COST GROWTH: PERCEPTION AND REALITY

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From the Government Accountability Office to think tanks and politicians, everyone agrees that rising weapons costs are evidence of acquisition system failure. However, in the complaints about cost growth, many basic questions go unanswered: Is cost growth always bad? What is cost growth? How serious is it? Why does it matter? What tools are really effective in combating it? A close examination of these questions reveals many misconceptions. These misconceptions lead acquisition executives to implement an endless cycle of reforms that begin with high hopes, yet prove disappointing in execution. This article analyzes the nature of cost growth, assesses its practical effects, surveys the recent literature, and offers insights about which actions are most effective.

Keywords: *Cost Growth, Cost Overrun, Weapon Systems Acquisition, Acquisition Reform, Selected Acquisition Reports (SARs), Weapon Systems Acquisition Reform Act of 2009*

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ACQUISITION
REALITY

"The cumulative cost overruns are...staggering... and the problems are pervasive."

—Gene L. Dodaro, Acting Head of the Government Accountability Office Letter to Congress, March 30, 2009

Our weapon systems acquisition process is a perpetual scandal. Investigation after investigation finds deep-seated faults and unsatisfactory outcomes. Cost growth figures prominently in these critiques. From the Government Accountability Office (GAO) to think tanks and politicians, everyone agrees that rising weapon systems costs are evidence of system failure. Typically seen as a consequence of shortsighted system advocates, technology-obsessed military services, greedy contractors, and inattentive government officials, cost growth is viewed as a simple system failure that needs "fixing."

In the moral indignation that arises from this unsatisfactory state of affairs, many basic questions go unanswered: Is cost growth always bad? What is cost growth? How serious a problem is it? Why does it matter? What tools are really effective in combating it? A close examination of these questions reveals that much of what people believe about cost growth is wrong, and these misconceptions lead them to an endless cycle of reforms that begin with high hopes, yet prove disappointing in execution. Although recent legislation (Weapon Systems Acquisition Reform Act of 2009) may be helpful, disappointment could continue unless decision makers, program proponents, and acquisition professionals are realistic about what can and cannot be done. This article analyzes the nature of cost growth, assesses its practical effects, surveys the recent literature, and offers insights to policy makers on which actions are most effective.

Is Cost Growth Always Bad?

Discussions about cost growth presume that it is always bad and that policy makers should take drastic actions to prevent it. A cautionary tale from the early days of the Republic shows that the situation is more complicated than the usual morality play about shortsightedness and incompetence.

In 1794, the young United States authorized the construction of six frigates (*United States, President, Congress, Constitution, Constellation,* and *Chesapeake*). Intended to be the major units of the new Navy, the ships represented the aspirations of an ambitious but inexperienced institution. In execution, all the pathologies of today's weapon systems acquisition were evident. Toll (2006) describes the history and construction of these ships.

- An innovative but unconventional design was criticized as "extravagant."
- A multi-mission requirement for irregular warfare (anti-piracy) and high-intensity warfare (against major powers such as Great Britain) put conflicting demands on the design.
- Use of exotic materials delayed construction and raised costs. (Key hull components required live oak, which had to be imported from inaccessible coastal areas in the South.)
- A divided political establishment argued over the need and cost.
- Contracts were spread around all the northeast states to ensure political support.
- Cost growth caused schedule slippage and program instability.
- Congress, alarmed at the costs and delays, conducted inquiries and railed against waste.

But the story did not end there. In service, the ships were spectacular successes. Over the course of their careers, they fought 11 combat actions, winning 8 and losing 3. The exploits of the *Constitution* particularly encouraged the young nation. These successes were achieved while badly outnumbered and fighting against the two best navies in the world—the British and French. How was this possible? The advanced design that caused so many problems during construction also gave the ships a decided advantage over other ships in their class. They could defeat any ship with comparable speed and outrun any ship that was more powerful. The unexpectedly high cost bought capabilities that proved important in war.

Substitute for frigates the M-1 tank, F-15 fighter, or Ohio-class submarine and the story moves forward two centuries. All of these programs had unexpectedly high costs, but proved world class in operation. The existence of cost growth therefore does not necessarily mean that the acquisition was a mistake.

What is Cost Growth?

Most of us call to mind the same informal definition of cost growth—when something costs more than expected. (For clarity, cost accounting professionals sometimes make a distinction between *cost growth* and *cost overrun*. Cost growth is more general and is the term used here. Cost overrun is used for higher than expected costs on a particular contract.) The vigorous debates about cost growth all assume that there is an agreed-upon definition for this concept called cost growth. In fact, several incompatible definitions exist. A detailed analysis is therefore in order.

All analyses of cost growth use the Selected Acquisition Reports (SARs) as their database.[1] The SARs are statutorily required and comprise

the department's official statement about the status of major acquisition programs (SARs, 2009). Despite some imperfections in their construction, SARs have been judged suitable for cost analyses when used appropriately (Hough, 1992). As a result, all analyses use the SAR's definition of a program's baseline—the configuration, characteristics, quantities, and cost estimate at the time the program is officially established (Milestone B). Any increases are measured against this baseline. (Although programs are rebaselined at Milestone C [initial production], so previous cost growth is, in effect, wiped away, analyses of cost growth generally ignore this rebaselining and use the original estimate.)

SARs divide cost growth into seven components: Economic (inflation), Quantity, Schedule, Engineering (performance characteristics), Estimating, Other (e.g., labor unrest, hurricane), and Support (unique facilities or maintenance equipment). This division of cost growth into seven components, however, is where definitions diverge.

Economic (inflation) is excluded from most analyses because it is external to the acquisition system and distorts comparisons. Inflation is the general increase of prices in the economy. Because this is a national economic phenomenon, the acquisition system or program managers have no control over it.

GAO uses all the other categories in its analysis, including quantity. Any increase in any category is cost growth because they must all be paid for. However, most other analyses exclude quantity. If a program's quantity increases, is this cost growth? If quantity declines, is this successful cost containment? The question has important implications. For example, when quantity is included, the F-22 appears to be a successfully managed program because it came in under its original cost estimate. The cost per aircraft doubled, but because the number of aircraft procured declined by 60 percent, the overall program was less expensive. Conversely, the Stryker combat vehicle appears to be poorly managed even though per-unit costs have remained relatively stable. The vehicle was a surprising success in Iraq, so the Army procured more than originally planned. Further, every vehicle lost in combat was replaced. With quantity included, the Stryker program shows large cost growth. John Young, then-Under Secretary of Defense for Acquisition, Technology and Logistics, made the argument for exclusion: Because acquisition quantities are set by factors external to the acquisition system, "purchasing greater quantities, and the associated cost of these items, is not acquisition program cost growth and does not reflect poor acquisition management" (Peters, 2009, para. 11). He made similar but broader arguments in a memo to the Secretary of Defense (Bennett, 2009).

The defense consulting companies, Institute for Defense Analyses (IDA) and RAND, have done extensive analyses of cost growth over the years. Both exclude escalation and quantity changes in their calculations. The Nunn-McCurdy provision, which sets benchmarks on program cost

performance,[2] also, in effect, excludes quantity and escalation by using unit cost as its metric.

IDA further tried to divide cost growth into *decisions* and *mistakes*. Decisions, which accounted for about a third of cost growth, captured cost increases that were caused by explicitly made decisions for whatever reason, the notion being that these were consciously accepted and were not mistakes as people understand them (McNichol, 2004, pp. 18–22). About half of decisions actually acquired some additional capability, so the final system was not the same as the one initially estimated.

None of these definitions includes what is called "intergenerational" cost growth, that is, the tendency for new systems to cost more than the systems they replaced. Thus, F-22 fighters cost more than F-15s, LPD-17 amphibious ships cost more than LPD-4s, and M-1 tanks cost more than M-60 tanks. Even if costs could be forecasted accurately and cost growth disappeared, the current generation of systems would still be expensive and require large budgets to acquire and support—a significant management problem in itself (Muczyk, 2007; Christie, 2008, p. 22).

How Serious a Problem is Cost Growth?

Ironically, although GAO's analysis grabbed headlines with its finding of cost growth at 26 percent, the amount is a lot larger when measured over a program's full life cycle.

GAO measured programs at a single point in time. GAO's 2009 analysis, for example, included 95 Department of Defense (DoD) acquisition programs defined as major and for which a SAR was produced. Cost growth was the amount that the total cost of these programs had increased from their baseline (excluding inflation). However, major acquisition programs run for many years. As a result, a snapshot in time captures some programs in their maturity—when most cost growth has occurred—while other programs are in their infancy before much cost growth can take place. In effect, this methodology measures cost growth at the program midpoint.

IDA and RAND did studies that analyzed programs over a lifetime in order to capture the full extent of cost growth. The results—even adjusting for quantity and escalation—were high. RAND found growth of 46 percent, with the amounts varying significantly by type of equipment, from 130 percent for launch vehicles to 23 percent for electronics (Arena, Leonard, Murray, & Younossi, 2009). IDA, using a different methodology, found 45 percent for development and 28 percent for procurement (McNichol, 2004). (Procurement cost growth in the IDA study may have been understated because of the study's cutoff date). Significantly, IDA found that cost growth was concentrated in about 20 percent of the programs, which had very high cost growth, thus skewing the average (McNichol, 2004;

McNichol, Tyson, Hiller, Cloud, & Minix, 2005, p. 6). In other words, high cost growth was not a phenomenon across the board but concentrated in a relatively few programs. Other lifetime studies by Ballistic Missile Defense Organization and Naval Air Systems Command report similarly high lifetime cost growth—40 percent and 50 percent respectively (Sipple, White, & Greiner, 2004, pp. 81–85).

Is Cost Growth Getting Worse?

GAO's analysis purported to show that cost growth became much worse from 2000 to 2007: 6 percent in 2000 versus 26 percent in 2007 (GAO, 2008).[3] This analysis was published during the 2008 presidential campaign and appeared to imply that the Bush Administration had been especially lax in its oversight of weapons acquisition. However, GAO's finding of lower cost growth in 2000 was entirely the result of reduced quantities from the end of the Cold War. When adjusted for quantity, cost growth was constant. Cost estimating actually improved, though engineering changes (some of which produced new capabilities) worsened.[4]

Comparisons such as this are also on shaky ground because they show when the cost growth became apparent, not when it was caused. For example, in 1996 the Navy's H-1 Upgrade program was formally established (Milestone II), with an estimated research, development, test and evaluation cost of $538 million and procurement cost of $2.255 million for 280 aircraft. The program soon developed troubles, requiring management and personnel changes. In 2002, it was finally restructured, having breached the Nunn-McCurdy limits. By 2005 costs had doubled, attributed mainly to faulty initial cost estimates. For this reason RAND and IDA, in their analyses, attributed historical cost growth to the date when a program was formally established (generally Milestone II or B), not to when the estimates were changed.

Both the IDA and RAND have done historical analyses of cost growth over long periods of time and adjusted their data for changes in quantity. Their general conclusion is that cost growth has remained high over the last two decades despite often intensive efforts at reform.

IDA found that cost growth declined in the period 1974–1983 when many now-standard cost control measures were introduced, e.g., SARs and independent cost reviews. Since then, the level has been remarkably constant, except for a spike during the Reagan buildup in the 1980s. Although IDA's analysis ended in 1997, its high and continuing level of cost growth (about 25 percent overall) showed no large decline that GAO was claiming just 3 years later (McNichol, 2004; McNichol et al., 2005, p. 2).

RAND similarly found higher cost growth in the 1970s and lower growth in the 1980s and 1990s. Growth in the 1990s appeared to be lower than in the 1980s, but RAND judged this to be a result of the fact that many

programs in the 1990s were not yet finished experiencing cost growth when the study ended. When RAND adjusted for ongoing programs, the 1990s had the same level as the 1980s (Younossi, Arena, Leonard, Roll, Jain, & Sollinger, 2007, pp. 19–23, 31–39).

Does Cost Growth Matter?

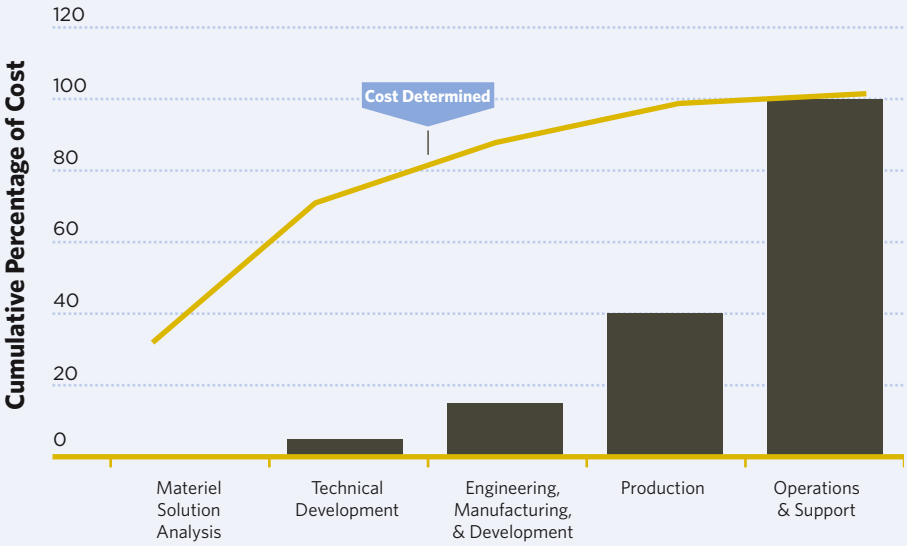
Cost growth does matter, but as analysis indicates, not for the reasons usually ascribed. The usual construct states that, "every dollar spent on cost growth takes money from something the troops really need." Thus, if a system was projected to cost $5 billion and ends up costing $7 billion, $2 billion was "wasted." The implicit assumption is that the system in question could have been acquired for the original cost estimate if only the process had worked (McNichol, 2004, pp. S-2, 9). This is generally not true. *You can't produce a Ferrari for the price of a Chevrolet no matter what the salesman said.* That is, a Ferrari costs a lot because of its features—a V-12/8400 rpm engine, aerodynamic body, high-performance suspension, and leather interior. The fact that the salesman quoted a low price does not make the features cost any less.

YOU CAN'T PRODUCE A FERRARI FOR THE PRICE OF A CHEVROLET NO MATTER WHAT THE SALESMAN SAID.

The F-22 provides a defense example. From the beginning, the aircraft was designed to include many cutting-edge features—supercruise (the ability to fly at supersonic speed for an extended time, not just sprint for a short period); stealth (never previously incorporated into a fighter); integrated avionics; and high-performance sensors. DoD originally estimated that producing these capabilities would cost $24 billion in research and development, and $96 million per aircraft for procurement (FY 2009 dollars). In any event, the research and development costs increased by 50 percent, and the cost to procure each aircraft doubled. "Cost discovery" might be a better term for the process of updating estimates because in retrospect it was clearly impossible to produce the stated capabilities for the originally estimated price.

This is not to say that all acquisition actions to contain cost are futile. Many have real value. Prototyping, for example, engenders design competition and demonstrates technologies; careful selection of contract type gives the producer incentives for better performance; and delaying production until development is complete avoids expensive retrofitting. However, there are limits to what these actions can accomplish. The Figure

FIGURE. COSTS DETERMINED V. FUNDS EXPENDED



(Gansler, 1989, p. 157)

makes the key point: Most of the cost of a system is locked in when the key capabilities are determined but before much money is spent. Starting ambitious programs is easy because early funding demands are low, uncertainty is great, and optimism reigns. Only later, once programs are well established and the magnitude of the challenge is understood, do the true costs become apparent.

Two Reasons Why Cost Growth Does Matter

First, with more accurate estimates decision makers might make different decisions; and second, cost growth acts like a tax, squeezing all acquisition programs and causing inefficiencies from reduced quantities and stretched schedules.

MAKING DIFFERENT DECISIONS

If the true costs of a weapon systems program were known from the beginning, then decision makers might make different choices. Before launching a new acquisition program, the Services conduct an analysis of alternatives[5] that looks at a variety of options. A low cost estimate for one option makes it more attractive and thus distorts the decision-making process. Frequently, these options involve buying a new system or upgrading an existing system. Because there is generally more uncertainty with a new system, the risk of underestimating costs is much greater,

particularly when the new capabilities are militarily attractive and sponsors become strong advocates.

Are there examples where decision makers might have made different choices? Although past acquisition decisions cannot be replayed with different cost estimates, subsequent history can give useful insights. In the recent past, several programs have been cancelled, at least in part,

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because of unexpectedly high costs: the Army's Comanche helicopter, the Navy's DDG-1000 destroyer, and the Air Force's Transformational Satellite Communications System (TSAT). Although we cannot be sure that decision makers would have made different decisions if they had known the true costs, the evidence indicates that they would have.

- Comanche was the Army's planned new-generation armed reconnaissance helicopter. Begun in 1982, unit costs had doubled, and the schedule slipped by a decade when the Army cancelled it in 2004. Instead, the Army opted to fund a wide variety of aircraft programs, noting that for the 120 Comanches it had planned to buy over 5 years, it would instead buy 800 other helicopters (Brownlee, 2004). For the $6.9 billion it had already invested in Comanche—without receiving any operational aircraft—the Army could have upgraded 350 of its AH-64 attack helicopters from the older "A" model to the modern and far more capable "D" model.
- In 2009, the Navy cancelled the DDG-1000 program, its next-generation surface combatant, mainly because of high costs, though also because of mission limitations. Instead, the Navy will buy additional DDG-51s. If it had made that decision initially, the Navy could have bought 13 of the latest version of the DDG-51 class for its $23 billion investment in three DDG-1000s.
- After spending $3.5 billion on TSAT only to see costs rise and the schedule slip, the Air Force cancelled the program in 2009. Instead it will buy more of the existing satellite designs. For its investment in TSAT, the Air Force could have bought seven of the modern and already developed Advanced Extremely High Frequency and Wideband Gapfiller satellites and avoided a threatened gap in coverage.

SQUEEZING PROGRAMS

Cost growth also acts as a "tax" on acquisition programs. That is, to offset their own and other's cost growth, acquisition programs have to continually find internal savings, generally by cutting quantities but also by slowing development work, reducing testing, and cutting support equipment. This produces a downward spiral. Reduced quantities spread fixed costs over fewer units and increase their costs, so even fewer units are bought. Instability in production disrupts suppliers' ability to plan and therefore establish efficient procurement chains. Slower development causes schedule delays. Reductions in testing increase risk of unexpected performance problems. Cuts in support equipment lead to low readiness rates when the equipment is fielded.

To reduce these secondary effects, acquisition officials have often adopted a "buy to budget" strategy, i.e., forcing each program to make accommodations within its own budget and not inflict instability on others. This is not always possible, however, because some programs are such high priority that they must be maintained, even at the price of destabilizing other programs. The effects go beyond the acquisition system. Because quantity is frequently cut to accommodate higher unit cost, what suffers, as Tom McNaugher (1989) argues, is "any semblance of rational force planning" (pp. 135–142). Force size and composition are set by the dynamics of the acquisition process and not by warfighting analysis.

So What to Do?

Because the acquisition process has been a perpetual scandal, efforts at reform have been continuous. Dozens of panels, reports, initiatives, and directives have made recommendations seeking to improve performance. These recommendations fall into several categories, and the analysis described previously shows why they have widely different effects.

One set of reforms are rhetorical—exhorting contractors to do better, railing about greed, and setting targets for improvement. These accomplish little but do set a tone, which may have some political value.

A second set focuses on reporting. Reporting can be bureaucratically burdensome, but is generally perceived as noncontroversial and is therefore politically attractive. Congress especially gravitates towards establishing reporting requirements because it finds process changes easier to deal with than policy changes and often uses the one to attain the other in an indirect way (Aspin, 1978). Reporting does have value. While it cannot reduce cost growth, it can reduce surprises. That is, it facilitates the process of cost discovery and can alert decision makers to problems earlier. Once alerted, decision makers can restructure or terminate a program, though generally only after a lot of money has been spent. However, because reporting is retrospective and typically occurs on established programs, it cannot

change the underlying cost growth dynamics. The recently passed Weapon Systems Acquisition Reform Act establishes both new reporting and new oversight requirements—the effects of which are not yet clear.

A third set focuses on acquisition strategies to better manage programs. Some are employed before cost growth occurs—prototyping, funding stability, technology maturity, or incentive-type contracts. These are widely believed to be helpful. However, analysis of the actual effects of various acquisition strategies to control costs is more ambiguous than one would expect, i.e., it is not clear whether these strategies actually work (Arena et al., 2006, pp. 13–16; Lovell & Graser, 2001; Monaco & White, 2005).

Some acquisition strategies are employed after growth has occurred and, typically, after a Nunn-McCurdy breach that requires explanations and justifications to Congress. These strategies—"Tiger Teams," personnel changes, program restructuring—generally mean more efficient management of the train wreck rather than actually preventing the wreck itself.

The final set focuses on program fundamentals and can potentially have large cost impacts.

- **Early, accurate, cost estimates.** This is the time when decision makers have the most latitude, and based on these estimates, they can make different choices. As programs progress and gain momentum, options narrow. Unfortunately, the less mature a program, the less certain the cost estimates. The Weapon Systems Acquisition Reform Act, by strengthening DoD's cost estimating organization, might be helpful in this regard.
- **Judiciousness in starting new programs.** If cost growth acts as a tax, then Service leadership ought to resist the temptation to satisfy internal advocates by starting as many new programs as possible. Aggressive acquisition reform efforts may mitigate cost growth, but history indicates that future budgets get squeezed by a variety of unexpected pressures—acquisition cost growth, rising personnel and health costs, operational commitments, or senior leadership initiatives. Therefore, if the military services commit every available budget dollar to new programs, with the hope of muddling through, then program instability will be inevitable.
- **A focus on requirements.** Once requirements are set, the ability to control costs becomes very limited. The Weapon Systems Acquisition Reform Act seeks to strengthen DoD's mechanisms for making such trade-offs by requiring both AoAs and the Joint Requirements Oversight Council (JROC—the Joint Staff's requirements-setting body) to consider trade-offs among cost, schedule, and performance. The direction

is appropriate, but the effort has been made before, e.g., the "cost as an independent variable" policy of the last decade, which sought to encourage trade-offs among cost, schedule, and performance (Aldridge, 2002).

Secretary of Defense Robert Gates, in his speech laying out the new administration's defense budget, criticized "exquisite requirements" in weapon systems and promised to keep requirements "reasonable" (Gates, 2009). His judgment was just right and gets at the most fundamental cost driver. The current absence of a peer, existential threat may open the door to more evolutionary developments, which typically are less technologically ambitious and have less cost growth (Muczyk, pp. 465–466). However, the execution will be difficult—what is "exquisite" to one person is "reasonable and necessary" to another.

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REFERENCES

Aldridge, E. (2002, January 19). *Cost-as-an-independent variable and spiral development implementation plans.* Memorandum to Army Acquisition Executive. Retrieved from http://ve.ida.org/rtoc/open/pdfs/020119CAIV_SpiralDevMemo.pdf

Arena, M., Leonard, R., Murray, S., & Younossi, O. (2006). *Historical cost growth of completed weapon system programs* (Report No. 343). Santa Monica, CA: RAND.

Aspin, L. (1978). The power of procedure. In A. Platt & L. D. Weiler (Eds.), *Congress and arms control* (pp. 43–57). Boulder, CO: Westview Press.

Bennett, J. (2009, February 1). Young memo assesses cost growth causes. *Defense News*. Retrieved from http://www.defensenews.com/story.php?i=3928016

Brownlee, L., Acting Secretary of the Army. (2004, February 23). *Briefing on the restructure and revitalization of army aviation* (News Transcript). Retrieved from http://www.defenselink.mil/transcripts/transcript.aspx?transcriptid=2122

Christie, J. (2008, June). DoD on a glide path to bankruptcy. *Proceedings*. Annapolis, MD: U.S. Naval Institute.

Department of Defense. (2008). *Operation of the defense acquisition system* (DoD Instruction 5000.02). Washington, DC: Author.

Gansler, J. (1989, April). *Affording defense*. Cambridge, MA: MIT Press.

Gates, R. (2009, April 6). *Defense budget recommendation statement* (Speech). Retrieved from http://www.defense.gov/speeches/speech.aspx?speechid=1341

Hough, P. G. (1992). *Pitfalls in calculating cost growth from selected acquisition reports.* Santa Monica, CA: RAND.

Lovell, M., & Graser, J. (2001). *An overview of acquisition reform cost savings.* Santa Monica, CA: RAND.

McNaugher, T. (1989). *New weapons, old politics: America's military procurement muddle.* Washington, DC: Brookings Institution.

McNichol, D. (2004). *Cost growth in major weapon procurement programs.* Alexandria, VA: Institute for Defense Analyses.

McNichol, D., Tyson, K., Hiller, J., Cloud, H., & Minix, J. (2005). *The accuracy of independent estimates of the procurement costs of major systems.* Alexandria, VA: Institute for Defense Analyses.

Monaco, J., & White, E. (2005, April–July). Investigating schedule slippage. *Defense Acquisition Review Journal, 12*(3), 177–190.

Muczyk, J. (2007, December). On the road toward confirming Augustine's predictions and how to reverse course. *Defense Acquisition Review Journal, 14*(3), 455–468.

Peters, K. M. (2009, March 31). *GAO: Staggering cost overruns dwarf modest improvements in Defense acquisition.* Retrieved from http://www.govexec.com/dailyfed/0309/033109kp1.htm

Selected Acquisition Reports, 10 U.S.C., subtitle A, pt. IV, chap. 144 § 2432 (2009).

Sipple, V., White, E., & Greiner, M. (2004, January–April). Surveying cost growth. *Defense Acquisition Review Journal, 11*(1), 79–90.

Toll, I. W. (2006). *Six frigates: The epic history of the founding of the U.S. Navy.* New York: W. W. Norton.

U.S. Government Accountability Office. (2008). *Defense acquisitions: Results of annual assessment of DoD weapon programs* (GAO-08-674T). Washington, DC: Author.

U.S. Government Accountability Office. (2009). *Defense acquisitions: Assessments of selected weapon programs* (GAO-09-326SP). Retrieved from http://www.gao.gov/new.items/d09326sp.pdf

Weapon Systems Acquisition Reform Act of 2009, 10 U.S.C., Pub. L. 111-23 (2009).

Younossi, O., Arena, M., Leonard, R., Roll, C. R., Jain, A., & Sollinger, J. (2007). *Is weapon system cost growth increasing?* Santa Monica, CA: RAND.

ENDNOTES

1. The Selected Acquisition Reports (SARs), initiated in 1968 and congressionally mandated in 1974 (10 U.S.C. § 2432), were intended to be a tool for cost control. Annually, each major acquisition program reports information on cost, quantity, performance, schedule, and contract status. Costs are shown in both base-year (constant) and then-year (inflated) dollars. "Major acquisition program" is defined by DoD Instruction 5000.2 (p. 33) and 10 U.S.C. § 2432. As of September 2009, 93 programs are defined as "major." A summary of SAR information is released publicly, but the full reports are restricted.
2. The Nunn–McCurdy provision, 10 U.S.C. § 2433, Unit Cost Reports, is designed to curtail cost growth in American weapons procurement programs. It requires notification to Congress of cost growth more than 15 percent and calls for the termination of programs whose total cost grew by more than 25 percent over the original estimate, unless the Secretary of Defense submits a detailed justification for continuation.
3. The 2009 analysis showed cost growth down slightly to 25 percent (GAO, 2009, "Analysis of DoD Major Defense Acquisition Progam," para. 1).
4. Data were extracted from September 30, 2001, and June 30, 2008, SAR summaries (excluding National Missile Defense because the 2008 program was fundamentally different from the 2001 program).
5. Analyses of Alternatives (AoAs) investigate different possible courses of action at key points in the acquisition process. Required by regulation, AoAs "focus on identification and analysis of alternatives, measures of effectiveness, cost, schedule, concepts of operations, and overall risk. The AoA shall assess the critical technology elements (CTEs) associated with each proposed materiel solution, including technology maturity, integration risk, manufacturing feasibility, and, where necessary, technology maturation and demonstration needs" (DoD, 2008).

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