

**Rolling On The Affordability River  
(While Managing The Acquisition Program In The Rapids)**

By

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March 2011***

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***ABSTRACT***

From inception through execution, every acquisition program in the Department of Defense is expected to incorporate aspects of affordability. The paper explains the role and importance of affordability; then, taking an empirical approach, it presents scenarios depicting actual illustrations based on the author's observation and experience within the context of two separate program offices. Affordability, cost estimating, and financial management processes are described and detailed within the scenarios. Problem root causes and areas of strength are briefly discussed, and some topical research is offered as supporting and explanatory material throughout. Finally, some affordability guidelines, public law, current Department of Defense Instructions, and senior leader perspectives are presented, reinforcing the importance of affordability in acquisition programs.

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Affordability. Stated in simplistic terms, it means that a given purchase meets the funding, performance and time constraints imposed or expected by the acquirer over its life cycle. Resources are balanced with the corresponding requirements and schedules.

When an acquisition program is affordable, it makes the job for cost estimators and financial analysts, well, much simpler. The initial life cycle cost estimate was correct. The actual expenditures on the cost performance reports and various earned-value data are in perfect harmony with what the program office expected they would be, and what the budget was programmed to accommodate based on the analysis of alternatives. There are minimal or internally offsetting cost overruns and schedule slips. Expenses fit easily within fiscal constraints. Managing technical complexity is a breeze for the senior scientist and systems engineers. Technology doesn't outrun its limits and adequately matures according to the expectations set in early system design reviews. Program reviews are festive gatherings to spread the good news of continued successes. The program director and contractor senior management are in a state of calm serenity. The PEO invokes minimal oversight. POM and FYDP budget requests flow through the Pentagon scrutiny cycle effortlessly. The program is on track, on time, floating steadily through the Milestones and primed for successful system development, test, production or delivery.

*Spoiler warning:* That nice stretch of flat, glassy-smooth water rarely stays calm for long.

Roiling whitewater arises when the purchase, or acquisition program, is not affordable. Or it becomes unaffordable due to planning considerations, technology issues and/or external forces. As one reporter noted, "It's the rare military plane, truck, ship, gun, sensor or service that comes in on time and under budget."<sup>1</sup>

Poor upfront planning can set the program up for a trip through the rapids. Technical challenges can arise that introduce complexity into the initial requirements portrayal. Seemingly arbitrary budget cuts can wreak havoc with the statement of work. Scope can creep in and become cancerous. Key performance parameters may undergo painful tradeoffs. Shifting system performance requirements often introduce cost, schedule and technical issues over and above the program of record and funding baseline. The integrated master schedule becomes a frothy sea of red, with so many slippage lines that

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<sup>1</sup> Ackerman 16 Nov 10, 1

it resembles a jumbled spider web, pushing various elements to the right. Design variables get tweaked. Budget turbulence reigns, and costers and financial analysts huddle with the technical teams, deconstructing and delving into the minutia of each requirement and each dollar allocated, questioning its appropriateness, relevance and impact to the program. Affordability drills are numerous, fast, furious, and stressful. Amidst this fray, one must maintain cognizance that the “spear” being developed, tested or produced for the warfighter may suffer compromises that can affect battlefield outcomes and endanger lives.

That is not a prime-time television reality show with coached participants. It is sometimes blunt reality.

This paper offers a practical discussion of affordability from the perspective of someone inside the program office. Drawing on past experiences, actual program office situations are used to illustrate and expose the pains and thrills of rowing through various affordability assessments. Of course, some data have been modified and generalized to protect the author and the program offices.

### **Building Affordability Into The Raft**

It is helpful to briefly review exactly how and when the concepts of affordability are introduced into the DoD acquisition process. The US National Military Strategy (NMS) articulates the Chairman of the Joint Chiefs of Staff’s recommendations to the President and Secretary of Defense on the employment of the military element of power in support of the President’s National Security Strategy. Supporting and spinning off from the NMS, the DoD’s Joint Capabilities Integration and Development System helps assess joint military capability needs. Additionally, the Capabilities-Based Assessment (CBA) process identifies the capabilities required to successfully execute missions, the shortfalls in existing weapon systems to deliver those capabilities and the associated operational risks, and the possible non-materiel approaches for mitigating or eliminating the shortfall.

Affordability is introduced when capability needs are identified. As the Defense Acquisition Guidebook states:

*“Program affordability is part of the Joint Capabilities Integration and Development System, which balances cost versus performance in establishing Key Performance Parameters. Moreover, all elements of life-cycle cost (or total ownership cost, if applicable) are documented as part of the Capability Development Document and the Capability Production Document (section 16 in both documents). To ensure the program is affordable, cost goals are established in terms of thresholds and objectives to provide flexibility for program evolution and to support further Cost-As-an-Independent-Variable and other system performance and program schedule-related trade-off studies.”<sup>2</sup>*

When appropriate, the CBA recommends pursuing a materiel solution. During the phase involving analysis of the materiel solution, an analysis of alternatives (AoA) study is conducted to assess alternatives that could provide the desired capabilities identified in the Initial Capabilities Document. The AoA lays out various materiel solutions that address those capability needs, comparing them on the basis of operational effectiveness, suitability and life-cycle cost. Again, affordability enters the picture and plays a key role, as the “the Materiel Solution Analysis can help determine the best path to the end-

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<sup>2</sup> Defense Acquisition Guidebook 2010, Chap 3.3.2.1

state solution, based on a balanced assessment of technology maturity and risk, and cost, performance, and schedule considerations.”<sup>3</sup>

Having presented the background and reasons for front-end insertion of affordability, depictions of program office scenarios can illustrate how affordability is actually incorporated. In the two situations discussed, the weapon system acquisition program has been approved, and a Government program office has been established to manage and oversee it. A budget and FYDP profile is set, the prime contractor is accomplishing scope effort against the Statement of Work, and the cost/performance reports are coming in.

### **Situation 1: Pushing The Envelope Sends Water Over the Gunwales**

One day, a Friday afternoon before a big weekend, the prime contractor informed the system program office (SPO) that a technical maturity issue has been discovered. During component integration and testing activities, a part wasn't giving results as predicted. Other corresponding technical performance measures being recorded were not up to specifications. Some internal pieces made with cutting-edge alloys failed. With heavy reliance upon this specially fabricated unit, there were critical downstream consequences. Having already hurriedly conferred with its key sub-contractors, the prime drew up a revised risk matrix, some technical mitigations and solutions and corresponding cost estimates, and analyzed schedule and performance impacts.

Blackberrys started buzzing repeatedly, phones on the desks of the SPO's division leaders lit up, and emails flew between offices. A barrage of questions ensued: What happened? Why did this happen? How do we fix it? What does it mean for the program? How much will it cost? Do we have the budget flexibility to absorb this?

As the facts of the situation unfolded, it wasn't pretty. Quick research showed this technical risk area was identified months ago and initially pegged by the responsible Integrated Product Team (IPT) as a 4x4 on the risk evaluation matrix, meaning it was assessed as having a moderately high likelihood or probability of occurrence coupled with equally troubling significant negative consequences to the program if it did occur. The IPT had pointed to the low technical maturity levels and wide cost variability as supporting criteria.

But the joint management team--government and contractor Program Directors (PD) and their senior staffs--agreed to undertake a number of offsetting risk mitigation strategies and plans, and knocked the risk down to a 2x3. That pulled it out of the "red" zone, and into the "yellow"—a manageable risk, not to worry about too terribly much.

Back in the early days, when the program was writing its Systems Engineering Plan for Milestone A and going through initial Systems Engineering Design Reviews, the program's architects and engineers were concerned about pushing the technology envelope with this particular unit. It had never been developed before. It required special metal alloys to be carefully fabricated to withstand extreme

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<sup>3</sup> Defense Acquisition Guidebook 2010, Chap 3.3.2.1

operating environments. Unique and highly corrosive chemical fluids had to flow through it and be mixed under high pressure. The component needed very high reliability. However, due to pressure from the PD and Pentagon staffers, they “let it ride” with minimal abatement or mitigation offsets, and assumed the prime contractor could eventually overcome the component’s complex technical design challenges. After the risk was down-graded during a Program Review, the IPT engineers vehemently disagreed with the PD’s assessment. But they didn’t raise or justify their concerns up the program office chain. They didn’t bird-dog the mitigation strategies to see that the contractor properly implemented and executed them. They didn’t follow through to check if the mitigations were, in fact, mitigating the risks, or if the risk was growing.

Like a barely submerged rock, the issue threatened to ground, damage, or upend the SPO.

The program control office, where the cost estimators and financial analysts reside, received the all-hands-on-deck call and was dragged into the fray after the PD fired off an email saying “get on this now, and we’ll discuss at 6pm.” Hint: it won’t be a short, 30-minute meeting. Calls were made to warn spouses and cancel babysitters—it was going to be a missed dinner date, a late night, and a working weekend.

Inside the program control office, spreadsheets outlining budgets were pulled up. With the help of pivot tables, analysts drilled down into specific line items in the affected IPT. They donned their PowerPoint warrior armor and began laying in the specific item’s Work Breakdown Structure components and associated funding profile, with placeholders for other analytical inputs of the brief. IGE’s, independent government estimates, were dug out of the archives and analyzed. Careful attention was paid to the confidence levels that were used, with an eye toward the standard deviations of those estimates (which indicates the variability of the estimate). Frantic phone calls and emails went out to the IPT engineers, begging for interpretations of the revised performance parameters the Prime had drafted against the various options. The costers needed this data to calculate rough-order-of-magnitude estimates for comparison purposes.

Earned value data was retrieved on the component and bounced against the Work-Breakdown Structure: any irregularities? was it overrunning? behind schedule? what explanations were offered in the last internal and joint IPT reviews? Assumptions had to be made, and ramifications contemplated, for any cross-IPT cost, schedule, and performance effects of the proposed solutions, as well as what upheaval was leveraged onto the FYDP profile. Pre-meetings were hastily called, and deliberations were heated over which capabilities were deemed unessential, and what unessential capabilities might be scrubbed, scaled back, and otherwise traded to recoup cost or schedule.

The PD meeting went late into the evening. Options were explored, way-aheads were ordered, follow-up meetings were scheduled. A sunny Saturday was spent in the office. Not a lot of smiling faces. Engineers and program control analysts were crammed into the conference room at the SPO. Dividing tasks, the groups broke into smaller forums. From the Pentagon, the program element manager and reps from the Program Executive’s Office were on the VTC monitor, offering their

input. All of the viable get-well options required some trade-offs in key performance parameters, and all had considerable cost and schedule impacts.

The group got sidetracked, trying to see how cheaply the mess could be fixed. One person pulled out an old affordability paper and read, “From a technology standpoint, affordability does not simply mean selecting the cheapest solution while productivity remains a secondary consideration. Performance is still critical, for if the weapon system or technology does not meet customer performance requirements it still has missed the mark. The challenge is establishing the balance between performance and cost—best value.”<sup>4</sup> That refocused the group immediately, as they realized the warfighter (the customer) was ultimately depending upon them to get this right.

The group delved into the Prime’s estimates of what the immediate fixes would cost, and what they believed the options will cost. The PD weighed in. He shared with the group a comment made by the Under Secretary of Defense, Acquisition, Technology and Logistics: “Will-cost is what you get from the independent cost estimators, and they tell you that this is what an aircraft is going to cost. It’s what it will cost if you keep doing things the way you’ve been doing them. I find those credible. We budget to them. They’re for budgeting and programming purposes. That’s good discipline. It’s lousy management. So we should be managing to what the things should cost, not to what an estimator says it will cost.”<sup>5</sup>

The team realized it must inject realistic, objective cost estimates into the entire analysis. They had located the right bail bucket to use.

Interdependencies were analyzed. The program control cost estimators chimed in about using cost-as-an-independent-variable (CAIV), quoting from another paper that said, “CAIV provides better support for critical decisions by identifying viable performance, schedule, cost (total ownership cost), and risk trade space.”<sup>6</sup> As the groups did deep dives into each option, the costers cranked variables into their laptops, performing real-time CAIV.

Over the next week, the options and associated trade-offs were refined and honed. SPO and prime contractor employees on the IPTs worked hand-in-glove analyzing and reviewing the data. Risks were properly scoped and presented. Capability impacts were outlined. An out-of-cycle Program Review was convened. The briefing clearly and objectively presented the cost, schedule and performance implications of each option. It wasn’t a good news story, but it was accurate--the decision maker had the right information, in the right context, with the right balance. Affordability was put at the forefront of the decision process, as it should be, and put into place as a program management tool. The rapids were behind them, with calmer waters ahead.

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<sup>4</sup> Poindexter, Stucke, and Shumaker 1999, 2

<sup>5</sup> Carter 15 Sep 2010 speech

<sup>6</sup> Kaye, Sobota, Graham, and Gotwald Fall 2000, 355

**Situation Two: Using Affordability to Patch A Budget Rip**

A different program office. This particular major acquisition program is unique in that it manages a weapon system in stages of future development; fielding; testing; systems engineering, integration and configuration management; equipment manufacturing and refurbishment; training, and operations and sustainment support. After weeks of rumors, Congressional rescissions have been released. The figures flowed downstream from agency headquarters to the program director's office. Not only were the cuts laid into the out-year FYDP, but the current budget year takes a sizeable hit.

The senior staff was bewildered. The program had just passed a recent major flight test event with flying colors, successfully demonstrating the weapon system's capability under rigorous criteria. Public Affairs had sent out self-congratulatory press releases, and media outlets had broadcast the event far and wide. The state's politicians had jumped on the story, using it as ammunition to justify the amounts requested in the President's Budget submittal and touting the great jobs supported by the program in their districts. It was supposed to be smooth sailing.

The program's Business and Financial Management (BFM) Director received an email from the PD asking for a total program look and analysis of the situation. The budget formulation analysts pored over the details of the rescission. Instead of an across-the-board cut, it appeared to be levied against specific program categories within the program element. That was bad and good: bad, because it cramped the flexibility to re-program funds from other areas, and good because funding for other elements was untouched and left intact.

Upon further analysis, the numbers revealed that the reduced funding profile scaled back the testing program and slipped delivery of production items. Development activities were being limited to only those required to complete integration and fielding of specific blocks. Some modeling and simulation efforts were curtailed. Element readiness tests were being eliminated after certain ground tests were complete. Integration of future sustainment builds were confined to system level labs. Pending test objective allocation, refurbishments of operational weapon systems were being instituted for flight tests, and those flight test schedules were delayed. The production delivery schedule was pushed to the right. The fleet avionics upgrade and obsolescence program was being re-evaluated and reduced.

After swallowing the full extent of the news, the systems engineers worried that significant risk had been introduced into key program areas. Furthermore, by slipping the integrated test master plan and stretching out system production, notional math told them that the resulting cost increases would drive significant shortfalls against the just-reduced FYDP budget profile.

But there won't be a future if the program office couldn't patch its raft and row through the current fiscal year. They had to somehow figure out how to fit 10 gallons of work into an 8 gallon bucket, while simultaneously repairing the torn budget.



The BFM analysts cranked up the affordability engine. To its credit, the program office had religiously maintained a prioritized requirements list (affectionately known as a 1-to-N list), organized by “swim lanes” of capability areas. In essence, a 1-N list documents the approved program of record. Under each priority, specific events and activities were listed, and the underlying database provided a means to drill down into each activity. The 1-N list served as a great starting point to begin affordability what-if excursions and develop possible courses of action for any contemplated restructuring of the overall program.

Meetings were convened with representation from various specialty areas: development, engineering, flight test, production, logistics and sustainment, and of course financial management. The first order of business was to fully comprehend the ramifications of the budget reductions to each area of the program.

Particularly troubling was the modeling and simulation curtailment. M&S activities typically offer crucial support to all phases of the weapon system, including development of modifications to the ground systems and weapon system development, flight test missions, ground tests, war-games, exercises, and performance assessment. M&S is usually tailored to the specific need of a component in its current phase of development, ranging from low-to-medium fidelity analyses supporting concept definition studies, to high-fidelity models used to support engineering development or testing, and is integrated into the overall program architecture. Digital simulations support Performance Assessment events, which provide critical system level performance data relative to all elements. M&S activities support incorporation of new system enhancements. The ripple effects of a reduced emphasis in M&S were painful for the engineers to forecast. Every phase of the program could eventually be impacted.

The flight and ground test program had been carefully structured to bolster confidence in the weapon system capabilities under development and ensure the capabilities transferred to the warfighter were operationally effective, suitable, and survivable. Sliding tests to the right coupled with scaling them back jeopardized the robustness of program’s integrated master test plan. Verification and validation could suffer. Simply put, cutting tests meant reduced confidence. That typically translated to increased risk and possible shortcomings against key performance parameters.

The loggies were concerned that severe O&S challenges could arise. The production and refurbishment slips impacted the program’s ability to replace older fielded systems, and disrupted the rotation plan for the fielded systems. Slower production also affected stockpile reliability, and might include manufacturing line restart and vendor requalification, costly propositions in terms of both dollars and learning curve efficiencies. They also expressed concerns about the external systems interfaces, the communications network underlying the weapon system, the weapon’s on-board communications system and data received from it, the site components, and the support systems and support equipment. If the proper M&S couldn’t be performed on these system components and enhancements, the downstream effects for weapon system operational performance and mission capability status were troubling. Furthermore, if obsolescence wasn’t fully incorporated, the costs of maintaining an aging weapon system would spiral.

It was evident that a program-wide affordability exercise was needed. Fortunately, the program office had the processes and procedures in place to support the teams on this effort. The data underlying the 1-N list was deep and detailed, and gave component integrators a superb foundation to understand the lowest levels of the program segments. The cost estimators had full and open access to the offices and engineers within the program, and the data flow nozzle was wide open to support the development and refinement of independent government estimates and CAIV analyses. Technical teams worked alongside budget formulation analysts to identify performance and capability trade-offs and understand their corresponding budgetary impacts. The prime contractor supported analytical excursions with its internal teams of specialized engineers and analysts, and actively participated in joint program office meetings and discussions.

How did this Congressional rescission-driven affordability voyage end?

Backed up by solidly crafted affordability analyses and considerations, the program took several strategic actions—repositioning key labs supporting development and especially modeling and simulation activities; development of M&S to increase fidelity and assess system performance in areas unable to test; supporting a hardware-in-the-loop M&S program; evolving an approach to ground test chamber utilization; rewriting the overall software sustainment strategy; revising the flight test strategy; scaling back the unifying weapon system integration plans; updating the integration and support plan for warfighter requirements; formulating a plan revising the manufacturing, production and delivery schedule with corresponding changes to the operations and support approach; and realigning MILCON phases to support the system's operational capability.

Contractual actions to carry out this revised program strategy included: re-scoping a construction project and carrying forward an enhanced capability cost for future funding decisions; re-scoping development and fielding activities; de-scoping an engineering readiness review and requirements development; de-scoping participation in certain flight tests and support activities; de-scoping a planned flight test-ready weapon system; re-scoping manufacturing deliveries; and stopping certain proposal definitizations stemming from engineering change proposals.

Financial actions involved: winning a reclama restoring funds for software builds supporting M&S activities; re-allocating funds for a key infrastructure laboratory supporting flight tests, and disposition of another lab; re-programming dollars for test articles, test planning, execution and analysis; budget re-planning to accommodate the new manufacturing and delivery schedules; inserting key affordability break points within the 1-N lists and updating independent cost estimate information in the corresponding database to support future what-if excursions; and re-working the program's Exhibit R-2, RDT&E Budget Item Justification (affectionately known as the R-docs) submission, completely explaining all programmatic changes and funding realignments for submittal to Congress.

Shining even more light onto weapon system affordability, the program incorporated a key technical performance measure that tracked the cost per kill.

### **A Quick Hotwash (Grab The Soap)**

Back in 1993, a paper done for the Industrial College of the Air Force outlined seven key weapon system cost drivers in priority order. They are displayed below.

Weapon System Cost Drivers<sup>7</sup>

Cost Driver	Cost Impact	
	Priority	Acquisition Category
Ineffective Program Leadership	1	Program Execution
Compartmented Program Development	2	Program Execution
Inadequate Planning Discipline	3	Program Execution
Faulty Requirements Generation	4	Program Initiation
Premature Technology Transition	5	Program Initiation
Excess Capacity	6	Industrial Base
Low Productivity Growth	7	Industrial Base

A root cause analysis of Situation One appears to point to Inadequate Planning Discipline and Premature Technology Transition as likely culprits. The military capability desired was entered into the requirements generation process unchallenged. The component’s cutting-edge design and expected performance exceeded the limits of technology to “catch up.” A philosophy of spiral development wasn’t properly factored in, and technological maturity wasn’t challenged. Program office engineers didn’t adequately accommodate or mitigate the risk of technology not maturing according to plan. Risk wasn’t adequately tracked for growth or retirement. A concurrent approach was not fully utilized. In fact, an early study of challenges facing defense acquisition programs cautioned, “The results are entirely predictable when technologies with high development risk are adopted as the program baseline--an expensive technology development effort must be undertaken. In turn, this effort holds the rest of the program ‘hostage’ until a technical solution is found. The root cause for premature technology transition can be traced to the role of technologists, users and developers during program initiation.”<sup>8</sup>

Introducing CAIV was the right move to make. The program office faced reduced performance levels in correcting the initial overly optimistic projections. As one author noted, “If your system is in the demonstration/validation phase, then CAIV provides an early opportunity, for industry and the government, to focus on a goal. Performance and design trades are made easier, and at less cost than, once the contractor has designed and tested the item.”<sup>9</sup>

<sup>7</sup> Gamache 1993, 2

<sup>8</sup> Gamache 1993, 21

<sup>9</sup> Kausal Nov-Dec 1996, 27

After the affordability drill, the program office revamped its overarching acquisition strategy and approach, and embraced the tenets of incorporating affordability across all offices and IPTs, helping to ensure a more focused and disciplined reaction the next time such a challenge was encountered.

In Situation Two, Congressional action drove the affordability analysis. The program office succeeded in the exercise because it had worked diligently to install a built-in ability to react to budget and programmatic oscillations. Gamache summarized that ability as follows: “The capacity to rapidly explore alternate planning options provides the breadth of program visibility needed to deal effectively with program instability.”<sup>10</sup> Kausal’s research seems to confirm the utility and value of the program’s detailed 1-N list. He stated that, “A systematic process that ties the SPO and the user together, must be in place to evaluate requirement changes and provide expeditious response. The user also needs information — what is the real cost of his or her requirement?”<sup>11</sup> Because this program office’s requirements databases were organized, populated and shared, they were able to respond to what-if funding and technical sensitivity analyses. Information flowed freely, and communication lines were open. Decision makers received the hard-hitting analyses they needed to make wide-ranging program determinations on capabilities, strategy, technology, transition, and cost.

### **Views From The Wheelhouse**

Acquisition plans can get swamped quickly when affordability is not properly added to the program’s navigational charts. As Dr. Melese cautions, “While AoAs (analyses of alternatives) correctly focus on lifecycle costs and operational effectiveness of alternatives, ‘affordability’ is an after-thought, at best only implicitly addressed in final stages of the analysis.”<sup>12</sup> Thus, affordability must play a primary role in the evaluation and selection of viable acquisition program options.

The governing regulations and guidance documents push home this point. The DoD Directive 5000-series directs an integrated management framework be defined for maintaining effective interfaces among three DoD decision making systems--the Requirements Generation System, the Acquisition Management System and the Planning, Programming, and Budgeting System (PPBS). These guidance directives also specify an event-driven acquisition process in which mission needs, alternative concepts and affordability goals are evolved into system specific requirements, a stable design and unit costs. A quote from DoD Directive 5000.01 seems quite illustrative: “All participants in the acquisition system shall recognize the reality of fiscal constraints. They shall view cost as an independent variable, and the DoD Components shall plan programs based on realistic projections of the dollars and manpower likely to be available in future years. To the greatest extent possible, the Milestone Decision Authority (MDA) shall identify the total costs of ownership, and at a minimum, the major drivers of total ownership costs. The user shall address affordability in establishing capability needs.”<sup>13</sup> Moreover, DoD Instruction 5000.02 states, “An affordability determination results from the

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<sup>10</sup> Gamache 1993, 17

<sup>11</sup> Kausal Nov-Dec 1996, 27

<sup>12</sup> Melese 2009, 1

<sup>13</sup> DoD Directive 5000.01, E1.1.4

process of addressing cost during the requirements process and is included in each Capability Development Document (CDD) using life-cycle cost or, if available, total ownership cost.”<sup>14</sup> As the program progresses past Milestone A, requirements for affordability assessments are levied as entrance criteria to both Milestones B and C.

A relatively recent public law addresses acquisition program affordability. The Weapon Systems Acquisition Reform Act of 2009 (Public Law 111-23) dictates consideration of the cost, schedule, and performance of the program, relative to current metrics, performance requirements, and baseline parameters. It requires determination of the extent to which the level of program cost, schedule, and performance relative to established metrics is likely to result in the timely delivery of a level of capability to the warfighter that is consistent with the level of resources to be expended, and to provide superior value to alternative approaches that may be available to meet the same requirement. It specifies that DoD consider the underlying cause or causes for shortcomings in cost, schedule, and performance, including the role, if any, of unrealistic performance expectations; unrealistic baseline estimates for cost and schedule; immature technologies or excessive manufacturing or integration risk; unanticipated design, engineering, manufacturing, or integration issues arising during program performance; changes in procurement quantities; inadequate program funding or funding instability; or poor performance by government or contractor personnel responsible for program management. Finally, it requires that appropriate trade-offs among cost, schedule, and performance objectives be made to ensure that the program is affordable when considering the per-unit cost and the total acquisition cost in the context of the total resources available during the period covered by the future-years defense program submitted.<sup>15</sup>

However, actual implementation of affordability in weapon system acquisition may encounter some choppy water. A myriad of mandates for acquisition reform have been issued over the past two decades. In a review of these Acts and directives, one report concluded that, “One key assumption of these reforms was that cost efficiency could be improved by using contractors more effectively—sometimes in more powerful roles than ever before.”<sup>16</sup> Critics suggest that recent DoD attempts at acquisition reform, particularly in the area of curtailing contracted-out efforts as a means to increase affordability, are leading to frustration because of opposing efforts within the Department. According to an article in the *Federal Times*, “Nowhere is the contradiction more profound than between the drive for affordability and the campaign to reduce reliance on contractors and insource work. Affordability means managing to cost and schedule, two things that government has never been good at but which are hallmarks of the American free enterprise system...The question is: If affordability is the overriding objective for acquisition reform, why is the Pentagon campaigning to insource work? Moreover, if the private sector provides the example of lowering costs and improving performance, why is OSD accepting

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<sup>14</sup> DoD Instruction 5000.02, 6.d.(4)

<sup>15</sup> Brown 4 Dec 2009 briefing

<sup>16</sup> Loudin Jan2010, 29

claims by some DoD organizations that the government can do this work more cheaply?...Insourced work is not cheaper; it merely has to be done with less money.”<sup>17</sup>

As illustrated in Scenario One, components inside the weapon system can push the technological envelope and force affordability reviews when cost and technological control cannot be maintained. Since many weapon systems rely on the prime contractor (with government oversight) to closely analyze make-or-buy decisions on components—decisions that directly impact affordability—insight into subcontractors is becoming blurred. The Government Accounting Office expressed concern about DoD’s limited visibility into major subcontractors. In a case study review of six major Acquisition Category 1D programs with total program costs above \$5 billion, the GAO “...found a number of issues with contractor estimating and purchasing systems that may present challenges in the government’s ability to ensure subcontract price reasonableness...(and) government program and contracting officials in our review, for the most part, did not see the benefits of requesting the contractor’s make-or-buy plan to provide perspective on the degree of competition at the subsystem level or on the prime’s rationale for its make-or-buy decisions..”<sup>18</sup>

A recent directive from the Under Secretary of Defense for Acquisition and Technology (USD(AT&L)) to the Service Secretaries and Defense Agency Directors puts affordability at the center of decision-making for many defense acquisition programs. For ACAT-1D programs at Milestone A, it requires programs to, “...establish an affordability target to be treated by the Program Manager like a Key Performance Parameter. This affordability target (initially, average unit acquisition cost and average annual operating and support cost per unit) will be the basis for pre-MS B decision making and systems engineering tradeoff analysis.” Furthermore, for Milestone B it asks for, “...cost tradeoff curves or trade space around major affordability drivers (including KPPs when they are major cost drivers) to show how the program has established a cost-effective design point for these affordability drivers.” The mandate also extends the reach of affordability beyond ACAT-1D programs, requesting a schedule to “establish affordability as a requirement for ACAT II and below programs.”<sup>19</sup>

There are a couple of other ‘game changers’ in this directive. For one, senior Government managers’ pay is now tied to affordability. A formal link is established between the performance appraisals of the program executive officer and program manager to “should cost” targets for ACAT I, II, and III programs, and ties contractor performance to those targets as well. Another section of the memo calls for greater emphasis and use of market research to grasp industry capabilities and understand their approach to pricing. It also decrees a 2% reduction be achieved in FY11 of single-bid competitive contracts, with further reductions in the years following, and sets firm-fixed-price contracts as the preferred contractual arrangement.<sup>20</sup>

One important data source is available to give the program office a navigational beacon to stay aware of lurking cost, schedule and performance “hidden rock” hazards. On a typical program,

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<sup>17</sup> Gouré 1 Nov 2010

<sup>18</sup> Chaplain 28 Oct 2010, 5

<sup>19</sup> Carter 3 Nov 2010, 1-2

<sup>20</sup> Carter 3 Nov 2010, 3-6

monthly earned-value reports are submitted by the prime contractor in accordance with specific contract data requirements listings. Subsequently, engineers and cost estimators alike can glean valuable information from the earned value management system (EVMS). The previous Deputy Under Secretary of Defense for Acquisition and Technology, James Finley, testified before a Congressional subcommittee that, "The EVMS Trip Wires have provided excellent insight for trends and projections of planning execution in a variety of cost, schedule, and performance criteria on a monthly basis utilizing EVMS as a management tool for decision making."<sup>21</sup> A recent article commented that while problems do exist in incentivizing contractors to under-run costs and deliver ahead of schedule, it asserted that, "EVM allows the government to identify risk and maximize efficiency to reduce that risk so a technically superior system can be produced for as little cost and in as little time as possible."<sup>22</sup>

### **Caution: Affordability Lifejackets Required**

The emphasis on affordability is currently high on the priority list of our most senior Defense Department leaders, embedded within the strong push for overall acquisition reform. Secretary Gates and Under-Secretary Carter have ordered that affordability be a top consideration across the Department of Defense. In a recent memo, Under Secretary Carter urges use of appropriate analytical tools to "...identify the best possible use of available DoD and industry resources at the system, subsystem, and component levels by analyzing all alternatives available to achieve the desired performance outcomes. Additionally, resources required to implement the preferred alternative should be assessed with associated risks. Sensitivity analyses should also be conducted."<sup>23</sup> The Program Managers Body Of Knowledge reminds cost estimators, financial analysts, and other SPO employees alike of the importance of affordability, stating "With the increasing DoD emphasis on system affordability through Cost as an Independent Variable (CAIV), cost (both manufacturing and support) must be considered as a design and program planning driver throughout the acquisition process."<sup>24</sup>

While cost estimators and financial analysts continue to strive for smooth sailing inside the affordability buoys of their respective acquisition programs, perhaps some key nuggets from the lessons, laws and directives discussed above can be extracted and worn as lifejackets during the trip, push weapon systems towards success, and make performance of job responsibilities easier, more comfortable, and involve less seasickness along the way.

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<sup>21</sup> Finley 25 Sep 2008, 8

<sup>22</sup> Zosh Sep-Oct 2009, 22

<sup>23</sup> Carter 6 Oct 2010 memo, 8-9

<sup>24</sup> PMBOK Guide June 2003, 213

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