

Reduction of Total Ownership Cost (R-TOC)

Recent History and Future Prospects

DR. SPIROS PALLAS • MIKE NOVAK

With the Cold War having run its course, significant new funding for DoD is not seen in the near future. But since the United States still maintains a worldwide role, weapons systems containing the latest new technologies are needed by our forces to replace aging systems.

DoD continues to look at a variety of methods to maintain its forces in a combat-ready status within budget limitations, but is having difficulty doing so. Thus, the common thread running through this article is that the Department is striving to maximize the use of modernization funds to improve operational readiness by making the entire Defense Life Cycle Cost system more efficient both in force readiness and in the use of scarce dollars.

Modernization Must Continue

There is an explicit recognition that DoD must continue to provide our forces with quality equipment to execute their missions even with reduced funding. Former Secretary of Defense Richard B. "Dick" Cheney, when talking about the Gulf War, gave praise to his predecessors who were responsible for development and acquisition of the equipment that ultimately resulted in a stunning victory for the United States.

Modernization must continue during this time of relative calm. We must en-



sure that the next time our forces are needed to defend our national interests, they can do so with the appropriate equipment that will allow them to gain their objectives at the lowest possible cost in human life.

Improving the Acquisition System Began Years Ago

Efforts to improve the acquisition system extend backward in time for a considerable number of years and administrations. The situation mentioned pre-

Pallas is the Principal Deputy Director, Strategic and Tactical Systems, Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD(AT&L)). His complete biography appears on p. 64. Novak is an action officer for air warfare systems, reporting to the Deputy Director, Air Warfare, Strategic & Tactical Systems, OUSD(AT&L). His duties include providing acquisition oversight and technical expertise, for such systems as the Joint Strike Fighter, Joint Primary Aircraft Training System, and T-45 aircraft. He is also Pallas's primary action officer for R-TOC and the development of cooperative international programs. His background includes serving as an operations officer at Naval Air Command for the F/A-18 aircraft; systems engineer for a support contractor involved in testing; and as an A-6 naval aviator aboard a U.S. carrier. He holds a bachelor's degree from the University of Maryland, and a master's degree from the Naval Postgraduate School.

viously (lower budgets with the same or improved readiness) was recognized long ago, and there have been many great thinkers working the problem. One of the landmark initiatives was the 1986 Packard Commission Study. Prior to that, the Grace Commission (1983) looked at the DoD acquisition process. David Christensen et al, in a DSMC thesis entitled, "The Impact of the Packard

program reviews. However, the acquisition community wrote and promulgated the above regulations and instructions.

Unit costs were easily seen and tracked in an acquisition budget, but the costs of operating and supporting systems were generally outside the sight and control of the acquisition community. Therefore, intense focus remained on acquisition costs, and attempts to control life cycle costs were minimal.

The R-TOC Environment

Initially, Reduction of Total Ownership Cost (R-TOC) did not spring forth as an



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explicitly stated initiative. Rather, it evolved under deliberations in the Defense Manufacturing Council (DMC), which later was renamed the Defense Systems Affordability Council (DSAC). Leadership of the multiple efforts that eventually became R-TOC was split between various groups.

The following discussion will attempt to track and document that path, including the events that shaped the environment within the Pentagon.¹

Perry Mandate

One major event that contributed to the environment not captured in Figure 1 was the February 1994 memorandum,

"The Problem - Why Change is Necessary," issued by then Secretary of Defense William J. Perry. That mandate appears to have started the most recent efforts to reduce DoD costs. Starting at this point in time, we will begin detailing a series of events leading to the initiative known as Reduction of Total Ownership Cost (R-TOC).

The Perry mandate made a number of excellent points. One of those points is restated here to frame this article:

"Adopt business processes characteristic of world-class customers and suppliers (and encourage DoD's suppliers to do the same)."

This point is not simply a re-statement that the DoD must procure items less expensively. Rather, the point is a call for DoD to mimic businesses that are driven by the "bottom-line" metric. That metric ties the quality of the equipment to the total cost of ownership of the system.

Color or "Pots" of Money

One difference (among many) between a "real" business and DoD (related to the total cost of ownership) is that business has only one "color of money," while DoD has many. Business can easily answer the question: how much does a particular investment cost the business (bottom line)? Money is money, and that shows up in the earnings per share for a company.

The Department of Defense, on the other hand, has different "pots" of money, controlled by different sectors in DoD. Because of different accounting rules and since every controlling interest jealously guards their "pot" from other DoD interests, scoring total savings across all of DoD is difficult at best.

Further, with the Cold War at an end, not all of those "pots" are adequately filled to perform the mission of preparing for war in order to keep the peace, which, after all, is the real job of DoD. Thus, trying to shift funds from one "pot" to another, in order to improve readiness while reducing total DoD costs,

Commission's Recommendations on Reducing Cost Overruns," listed some of the more important events, studies, and regulations (Figure 1).

The major thrust of the majority of these efforts was in the area of reducing acquisition costs. To be sure, total life cycle cost was explicitly mentioned in some of the initiatives (such as Department of Defense Directive [DoDD] 5000.28, Design to Cost), and "reliability and maintainability" were routinely considered in

FIGURE 1. Efforts to Improve Defense Acquisition

Year	Regulation or Initiative Published
1969	Packard Initiatives
1971	Blue Ribbon Defense Panel (Fitzhugh Commission)
1972	DoDD 5000.1 (Major System Acquisitions); Commission on Government Procurement
1973	DoDD 5000.4 (CAIG); DoDD 5000.28 (T&E)
1975	DoDI 5000.2 (Major System Acquisitions) DoDD 5000.28 (Design to Cost)
1976	OMB Circular A-109
1978	Defense Science Board Acquisition Cycle Task Force
1979	Defense Resource Management Study
1981	Carlucci Initiatives; Defense Acquisition Improvement Program
1982	Nunn-McCurdy (thresholds)
1983	Grace Commission
1985	DoD 5000.43 (streamlining)
1986	Packard Commission
1987	DoDD 5134.1 (USD[A&T]); DoDD 5000.49 (DAB)
1989	Defense Management Review
1991	Revised DoDI 5000.2 (Major System Acquisition)
1994	Federal Acquisition Streamlining Act (FASA)
1995	Federal Acquisition Improvement Act (FASA II)
1995	Cost As an Independent Variable (CAIV) Policy
1998-9	Section 912c Studies

rapidly becomes a bureaucratic nightmare. Only when the mission of DoD becomes compromised through decreased readiness will money readily flow from “pot” to “pot.” However, transfer of funds to meet a current “emergency” may not be the most cost-effective way to do business.

For a number of years, there was (is) a consistent leakage of money (estimated to be about \$2 billion per year) from the modernization “pot” to the maintenance “pot.” While this flow of money did help shore-up weapons system readiness, it had the impact of mortgaging future mission capabilities.

Money that was meant to improve future capabilities was being used to maintain the aging equipment that was needed to retain readiness. The resulting lack of modernization funds meant that the aging equipment would not be replaced as rapidly as desired. This, in turn, meant that more money would be needed to maintain the aging equipment.

The “Death Spiral”

Under Secretary of Defense for Acquisition, Technology, and Logistics Dr. Jacques S. Gansler termed this the “death spiral” after he took office in 1999. This short descriptor caught the attention of

Defense and Congressional leadership and was a factor in accelerating efforts to reduce ownership costs.

A reasonable approach to reducing the overall cost for weapon systems is to look at what it costs to develop, buy, maintain, and dispose of systems, and then focus efforts on the cost drivers. For platforms (aircraft, ships, etc.), informal estimates have been used to indicate that the costs to use equipment can be on the order of 60 percent of the life cycle cost, with the rest of the total cost split up into the other areas.

While this percentage will vary with the specifics of the platform, clearly, the cost of using the systems has to be considered an important component in DoD’s total expenditures. In addition, in order to modernize the force, the hemorrhage of modernization funds has to be reduced or stopped.

CAIV and Readiness

Dr. Paul G. Kaminski, then Under Secretary of Defense for Acquisition and Technology, issued a memorandum in December 1995, “Reducing Life Cycle Costs for New and Fielded Systems,” addressing this concern. He stated that “reducing the cost to acquire and operate the Department’s equipment while main-

taining a high level of readiness for the user is my highest priority.” (That memorandum is commonly referred to as the memorandum that directed the use of Cost As an Independent Variable [CAIV] in Defense acquisition.) There were two parts to the memorandum: one addressed developing systems that are in the acquisition cycle, and the other part addressed fielded systems.

In the implementation portion of the memorandum, he directed that for fielded systems, the Deputy Under Secretary of Defense for Logistics would:

- Implement an awards program to incentivize individuals and organizations to reduce life cycle costs.
- Develop a mechanism to reduce life cycle costs by making investments that result in high payback with Comptroller and Service Acquisition Executives working together.
- Implement a CAIV-based program of modernization through Form, Fit, and Function spares upgrades.
- Provide within six months a list of candidate programs within each Service, along with a plan for speedy implementation.

This direction eventually led to the organization of other groups by the Deputy Under Secretary of Defense for Logistics. These groups continued to address the difficult problem of improving readiness, while at the same time reducing the cost to maintain fielded equipment. (Note that there are other methods to do this such as closing facilities, but these are outside the scope of this article.)

Chronology of Events

Formal establishment of the reduction of total ownership cost (TOC) occurred in roughly mid-1997, although it was the topic of 1996 discussions at the DSAC, which were reported to the DSAC Executive Committee in 1997. This briefing was on the progress of what was then called the reduction of TOC.

In 1998, a series of related activities started that all focused on R-TOC and gave rise to the feeling that an integrating body should be formed.² Some of

these efforts came from the CAIV legacy; others were driven by the formation of study groups that were established in response to legislation (Section 912(c) of the 1998 Defense Authorization Act).

Eventually, all of the activities were morphed into a single effort under the leadership of a senior DoD official. This action ensured that all initiatives were fully coordinated, and data gathering and reporting did not unduly burden the Services. Figure 2 lists the major events that led to the current effort.

Key Event — R-TOC Working Group

Key among these events was establishment of an R-TOC Working Group (WG), chaired by an Office of the Secretary of Defense (OSD) official, to coordinate all of the Department’s efforts. The June 1998 tasking by Gansler, “DoD Focal Point for Total Ownership Cost (TOC) Reduction,” was to: 1) integrate the TOC reduction goals; and 2) provide a DoD focal point. It is at this point that all of the various activities that contributed to reduction of TOC began to be coordinated and duplication minimized. Clearly, a number of these ongoing activities provided valuable information and insights that were later melded into the current R-TOC effort.

Some of the more important of these include the following:

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SECTION 912(c), NDAA, FY98

Section 912(c) of the National Defense Authorization Act for Fiscal Year 1998 was one impetus for the formation of other groups to look intensely at reducing the cost of maintaining fielded equipment. In Section 912(c), the Secretary of Defense was required to submit to Congress an implementation plan to streamline the acquisition organizations, workforce, and infrastructure.

The Secretary of Defense Report to Congress, in response to Section 912(c), was entitled, “Actions to Accelerate the Move-

ment to the New Workforce Vision.” An important section of that report dealt with the restructure of sustainment processes for DoD equipment:

- Re-engineer the Product Support Process to Use Best Commercial Practices
- Competitively Support Product Support
- Modernize Through Spares
- Establish Program Manager Oversight of Life Cycle Support
- Greatly Expand Prime Vendor and Virtual Prime Vendor

R-TOC PILOT PROGRAMS

In addition, Section 816 of the National Defense Authorization Act for Fiscal Year 1998 required the Secretary to designate 10 significant programs for which the program manager (PM) would be made responsible for ensuring that product support functions are properly carried out over each program’s entire life cycle.

In Cohen’s report to Congress, Gansler, as Under Secretary of Defense for Acquisition and Technology, was designated as the lead in these efforts. At the end of 1998, Gansler requested a list of 10 potential programs from each Service. He later stated in 1999 that although only 10 of the 30 programs that were nominated by the Military Departments would be sent to Congress, all 30 would be tracked internally to glean lessons learned.

These 30 programs became the set of programs for all “Pilot Program” efforts. This set was designated R-TOC Pilot Programs.

STUDY GROUPS

Two study groups, which became part of the overall R-TOC effort, as mentioned previously, were established to develop implementation plans in accordance with the Secretary’s response to Congress. One study group was chartered by David Oliver, Principal Deputy to Gansler, in August 1998. Oliver’s memorandum, “Establishment of a Study Group on Program Manager Oversight of Life Cycle Support,” chartered the group to look at Program Manager Oversight of Life Cycle Support (PMOLCS).

FIGURE 2. R-TOC Events

Date	Event
July 10, 1997	Formal initiation of Reduction of TOC.
1998	Initiation of Section 912(c) studies.
June 30, 1998	USD(A&T) directs that R-TOC be tracked under the oversight of the R-TOC Working Group (WG) headed by an OSD Point of Contact.
Nov. 6, 1998	USD(A&T) requests 10 programs from each Service to potentially serve as Pilots to demonstrate expanded PM control of the logistics phase. This was prompted by Section 816 of the 1998 Defense Authorization Act.
Late December 1998	Thirty potential Pilot programs were provided to USD(A&T) together with a recommendation that 10 be forwarded to Congress under the provisions of Section 816.
Feb. 5, 1999	Ten programs were forwarded to Congress.
May 10, 1999	USD(A&T) directs the focus of the Pilot programs.
Aug. 31, 1999	R-TOC Forum held for all 30 Pilots.
Feb. 3, 2000	First Quarterly R-TOC Forum.
April 25, 2000	Second Quarterly R-TOC Forum.
Aug. 1-2, 2000	Third Quarterly R-TOC Forum.

Dr. Spiros G. Pallas
Principal Deputy Director,
Strategic & Tactical Systems
Office of the Under Secretary of Defense
(Acquisition, Technology and Logistics)



Dr. Spiros G. Pallas is the Principal Deputy Director, Strategic and Tactical Systems, Office of the Under Secretary of Defense (Acquisition, Technology and Logistics) (OUSD[AT&L]), a position he has held since 1994. In this capacity, he is responsible to the USD(AT&L) for oversight of all major weapons and support programs except for Space and Command, Control, Communications and Intelligence (C3I). In addition to his regular duties, he has been actively involved in acquisition reform and is the DoD focal point for integrating policy on Reduction of Total Ownership Cost (R-TOC); focal point for the Cost As an Independent Variable (CAIV) process; and Chairman of the International Cooperative Opportunities Group (ICOG) programs and processes.

From 1991 to 1994, Pallas served as the Deputy Director for Air Warfare, OUSD(A&T)/Tactical Warfare Programs (TWP). Prior to that assignment, he served as the Special Assistant (Chief Scientist), also in TWP – a position he held from 1987 to 1991.

As manager for Close Air Support and Battlefield Interdiction, Office of the Secretary of Defense, from 1982 to 1987, Pallas provided oversight and review of related programs. From 1976 until 1982, he was the Chief, Engineering Division, U.S. Air Force Precision Guided Weapons Program Office, responsible for development and developmental test of all Air Force air-to-surface smart bombs.

During his tenure from 1973 to 1976 as the Chief, U.S. Air Force Armaments Lab–Air-Launched Weapons, Pallas provided systems analysis support for six Direction of Flight (DOF) Hardware-in-the-Loop Simulations for Flight Test Support and design synthesis and evaluation for various weapons programs.

Pallas taught undergraduate and graduate-level courses from 1965-1973 at the University of Texas; at Auburn University; at University of Florida Extension; and, as guest lecturer at University of California at Los Angeles (UCLA). Courses taught included Propulsion; Aerodynamics; Astronautics; and Structures, Guidance, and Control. During the same period, he conducted research in related topics as well as in areas of biomedical engineering where he holds two patents.

Pallas holds a Ph.D. from the University of Texas at Austin, in Fluid Mechanics/Aero. He also holds a B.S. and an M.S. from Auburn University in Aero/Propulsion/Structures. Pallas is a graduate of the Defense Systems Management College 's premier course offering, the Program Management Course (now the Advanced Program Management Course), and has completed numerous DSMC short courses in Defense Systems Acquisition.

The group's final report was released in October 1999. The report identified the need for a substantive change in the role of PMs in the area of managing the sustainment processes of systems. It also recommended that the R-TOC Pilot Programs be designated to spearhead these efforts. Additionally, the report recommended that the chairperson of the Reduction in Total Ownership Costs (R-TOC) Working Group (the implementation arm of the DSAC, as discussed earlier in this article) monitor/oversee/facilitate the progress of these R-TOC Pilot Programs. (These latter two recommendations were implemented through the DSAC.)

The second study group was tasked by Gansler in a September 1998 memorandum, "Establishment of a Study Group to Implement Re-engineered Product Support Practices Within the Department of Defense," to determine how best to implement re-engineered product support activities within the DoD. That group also reported back to Gansler in July 1999, "Product Support for the 2st Century," with recommendations to improve the current processes. Notable in their report is the fact that they felt that their recommendations should be first tested in the 30 Pilot Programs before policy is proposed and promulgated. This was part of the initial discussions on the role of the R-TOC WG.

Senior Management Oversight

Senior management oversight of the efforts to improve readiness at reduced costs continues to be managed at a senior level through DSAC. This body is chaired by Gansler.

It became clear from discussions by the DSAC, as further evidenced in the two reports referenced earlier, that much depended on the implementation results of the 30 Pilot Programs that evolved from the Section 912 (c) studies. Given the importance of these Pilot Programs to DoD, Gansler outlined his expectations in a May 1999 memorandum, "Future Readiness," for the 30 Pilot Programs (which included the 10 Section 816 Pilots), and discussed the need for TOC reduction plans based on trade-off

studies in three large potential savings areas:

- Reduced demand from weapon systems via reliability and maintainability improvements.
- Reduced supply chain response times, leading to reduced spares, system support footprint, and depot needs.
- Competitive sourcing of product support, leading to streamlining and overhead reduction.

The current R-TOC WG is being used to support the DoD focal point's efforts to harmonize the various efforts across DoD. One of the early issues dealt with by the WG was the span of control of PMs for R-TOC. The PMOLCS Study Group had not yet published its final report, but it seemed clear that naming a PM responsible for things totally outside of his or her control was not reasonable. The Secretary of Defense did intend R-TOC to be a DoD-wide effort, but for the most part, the PM's authority was limited to the acquisition aspects of TOC.

For this reason, the WG recommended to Gansler that he re-affirm the overall

goal of R-TOC for everyone in the acquisition chain, but give the PMs a primary focus on reducing Defense Systems TOC.

Gansler agreed with the WG in a November 1998 memorandum, "Definition of Total Ownership Cost (TOC), Life Cycle Cost (LCC), and the Responsibilities of Program Managers." For consistency with past initiatives, Defense Systems TOC is defined as Life Cycle Cost (LCC). LCC (per DoD 5000.4M) includes not only acquisition program direct costs, but also the indirect costs attributable to the acquisition program (i.e., costs that would not occur if the program did not exist).

For example, indirect costs would include the infrastructure that plans, manages, and executes a program over its full life and common support items and systems. Note, however, that the memorandum also points out that the reduction of TOC in its fuller definition is still the role of "each Service."

Another important initial issue addressed by the WG was the funding available for

R-TOC. Although the Services were making strides in providing the funding needed to implement R-TOC plans, in some cases the funds were not visible to senior management. Two actions were pursued along these lines.

- First, words were put into the Defense Planning Guidance for 2001-2005 to ensure that reasonable funds were made available for R-TOC.
- Second, Program Budget Decision 721 for 1999 was drafted and eventually funded. This made new money available to each Service for R-TOC in order to provide funds for critical R-TOC initiatives and to demonstrate the commitment of OSD senior management.

Management of the R-TOC aspects for the 30 programs that were designated as R-TOC Pilot Programs was another task undertaken by the R-TOC WG. Working through the DSAC, it was decided that each of the 30 program managers would report orally once a year, and quarterly in writing.

The Pilot Programs submitted their R-TOC Plans, including baseline information, to the DoD (R-TOC WG) in October 1999. The initial Forum (before R-TOC Plans were submitted), which involved all of the Pilots, was held Aug. 31 - Sept. 2, 1999. Quarterly Forums, involving sub-sets of the 30 Pilots, are scheduled into the foreseeable future. All discussions at the Forums are held on a nonattribution basis, and only a given program can authorize release of program data, since in most cases reporting is made on work in progress. Figure 3 lists the programs that are currently designated as R-TOC Pilot Programs.

To date, three R-TOC Quarterly Forums have been held, in addition to the August 1999 Forum for all of the Pilot Programs. Despite the fact that designation as an R-TOC Pilot Program carries with it an increased workload for the program, the response and participation has been overwhelmingly positive. Factors in this willingness to participate include the benefits of cross-fertilization, new money, and visibility gained by the programs.

FIGURE 3. List of Pilot Programs

U.S. Army	U.S. Navy	U.S. Air Force
<i>AH-64 Apache</i>	<i>SLAM-ER - Standoff Land Attack Missile Expanded Response</i>	<i>F-16</i>
<i>Abrams</i>	<i>ASE - Aviation Support Equipment</i>	<i>C-5</i>
<i>AFATDS - Advanced Field Artillery Tactical Data Systems</i>	<i>H-60</i>	<i>B-1</i>
<i>CH-47</i>	<i>LPD-17</i>	<i>C/KC-135</i>
<i>Crusader</i>	<i>AAAV - Advanced Amphibious Assault Vehicle</i>	<i>AWACS - Airborne Warning and Control System</i>
<i>HEMTT - Heavy Expanded Mobility Tactical Truck System</i>	<i>Aegis Cruisers</i>	<i>C-17</i>
<i>Comanche Guardrail</i>	<i>EA-6B</i>	<i>F-117</i>
<i>HIMARS - High Mobility Artillery Rocket System</i>	<i>MTVR - Medium Tactical Vehicle Replacement</i>	<i>SBIRS - Space-based Infrared System</i>
<i>TOW-ITAS - Tube-Launched, Optically Tracked, Wire-Guided Missile System—Improved Target Acquisition System</i>	<i>Common Ship</i>	<i>JSTARS - Joint Surveillance and Target Attack Radar System</i>
<i>*Section 816 Pilot Programs italicized.</i>	<i>CVN-68 Class Carrier</i>	<i>CMC - Cheyenne Mountain Complex</i>

Interest by senior management has been keen. Gansler, Oliver, and Service officials have attended all of the forums.

Themes put forward at these Forums by Gansler and Oliver include the importance of sharing data and experiences from the Pilot Programs, and using those data to quantify the savings that result from the individual initiatives. With valid data, it was argued, it will be easier to convince those who are not intimately involved with the R-TOC effort that additional reforms in legislation and regulation are warranted. This could accelerate the rate at which savings are realized and simultaneously improve the readiness of our forces.

Savings

At this time, savings/cost avoidances are still in the future since initiatives are just now beginning. The date at which that measure will be taken is in Fiscal Year 2005, and all the programs are working toward “stretch” goals of 20 percent+ reductions in Operations and Support (O&S) costs. The R-TOC WG will track the program-generated metrics to see if the Pilot Programs are proceeding on course.

Projected savings in Fiscal Year 2005 vary according to program, but range from a few percent to over 35 percent. Some savings are “in the pipeline” with funds programmed for needed investments. Other savings await the identification of investment funds. That is one of the issues being worked by the Services and the Working Group.

One point that seems to have emerged from the data, thus far, is that the largest savings result from global changes to a weapons system that simultaneously address military readiness and cost. In other words, the way business is performed was changed, as called for by the Perry mandate, in order to maximize the return on the time and funds invested to reduce costs.

R-TOC — A Fertile Soil

The R-TOC Working Group has seen clearly that the policy on R-TOC is being embraced and institutionalized by all of

DoD has different “pots” of money, controlled by different sectors in DoD. Because of different accounting rules and since every controlling interest jealously guards their “pot” from other DoD interests, scoring total savings across all of DoD is difficult at best.

the Service acquisition communities. The speed at which this transformation has taken place is gratifying, and points to the fact that the acquisition reform initiatives have created a fertile soil for concepts like these to flourish. Further, the use of CAIV as a tool for R-TOC has gained wide use by acquisition programs. This has been reported to the DSAC as a very positive sign.

On the other hand, both of these concepts (CAIV and R-TOC) need to be more fully employed across the entire DoD. Both policies are primarily acquisition policies. They enjoy strong support from that community, and funding and programmatic changes are being made to ensure that the policies can be implemented. However, it remains unclear if these policies enjoy the same support from communities outside of acquisition. This is an area that will need continued attention as implementation proceeds and tangible savings result.

Other changes may be needed, as well. The R-TOC Working Group continues to examine the advisability of trying to change both regulation and legislation

to further speed R-TOC implementation. Regulation, which is under the control of the DoD, is being actively studied to see what changes make sense. Legislative changes, on the other hand, require that a strong business case be assembled to argue that changes are needed. Preparation of a business case will start as soon as hard data are obtained.

One of the intended outputs from the Pilot Programs are data that can be used to spark ideas beneficial to all DoD programs. Data from these various Forums and written Quarterly reports are currently being analyzed to provide generic “lessons learned” that can be shared with others. To date, these lessons learned are not really lessons. Often, what is reported at the Forums and in writing are approaches that are being tested. The results will not be in for some time. Near-term (five years out) “stretch” goals of 20 percent savings in O&S costs appear to be attainable for many systems.

To the extent possible, summary data will be released. Currently, a Web site is under development to provide data on the overall effort and provide links to data maintained by the Military Departments. Full implementation of R-TOC initiatives within the Pilots and across other DoD programs will continue for some time into the future. Momentum for the R-TOC efforts will build as real, measurable results are obtained.

Editor’s Note: The authors welcome questions or comments on this article. Contact Pallas at pallassg@acq.osd.mil; contact Novak at novakmj@acq.osd.mil.

E N D N O T E S

1. Note that not all of the events can be captured neatly through documentation. In some cases, direction was given through the DSAC meetings, or through various working groups.
2. There are several acronyms for Reduction of Total Ownership Costs. R-TOC is used within the Office of the Secretary of Defense, while the Services have some literature that references TOC-R. These are the same.