acquisition program. Such challenges make the C-17 depot activation process a test case for how effectively the government can initiate organic repair capabilities with a prime contractor. The Air Force should monitor and record lessons learned from its experiences with C-17 depot activation in order to ensure an effective and stable organic repair infrastructure for its premier airlifter and to establish management processes for new depot activation efforts for future weapon systems. Going organic is the way of the future for farmers and members of the defense acquisition workforce alike.

The authors welcome comments and questions and can be contacted at albert.barnes@dau.mil and lewis.johnson@edwards.af.mil.



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A Good Idea Comes to Fruition

The F/A-18 Center Barrel Replacement-Plus Program

Jim Boone ■ William F. Conroy III ■ Capt. Mark Darrah, USN ■ Rick DeVore ■ Capt. Fred Hepler, USN
Rear Adm. Mark Skinner, USN



Naval jets live hard. That point is well illustrated by the U.S. Navy's premier fighter/attack aircraft, the F/A-18 Hornet. Achieving initial operating capability in 1984, the Hornet was designed to fly 6,000 hours and accumulate 2,000 arrested landings (landings on board an aircraft carrier where the aircraft is abruptly stopped by the use of a tail hook and arresting cable stretched across the flight deck) and 8,300 total landings. Day after day, the jets are stressed to the edges of the engineering envelope, and the real-world toll of repeated oscillating G-forces isn't easily predicted when the structures are initially designed.

Boone is a DAU professor of acquisition management and life cycle logistics. **Conroy** is a DAU professor of life cycle logistics and production, quality, and manufacturing. **Darrah** is the program manager for PMA 265. DeVore is the F/A-18 A-D Air Vehicle IPT lead for PMA-265. **Hepler** is the deputy program manager, Air Vehicle Systems, F/A-18 and EA-18G for PMA 265. **Skinner** is the program executive officer, Tactical Aircraft Programs, Naval Air Systems Command.

Such destructive forces have their greatest effect on attach points, where the aircraft's wings and main landing gear join its fuselage frame. Those attach points, along with the surrounding fuselage section, are dubbed the aircraft's center barrel. One expression of the destructive toll is a metric called wing root fatigue life expended (WRFLE), and it is calculated through a complicated engineering analysis that determines each aircraft's remaining structural integrity at the critical wing attach points. Thus, a severely used aircraft can have far fewer flight hours and landings than the stated design limits and still be scrapped as a result of excessive metal fatigue wear and tear.

WRFLE values increase over time at variable rates depending on the aircraft's environment, mission, and operational use. For the F/A-18 C and D models, WRFLE is capped at 0.78 for older aircraft and 1.0 for newer models. The reason for the difference is that engineers learned from the testing of older aircraft and designed newer aircraft to be less susceptible to fuselage fatigue cracks than their predecessors.

Origins from a Crash Landing

The life of naval aircraft is one of repeated controlled crashes. Tasked with landing 25,000 pounds of hardware on a floating airport in the middle of the ocean that may be moving several feet per second laterally and vertically, naval aviators aren't to blame for being a bit decisive when landing. Such decisiveness translates to abrupt forces resonating through the aircraft that contribute to the dreaded increase in WRFLE with each additional carrier landing.

In 1991, a Hornet with low flight hours experienced an excessively hard carrier landing that caused what was considered irreparable damage to the aircraft's center barrel section. Normally, the Navy would rely on one of its two Fleet Readiness Centers (organic depots) to repair the damage. The crippled Hornet was shipped to the Navy's FRC Southwest in San Diego, Calif., for damage assessment. The damage was so severe that it was judged to be beyond even the FRC's capabilities. In the past, this type of damage would remove the aircraft from service to be cannibalized for spare parts—a sad end for an almost-new airplane. After evaluating both the aircraft and their options, the Navy turned to the private sector in hopes of finding a way to repair the low-hour aircraft rather than accepting the traditional outcome.

Industry repair estimates were as high as 50 percent of the original procurement cost, and the time to design and build repair fixtures was forecast at three years. The complicating factor that drove these estimates was that the separation point of the fuselage for this repair was different from the fuselage separation point for the original construction. This eliminated the ability to use existing equipment and meant that everything had to be designed and built from scratch. Hence, they didn't see commercial repair as a viable option. Unwilling to retire a relatively new aircraft, the Navy reassessed its options.

A team of depot engineers, technicians, and logisticians within FRC Southwest rose to the challenge to do what had never been done before. Given the green light to think and act outside the box, they developed the machinery and technology to remove and replace the damaged center barrel. They created a procedure that allowed them to break apart a Hornet where it was never designed to be taken apart in order to replace the crucial center part of the aircraft that supports the wings and landing gear. In the end, FRC Southwest completed the initiative in just 18 months at a cost of approximately \$4 million. More important, they saved a low-flight-hour aircraft from being scrapped.

A Perfect Storm

There were further challenges for the Hornet in the future. The 1997 retirement of the medium-attack bomber, the A-6E Intruder, coupled with the Hornet's participation in three subsequent wars has caused a higher-than-anticipated aircraft utilization rate. Because of those unanticipated circumstances, the Hornet had more tasks to accomplish in a shorter period of time than the designers had anticipated. With every increment of increased demand, the Hornet's calendar life expectancy decreased as a result of the increased number of hours flown and landings, coupled with taking fewer hours to reach WRFLE limits because of the stresses imposed on the aircraft as it flew its training and combat missions.

FRC Southwest's innovations, however, established a process for repair and maintenance that could be improved and adapted to respond to today's requirements.

Expanding an Innovative Process

Techniques developed by the FRC Southwest team from this incident transformed the Hornet community's views of the impact of WRFLE on an aircraft's serviceability and gave DoD valuable breathing space in developing a successor platform for the Hornet. FRC Southwest, along with its sister depot FRC Southeast in Jacksonville, Fla., now performs F/A-18 center-barrel repairs on a repetitive basis.

The process, named the Center Barrel Replacement-Plus (CBR+) Program, has morphed to add additional repairs that extend to other aspects of the F/A-18's structural life. By detecting, removing, and replacing corroded parts, the process eliminates much of the effort that would have been required to inspect over 200 hot spots inside the aircraft's center barrel section—previously accomplished during scheduled maintenance—then design and analyze repairs for each instance of corrosion or other damage found. The CBR+ process also includes the removal and replacement of portions of the aircraft's spine (the dorsal deck) and analysis of any local modifications that may be required to fit the new CBR module at fuselage interfaces, including crack initiation life analysis (the time it takes to generate a fatigue crack in a new part under fatigue test and/or service loads), and crack growth analysis (the time it takes a crack to grow from

crack initiation to a size that will cause the part to fail under maximum service loads).

As it has evolved, CBR+ has come under the management of the Naval Air Systems Command's F/A-18 Program Office (PMA 265). CBR+ kits are funded and procured through Northrop Grumman (the prime contractor) and installed by the two FRCs. Attaining the formal recognition as Engineering Change Proposal 904, CBR+ is now slated for F/A-18s whose fatigue life reaches WRFLE level of 0.78 or catapult/arrested landing limits as described elsewhere in this article. Installing the Engineering Change Proposal requires about 14,000 man-hours per Hornet—a lot of time and money, but given the alternatives, well worth the investment. The cost for the CBR+ replacement is now approximately \$2.5 million as cost reductions have been realized since the first replacement was done.

The fixture and tooling designed at FRCSW for the CBR+ process is a story unto itself. Three aluminum work stands, standing over 16 feet high, were designed and constructed to enable the depot technicians to work from both above and below the aircraft. The stands are able to handle the specialized tooling used by sheet metal mechanics and have trimmed off about 2,000 manhours per CBR+ event. Furthermore, the stands ensure that the interface alignment between the replacement center-barrel and remaining fuselage sections is maintained to factory tolerances. In other words, the aircraft isn't misaligned when the process is complete—no small feat when working with parts the size of small automobiles.

CBR+ dramatically reduces engineering requirements, labor costs, and processing time (which equates to out-of-service time as well) by replacing the entire center barrel module at splice joints versus completely disassembling the core of the airframe, replacing dozens of worn-out components, installing major modifications to dozens more, and reassembling the airframe. According to Rick DeVore, the FRCSW engineer credited with leading the CBR+ innovation process and co-author of this article, "The CBR+ process allowed us to extend the service life of the aircraft and minimize much of the analysis that will be required during the planned service-life extension program."

A Best Business Practice

The CBR+ program has substantially extended the service life of the F/A-18 and provided an economical alternative to procuring new airframes. Program manager for PMA265 and co-author of this article, Navy Capt. Mark Darrah, observed, "The CBR+ program has provided PMA265 with a lot of capability that otherwise would not be possible. It cannot be overestimated how these types of initiatives can act as an enabler to leverage greater capability from our limited resources."

Navy Capt. Fred Hepler, the F/A-18 deputy program manager and co-author of this article, had a similar comment when he stated, "The CBR+ program is a great illustration of the type of innovation possible at any level of an organization. There are a lot of great people with a lot of great ideas. Weapons systems program offices cannot afford to miss any opportunity to further enhance their program's efficiency in terms of performance, cost, or schedule."

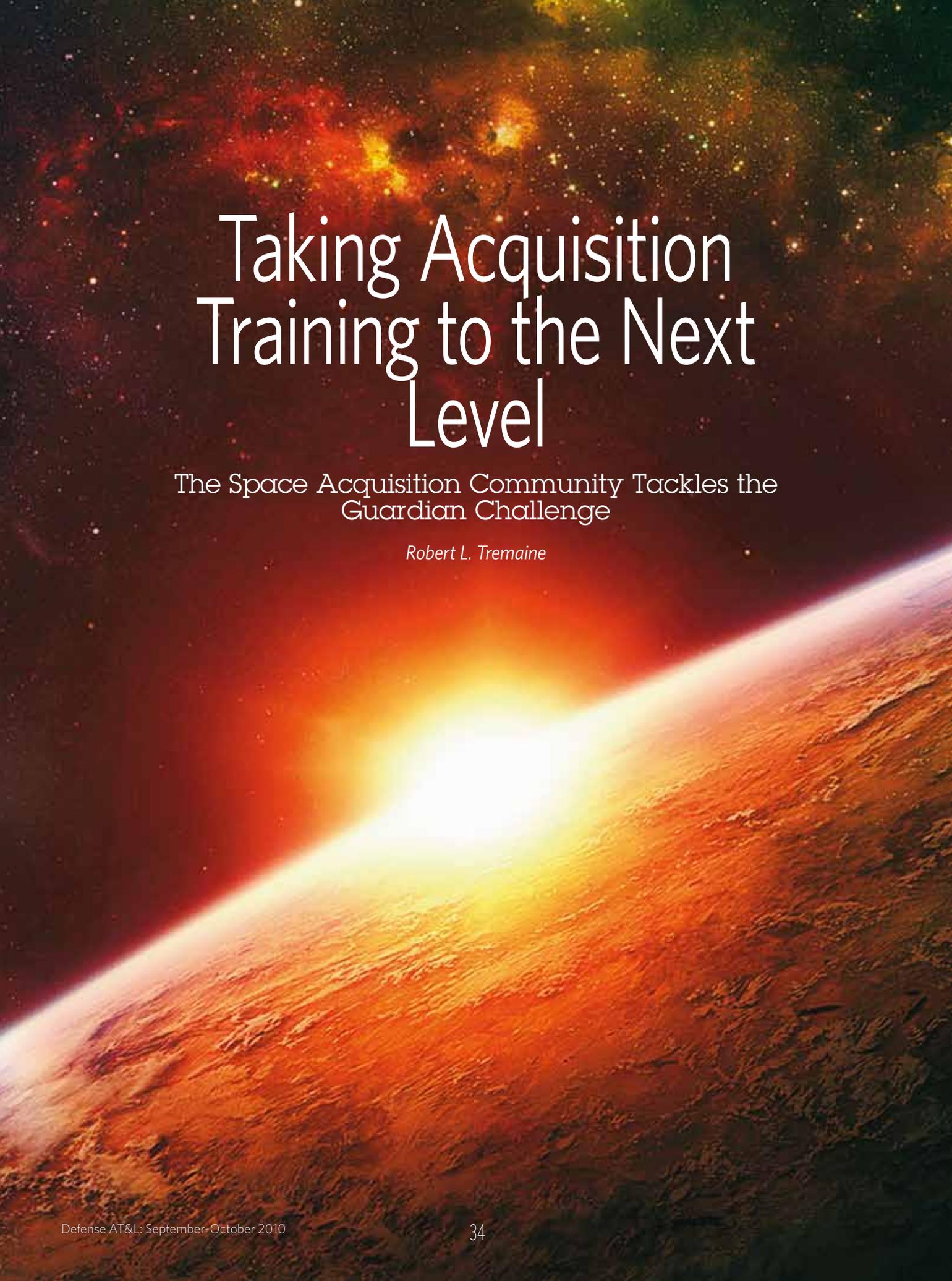
Tasked with landing 25,000 pounds of hardware on a floating airport in the middle of the ocean that may be moving several feet per second laterally and vertically, naval aviators aren't to blame for being a bit decisive when landing.

Those assessments, by any definition, place CBR+ firmly in the realm of a best business practice. Since 2001, more than 110 CBR+ procedures have been completed at the FRC facilities in California and Florida. Currently, there are more than 30 aircraft per year scheduled to complete the procedure through 2017.

CBR+ has enabled the naval aviation enterprise to address its air combat readiness requirements while maintaining a more balanced, cost-effective readiness approach toward extending the service life of the Navy's fleet of Hornet aircraft. Rear Adm. Mark Skinner, program executive officer for Tactical Air Programs and co-author of this article, remarked that, "With resources under increasing scrutiny, initiatives like the CBR+ program are critical to the continued readiness of naval aviation. Programs will continue to be asked to seek out-of-the-box solutions to problems. I think the CBR+ program is a great illustration of how the acquisition community can work together to benefit not only our naval aviators but our taxpayers as well."

Given its grass-roots evolution and CBR+'s impact on naval aviation readiness, it's hard to argue with these points.

The authors welcome comments and questions and can be contacted at james.boone@dau.mil, william.conroy@dau.mil, mark.darrah@navy.mil, alan.devore@navy.mil, fred.hepler@navy.mil, and walter.skinner@navy.mil.



Taking Acquisition Training to the Next Level

The Space Acquisition Community Tackles the
Guardian Challenge

Robert L. Tremaine



The Space and Missile Center (SMC) showed its acquisition mettle in late April of this year during an intensive two-and-a-half day event called the Guardian Challenge.

The Guardian Challenge

Two years ago, Air Force Space Command expanded its Guardian Challenge program (largely an operational-centric scenario-based exercise designed to test personnel's inherent leadership and functional expertise) to the acquisition community. AFSC's Headquarters felt all command-wide personnel should have an opportunity to demonstrate their talents—not only the operators but also the acquirers who deliver

Tremaine is an associate dean at DAU's West Region in San Diego with over 28 years of acquisition experience in program management and systems engineering.

the crucial operational systems. Surprisingly, the space acquisition community previously lacked a competition exercise that tested them in the field.

SMC, joining in the Guardian Challenge again, selected six four-person teams to compete for the coveted distinction of first place in the challenge. Each of the six teams—composed of captains/majors and equivalent-ranking civilian government personnel—had members experienced in various levels of Defense Acquisition Workforce Improvement Act certifications. Program management, systems engineering, budgeting, cost estimating, and contracting were well represented.

Planning for the event actually started a couple of months earlier, when two key partners, the Defense Acquisition University and SMC, teamed up to produce a real-world challenge facing the space community today: how to best satisfy a shortage in satellite communications bandwidth. This was the first time DAU supported the event.

Based on lessons learned, this version of the Guardian Challenge needed to be more challenging and encompassing for its acquirers than in previous years. The DAU-SMC design team created a set of competition material rich in detail that would stimulate critical thinking. Aspects of the challenge—the “artifacts”— would also quickly situate and stretch the competitors’ abilities and would ultimately represent a real-world space acquisition experience. The artifacts were:

- A robust space acquisition scenario
- Three viable satellite materiel options:
 - Option 1: Hosted payload on a commercial satellite (e.g., sharing space with other planned payloads)
 - Option 2: Dedicated pay-for-service commercial satellite
 - Option 3: Leased pay-for-service commercial satellite with an option to buy
- Competition timeline
- Competition instructions and rules of engagement.

The DAU-SMC design team created a set of competition material rich in detail that would stimulate critical thinking.

These artifacts were intended to quickly introduce the teams to the scenario and taper any competitive variances without inhibiting the teams’ ability to innovate—an important tenet in the acquisition profession and decidedly one that DoD Instruction 5000.02 emphasizes. Each of these artifacts had also been carefully refined following a comprehensive beta test conducted just two weeks prior to the real contest. The beta test revealed a few shortcomings that inhibited game play, including time constraints, lack of a concept of operations, and the downside of a “planned” delayed release of the materiel options available (the development team initially felt that too much data too fast would overwhelm the competition teams). All these deficiencies were reconciled before competition execution day.

A Robust Space Acquisition Scenario

The satellite product-line-specific scenario was designed to trip a few intellectual switches. Each team would be responsible for developing a robust and innovative acquisition strategy that called for vital satellite services to fill a critical and urgent communications gap. When combined with the Air Force’s Distributed Common Ground Station, more communications bandwidth would better enable the Air Force’s Global Hawk unmanned aerial vehicles to provide intelligence, surveillance, and reconnaissance capabilities to the warfighter in the U.S. Central Command area of operations. Each team was also given a representative Central Command concept of operations that confirmed bandwidth demands had already exceeded available capacity. The concept of operations implied that the warfighters were forced to forfeit an operational advantage they had previously enjoyed. They could no longer fully exploit crucial imagery data. Worse, the effectiveness of combat operations in their area of responsibility could soon be at risk.

From start to finish, the pace of the competition would be very ambitious. From the time the competitors received the warning order on Tuesday at 12 p.m. to the time they delivered their presentation finale to the evaluators on Thursday at 8 a.m., time was recognized as a premium. Even though the competition was appropriately sized for the set timeframe, there was no occasion to be idle. The teams had to respond to a short fuse with little time to distill a lot of data. A critical analysis was essential. The teams had to (1) identify and mitigate programmatic risk (Part IA, worth 20 points), and (2) develop a comprehensive set of evaluation criteria (Part IB, worth 20 points) before they could narrow their selection of three available (given) options. Parts IA and IB were also expected to help narrow the teams’ focus on the more critical elements early and ease them into the development of a more comprehensive acquisition strategy later. After they submitted their results for parts IA and IB to the evaluators, they would need to turn their attention to Part II (worth 60 points) and build a defensible acquisition strategy.

Part of the competition's success would depend on a thorough understanding of the competition instructions. As a result, SMC published a number of imperatives to safeguard game play, including:

- Rules of engagement that specified game expectations, team interactions, and taboos
- A well-understood communications plan that characterized all dialogue internal and external to the teams
- Specific scoring criteria and an accompanying evaluation rubric for all deliverables that clearly stated how the 100 points available would be awarded and under what conditions.

Game Day

On game day, the high energy level was apparent. Six teams were ready to play. Already in the hunt for the trophy, they had to overcome two major obstacles first—a tight timeline and too much data.

Aside from their inherent level of expertise, the competition teams had some additional help through virtual access to the *Defense Acquisition Guidebook (DAG)* and other very useful internet links; however, the teams were prohibited from seeking advice and counsel from other, more experienced people—which was to level the playing field. This decision created some intrinsic knowledge limitations. As a result, the teams were armed with just what they could deduce themselves and what they could supplement from the net. They had no secret weapons—just each other.

The teams received their warning order simultaneously at high noon on day one at their respective locations. Five teams were operating in conference rooms spread across SMC's Los Angeles Air Force Base, and one team was operating out of SMC's Kirtland Air Force Base site. The teams had just a couple of hours to digest the data and could generate up to five questions on any aspect of the game—from basic clarification questions to more detailed questions about any of the material provided. As part of the original plan, DAU and SMC established a command and control post to field the questions and guide the competition. Within two hours, questions started to roll in—questions like:

- "Is a fiscal year 2013 PB [*President's Budget*] and updated fiscal year 2014 POM [*program objective memo-*

randum] funding profile available for consideration with the criticality of the program, or are we to assume all deltas in future years will be approved in the future POM submittals?"

- "If a launch is delayed because of late arrival of GFE [*government-furnished equipment*], the commercial payloads may need to be compensated for lost revenues. What is the monthly dollar figure for slipping a launch for each of the commercial satellites manifested (Intelsat-19, Insat-3E, SES New Skies NSS-21, and Intelsat-20)?"

The teams immediately quantified some of the unknown variables and assessed them upfront. Understanding and reconciling the operational requirement was crucial, but their ability to carefully manage the ongoing uncertainty—a constant in the acquisition profession—could become a competitive advantage. The

more probing questions the team asked to mitigate most of the uncertainty, the better acquisition strategy they could build as they pressed ahead.

Results

The teams quickly dove deeply into the data stack. What the teams were able to achieve in a condensed amount of time was extremely notable—a testimony to their determination. In the end, and after performing the cost-schedule and performance trades, each team

selected the same option—a dedicated pay-for-service satellite versus option 1 (sharing real estate on another satellite [e.g., hosted payload]) or option 3 (leasing a satellite with an option to buy). In Part IA of the competition, the team had to list three to five key programmatic risks for all the options. The risks associated with their final selection would resurface in Part II and require a more thorough assessment.

From a competitive perspective, what differentiated the teams had more to do with their:

- Acquisition approach (from capability needs to key performance parameters)
- Programming, planning, budgeting, and execution strategy
- Detailed integrated schedules
- Identification of major programmatic risks and key mitigation strategies within the context of the risk cube

Junior personnel had an opportunity to demonstrate their collective mettle and test drive their acquisition skills across the entire acquisition integrated framework.

Table 1: **Rating the Scenario**

Participants: How Would You Rate the Scenario?	% Agree, More than Agree, Strongly Agree
Scenario was realistic	96%
Relevant and appropriate	100%
Exercise instructions were clear and straightforward	58%
Correctly sized for the time allotted	75%
Scenario stretched me intellectually	100%
The Artifacts provided were adequate	88%

Evaluators: How Would You Rate the Scenario?	% Agree, More than Agree, Strongly Agree
Scenario was realistic	88%
Relevant and appropriate	100%
Exercise instructions were clear and straightforward	88%
Correctly sized for the time allotted	88%
Scenario stretched the participants intellectually	100%
The Artifacts provided were adequate	100%

- Systems engineering approach and associated processes
- Assessment and reconciliation of the major design considerations
- Other programmatic considerations, including coordination with external stakeholders across the enterprise, harvesting existing technology from cancelled programs, and potential integration with other space command and control mission suites.

Looking back at the dynamic basis of the competition and the end result, all six teams deserve a lot credit. Each team focused its efforts with considerable intensity, even though the pressure did not let up once the competition began.

Table 2: **Rating Participation**

Participants: How Would You Rate Your Participation?	% Agree, More than Agree, Strongly Agree
Tested my fundamental acquisition knowledge	96%
Verified my ability to apply key acquisition principles	96%
Reinforced my strengths required by area of expertise	92%
Uncovered my training needs in acquisition life cycle	88%
Gave me a better feel for typical acquisition issues	92%

Evaluators: Observations on Participants	% Agree, More than Agree, Strongly Agree
Tested their fundamental acquisition knowledge	100%
Verified their ability to apply key acquisition principles	100%
Reinforced their strengths required by area of expertise	88%
Uncovered their training needs in acquisition life cycle	88%
Gave them a better feel for typical acquisition issues	88%

Ultimately, the team from Kirtland Air Force Base representing the Space Development and Test Wing won the honors and bragging rights this year.

Feedback

After the competition ended, the development team launched a survey that sought unvarnished feedback from each team member as well as the eight senior evaluators. Their views mattered, as they represented the goodness of this event, what everyone had to say about the ride, and whether or not SMC’s participation in the Guardian Challenge should continue.

Table 1 shows how the participants individually rated the scenario in contrast to the evaluators’ views. (Additional choices, not shown in the tables, were “Strongly Disagree” and “Disagree.”) Aside from the exercise instructions—which created a little

more fog than anticipated—and the limited time available to complete the tasks, the ratings were noticeably high. Views from the eight individual evaluators were generally consistent with the competitors’ views. The limited time constraints appeared to create some burden for both the teams and the evaluators, although the evaluators didn’t witness as much instructional fog as the teams experienced.

Table 2 shows how the individual participants and evaluators rated the participants’ general performance. The ratings were very consistent between both groups. In the narrative section of the survey, both the individual participants and evaluators amplified the need for more training. One individual even remarked that he needed to treat DAU training courses more seriously. A well-

known fact—training in operational exercises has always been the key ingredient to their success in real-world situations. In a similar fashion, “training like you fight and fighting like you train” in the acquisition profession could possibly promote more successful outcomes and maybe even boost performance.

Table 3 captures the views of the competition itself. Both the competitors and evaluators rated each category with the same consistency. Although the participants felt the competition highlighted the team functional dependencies and other key team dynamics, the evaluators

felt the challenge demonstrated a little less functional dependency. The evaluators also did not see the teams coalesce as much as the teams saw themselves coalesce.

Table 3: **What the Competition Demonstrated**

Participants: The competition demonstrated:	% Agree, More than Agree, Strongly Agree
The diverse capabilities of my organization	96%
Our functional dependencies	100%
Our functional strengths	100%
Our team's competencies	100%
The effectiveness of our team	100%
How well we performed under stress	100%
How well we coalesced as a team	100%
The application of key system acquisition processes	96%

Evaluators: The competition demonstrated:	% Agree, More than Agree, Strongly Agree
The diverse capabilities of SMC's organization	100%
SMC's functional dependencies	88%
SMC's functional strengths	100%
SMC team's competencies	100%
The effectiveness of SMC team	100%
How well SMC performed under stress	100%
How well SMC coalesced as a team	88%
SMC's application of key system acquisition processes	88%

A Meaningful Training Event

At the first glance, an acquisition competition conducted as part of an operationally centric Guardian Challenge exercise might appear to be a little unusual; however, the very prospect can provide some significant dividends in the form of experience gains. This competition showed just that.

What else made the competition relevant and meaningful? Many junior personnel had an opportunity to demonstrate their collective mettle and test drive their acquisition skills across the entire acquisition integrated framework—within their own product line at their own base alongside their own colleagues. With more of these type of engagements complemented by other, more focused training, SMC might be able to help overcome some the experience

Something like an acquisition competition in the context of a Guardian Challenge-like event just might take acquisition training to the next level.

limitations identified in a March 2010 Government Accountability Office report that indicated “insufficient numbers of experienced space acquisition personnel and inadequate continuity of personnel in project management positions.” Perhaps exercises like the Guardian Challenge can help confirm other critical acquisition functions that need to be strengthened to overcome these very real challenges.

So, should the acquisition community continue to participate in future Guardian Challenge exercises? The answer is indeed “yes” and the reason can best be summarized by one competitor’s survey comment (echoed by many others): “This is definitely a rewarding experience. The given scenario tested my acquisition knowledge and skill sets.” This competition also validated the importance of Defense Acquisition Workforce Improvement Act certification

in a real-world scenario. What students demonstrate in the classroom is just one component; what they can apply in the field is even more significant.

In retrospect, the operational and acquisition communities indeed seem to share many of the same training imperatives after all—which an expanded Guardian Challenge set out to prove. If the Department of Defense moves toward implementing qualification standards for acquirers much like the operational community has in place today, events like the Guardian Challenge can create experience breakthroughs for the acquisition community since they simulate real-world scenarios that acquirers face every day within their own organizations. While the Guardian Challenge is unique to AFSPC, other materiel developers across the DoD enterprise might be well served by demonstrating their mettle in similarly constructed competitions. In the long run, nothing shows an organization’s preparedness and key competencies like scenario-based competitions, and something like an acquisition competition in the context of a Guardian Challenge-like event just might take acquisition training to the next level.

Note: The author thanks DAU West Dean Andy Zaleski, Woody Spring, Col. Chuck Cynamon, Rick Agardy, and Donna Seligman for their tireless support in the development and analysis of this acquisition competition. While all were extremely busy with their other chief duties, they were the reason this event was so meaningful and successful.

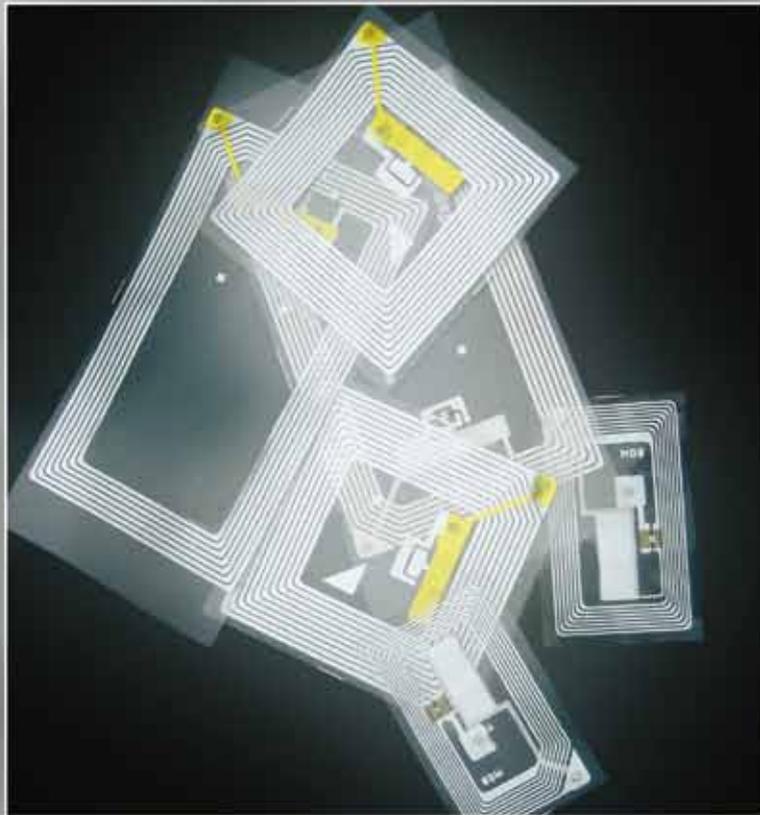
The author welcomes comment and questions and can be contacted at robert.tremaine@dau.mil.

Radio Frequency Identification

The Future is Now!

T. Michael Johnson

[Note: Mention of industry organizations in this article does not constitute endorsement by the Department of Defense.]



Most radio frequency identification (RFID) tags contain at least two parts. One is an integrated circuit for storing and processing information, modulating and demodulating a radio frequency signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal.

Johnson is an acquisition program manager for E-3 AWACS aircraft. He previously worked as an equipment specialist and life cycle logistics specialist.

The Department of Defense mandated that active and passive tags are required to:

- Provide near-real-time visibility of certain classes of supplies and material in transit
- Provide information as to the content and data included in the container
- Provide nonintrusive identification
- Enhance item visibility.

The goal is to make the supply chain visibility fully automated, thereby reducing both human error and manhours required to deliver the right materials to the right user at the right time. Active tags will be used for large freight containers for visibility during transit. Once the container has reached the theater of operation, it will be unpacked. The items inside of the large shipment will contain passive tags to facilitate automated receiving and distribution.

Currently, active RFID tags are applied by DoD personnel only to large consolidated shipments that are moving from the continental United States to areas outside of the continental United States. If the volume exceeds DoD capabilities, the suppliers will be provided tags to attach to their shipments.

The Future Has Arrived

Originally, DoD instituted item-unique identification and RFID for the purpose of rectifying supply chain inefficiencies and the lack of asset visibility. RFID in particular brings a hands-off data reading capability; and when linked to global positioning satellites, an active RFID tag produces real-time tracking of supplies anywhere in the world. A memorandum was issued by the acting under secretary of defense for acquisition, technology and logistics on July 30, 2004, calling for the mandatory use of RFID tags across the supply chain beginning Jan. 1, 2005. That was a great starting point for the use of this technology, but in the years since this policy took effect, the technology has been developed into much more than a capability for tracking pallets of material.

Private industry has fully embraced and continues to develop RFID technology into a tool that can do more than asset tracking and visibility. Imagination seems to be the only limiting factor of what RFID can do. The Airbus Company has fully embraced this new technology by developing and using RFID on its latest entry into the commercial airliner market—the model A380, a behemoth that can transport 555 to 835 passengers depending on its seating configuration. The A380 was designed and built with a fully integrated use of RFID technology.

Airbus deliberately planned every phase of logistics support for their new aircraft. The business plan involved three phases:

- Phase I: RFID tagging would be the enabler to fully integrate all suppliers by providing asset visibility throughout the supply chain.
- Phase II: Manufacturing processes would use RFID to not only get the right part to the right place at the right time, but would also enable automated re-ordering of consumable parts on the assembly line.
- Phase III: Maintenance processes and parts would be reviewed, and an electronic manifest to speed and improve aircraft serviceability would be built.

With all three phases completed according to the company's master plan, the first A380 was delivered on Oct. 15, 2007. The new airliner is currently flying with fully integrated RFID technology. The A380 incorporates approximately 10,000 RFID tags on board the aircraft. The tags are programmed for a wide variety of functions. One function is that time change—or time-controlled, limited-lifetime parts—have been equipped with RFID smart labels to store maintenance and inspection data. These data are transmitted via the tag's antenna without a maintenance person ever having to remove or gain access to the part being tracked. That saves time and money in maintenance hours, and simplifies components and spares management.

By using onboard computer servers, the repair and flight history of RFID-tagged components can be transmitted in electronic format while in flight. The aircraft also has a central data connection point that allows maintenance personnel to connect a laptop computer and download all system data. That allows for comprehensive tracking and accuracy of aircraft components. When coupled with in-flight data transmissions to the Airbus operations center, system failures can be transmitted in real time, allowing maintenance crews to be alerted, parts acquired, and service procedures prepared so repair work can begin as soon as the aircraft lands.

RFID in DoD

Starting out as a method of supply chain management, RFID has now expanded to include logistics and distribution, manufacturing assembly lines, and tracking of maintenance and repair process flow. RFID-enabled processes are similar to government aerospace operations, specifically Air Force Programmed Depot Maintenance facilities. Let us examine some of those process areas to see how RFID technology could be adapted to government aerospace by using what the private sector has already proven to be a viable solution.

I will use the Air Logistics Center, Tinker Air Force Base, Okla., as an example of how this new technology could be used to improve process performance and cut costs. Tinker AFB's engine maintenance facility performs repair, modifications, test, and reclamation of 14 different engine types while sustaining a supply of more than 22,000 engines for the Air Force fleet. Tinker also hosts programmed depot maintenance functions on a wide range of complex aircraft. The Air Logistics Center performs all of the same functions that Airbus and other aerospace companies perform in the private sector. Although the Air Logistics Center is the primary example, the tactics could apply to any Department of Defense center.

Supply Chain/Logistics

One example of how Tinker AFB's engine line might use RFID technology is the use of automated receipts for verifi-

cation of engines, parts, and assemblies that arrive on the loading dock. Scanners would read RFID on the shipment container, providing instant verification of what the container holds without its ever having to

be opened. Zones could also be set up that would sound an alarm or initiate an e-mail if an engine container or component assembly was moved to the wrong location. This near-real-time tracking would help eliminate time wasted trying to locate a misplaced item, or an item's falling behind schedule in the repair process because it was moved to the wrong location and forgotten.

Manufacturing

During manufacturing, many consumable and non-consumable parts are kept in some form of bins. RFID tags could be used to monitor the levels of stock of those items. When an item reaches a predetermined low level, new parts would be ordered automatically, ensuring no work stoppages as a result of a lack of parts. Another way man-

ufacturing could benefit is if each component installed into an engine is scanned into a computer. The master parts list of that engine could be compared to what has been installed, ensuring no parts are forgotten during the assembly. That would lead to a higher level of quality and reduce the chances of an engine's having to be reworked. It would also lead to tighter control of scheduling, and would give real-time visibility into the work process and time required for installing and building the engine.

Programmed Depot Maintenance

The use of RFID tags and equipment gives a new method of real-time tracking of day-to-day status. This enables managers to uncover process choke points and errors before they can affect production schedules and cause a reduction in output. Installing RFID-automated tool control centers could easily address and simplify tool inventories/locations/calibration and the amount of time used for check-in/check-out procedures.

RFID technology continues to grow and become more powerful, and it is also gaining acceptance across a diverse set of users—and that is lowering the cost of the technology both for hardware and for software and making the return-on-investment timeline decrease as the price of this new technology continues to drop.

As an example, “special tools” that require periodic calibration could be set up to send an alert whenever they are about to exceed their calibration date. Inventory of a toolbox could be accomplished by the wave of a handheld scanner, which would ensure accuracy and reduce the loss of valuable time resulting from the current methods. Lost tools present a real hazard to aviation maintenance. An important safety benefit could be realized by quickly finding a missing tool on an aircraft with a scanner as opposed to a crew of workers spending hours looking for it. The scanner would inform immediately if the missing tool is even on board the aircraft, thus eliminating a potential safety hazard in minutes instead of hours.

Inventory Carry-On Equipment

RFID can be used for process improvement in aerospace operations from the supply line to maintenance, and one example is using a hand scanner to inventory carry-on equipment without ever having to see or physically touch it. Expanding this idea a bit makes it easy to see how this simple method of inventory control could be adapted to all branches of the military. Military members rely on inventories of one form or another. Some items are critical to missions and can easily be tagged and scanned, such as mobility items, weapons, vehicles, and almost anything else that would require item accountability. The time saved by automated logging and inventory of these items could reap huge benefits. This ability could improve rapid-response missions by decreasing logistics timelines.

The Possibilities are Boundless

The use of RFID tags is limited to one’s imagination and the amount of data or programming that the tag can hold. A perfect example of using one’s imagination with RFID is in-flight meals. RFID-coded instructions on each frozen meal can tell the oven what temperature and how long the item should be cooked to come out perfect every time. RFID technology continues to grow and become more powerful, and it is also gaining acceptance across a diverse set of users—and that is lowering the cost of the technology both for hardware and for software and making the return-on-investment timeline decrease as the price of this new technology continues to drop.

DoD jumped on the RFID bandwagon early but needs to continue to invest in the technology. In the constant search for better ways to save tax dollars and improve processes. RFID shows the promise of being able to help all of DoD accomplish this difficult task.

To learn more about RFID, I suggest you read the *RFID Journal* at <www.rfidjournal.com>.

The author welcomes comments and questions and can be contacted at todd.m.johnson@tinker.af.mil.



A Six-pack of Tips for Defense AT&L Authors

- 1** *Look at back issues of the magazine. If we printed an article on a particular topic a couple of issues ago, we're unlikely to print another for a while—unless it offers brand new information or a different point of view.*
- 2** *We look on articles much more favorably if they follow our author guidelines on format, length, and presentation. You'll find them at <www.dau.mil/pubs/dam/DAT&L%20author%20guidelines.pdf>.*
- 3** *Number the pages in your manuscript and put your name on every page. It makes our life so much easier if we happen to drop a stack of papers and your article's among them.*
- 4** *Do avoid acronyms as far as possible, but if you must use them, define them—every single one, however obvious you think it is. We get testy if we have to keep going to acronym finder.com, especially when we discover 10 equally applicable possibilities for one acronym.*
- 5** *Fax the Certification as a Work of the U.S. Government form when you e-mail your article because we can't review your manuscript until we have the release. Download it at <www.dau.mil/pubs/dam/DAT&L%20certification.pdf>. Please don't make us chase you down for it. And please fill it out completely, even if you've written for us before.*
- 6** *We'll acknowledge receipt of your submission within three or four days and e-mail you a publication decision in four to five weeks. No need to remind us. We really will. Scout's honor.*

Meeting Defense Information Needs for 65 Years

A Profile of the Defense Technical Information Center

Cheryl Bratten ■ Sandy Schwalb



Technology advances so rapidly that the world must continually adapt to remain relevant. Having the right information at the right time is key to adaptability. In the case of our nation's warfighters, adaptability can mean the difference between life and death. The Department of Defense's science and technology, research and development, and test and evaluation communities are the driving forces behind the warfighter's technological edge. Providing essential technical research, development, testing, and evaluation information, rapidly, accurately, and reliably to support our customers is the mission of the Defense Technical Information Center (DTIC®).

Bratten is a writer-editor in DTIC's Marketing and Registration Division. Prior to joining DTIC, she was an editor for an education association. **Schwalb** is DTIC's public affairs officer. She has worked for a U.S. senator and was a speechwriter at the Government Printing Office.

What is DTIC?

The premier provider of science and technical information (S&T) for the defense community, DTIC collects, stores, and disseminates authoritative DoD scientific, research, and engineering information. The center provides controlled access to S&T information; supports S&T specialized subject areas; offers up-to-date electronic information using various technologies, including Web 2.0 tools; and makes available customized training in searching DTIC databases and marking documents.

DTIC creates and hosts more than 100 official DoD websites, several of which specifically support the director of defense research and engineering (DDR&E). DTIC Web hosting includes full-service Web support, an established and secure Web architecture, and customer assistance.

In 2004, DTIC was established as a DoD field activity within the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics and reports directly to DDR&E. As a DoD field activity, DTIC is one of several organizations whose work reaches across all segments of the defense department.

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Meeting Your Collaboration Needs

DoDTechipedia

DoDTechipedia.mil, a wiki application, is a secure online system designed to increase communication among DoD scientists, engineers, program managers, and operational warfighters. This tool enables defense personnel to collaborate on technological solutions, reduce costs, add capability, and avoid duplication. The DoDTechipedia vision is to aid in the rapid development of technology and the discovery

DoDTechipedia



of innovative solutions to meet critical capability needs and gaps. Some of its features include a live forum, a quick registration process using a CAC, a “sandbox” for users to practice posting and editing content, acronyms/definitions, technology areas where discussions about S&T investment areas or enabling technology take place, interest area pages for DoD personnel and DoD contractors to work together on challenges and solutions, blog capabilities, hyperlinking of terms, and the ability to upload attachments. Launched in 2008, DoDTechipedia boasted more than 11,000 users in June 2010.

DoDTechipedia was awarded the Government Computer News award for “Outstanding Information Technology Achievement in Government” in 2009. Additionally, the wiki was highlighted on the White House website in the Open Government Initiative/Innovations Gallery.

Currently, DTIC hosts DoDTechipedia Limited and DoDTechipedia Classified.

DefenseSolutions.gov

Imagine a website that allows innovative thinkers to suggest and submit products, help the United States, and, ultimately, make ground-breaking ideas reality. DefenseSolutions.gov, located at <www.defensesolutions.gov> is that site. It is a portal through which cutting edge companies, entrepreneurs, and research organizations that

DTIC Online Access Controlled



have not considered doing business with DoD in the past can offer potential solutions to defense problems.

The DDR&E Rapid Fielding Office posts technical areas, or “themes,” seeking vital ideas, suggestions, and solutions to DefenseSolutions.gov. Ideas selected for further consideration have the potential to be awarded quick funding for development or prototype production and to be integrated with other defense technologies or programs. Not only is the proposal process streamlined, but the response from high-level experts reviewing the submitted ideas is given within 30 days. Any proprietary information is protected under various statutes, including the Freedom of Information Act, for five years.

The first technical area posted on DefenseSolutions.gov was “Battlefield Forensics,” which pertains to the DoD applying criminal forensic capabilities and technologies typically used in law enforcement to meet national security and counterterrorism needs. Registration to access the site is not required. Innovators can sign up to receive e-mail notification as the themes change.

Aristotle

Launched in March 2010, Aristotle is a professional social networking site for the DoD S&T community. It provides a secure environment for scientists, engineers, researchers, and program managers to network, create, and collaborate with other experts in the S&T community. Not only can you network with other individuals, you can also link to topics, projects, and documents. Aristotle provides situational awareness of the larger DoD S&T community.

This powerful application helps S&T professionals do their jobs more efficiently and effectively. You can organize and share information and collaborate with colleagues around the world on projects; gather, prioritize, and utilize information; and keep up-to-speed on developments in areas vital to your work. In addition to the security provided by the requirement to sign on with a

**With so many resources
accessible from one website,
DTIC's suite of services
saves both time and effort.**

DTIC Online Welcome Screen



registered CAC or using a user ID and password, you can assign permissions to everything you create in or upload to Aristotle.

Why Not Just Google® It?

If the information is out there, can't any Internet search engine find it? The answer is no. Commercial search engines cannot access all of DTIC's databases, and certainly not any information that is controlled or marked as classified.

"We're trying to educate people that limiting searches to the general Internet is not the most productive way to do research," said Ryan. Commercial search engines cannot crawl the "deep Web," which is where most S&T databases reside.

The MultiSearch function, found on DTIC Online, accesses the deep Web. It is a federated search surveying more than 50 sources worldwide, some of which are federated themselves, which means that they spider out to other deep-Web databases. MultiSearch ultimately queries more than 400 sources, including Science.gov, World Wide Science, and Scitopia, and it is all real-time data. These multi-faceted search features allow for fast information without the hassle of opening up endless Web pages.

Meeting Your Needs for 65 Years

DTIC has been in the information business for 65 years and is a recognized leader in information- and knowledge-management innovations for the defense community. With so many resources accessible from one website, DTIC's suite of services saves both time and effort.

MEETING YOUR INFORMATION NEEDS

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- Technical reports collection with more than 2 million S&T documents
- Congressional budget data available within days of its release from Congress.

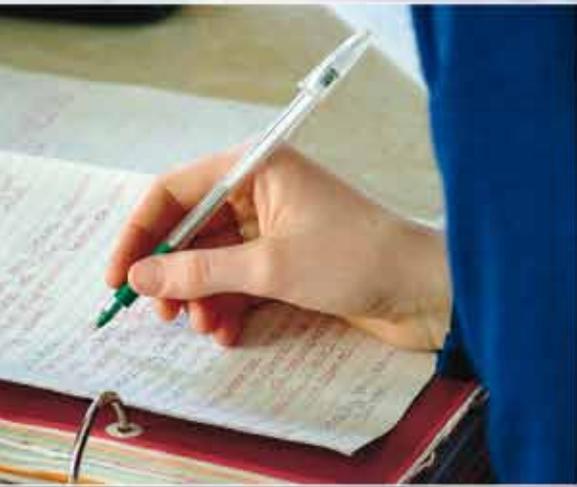
Available on DTIC Online Access Controlled only:

- Research summaries collection, including over 300,000 descriptions
- Independent research and development database with more than 172,000 descriptions of R&D projects conducted independent of DoD funding
- Access to DoDTechipedia, DoD's S&T wiki, which enables S&T professionals to collaborate to help warfighters
- Aristotle, DoD's professional networking tool, which provides a secure environment to network, create connections and collaborate with other experts in the federal government S&T community
- Congressional budget queries, allowing resource managers to locate and respond to budget changes
- Biomedical research database, containing federally funded biomedical research, testing, or training program information
- Defense S&T planning, providing latest planning documents describing major technology areas and programs
- Lab demographics, offering demographic information on in-house civilians
- Dialog NewsEdge Service, keeping users up-to-date with important news while online
- ProQuest Research Library Complete, a periodical indexing service providing search and retrieval for articles from over 2,575 periodicals.

In the 21st century, advancement calls for the collection, analysis, and distribution of information quickly, accurately and reliably to effectively yield solutions—that is information agility, and DTIC sets the standard. From civil engineers to biologists, security experts to program managers, librarians to acquisition professionals to warfighters in-theatre, DTIC customers can access multiple resources, both within DoD and worldwide, with a single sign-on, regardless of the computer's operating system. This is information at your fingertips—literally—from anywhere in the world.

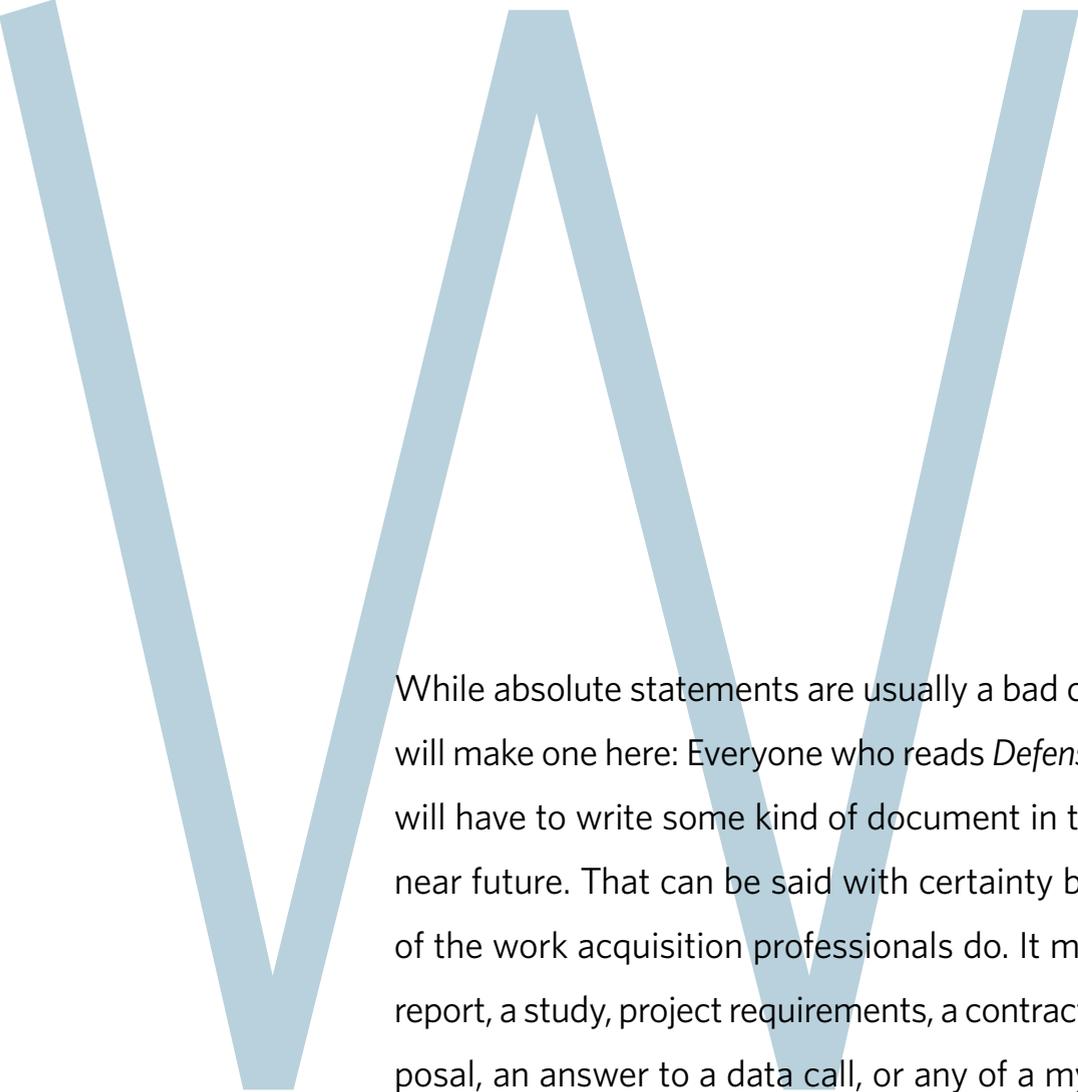
DTIC ensures the preservation and availability of S&T research and information over the long term, no matter what agency is reorganized, what website shuts down, or which authors lose their documents.

For further details on the information in this article or to register, go to <www.dtic.mil> or call 800-225-3842.



Surviving Written Communication

Wayne Turk



While absolute statements are usually a bad choice, I will make one here: Everyone who reads *Defense AT&L* will have to write some kind of document in the very near future. That can be said with certainty because of the work acquisition professionals do. It may be a report, a study, project requirements, a contract, a proposal, an answer to a data call, or any of a myriad of other documents. It could even be an e-mail (although you probably write many of those each day). I'll ignore e-mails for this article, but they should be professional, and many of the rules I'm going to discuss in this article apply. No matter what the document, to be successful, work products need to be written well.

Turk is an independent management consultant. A retired Air Force lieutenant colonel and defense contractor, and the author of *Common Sense Project Management* (ASQ Press, 2008), he is a frequent contributor to *Defense AT&L*.

In today's government-related work world, the ability to communicate effectively in writing is a critical survival skill. If you can't write, in many cases, slick verbal skills, technical knowledge, or other talents will only take you so far.

What follow are some suggestions on how to improve your writing. The tips are not comprehensive, but they can help.

The Written Word

You don't have to be the world's greatest writer, but you do need to be able to put words on paper in a way that is readable, grammatically correct, and gets the idea or point across. The ability to write well is a highly valued skill. Surprisingly few people can do it any better than adequately (and many can't even do that—or maybe they are just not willing to take the time or make the effort). A well-written proposal, report, technical document, request for resources, or some other document will get you

The ability to communicate effectively in writing is a critical survival skill.

noticed and may put you in demand. Managers at every level are looking for people who can write well. While the written word is only one aspect of communication, it's the one that leaves a permanent record.

Even if you don't write documents, you may have to edit them. At the managerial level, you will be responsible for the content, format, and readability of any written material that is a product of your people.

Documents that are readable, understandable, and accurate are always needed in our field and any other area of endeavor. Content is, or should be, critical; but sometimes grammar, spelling, format, and readability are seen to be almost as, and sometimes more, important. So however good the content, sloppy can quickly detract from content. Accuracy in what you write is crucial. Get the point across concisely, accurately, and understandably so that the right outcomes happen—this could be a decision, funding, schedule extension, or just acceptance of the document by the powers that be. Good writing is a skill that will pay handsome dividends.

Practical and Specific Suggestions on Good Writing

Much of the following is based on suggestions in "How to Write Right," an article by Gerald Blair, a professor at

Edinburgh University. Although his article was directed at engineers, most of his suggestions are appropriate and applicable for everyone and for any writing task. According to Blair, when you approach a professional writing task, you need to follow a very simple procedure:

- Establish the aim or goal
- Consider the reader
- Devise the structure
- Draft the text
- Edit and revise.

Start with your aim or goal. Every document should have a single aim—a specific reason for being written. Once you have established your goal, decide what information is necessary to meet it. Apply your knowledge to determine the relevant facts for the document and present them precisely and concisely. When you are writing some documents, you may have to present background, explanations, and justifications along with the pertinent facts. Just leave out the gobbledegook and the irrelevant information.

Every document should tell somebody something. As the writer, you have to decide what to tell and how best to tell it to your intended audience. Who will be the reader? Blair says that there are three considerations:

- What they already know affects what you can leave out.
- What they need to know determines what you include.
- What they want to know suggests the order and emphasis of your writing.

Let's look at a business world example. In a proposal for a new product, different departments need different information. Marketing would want to see the product's differentiation and niche in the marketplace; finance would be interested in projected development costs, profit margins, and risk analysis; and research and development would want the requirements and the technical details. To be most effective, you might need to produce three different reports for the three different audiences; however, most of us would prepare a single document, but with sections applying to the specific needs of the different readers.

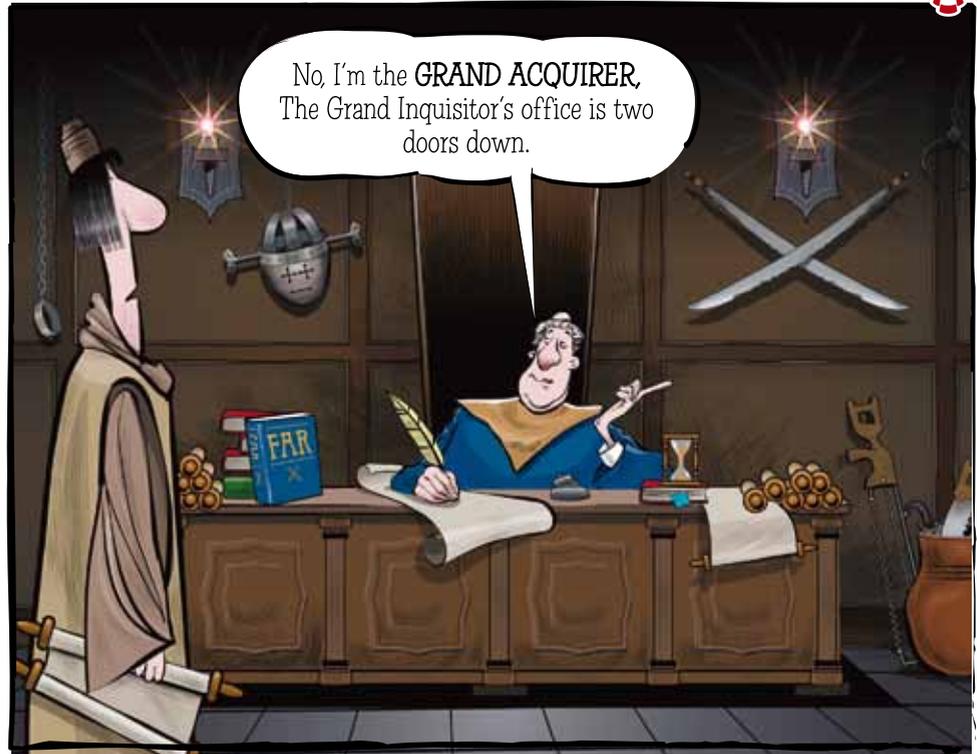
Structure is used to present the information in such a way that the reader can find and understand the information

You have to be able to get your points across to others concisely and effectively.

he needs. It is a good idea to provide information in small, manageable chunks, and to use the structure of the document to maintain the context. Divide the document into sections that can be written and read separately. Similarly, those sections can be broken down into subsections.

Blair says that every paragraph in your document should serve a purpose or be removed. A paragraph should convey a single idea. There should be a statement of that key idea (remember the term “topic sentence” from when you were in school?) and additional information such as:

- Development of the idea
- An explanation or analogy
- An illustration
- Support or evidence
- Contextual links to reinforce the structure.



After you have decided what to say, who the intended reader is, and the structure, write the text and then check it for clarity and effectiveness. After you check it, have someone else read it too. The time that spent ensuring that the document is readable and understandable will be worth it. Many companies and organizations require at least two sets of eyes to see every document before it is deemed final. That ensures a higher-quality document, assuming that the second set of eyes actually reads the document and is smart enough and willing to point out flaws.

A Few Examples of Bad Writing

The following are examples of bad punctuation, word choice, grammar, or some other error that changes or hides the real message. This is what can happen if you don't look over what you wrote and have someone else read it, too. These all were first reprinted in *The New Yorker*.

- “I would not ever want to say there are not people on our campus that at first in the classroom are not hard to understand, at least until students get used to them,” Watkins said. [From the *Bloomington Pantagraph*]
- “This is the first time there has been institutional support,” said Martin Levinson, the director of the drug prevention program in District 30 in Queens. “For the morale of the drug workers, it is a shot in the arm.” [From *The New York Times*]

- “Teaching is like a disease; those of you who have it are lucky, you are blessed,” Honig said. [From the *Stockton Record*]
- Lady wants ride to South Western Pennsylvania. Will more than share expenses. [Advertisement in *Cocoa Today*]
- Like the family barn, Harold Wright's car is still going strong after 285,000 miles. [Photo caption in the *Burlington Free Press*]
- Excellent skills in written communication is required. [Advertisement in the *Chicago Tribune*]
- Eradication Fails To Slow Fire Ants [Headline in the *Memphis Commercial Appeal*].

Writing for Success

To survive and prosper in the workplace you have to communicate well. You have to be able to get your points across to others concisely and effectively. You need to be able to do it in writing as well as verbally. Being able to write well makes you more visible to those above you and more desirable as an employee and as a manager. It will help you toward success in your work and progress in your career. Not being able to write effectively can put barriers in the way of organizational and personal success. And success is something that we are all looking for.

The author welcomes comments and questions and can be contacted at rwturk@aol.com.

The Courage to Raise Your Hand

Owen Gadeken



The scene, which occurred many years ago, was all too familiar to me: A new leader with a new program. Gone were my days as a manager on Air Force missile development programs. I had just joined the faculty at Defense Systems Management College to teach program management. We had a new commandant, an Air Force brigadier general, who was ready to revolutionize our capstone program management course. In due fashion, he assembled his team of faculty and staff and announced he had a new vision for program management training in the Department of Defense. We would create a new course with a single evolving program as a central theme. We would cover the entire acquisition life cycle using a series of case studies based on this single program. Furthermore, we would construct the new course as a living program so student decisions could be incorporated to change the scenario as it evolved. This ability to adjust the case on the fly would allow students to actually see the impact of their early decisions on program outcomes.

Gadeken is a professor of program management at DAU's School of Program Management, with more than 25 years of experience as a DAU faculty member. His current interest centers on helping program managers become effective leaders. Gadeken earned his doctorate in engineering management from The George Washington University.

As he went on, I remember saying to myself, "What an innovative concept, but it will never work in our system." We had up to 300 students going through the course at a time. If student groups were allowed to adjust the scenario as they went along, we would have an enormous configuration management problem. Also, the bulk of our cases studies came from real-world programs where we had actual cost, schedule, and performance data. Where would we get the data to feed to each group as they departed from the baseline scenario? Our faculty prided themselves on meticulous preparation before teaching each case study. What type of faculty would it take to respond to this constantly changing scenario? Negative fantasies raced through my mind as I wondered what would happen if we adopted the commandant's proposed approach.

After concluding with a comment about how this would revolutionize our educational process, the commandant said he was interested in our candid feedback on his proposal. My instant reaction was to think, "Sure, he's interested in feedback so long as it supports his idea." Having been through situations like this many times before, I resolved to keep my mouth shut and was certain my colleagues would do likewise. Even if the vision proved futile, which was highly likely in my opinion, we would just wait a couple years for the next commandant to rotate in with another vision.

So I anticipated the usual prolonged and uncomfortable silence followed by a politically correct question or two. But this was not to be, as my colleague Don raised his hand and stood up to speak from the back of the room. "Sir, with all due respect, your vision won't work," he said. "I admire the concept, but it is too complex for our students and faculty to execute."

I couldn't believe Don was saying that publicly, and I wondered about the consequences. Perhaps the commandant would let Don stay on for a few weeks before he terminated Don's faculty appointment (all faculty members were on excepted service term appointments). Or maybe he would just reassign Don to one of our new regional offices—a sort of exile.

After giving Don time to outline his position, the commandant responded immediately. He surprised us all by praising Don for the courage to voice an opinion counter to his vision. The general went on to say that he encouraged people to state their honest opinions even if they were not in agreement with his or other senior leadership positions.

Even after this statement by the commandant, many of us continued to expect negative fallout from Don's challenge to the general's vision, but it never came. Don kept his viewpoint and his job, and actually became the commandant's favorite lightning rod for candid feedback on any new proposals. And the commandant's vision? It never came to be. We worked hard on it and had some success in our pilot offering. But in

**"Often the difference between a successful person and a failure is not one's better abilities or ideas, but the courage that one has to bet on his ideas, to take a calculated risk, and to act."
Maxwell Maltz, author of *Psycho-Cybernetics: A New Way to Get More Living Out of Life***

the end, Don was right. It was too complex for both faculty and students to execute.

Don't Shoot the Messenger

Ironically, there were several positive effects resulting from that experience. Don's "free to speak your mind" example was not lost on the organization. Other faculty and staff gradually felt more empowered to offer their candid views about ongoing projects. Even though the commandant's vision ultimately failed, we learned a great deal from the experience that we incorporated as improvements to our existing program management courses. We also kept the spirit of experimentation and allowance for failure alive and well at the college. We continued to try new approaches. Even if they didn't succeed, we always learned valuable lessons from the process.

As I think back on this incident, it stands out clearly as one of the turning points in my career in program management training. While it seemed like an almost trivial event at the time, it reinforced the value of praising rather than shooting the messenger.

The same scenario can play out in acquisition program offices, as explained by one of our course's frequent guest speakers at the time, Robert "ChedBob" Chedister, who as a colonel had been the program manager of the Joint Surveillance Target Attack Radar System (JSTARS) program at Hanscom Air Force Base, Mass. When he took over the program, Chedister discovered that the program's cost estimate was significantly understated (by more than \$1 billion) to buy the 19 aircraft

In addition to speaking up to senior management, it is equally important for good acquisition leaders to create open and trusting environments in their organizations where subordinates can speak to them.

required. He dutifully reported this to his senior Air Force leadership and was immediately rebuffed. He came back a second time and was again turned away. Chedister's boss then hired a retired Air Force two-star general who worked with him for the next two and a half months. At that point, the retired two-star reported that Chedister was actually \$1.2 billion short, whereupon the two-star was fired on the spot. Chedister was then given a retired four-star general to help him get to the "right" cost number. After three and half months, the retired four-star reported that the program was actually \$1.4 billion short, but he knew a way to save \$0.4 billion (making it back to the original \$1 billion shortfall).

This time, no one was fired. The Air Force argued about the cost for the next two years and finally gave the \$1 billion to the program manager after Chedister. Chedister bought 13 aircraft, and the Air Force ended up with a total of 17 aircraft. By repeatedly going back to his senior leadership, Chedister knew he was risking his job and possibly his career. But he knew that if he didn't go back, the true cost of the program would still come out. As a postscript, Chedister was promoted twice more and retired as a major general commanding the Air Armament Center at Eglin Air Force Base, Fla.

Having Courage

Unfortunately, such examples of courage in the acquisition line of fire are the exceptions rather than the rule. In our environment, there are tremendous institutional pressures to remain silent and go with the flow of direction coming down from senior management. After all, acquisition organizations are nothing more than military bureaucracies in a light disguise. As such, they conform to a hierarchical chain of command that has, as its basic premise, top-down control. But that leads to organizations where subordinates rarely, if ever, confront their superiors with a difference of opinion, even on important matters. A retired major general commented on this climate in a March 19, 2006,

op-ed piece in the *New York Times*: "I've seen a climate of groupthink become dominant and a growing reluctance by experienced military men and civilians to challenge the notions of senior leadership."

So what does it take to break this climate of groupthink? It's simple: It takes the courage to raise your hand and speak the truth. That sounds simple but can actually involve taking considerable personal and career risk. Failure to take such risk, however, is a sign of weak leadership. Such failure is also noticed by the rest of the team and organization, making them more reluctant to take risks.

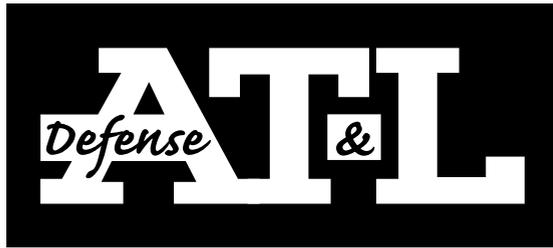
In addition to speaking up to senior management, it is equally important for good acquisition leaders to create open and trusting environments in their organizations where subordinates can speak to them. There is no better example of this than a plaque I recently noticed at the Valley Forge National Historic Site near George Washington's headquarters. During this extremely difficult winter encampment, Washington could have easily taken total control. But he didn't. In fact, he allowed and even encouraged open debate among his staff. As the plaque stated, "His officers deeply respected him, but their conversation was not constrained by deference."

As Maxwell Maltz, author of *Psycho-Cybernetics: A New Way to Get More Living Out of Life*, wrote, "Often the difference between a successful person and a failure is not one's better abilities or ideas, but the courage that one has to bet on his ideas, to take a calculated risk, and to act."

In our environment, there are tremendous institutional pressures to remain silent and go with the flow of direction coming down from senior management.

So, would *you* raise your hand?

The author welcomes comments and questions and can be contacted at owen.gadeken@dau.mil.



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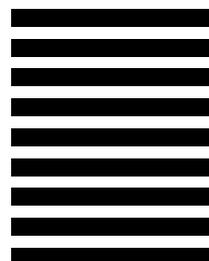
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Purpose

Defense AT&L is a bi-monthly magazine published by DAU Press, Defense Acquisition University, for senior military personnel, civilians, defense contractors, and defense industry professionals in program management and the acquisition, technology, and logistics workforce. The magazine provides information on policies, trends, events, and current thinking regarding program management and the acquisition, technology, and logistics workforce.

Submission Procedures

Submit articles by e-mail to [datl\(at\)dau.mil](mailto:datl(at)dau.mil) or on disk to: DAU Press, ATTN: Carol Scheina, 9820 Belvoir Rd., Suite 3, Fort Belvoir VA 22060-5565. Submissions must include the author's name, mailing address, office phone number, e-mail address, and fax number.

Receipt of your submission will be acknowledged in five working days. You will be notified of our publication decision in two to three weeks.

Deadlines

Issue	Author Deadline
January-February	1 October
March-April	1 December
May-June	1 February
July-August	1 April
September-October	1 June
November-December	1 August

If the magazine fills before the author deadline, submissions are considered for the following issue.

Audience

Defense AT&L readers are mainly acquisition professionals serving in career positions covered by the Defense Acquisition Workforce Improvement Act (DAWIA) or industry equivalent.

Style

Defense AT&L prints feature stories focusing on real people and events. The magazine also seeks articles that reflect your experiences and observations rather than pages of researched information.

The magazine does not print academic papers; fact sheets; technical papers; white papers; or articles with footnotes, endnotes, or references. Manuscripts meeting any of those criteria are more suited to DAU's journal, *Acquisition Review Journal (ARJ)*.

Defense AT&L does not reprint from other publications. Please do not submit manuscripts that have appeared in print elsewhere. *Defense AT&L* does not publish endorsements of products for sale.

Length

Articles should be 1,500 – 2,500 words.

Format

Submissions should be sent via e-mail as a Microsoft® Word attachment.

Graphics

Do not embed photographs or charts in the manuscript. Digital files of photos or graphics should be sent as e-mail attachments or mailed on CDs (see address above). Each figure or chart must be saved as a separate file in the original software format in which it was created.

TIF or JPEG files must have a resolution of 300 pixels per inch; enhanced resolutions are not acceptable; images downloaded from the Web are not of adequate quality for reproduction. Detailed tables and charts are not accepted for publication because they will be illegible when reduced to fit at most one-third of a magazine page.

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