Review Essay: Reading The *Dream Machine: The Untold Story of the Notorious V-22 Osprey*, by Richard Whittle, In Light of the Defense Acquisition Performance Study

Steven L. Schooner & Nathaniel E. Castellano

2014

Vol. 43, No. 3 Public Contract Law Journal 391 (Spring 2014)

REVIEW ESSAY: READING *THE DREAM MACHINE: THE UNTOLD STORY OF THE NOTORIOUS V-22 OSPREY*, BY RICHARD WHITTLE, IN LIGHT OF THE DEFENSE ACQUISITION PERFORMANCE STUDY

Steven L. Schooner & Nathaniel E. Castellano

Nothing is . . . simple in the brambly world of defense procurement, a thicket of regulations, bureaucracy, and politics where no path leads in a straight line.[1]

Practitioners and policymakers would be well served to spend some time with Richard Whittle's splendid tiltrotor acquisition case study, *The Dream Machine: The Untold Story of the Notorious V-22 Osprey*. Demonstrating that

1. RICHARD WHITTLE, THE DREAM MACHINE: THE UNTOLD STORY OF THE NOTORIOUS V-22 OSPREY 88 (2010). The book now is available in hardcover (Simon & Schuster, 2010, 464 pages, including eight pages of black & white photographs, just under 400 notes, and an extensive index), to which all page citations herein refer; paperback (Simon & Schuster, 2011); and audio CD and audio download (Tantor Media, unabridged, 18 hours, 32 minutes).

Steven L. Schooner (sschooner@law.gwu.edu) is the Nash & Cibinic Professor of Government Procurement Law at The George Washington University Law School. Professor Schooner is a director of the Procurement Round Table, a Fellow of the National Contract Management Association (NCMA), and a 2012 recipient of NCMA's Charles A. Dana Distinguished Service Award. Nathaniel E. Castellano (necastellano@law.gwu.edu) is a rising third-year student at The George Washington University Law School and a member of the George Washington Law Review.

Professor Schooner gratefully acknowledges Seymour Herman for his continued support of government procurement law research at The George Washington University Law School, Richard Whittle for taking the time to discuss his work, and Neal J. Couture and Daniel I. Gordon for their helpful suggestions and comments.

truth is stranger than fiction—or at least as interesting—Whittle's meticulously researched effort is as informative as it is entertaining.[2] While the technical explanations may baffle some and seem superficial to others, the content is easily accessible to readers of the *Public Contract Law Journal*, but the author's perspective leads to a story far different from what a seasoned reader of the Federal Acquisition Regulation (FAR) would expect. The book also serves less grizzled audiences, offering casual observers, students, and newer practitioners (or practitioners whose practice is not defense-centric) valuable context. *The Dream Machine* offers some sense of why otherwise seemingly sophisticated, complex, lengthy contracts—in which it appears that every contingency has been anticipated and dickered—don't play out as planned.

The disproportionately prominent role of attorneys (and accountants) in influencing government procurement law, regulation, policy, and practice contributes to the extraordinarily regulated nature of the environment in which we practice. At the same time, an extensive regulatory scheme, policed by ever-increasing and overlapping oversight regimes, suggests that government contracts are conceived, competed, awarded, and performed within a transparent, tightly constrained, and orderly system. Obviously, that is not the case. Legal realists periodically remind us of the chaos that actually defines our field, particularly in the high-stakes, long-term, technically complex business of major weapon systems acquisition.[3]

While the Osprey saga leaves plenty of room for differences of opinion, it is hard to avoid the conclusion that something fundamental is awry with the complex, inefficient, time-consuming, and unpredictable system that the book describes. With his Osprey case study, Whittle provides a sobering perspective of a Major Defense Acquisition Program (MDAP), describing a process strangely unfamiliar to the orderly regime articulated in the FAR and laid out in painstaking detail in the Department of Defense (DoD) 5000 Instruction.[4] While *The Dream Machine*, published in 2010, is no longer hot off

2. In particular, the accident passages make for compelling reading. Even knowing that the outcome is pre-ordained, the reader feels the tension rising and, once the inevitable occurs, cannot help but empathize with the families and colleagues left behind.

3. *See, e.g.*, Elizabeth Mertz, *An Afterword: Tapping the Promise of Relational Contract Theory—"Real" Legal Language and a New Legal Realism*, 94 NW. U. L. REV. 909, 910 (2000) ("Along with Stewart Macaulay and Richard Speidel, [Ian] Macneil persistently shoved a generation of legal thinkers out of the comfortable (if unrealistic) clarity of classical and neoclassical doctrinal analysis, pointing out the importance of examining the messy relational clutter that so often surrounds—and indeed defines—human agreements and conflict."); Jay Feinman, *Relational Contract Theory in Context*, 94 NW. U. L. REV. 737, 739–40, 742 (2000) ("The classical method involved the application of relatively clear rules of legal doctrine, typically framed at a high level of generality and presenting dichotomous choices. . . . Macneil's work brought to light the importance of considering relational contracts—extensive, long-term relationships—as a distinctive form of contracting. Relational contracts, like sales contracts, can be governed by the core principles of contracts, as long as the courts applying the principles are sensitive to the factual differences in context. . . . Relational analysis is contextual with a vengeance, immersing itself in the facts of the particular contract and of the contexts from which it arises.").

4. DoD Instruction 5000.02, *Operation of the Defense Acquisition System* (Dec. 8, 2008), currently replaced, in its entirety, by Interim DoD Instruction 5000.02, *Operation of the Defense*

the press, its lessons learned are both vital and timely today, particularly as the DoD embarks upon the critically important, but admittedly daunting, task of embracing meaningful performance measures to assess the defense acquisition process.[5]

Against that backdrop, this review commends *The Dream Machine* to a broad range of readers, including public contracts attorneys, acquisition policy officials, contracts professionals, government procurement law students, as well as consumers of military history. It's a remarkable story told with style. We then juxtapose some aspects of Whittle's exhaustive case study of this seemingly problematic program against the Defense Department's nascent effort to assess the performance of the Defense Acquisition System. We make no secret of our belief that DoD's acquisition performance assessment has the potential to become one of the most significant recent developments in defense acquisition. Along the way, we pause to highlight some particularly informative or entertaining aspects of the book. Finally, we conclude by focusing on the ultimate question that we hope DoD chooses to address more broadly in its performance assessment: is the V-22 a success story, a cautionary failure, something in between, or none of the above? Our concern is that DoD might be asking the wrong questions.

Acquisition System (Nov. 26, 2013). Outgoing Deputy Secretary of Defense Ashton Carter recently explained that

> I have determined that the current DoD Instruction (DoDI) 5000.02, "Operation of the Defense Acquisition System," December 8, 2008, requires revision to create an acquisition policy environment that will achieve greater efficiency and productivity in defense spending and effectively implement the department's Better Buying Power (BBP) initiatives. Therefore, I am canceling this issuance . . . and replacing it with the attached interim policy effective immediately.
>
> I am directing . . . USD(AT&L) [and others] to jointly prepare a revised DoDI 5000.02 within 180 days. The USD(AT&L) will draft a new instruction to address acquisition of services in the same time period.

Memorandum from the Deputy Sec'y of Def. on Def. Acquisition to the Sec'ys of the Military Dep'ts et al. (Nov. 26, 2013), *available at* http://www.acq.osd.mil/docs/DSD%205000.02_Memo+Doc.pdf. Under Secretary Frank Kendall explained that, among other things, the new document

> implement[s] a number of statutes and regulations that have come into existence since . . . 2008[;] . . . make[s] the document more readable and helpful . . . [and] trie[s] to reinforce the importance and primacy of the acquisition chain of command—particularly Program Executive Officers (PEOs) and PMs.

Memorandum from the Under Sec'y of Def. for Acquisition, Tech. & Logistics for the Acquisition Workforce on the New Dep't of Def. Instruction 5000.02 (Dec. 2, 2013), *available at* http://www.acq.osd.mil/docs/2013_12_03%20Signed%20Kendall%20Distro%20Memo.pdf. Kendall concedes that "[t]he new 5000.02 is longer than [he] would have preferred." Kendall also explained that the Department of Defense (DoD) envisions "a legislative proposal that would simplify the existing body of law and replace it with a more coherent and 'user friendly' set of requirements. . . ." *Id.*

5. *See generally* DEP'T OF DEF., OFFICE OF THE UNDER SEC'Y OF DEF., ACQUISITION, TECH. & LOGISTICS, PERFORMANCE OF THE DEFENSE ACQUISITION SYSTEM, 2013 ANNUAL REPORT (2013), *available at* http://bbp.dau.mil/doc/Report_on_the_Performance_of_the_Def_Acq_System.pdf [hereinafter DoD MDAP REPORT].

I. THE V-22 SAGA: A TORTURED TALE TOLD WELL

For baby boom-era acquisition professionals, the V-22 program—and its oft-tortured history—spanned much of our professional careers. All of the familiar themes are featured here: advancing the state of the art; buying in; campaign contributions; competition; configuration control and customer discipline; contract type selection; optimistic estimates; cost overruns; partnering (and related diffusion of responsibility); post-award contract management; quality control; sacrifice; scandal; stretch outs and quantity reductions; oversight; and, of course, even "unknown unknowns" and whistleblowers. Indeed, the author highlights the length of the saga in describing the commencement of the Osprey's initial deployment.

> On September 17, 2007 . . . [the] pilots flew their ten Ospreys, carrying baggage, tools, spare parts, and about sixty mechanics, to the USS *Wasp* as it sailed near the North Carolina coast. *Twenty-six years to the month* after Navy Secretary John Lehman had told the Marine Corps to buy a tiltrotor rather than another helicopter to replace its CH-46 Sea Knights, the Osprey was finally on its way to war.[6]

One of the most intriguing aspects of the V-22, the first major tiltrotor deployed by the military, and, no doubt one of its chief selling points, is that it is different. The V-22 did not promise *incremental* improvement to an existing platform (primarily large helicopters); it offered a distinct approach. Being neither fish nor fowl, however, it all too often failed to appeal to either of the existing and entrenched fixed-wing (airplane), helicopter, or even VTOL (Vertical Take Off and Landing)[7] communities. As a result, throughout its history, it polarized opinion, captivating the hearts and imaginations of proponents, while infuriating and alienating opponents. Neither successes nor failures—and the book chronicles many instances of both—tended to sway opinion. Having covered the program for more than twenty years, the author analogized the experience to covering the abortion debate:

> No matter what I wrote, I could usually count on being chastised by someone, for the Osprey was as close as a defense issue gets to being a religious question. There were believers and nonbelievers, and neither had much use for those who gave any credence to the other side.[8]

This perspective, and the author's grasp of tension, adds much to the story. It is no surprise—and it is apparent throughout the book—that Whit-

6. WHITTLE, *supra* note 1, at 377 (emphasis added).

7. The author explains why the Marine Corps Harrier "jump jet"—despite the fact that it entered full production and was deployed in combat—was not a useful analogue.

> This "vectored thrust" aircraft, which could point its jet exhaust downward to take off and land vertically or hover, was strictly a one-seat fighter plane. It was far removed from the passenger machines the true believers in the convertiplane had envisioned, and by the mid-1970's, engineers had concluded that building a VTOL passenger jet was impractical. . . . A machine big enough to carry passengers would burn so much fuel lifting off vertically it would have little range.

Id. at 34.

8. *Id.* at 395.

tle knows the aviation industry. For the 2013–2014 academic year, he served as the National Air & Space Museum's Alfred V. Verville Fellow focusing on the Predator and "The Drone Revolution." He spent decades reporting on defense and security-related issues for *The Dallas Morning News* and *Congressional Quarterly*. Whittle spent time with the Osprey squadron at New River Marine Corps Air Station, North Carolina, and in Yuma, Arizona, and "was one of fewer than half a dozen journalists the Marines permitted to visit [the Osprey squadron] in Iraq."[9] He is nothing if not thorough, having "conducted more than four hundred interviews with more than two hundred people" during this project.[10]

Ultimately, the author seems torn between loving, or at least admiring, the V-22 as a capability-enhancing upgrade for the Marine Corps and damning the deeply flawed acquisition system, legislative process, and corporate missteps that birthed the product. To the extent that Whittle spent years on this project, the title's inclusion of the word "notorious" cannot be disregarded.

This book offers a healthy dose of reality for students, practitioners, and policymakers. Given how much time and energy are spent manipulating the language in the FAR, DFARS, and DoD 5000 Instructions, one might think the regulatory regime has at least *some* impact on the Defense Department's highest profile, and most expensive, purchases. The *Dream Machine* might convince readers that nothing could be further from the truth; or that the regulatory regime serves primarily as an obstacle course that program managers and contractors must learn to bypass in order to succeed. If programs succeed *despite* the regulatory process rather than because they comply with it—maybe it is once again time to rethink the enterprise. Reform *might* prove meaningful if DoD's recent efforts lead to a reevaluation of the acquisition process with an eye towards achieving successful outcomes, rather than the perpetuation of formalistic compliance with inefficient and ineffective processes. Currently, however, that seems unlikely.

II. SOMETHING IS ROTTEN IN THE STATE OF DENMARK[11]

Regardless of readers' perspectives on the Osprey, it is difficult to digest *The Dream Machine* without concluding that the developmental "system" described in the book is, at best, haphazard; at worst, doomed to fail; but in any event, deeply in disarray. DoD's performance analysis report reinforces the

9. Whittle also was "among the first reporters to ride in the Osprey at New River on July 13, 2005, [after which he concedes he wrote] an enthusiastic first-person account. . . . Flying in the Osprey was like nothing else. Its power and speed and novelty made the ride exhilarating." *Id.* at 381.

10. *Id.* at 401.

11. With apologies to William Shakespeare, this well-worn phrase from *Hamlet*, spoken by Marcellus to Horatio, typically describes corruption, a fundamental institutional flaw, or both. *See* WILLIAM SHAKESPEARE, HAMLET act I, sc. IV (first printed in 1603, widely republished).

realization (or the media's and Congress's typical refrain) that the Osprey acquisition is not an outlier. Cost overruns, delays, and performance problems are standard fare in MDAPs.[12] (Of course, cost growth and schedule slip frequently escalate hand-in-hand and derive from related pathologies.) While the F/A-22 was delayed more than twenty-six years,[13] the Navy's A-12 never achieved first flight, instead spawning a unique litigation legacy that spanned more than two decades,[14] and only recently settled[15] with congressional intervention[16]—which might better be described as a mercy killing.[17]

12. *See generally* DoD MDAP Report, *supra* note 5.

13. *See* 152 Cong. Rec. S6339 (daily ed. June 22, 2006) (statement of Sen. John McCain):

> The F-22 experienced an initial operational capability delay of 9 years 9 months; initial operational test and evaluation delayed 5 years 3 months; full rate production delay of 5 years 3 months; low rate initial production, 4 years 9 months; first delivery of operational aircraft delayed 4 years 7 months; first flight delayed 2 years; and completion of critical design review delayed 1 year 4 months. The record is not good. In fact, the record is terrible. In 1991, the estimated cost, according to the U.S. Air Force, for the [F-22] aircraft was going to be $114 million—in then-year dollars; now, $354 million per copy.

Id. See generally Thomas A. Gabriele, *Could the Weapon System Acquisition Reform Act of 2009 Have Fixed the Problems That Plagued the F-22 Acquisition Project Back in 1981?*, 40 Pub. Cont. L.J. 741, 759 (2011).

14. *See* David Alexander, *After Two Decades, U.S. Navy Near Deal to Settle "Flying Dorito" Suit*, Reuters (Aug. 2, 2013, 6:14 PM), http://www.reuters.com/article/2013/08/02/us-usa-defense-flyingdorito-idUSBRE97118K20130802 ("The radar-evading, carrier-based McDonnell Douglas plane was eighteen months behind schedule and about $1.4 billion over cost when then-Defense Secretary Dick Cheney canceled the $57 billion program back in 1991. The case over the triangular-shaped A-12 Avenger, which was dubbed the 'Flying Dorito,' has been in legal limbo ever since, going all the way to the Supreme Court in 2011 before being referred back to a lower court. Now, after twenty-two years, a settlement is on the horizon.").

15. *See generally* W.J. Hennigan, *Suit Filed In '91 over Aircraft Settled*, L.A. Times (Jan. 24, 2014), *available at* http://articles.latimes.com/2014/jan/24/business/la-fi-navy-jet-suit-20140125 (Court of Federal Claims dismissed lawsuit January 23, 2014).

16. *See* Beth Brogan, *Delegation Pushing for $100M to Start New Destroyer at BIW*, Bangor Daily News (Jan. 1, 2014), http://bangordailynews.com/2014/01/07/business/defense-expert-maine-delegation-likely-to-land-100-million-to-build-destroyer-at-bath-iron-works.

> The recently signed National Defense Authorization Act also includes another amendment authored by Collins and King that settled a decades-old lawsuit and allows work on the third DDG-1000's steel deckhouse, hangar and aft vertical launching missile system modules to continue at BIW.
>
> The A-12 aircraft lawsuit stems from 1991 when the Pentagon canceled a $4.8 billion stealth aircraft contract with General Dynamics and McDonnell Douglas, which has since been acquired by Boeing, according to *Aviation Week*. General Dynamics and Boeing sued the government for wrongful contract termination and the case has been in legal limbo ever since.
>
> Language in the 2014 Defense Authorization Act allows the Navy to receive $400 million worth of military hardware at no cost, including a nearly $200 million credit for the third DDG-1000, the next-generation destroyer being built at Bath Iron Works. According to Collins, this firms up the construction program and protects jobs at the Bath shipyard.

Id.

17. As impressive as the $400 million (in kind, not cash) settlement appears, the conclusion is arguably closer to a walkaway resolution of this multibillion-dollar dispute. Given the passage of time, even employing overly conservative figures, the settlement represents a recovery of less than $172 million combined, which would generate more than $229 million in statutory interest over the last twenty-three years. Or, more specifically, the two firms' ultimate liability was probably no more than $86 million each, plus interest over twenty-three years. Spreadsheet available

One approach to these problems is the next round of never-ending, but nonetheless sweeping acquisition reforms, one of which is currently percolating on Capitol Hill.[18] That solution presupposes, among other things, that Congress or procurement policy officials understand the externalities that the current regime generates. It also presumes that Congress is willing to both eliminate systemic inefficiencies and employ meaningful incentives to drive more customer-friendly outcomes, as well as impose the necessary budgetary discipline required to stabilize funding. That seems optimistic. When a long-standing institution—particularly one of grave importance to national security that annually consumes a significant portion of the gross domestic product—appears obviously flawed based upon decades of accumulated data, it is prudent to investigate and learn from mistakes before rebuilding from scratch.

Consider the system's legacy of cost overruns. It is standard practice to evaluate an acquisition's effectiveness by comparing the initial price agreed upon at award with the ultimate cost incurred or price paid upon performance. That's a dicey proposition. As discussed below, the acquisition planning process is sufficiently inundated (and thus shaped) by lobbying and bureaucratic requirements that buyer and seller appear to conspire to unrealistically and arbitrarily inflate expectations and project low costs. If surviving the planning process requires irrationally optimistic initial requirements and cost estimates, rather than reflecting a bargain based upon government needs and what the contractor can provide, then initial cost and schedule estimates are meaningless. Given that basic premise, and multiplied by the series of contracts that make up any given MDAP,[19] cost "growth" during the performance of a program represents a rather arbitrary benchmark.

Even if the initial cost estimates do represent a reasonable and obtainable bargain, the common practice of concurrent development in MDAPs—producing prototypes while design details are still in flux to save time—means that at the time of contract award, stable and accurate designs do not exist. It is practically guaranteed, therefore, that during performance, some aspect of the design will change and cost will surely rise as well. If the

from authors based upon *Prompt Payment Act Interest Rates*, TREASURY DIRECT, *available at* http://www.treasurydirect.gov/govt/rates/tcir/tcir_opdprmt2.htm (providing CDA interest rates during this period). One wonders how these sums compare to the total amount expended in attorney fees and litigation support over the same period.

18. The House Armed Services Committee recently launched a long-term effort to reform the DoD, including a hard look at acquisition with two October hearings. *See, e.g.*, Rep. Mac Thornberry, Address at the Center for Strategic and International Studies (CSIS) (Nov. 18, 2013), *available at* http://armedservices.house.gov/index.cfm/durable-defense-reform.

19. Experienced attorneys recognize individual contracts as the trees that constitute the larger forest of program management. Unlike contracts, which might be negotiated or litigated in a vacuum, programs span broader timelines. They progress through acquisition planning, as well as research and development contracts—including concept formulation, production (ranging from prototypes to low-rate initial production into full-scale development and, eventually, full production), maintenance, upgrading, and repurposing.

parties agree upon a price absent a realistic production design, then reliance on that price estimate is as misguided as it is premature.

Finally, weapons systems cost money to deploy, arm, and operate. Helicopters, airplanes, tiltrotors, aircraft carriers, and other state-of-the-art equipment do not care for themselves, particularly when used in combat. The costs associated with arming, operating, maintaining, and periodically updating these products—long after delivery—are elements of life-cycle cost (discussed at length below), as is the purchase price or the cost of acquisition. Thus, it seems that the primary benefits of cost growth as a metric are that it is an easy number to calculate and it provides a figure, albeit a meaningless one, to immediately analyze. Conversely, life-cycle cost requires anticipating future needs and quantifying a proxy for "bang for the buck."

The government obsesses over how far behind schedule programs slip before final delivery. While it is always nice for things to arrive on time, timeliness means little where the customer ordered the wrong product or no longer needs it. Optimistic contract schedules established during the planning stage, which, among other things, necessitate concurrent development, can guarantee little more than inefficiency and disappointment. Even if the initial schedule was accurate, design corrections and the inevitable production setbacks associated with concurrent development make the initial schedule arbitrary. To the extent that schedule becomes an arbitrary metric, the tyranny of schedule exerts sufficient pressure on contract administrators and contractors that safety and quality may suffer. *The Dream Machine* is in many ways a story about lost lives and wasted tax dollars due to poor management focused more on arbitrarily cutting costs and adhering to an unimportant schedule than safely building a quality product to enhance the nation's defense.

III. THE DoD PERFORMANCE MEASUREMENT STUDY

With that in mind, we are thrilled to see DoD publish the first of a series of reports utilizing objective data and analysis to measure the performance of the defense acquisition system.[20] This first report focuses only on MDAPs, a relatively small number of large, expensive, or important programs.[21] To the extent that DoD appears willing to focus on measuring *performance* and moving away from a near-exclusive reliance on cost growth and schedule, the report is a sign of good things to come. That being said, some of the methods and conclusions echo business as usual.

Fortunately, the report immediately recognizes not only the importance of measuring performance, but also of carefully choosing performance metrics:

> Fundamental to improving acquisition is to understand, in sufficient detail, how well we actually *are* performing: whether we are getting any better or worse, and, most importantly, understanding *why* any discernible trends exist. Without

20. *See* DoD MDAP Report, *supra* note 5, at iii.
21. *See* 10 U.S.C. § 2430 (2012).

> baselines and trends, it is impossible to know where to focus our efforts, what initiatives should be considered (or abandoned), and whether those initiatives are producing the desired results.[22]

The report (and the initiative) merit(s) praise for acknowledging that, historically, the system may have been focusing on the trees, rather than the forest. For example, DoD recognizes that ultimate program performance compared to the initially established baselines is not correlated with obtaining best value for tax dollars:

> Performance relative to original baselines does not guarantee lowest end cost to the taxpayers. Baselines at Milestone B are static yet help to control appetites and provide valuable triggers to explain substantial changes. Original baselines at Milestone B provide a useful reference point for subsequent cost and schedule performance, but developmental uncertainties, changing operational needs, and other mechanisms for controlling costs make such baselines somewhat arbitrary and misleading if used as absolute reference points.[23]

This is both profound and important. Also praiseworthy, the report takes time to note the difference between contract management and program management:

> *Program-level measures* show how well the acquisition system developed the ability to produce the overall program against original estimated baselines despite quantity changes. . . .
>
> *Contract-level measures* provide early indicators of potential program-level issues by examining performance when the Department contracts for specific work from industry. . . . Contract performance can be earlier, leading indicators of the larger program's performance but they do not necessarily reflect the performance revealed in program-level measurements.[24]

Most exciting is DoD's actual attempt to go beyond its familiar and oft-superficial analysis of cost growth and schedule compliance to place greater emphasis on, for example, life-cycle costs. The report "[f]ocuses on more in-depth indicators of system *outcomes*, particularly with respect to cost and schedule, and does so by looking at various institutional trends."[25] Further:

> The report provides improved insights into key aspects of total life-cycle cost performance to inform policy decisions about the overall acquisition system and institutions. There are important differences in how programs are managed depending on where they are in their life cycles.[26]

Unfortunately—but understandably, given that they are attempting to reverse decades of bad precedent—the report continues DoD's heavy reliance on cost growth and schedule to measure *benefits*:

> Institutional performance is all about getting value. Value to the Department stems from the relative benefits (e.g., technical performance) of the goods and services ac-

22. *See* DoD MDAP Report, *supra* note 5, at 1.
23. *Id.* at 110.
24. *Id.* at 6.
25. *Id.* at iii (emphasis added).
26. *Id.* at 2.

> quired in a responsive time (schedule) compared to the costs to the taxpayer. Hence, measures of cost, schedule, and performance serve as the basis for measuring the effectiveness of the acquisition system in converting inputs to outputs.[27]

We agree that value stems from the relative benefits (e.g., technical performance) of the goods and services acquired compared to the public's expenditure. But we take issue with the conclusion that "measures of cost, schedule, and performance serve as" either an accurate or a meaningful "basis for measuring the effectiveness of the acquisition system[.]"[28]

This begs the question of which metrics accurately represent the cost and benefit of an acquisition effort. We assert that the three most common measures—the original contract price, the original delivery date, and the original performance specification—offer more heat than light in this context. We sense that most consumers' glee surrounding their shiny new automobile—purchased for a price well below the manufacturer's sticker price and delivered on the date promised—fades quickly in light of five to ten years of a bumpy or harsh ride, higher than expected fuel consumption, inordinately frequent maintenance, or disappointment surrounding an anemic resale value. Similarly, in public procurement, we would prefer any inquiry into performance measurement that balances the *overall cost* of a program with the customer's satisfaction with the end product. In other words, acquisition performance must assess how happy the government is with the bargain it ultimately receives (as opposed to how disappointed the government initially was that its all-too-often unrealistic expectations were not met). While trying to find a perfect analogue for either of those two variables is very difficult, the current practice of focusing on cost growth and schedule is too far off the mark to be helpful.

All of which is why reviewing the V-22 anecdote—and trying to divine whether the acquisition was a success or failure—proves so intriguing. The DoD report claims to "leave it to the reader to draw his or her own conclusions and observations about the performance of the defense acquisition system, its sufficiency, and the degree of progress made to date."[29] Similarly, Whittle does not attempt to pass judgment on any particular player in the V-22 saga; instead, he unfolds the story and allows the reader to decide where, if anywhere, to praise and blame. In the end, it is possible to conclude that no one deserves any blame at all. It could be that this is just how defense acquisition sausage is made, and for now at least, we gain greater insight into what we are eating.

IV. THE CONTRACT DOES NOT TELL THE WHOLE STORY

A casual observer might struggle to understand how the seemingly ordered regulatory regime of the FAR, supplemented by the DFARS and the

27. *Id.* at 4.
28. *Id.*
29. *Id.* at 7.

DoD 5000 Instruction, could permit the tortured history of the V-22 detailed in *The Dream Machine*. Not surprisingly, a case study paints a more nuanced picture than does the DoD MDAP Report, which concatenates objective data[30] with little regard for the political, bureaucratic, and ultimately very personal nature of the acquisition process. Whittle, having covered the industry for many years, offers an arguably jaded, but nonetheless instructive, perspective on the business of weapons system procurement.

> Selling the military an aircraft or major system isn't like selling a car. It's more a courtship or a seduction than a sale. A defense company . . . will spend its own money to develop a concept . . . or an improved model . . . designed to suit some presumed future military need, and try to get the services interested in developing it. . . . Then they take it on the road. They show it to military officers and relevant Defense Department civilians. The marketers carefully note their reactions . . . [then] go home and huddle with the engineers to tweak the design, trying to tailor the concept to what the military seems to want and the Congress will buy. . . . This can go on for years. . . .
>
> Along the way, the marketers brief members of Congress and their aides. . . . The goal is to be able to tell that colonel or general, when the timing is right, that if he's interested in this new [weapon], there's support for it in Congress, which has to provide the money. By the time the Pentagon solicits bids for a contract to actually build the thing, the company hopes its concept is already the favorite.[31]

How do we reconcile this with the regulatory requirements that guide us through the acquisition process? The FAR offers a more formalistic (and, accordingly, less exciting) description of the general procedures for acquisition planning:

> In developing the plan, the planner shall form a team consisting of . . . contracting, fiscal, legal, and technical personnel. . . . [T]he planner shall also consider inclusion of the combatant commander or chief of mission, as appropriate. The planner should review previous plans for similar acquisitions and discuss them with the key personnel involved in those acquisitions. At key dates specified in the plan or whenever significant changes occur, and no less often than annually, the planner shall review the plan and, if appropriate, revise it.[32]

Of course, from a regulatory perspective, the FAR encourages acquisition planners to "avoid issuing requirements on an urgent basis or with unrealistic delivery or performance schedules, since it generally restricts competition and increases prices."[33] The DoD report stops just shy of stating that requirements changes are inevitable during major defense acquisitions, but it recognizes that those requirements contribute to cost growth and schedule delays:

> Performance (good or bad) in planned defense acquisition is intertwined with cost and schedule implications from unplanned responses to these external demands.

30. *See id.*
31. WHITTLE, *supra* note 1, at 44–45.
32. FAR 7.104(a).
33. FAR 7.104(b).

> This is not an excuse for cost and schedule growth, but an observation from first principles that changing threats and needs can add costs and delays relative to original baselines as ongoing acquisitions are adjusted.[34]

Experienced practitioners need not read the history of constantly changing requirements in the V-22 acquisition to know that the FAR is understandably out of touch with reality on this score. Similarly, DoD appears to have complacently overplayed what is, in reality, a delicate balance between acquiring up-to-date technology and acquiring technology that the government actually needs.

The requirements process merits special attention in an era of decreasing defense budgets with relentless pressure to reduce defense procurement spending. Sophisticated readers of this *Journal* understand what the Congress, media, and public neither grasp nor wish to acknowledge: in order for the government (or, more specifically, DoD) to dramatically reduce its expenditures, the government must purchase less. Despite what advertisements tell consumers, shopping at sales events saves less money than not going to the store. Indeed, no empirical evidence suggests that it is rational to expect the kind of economy-altering savings needed simply by improving acquisition procedures or negotiating marginally better contracts. The government's leadership, or what we refer to as the "requirements generators"—not the acquisition community—must determine what it can live without.

Echoing this frustration, Whittle identifies one of the most challenging (or, depending upon your perspective, pernicious) aspects of weapon system acquisition. In the never-ending quest for battlefield superiority and technological surrogates for human sacrifice, the Defense Department craves (and implicitly demands) unproven state-of-the-art solutions.

> [T]he military often issued unrealistic requirements for big procurements, in part to spur industry to greater heights, in part because the officers who wrote the requirements could be poor judges of what was possible, in part to justify starting a new program. . . . When it came to writing requirements, the services always asked for the sky and contractors always told them they could deliver it "by yesterday" and priced to "sell at the ten-cent store." . . . That was why stories on outrageous schedule delays and cost overruns were a staple for reporters on the Pentagon beat. Development schedules and costs estimates for major military hardware—especially aircraft—were almost always ridiculously optimistic. The incentive on both sides . . . was to shoot for the moon and worry later about how much they were going to miss it by.[35]

It is easy to become complacent with the idea that procurements will suffer delays, especially when coupled with the rationale that the government should be able to adjust its requirements in proportion to its needs to avoid spending money on goods and services that are not needed. Indeed, this is exactly why we have a rich, longstanding history of mandating and

34. DoD MDAP Report, *supra* note 5, at 109.
35. Whittle, *supra* note 1, at 115–16.

exploiting the Termination for Convenience and Changes clauses.[36] To be sure, this justifies occasionally adjusting requirements to keep up with changing needs, but only to a certain point. Eventually, delays from changing requirements leech more value from the acquisition than the changes can provide in return. As the DoD MDAP report concludes, delays from changing requirements are often so extreme that "the time required to acquire next-generation capabilities is often larger than the strategic threat and technology cycles these capabilities are meant to address."[37] That is a stark admission. Surely, DoD should avoid buying outdated technology, but modern, cutting-edge technology procured to address an extinct problem sounds equally inefficient.

To the extent that the FAR accepts, but does not dwell on, the reality of the congressional authorization and appropriations process, few readers will be surprised by the attention devoted throughout the book to the importance of managing Congress, lobbying, making charitable contributions, and cultivating friends in high places.[38]

> [D]efense contractors, like other special interests, pay lobbyists fat fees or salaries to track the budget process and try to influence it in the product's favor. Most lobbyists do this partly by trying to make sure the right Pentagon officials and military officers, members of Congress, and congressional aides get persuasive briefings about their products. . . . To get access, almost all lobbyists make campaign contributions and get their clients to make them as well. . . . Crooked lobbyists sometimes bribe or try to bribe lawmakers, though that's probably less common than popularly assumed.[39]

Given the lengthy history of this program, the author reminds us that political support is an ongoing necessity, rather than a one-time rite of passage.

> In Washington, no program is ever truly sold, no issue ever truly settled; the annual budget cycle ensures that. This is why defense companies keep marketers . . . lobbyists . . . and public relations teams on their payrolls. The marketers would have to keep explaining the [program] . . . to new Pentagon action officers and uniformed military leaders, who rotate to new assignments every three or four years. The lobbyists . . . need to educate new members of Congress and their aides . . . and others in government, and curry favor with them. The public relations people . . . would have to try to shape public opinion by periodically firing off encouraging reports . . . in press releases and staying ready to shoot down any incoming attacks on the [program.][40]

36. *See*, *e.g.*, United States v. Corliss Steam Engine Co., 91 U.S. 321, 323 (1875) ("[I]t would be of serious detriment to the public service if the power of . . . [the] Navy Department did not extend to providing for all such possible contingencies by modification or suspension of the contracts, and settlements with the contractors."); United States v. Speed, 75 U.S. 77, 81–82 (1868) (referencing Rule No. 1179 in the Army Regulations of 1863, and the contract "clause for its termination at the will of the [government]").

37. DoD MDAP Report, *supra* note 5, at 109.

38. Granted, the Federal Acquisition Regulation (FAR) does remind us that, as a general rule, lobbying and political activity costs are unallowable. *See* FAR 31.205-22.

39. Whittle, *supra* note 1, at 92.

40. *Id.* at 143.

Students and practitioners alike are comfortable blaming acquisition shortcomings on the familiar laundry list of administrative inefficiencies: stifling regulations; compliance costs; poor planning; inadequate market research; cost increases; cost drivers; and overstretched procurement personnel. In describing the influence of lobbyists, politicians, and bureaucrats in every stage of the Osprey's life, Whittle makes the usual suspects seem like little more than rounding errors in the big picture. Terms such as the "iron triangle" and the "military industrial complex" rarely resonate with post baby-boomer generations and, alas, may be at risk of becoming anachronistic terms. A few hours with *The Dream Machine*, however, breathes life into Eisenhower's warning:

> In the councils of government, we must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex. The potential for the disastrous rise of misplaced power exists and will persist.[41]

One general complaint about the government contracting process is that the government customer's monopsony allows it to change requirements without any competitive market to provide a reality check.[42] The V-22 tale reveals that reality is both more complex and more dangerous than the one-customer theory suggests. The government's position was unique, as the only entity that could afford to fund the development of tiltrotor technology, but the government's interests are far from monolithic. "The Military" did not agree to buy a tiltrotor; instead, the tiltrotor concept was marketed and sold to the Navy, Air Force, and Marines. Dick Spivey and the Bell marketers spun an engaging, customized story of tiltrotor benefits to each military branch, but they could not convince any individual service to commit to buy enough tiltrotors to make their order cost-effective. The result was compromise: marketing a single tiltrotor—the Osprey—that all three services would deploy. This led to two pathologies. First, the Osprey became weighted with contradictory specifications (meaning that all customers sacrificed their optimum performance and paid for certain features they did not value). Second, three fickle government customers' vacillating support and investment consistently altered production quantities and, accordingly, unit pricing.

The idea that defense acquisition is not merely a dance with a single, homogeneous, disciplined customer is reflected in the colorful characters that Whittle weaves into the story.

41. President Dwight D. Eisenhower, Farewell Address (Jan. 17, 1961), *available at* http://www.eisenhower.archives.gov/research/online_documents/farewell_address.html.

42. *See, e.g.*, DAVID S. SORENSON, THE PROCESS AND POLITICS OF DEFENSE ACQUISITION: A REFERENCE HANDBOOK 165 (2008).

> [T]he principle [sic] problem with the acquisition system is the nature of the system itself and the military requirements that it supports. There is still one customer, a handful of suppliers, uncertain threats for the military to respond to, and highly technical systems that are produced in inefficient numbers. Those who describe the Pentagon acquisition as one of the last bastions of socialism are perhaps not far from the truth.

Id.

V. THE CULT OF PERSONALITY: A COLORFUL CAST OF CHARACTERS

Like a good novel, *The Dream Machine* excels in character development. It is remarkable to see not only how different individuals affected the Osprey, but also how much of an impact the Osprey had on those whose path it crossed. Whittle's primary protagonist, Dick Spivey, occupies the space in acquisition—sales—into which lawyers frequently have the least insight. Spivey's unique perspective and role are derived from his progression from a Bell Helicopter engineer to the marketing team, which permitted him to embrace the machine—or, more aptly, the *dream*—with a unique conviction and intensity. Spivey began work at Bell as a $1.78-an-hour co-op student, where he first glimpsed the Osprey's predecessor prototype, the XV-3, before being assigned to the tiltrotor team as an engineer and later as a "sales engineer."

> A simple glimpse can give birth to infatuation. Infatuation can mature into passion, and passion is obsession's parent. Dick Spivey caught his first glimpse of the XV-3 the day he arrived at Bell in 1959. It was sitting on the flight line as Warren Jones showed him around. Spivey was infatuated right away.
>
> The first Bell tiltrotor piqued Spivey's curiosity because it was such a "strange-looking beast, compared to everything else," he remembered years later. The XV-3 had been cobbled together with parts from existing aircraft, and it showed. It looked like a helicopter that had been rear-ended by an airplane. . . . Spivey thought it was really cool.[43]

The tiltrotor became Spivey's life's work and, in many ways, his life.

> Spivey quickly learned that selling a dream, no matter how much you believed in it, was a lot like being a missionary. You had to make one convert at a time, and you had to have a lot of faith. The more Spivey preached the tiltrotor gospel, the more faith and fervor he put into his mission, the more his own faith in the dream machine grew.
>
> Virginia Copeland, who became his assistant twenty years later, joined Bell's marketing department in 1974. The XV-15 wouldn't fly for another three years, and hanging over Spivey's desk from a string attached to the ceiling was a model of it someone had hung to rib him. If you turned on a floor fan and aimed it up, you could make the little model sway in the air. Every now and then, Spivey would call out, "Come on, look at this! Someday that thing is going to fly! Someday you're going to see that in the air!" Spivey's enthusiasm wasn't limited to the XV-15. "If it tilted its rotor, he loved it," Copeland thought. Spivey really believed tiltrotors were going to change the world. "He couldn't figure out why everybody else couldn't see this," she said. . . .[44]

While few *Public Contract Law Journal* readers may be familiar with Dick Spivey, many readers will not be surprised to learn that Navy Secretary John Lehman played a prominent role in the program's formative years. Whittle analogizes Lehman to Winston Churchill at length.

> Lehman was brassy, and he took over the nation's Navy at a strikingly young age [of thirty-eight].

43. WHITTLE, *supra* note 1, at 36.
44. *Id.* at 50–51.

> Lehman also had famous relatives [including] . . . Princess Grace of Monaco, the former American actress Grace Kelly. . . . After Cambridge, Lehman worked for Henry Kissinger at the National Security Council in President Richard Nixon's White House. . . . All that and the backing of two powerful senators . . . helped Lehman land the Navy secretary job.
>
> Like the real Young Winston, Lehman seethed with ambition and audacity. He set bold goals and went after them boldly, and he ran the Navy like no secretary in memory before or since, bossing around older admirals in ways many found hard to swallow.[45]

Lehman quickly became enamored with the tiltrotor concept, setting in motion an extraordinary saga.

> When Lehman saw the XV-15 at the 1981 Paris Air Show, his pulse quickened. Lehman was a flyer . . . a bombardier-navigator in the A-6 Intruder fighter-bombers as a Naval Reserve lieutenant commander. . . . Lehman arrived at Paris and saw the XV-15 on June 5. That same day, the secretary's military assistant . . . started making . . . repeated visits to the Bell Helicopter chalet to deliver a message from his boss: Lehman wanted to fly in the XV-15. At the air show.[46]

One passage, describing an impromptu meeting when the Marines were looking at replacing their CH-46 helicopters, suggests both vintage Lehman decisiveness and the author's understanding of how important personalities are in the acquisition process.

> Over the years, Dick Spivey and other Bell reps had gotten a number of lower-ranking officers interested in the tiltrotor, but as far as those wearing stars on their shoulders were concerned, it wasn't in the running to replace the CH-46. Navy Secretary John Lehman was about to give the brass new instructions. . . .
>
> [General] Kelley and [Vice Admiral] Seymour sat down on a sofa opposite of Lehman, who got right to the point. "I am not going to spend two billion dollars of non-recurring cost to evaluate a new helicopter," he told them. The United States was now competing with the Soviet Union not just militarily but economically and for global leadership in aerospace. "I want to bring the Marine Corps into the twenty-first century on the leading edge of technology, and that leading edge is tiltrotor," Lehman said.
>
> As far as Kelley was concerned, that was that. "I went back to Headquarters . . . and I said, '[t]he decision has been made. It's not going to be another helicopter. It's going to be the tiltrotor concept.'" From then on, as far as the Marines were concerned, they were going to buy a tiltrotor.[47]

45. *Id.* at 84. Whittle is not alone singling out Lehman's impact during this era. In his critique of the A-12 debacle that overlapped much of the V-22's development, author James Stevenson explained, among other things, that "Lehman had a message and he immediately began to convey it. . . . When John Lehman came to the navy, he held strong opinions developed from his previous experience, which included serving on the National Security staff. . . . John Lehman had come into the Pentagon like a swaggering buccaneer[.]" JAMES P. STEVENSON, THE $5 BILLION MISUNDERSTANDING: THE COLLAPSE OF THE NAVY'S A-12 STEALTH BOMBER PROGRAM 25, 27, 30 (2001).

46. WHITTLE, *supra* note 1, at 83.

47. *Id.* at 87–88.

To the extent that cost estimating, cost control, and the management of cost overruns play a prominent role throughout Whittle's book, seasoned practitioners will find it refreshing that David Chu features prominently in the book.[48] Grasping Chu's role is a credit to Whittle's understanding of the importance and intricacies of the cost-estimating bureaucracy. For example, one of the many times the Osprey's prospects dangled by a fraying thread arose when Vice President Cheney cut the defense budget and defunded the project. Upon hearing the news, Spivey's mind raced in disbelief:

> What was Cheney thinking? Weren't the Marines telling him how important the Osprey was to them? Had anyone explained to Cheney how important the tiltrotor was to civilian aviation? Didn't he understand that the tiltrotor was a national asset? Who in the world had talked Cheney into this?
>
> The answer was Pentagon bureaucrat David Chu, the tall, slender, cerebral economist who ran the Office of Program Analysis and Evaluation, PA&E, whose by-the-numbers, dollars-and-cents assessments could torpedo an expensive procurement. Chu had a lot of clout, partly because he had a lot of experience. Civilian leaders at the Pentagon are by and large political appointees who stay a couple of years. Chu had come to PA&E as its director from the Congressional Budget Office in May 1981, kept the job through the Reagan administration, seen his title elevated to Assistant Secretary of Defense for Program Analysis and Evaluation in 1988, and been asked to stay when President Bush took office in 1989. Chu liked it in the Pentagon, where everyone called him "Dr. Chu."[49]

Unlike others, Chu was not afraid to question Lehman's decision to build a tiltrotor instead of purchasing proven helicopter technology:

> Chu's opinion hadn't changed since 1983, when he told the Marines they might be better off buying a mix of Sikorsky Aircraft's UH-60 Black Hawk and CH-53E Super Stallion helicopters rather than investing the time and money it would take to develop a tiltrotor to replace their CH-46 helicopters. John Lehman and the Marines had brushed Chu's argument aside. In 1986, when the Osprey needed Defense Systems Acquisition Review Council approval to go into Full Scale Development, Chu tried to stop it again. Lehman and the Marines won that debate, too. "Lehman made a command decision that he was intrigued by this technology, thought it was revolutionary in character," Chu told me. "The sincere difference of view is, we couldn't see the revolution. We, the analytic community, couldn't see what the payoff was to this investment." Chu didn't have anything against the tiltrotor, he just thought it too rich for the Marine Corps' blood. He also didn't buy the idea that the tiltrotor was going to revolutionize civilian aviation but had to be developed by the military first. Chu believed in the wisdom of the free market. If the tiltrotor was that desirable for civil aviation, why wasn't the private sector developing it already, he wondered? If the Defense Department

48. Like Lehman, Chu is a major player in the A-12 saga. *See* STEVENSON, *supra* note 45, at 30. Chu is described as far less strident in his role in the well-known retelling of the Bradley Fighting Vehicle history. *See* JAMES G. BURTON, THE PENTAGON WARS: REFORMERS CHALLENGE THE OLD GUARD 77, 272 (1993) ("Chu had lost his enthusiasm for solving this problem. He hemmed and hawed and tap-danced all around the subject but gave no instructions on what to do. . . . Too many times . . . [Chu's] responsibilities were abrogated in favor of the politically expedient course of action.").

49. WHITTLE, *supra* note 1, at 172–73.

> needed to pay to develop the Osprey, that was a strong signal that the tiltrotor must not really be all that attractive economically. To Chu, this was simple logic.[50]

In exposing the power that individuals (other than, say, Contracting Officers) exert on acquisitions, *The Dream Machine* reveals a contract planning process worlds away from the order of the FAR and the objectivity of the DoD report. The political and bureaucratic influence that pervades the planning process spills over into contract formation and continues throughout each contract's administration. The pressure on agency officials and contractor management to reconcile expenditure to funding, constantly change requirements, and hew to arbitrary schedules appears to trump considerations of quality and safety. Unfortunately, in the case of the Osprey, those skewed incentives ultimately led to the avoidable loss of lives.

VI. MISTAKES WERE MADE

During what Whittle refers to as the Osprey's "Dark Ages," mistakes were made. For anyone who has ever read a Government Accountability Office (GAO), DoD Inspector General, or RAND Corporation report on a troubled weapons system, the story sounds familiar.

> There were a lot of reasons things had gone so wrong over the years. The overly ambitious requirements of the original . . . program, the companies' blithe assurances on schedules and lowballing of bids, the attempt to cram so many new technologies into a new kind of aircraft, the 50-50 Bell-Boeing partnership and their culture clash, the design compromises dictated by the need to fly from amphibious assault ships, former Navy Secretary John Lehman's insistence on a fixed-price development contract, funding shortfalls during [Defense Secretary] Cheney's attempt to cancel the Osprey, the push by the Marines to get the Osprey into service as fast as possible. . . . *Most agreed . . . that the biggest mistake had been allowing time—schedules—to drive the program.*[51]

Of course, perspectives differ. Indeed, "Spivey blamed the machinery of procurement—the way the Pentagon buys weapons—rather than the machine itself for the Osprey's troubles."[52] Similar concerns were recently reiterated—in a broader context—by Linda P. Hudson, then-CEO of BAE Systems Inc., suggesting that history repeats itself:

> [D]efense contractors . . . are caught in a perfect storm of our own when it comes to our ability to deliver for warfighters and the taxpayer—a storm created by an unprecedented confluence of political, economic and social factors on multiple fronts.
>
> First . . . we have been blown by budget winds into three fiscal cliffs in barely more than a year and a half. . . . [S]econd . . . is a howling gale of contradictions between the nation's long-term fiscal direction and the realities of an increasingly unstable

50. *Id.* at 173.
51. *Id.* at 333 (emphasis added).
52. *Id.* at 389.

> and dangerous world. . . . [O]ur nation is up against growing threats to our security, and rising expectations on our military forces and the contractors who supply them. . . . [T]hird . . . is the downward pull of a defense procurement process that: takes longer, costs more, and delivers less than it should; includes an "atrophied" acquisition workforce . . . lacks systems engineering expertise . . . [and] lacks a sufficient, two-way partnership with industry. . . . [Fourth: contractors] are in danger of being swept over by a rising, increasingly expensive and exhausting wave of regulations and disclosure requirements unrelated to our mission.[53]

The recent DoD performance assessment report and the V-22 case study reinforce the inescapable truth that cost growth happens. Cost growth seems inevitable in MDAPs to the extent that they typically involve R&D,[54] longer running programs, and continuous unscheduled introduction of new and evolving technologies, processes, materials, vendors, and threats. Indeed, the DoD report catalogued seven different kinds of cost growth, each differentiated by underlying behaviors during contract planning and management: (1) well-managed, (2) premature start, (3) premature start with poor estimate, (4) work added later, (5) work added later with poor estimate, (6) poor estimate only, and (7) poor contract management.[55] Regardless, whether one prefers to focus on the generic label "cost overrun" or think in terms of unit cost, the cost growth over the life of the V-22 program—

53. Linda P. Hudson, *The Perfect Storm for Defense*, 55 GOV'T CONTRACTOR ¶ 119 (Apr. 17, 2013) (from the keynote presentation at the March 14, 2013, George Washington University Law School Program *The Intersection of Competition and Procurement Policy*). *See also* Dion Nissenbaum, *Cut Defense? A Fight Begins*, WALL ST. J. (last updated Apr. 23, 2013, 12:31 PM), http://online.wsj.com/news/articles/SB10001424127887323551004578439243072042424 ("Executives from BAE Systems . . . and . . . its suppliers are heading to Washington, D.C., . . . [to] lawmakers to divert millions of dollars to . . . continue work on the Army's fleet of Bradley fighting vehicles."); Marjorie Censer, *BAE Systems Names New Chief Executive Jerry DeMuro*, WASH. POST (Jan. 7, 2014), http://www.washingtonpost.com/business/capitalbusiness/bae-systems-names-new-chief-executive-jerry-demuro/2014/01/07/923c3f04-77a5-11e3-8963-b4b654bcc9b2_story.html ("Arlington-based U.S. unit of contracting giant BAE Systems . . . selected Gerard J. DeMuro, formerly of General Dynamics, to . . . [replace] Linda Hudson, the first woman to head a major U.S. defense contractor.").

54. *See* DOD MDAP REPORT, *supra* note 5, at 109.

> Acquisition is about risk management—not certainties. Especially for major weapons systems acquisitions—which almost always involve research and development—uncertainties imply cost, schedule, and performance risks relative to early estimates. These risks diminish as we move from research to development through production to sustainment, but their realization may result in cost and schedule growth. These risks also require use of different management tools (such as the right contract types and incentives) at different stages to mitigate risks and motivate industry to achieve the lowest possible total price to the government. We must monitor and explain risks, but it is important to remember that developing technologically superior military capability is not a risk-free endeavor.

Id.

55. *Id.* at 46. We encourage readers not to skim over the irony of this incongruity. On the one hand, DoD acknowledges that cost growth is justified, nay, inevitable, given the unavoidable changes constantly experienced in, among other things, circumstances and technology. Nonetheless, DoD's matrix of common cost drivers, which appear largely based upon planning failures and management deficiencies, suggests that the most significant variable—unpredictable but unavoidable evolution—somehow can (or should) be controlled.

measured in terms of orders of magnitude rather than percentages—was jaw dropping.

> Calculating from the first contract in 1983 and including inflation, [the Osprey's] total cost was expected to top $54 billion—a full $13 billion more than estimated in 1982 for what at the time was expected to be nearly three times as many aircraft.[56]

Legal and regulatory insiders—and, no doubt, experienced Hill staffers—may be disappointed that Whittle never specifically mentions that the V-22 suffered a Nunn-McCurdy breach,[57] despite extensive discussion of congressional appropriation and oversight wrangling. And, not surprisingly, cost control remains a concern. In 2011, GAO explained:

> [T]he aircraft has experienced reliability and readiness issues that have resulted in high maintenance and operating costs. . . . [T]he program has undertaken several initiatives to understand and reduce operations and maintenance costs after it became apparent the MV-22 was exceeding its budgeted cost per flight hour. The program developed a new cost model to increase the quality and accuracy of cost per flight hour estimates and established a team to identify cost savings opportunities.[58]

While there are many culprits for the Osprey's problems, Lehman's critics, of course, would assume that these types of problems derive from the reliance—especially during the Lehman-era obsession with fixed-price R&D work—upon certain, disfavored types of contracts.

> [Lehman] was sick of cost overruns. . . . He wasn't going to have another one. Go back and make the Osprey contract "fixed price," Lehman told the Navair officials. Under a fixed-price contract, the companies would have to finish [full scale development, or FSD,] . . . at their own expense if they busted the ceiling price.
>
> Lehman wanted something else . . . a "Not to Exceed" price—a cap—on how much Bell-Boeing could charge for each Osprey in the first couple of lots produced. . . .
>
> Bell president Horner nearly fell off his chair when he heard Lehman's demands. It would be a *huge* gamble. . . . All kinds of unforeseeable problems might arise that would increase the cost, things engineers call "unknown unknowns" or "unk-unks." The companies would be *nuts* to agree to a fixed price for FSD, Horner thought.
>
> On October 10, 1985, Horner [and a number of other executives] . . . went to the Pentagon hoping to reason with Lehman. . . . The executives stormed out, their

56. WHITTLE, *supra* note 1, at 391.

57. "The Nunn-McCurdy Act requires DoD to report to Congress whenever a major defense acquisition program experiences cost overruns that exceed certain thresholds. The . . . act was to help control cost growth . . . by holding the appropriate Pentagon officials and defense contractors publicly accountable and responsible for managing costs." MOSHE SCHWARTZ, CONG. RESEARCH SERV., R41293, THE NUNN-MCCURDY ACT: BACKGROUND, ANALYSIS, AND ISSUES FOR CONGRESS (2010), *available at* http://www.fas.org/sgp/crs/misc/R41293.pdf.

58. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-233SP, DEFENSE ACQUISITIONS: ASSESSMENT OF SELECTED WEAPON PROGRAMS 151 (2011) [hereinafter GAO-11-233SP].

> faces red. . . . [Beverly] Dolan [chief executive officer of Bell corporate parent Textron Inc.] couldn't believe Lehman's arrogance.
>
> [Lehman knew] the government was partly to blame for cost overruns. . . . Government program offices had a bad habit of changing requirements and making contractors add or upgrade gear as ships and aircraft were being developed. That added costs. This would be the beauty of a fixed-price contract. . . . Navair wouldn't be able to do that on the Osprey because the companies could just say no to changes that weren't reasonable, tell Navair they wouldn't do them without extra money.[59]

We find Lehman's faith in fixed-price R&D contracts misplaced. Indeed, we are not surprised by DoD's recent conclusion that intelligent application of acquisition of fundaments, *not contract type alone*, is the best way to curtail cost growth:

> Analysis of past acquisitions shows that, when controlling for other factors that contribute to contract cost performance, contract type alone (e.g., fixed price or cost-reimbursable) does not predict lower cost growth in development or early production contracts. This suggests that relying on contract type alone to achieve better affordability outcomes will not likely be successful. This does not absolve us from the need to carefully consider and select the most appropriate contract type given the maturity, system type, and business strategy for each system.[60]

Of course, history already has demonstrated that Lehman's use of a fixed-price contract did not fortify Bell or Boeing with the backbone necessary to resist the government's changing requirements; and costs continued to rise.

> In 1998, Bell and Boeing could see they were going to overrun their . . . FSB contract badly, and, under the fixed-price terms, there was no end to the red ink in sight. Lehman's theory that a fixed price would let the companies resist Navair demands for changes in the design wasn't panning out. Navair kept insisting on changes and the companies felt they had to go along to stay on good terms with The Customer.[61]
>
> As with most major military purchases . . . the Osprey buy was going to be spread over more years to keep annual defense budgets down. The smaller buy, the stretched-out production schedule, and the cost of the design changes, as well as inflation, were going to make the Osprey a lot more expensive than originally advertised.[62]

It is one thing for changing requirements to increase costs and delay production. When coupled with increasing pressure to produce quickly, quality and safety suffer, with the potential for tragic consequences.

59. WHITTLE, *supra* note 1, at 147–49.

60. DOD MDAP REPORT, *supra* note 5, at 110. *See also* Memorandum from the Under Sec'y of Def. for Acquisition, Tech. & Logistics to the Def. Acquisition Workforce on Better Buying Power 2.0: Continuing the Pursuit for Greater Efficiency and Productivity in Defense Spending (Nov. 13, 2012), *available at* http://www.acq.osd.mil/docs/USD(ATL)%20Signed%20Memo%20to%20Workforce%20BBP%202%200%20(13%20Nov%2012)%20with%20attachments.pdf (identifying the initiative "Employ appropriate contract types").

61. WHITTLE, *supra* note 1, at 164–65.

62. *Id.* at 245.

> By Defense Department regulation, a new aircraft can move from [Low Rate Initial Production or] LRIP into Full Production—where contractors make their greatest profits—only after passing both developmental testing, conducted by special test pilots and engineers, and operation testing, conducted by military pilots and personnel. . . .
>
> Like the Osprey itself, its flight test program had been radically redesigned after Bell and Boeing got their EMD [engineering and manufacturing] contract in 1992. The companies were reluctant, but Navair ordered them to consolidate developmental testing, the kind done by professional test pilots. . . . Navair also rejected a Bell-Boeing proposal to build six new prototypes, saying it would cost too much. . . .
>
> The Osprey wasn't the only program being treated that way. "Tremendous oversight pressures from governing bodies and funding sources are dictating shorter program schedules, less flying and avoidance of hazardous testing altogether," *Aviation Week* reported in its June 12, 1995 issue. "Flight officials are adamant that skimping on development testing is much more expensive in the long term. They unanimously agree that, if there is any chance that a fighter, helicopter or transport aircraft can get into a particular flight condition, sooner or later it will. At that point, the man or woman flying the aircraft in line service becomes the test pilot, if that condition was skipped or deleted from the original evaluation." For the Osprey, that warning proved prophetic.[63]

A popular Pentagon adage, attributed to General George S. Patton, is that a good plan executed violently today is better than a perfect plan tomorrow. Because this practice is both understood and widely accepted, contractors willingly sign government contracts, despite the very real risk of catastrophic failure and monumental losses (and, of course, endless litigation).

> In August [of 2001], the Pentagon inspector general's office . . . question[ed] whether the Osprey was ready for Full Rate Production. The report said the Navy Department had let the Osprey go into [Operation Evaluation (OPEVAL)] before it was ready, waiving twenty-two requirements that should be tested before the aircraft was fielded. . . .
>
> "The desire to meet milestones resulted in demands being made to complete operation test and evaluation quickly . . . rather than delaying the program and risk losing the funding," the report concluded. . . .
>
> A few weeks later, despite the disappointing results in the report, the Navy's Operational Test and Evaluation Force declared that the Osprey had passed OPEVAL and was "operationally effective" and "operationally suitable," two legal standards a major new piece of defense equipment must meet.[64]

This constant willingness to cut corners to cut cost and meet schedule culminated in some of the most jarring passages in the book. Unaware that a flight line mechanic, bitter about the loss of life in a recent V-22 crash, had concealed a tape recorder, a military officer told a meeting of maintainers

63. *Id.* at 248–49. *See, e.g.*, FAR pt. 34 (suggesting an orderly progression through a series of contracts for concept exploration "for relatively short periods . . . to refine the . . . concept and to reduce . . . technical uncertainties"; demonstration; full-scale development; and, ultimately, full production). *See also* Interim DoD Instruction 5000.02, *supra* note 4.

64. WHITTLE, *supra* note 1, at 288–89.

that the squadron needed to increase its readiness rate up, even if that meant lying:

> [T]he new reporting system was a problem. With the old system . . . it was possible to "screw with the data a little bit," but the new system "does not let us lie. The problem is, we have it here and we need to lie. And the reason we need to lie—or, or manipulate the data, or however you want to call it—is that until Milestone III comes along, and Milestone III being a Full Rate Production decision, this program is in jeopardy."
>
> Over the next twelve days . . . the [reported] readiness rate of . . . [the] Ospreys each day was 100 percent.[65]

In addition to the perverse incentive structure that led cost and schedule to be valued more than safety and quality, another source of problems derived from management missteps by Boeing and Bell. Some of this was by design; the fifty-fifty partnership between Bell Helicopter and Boeing Vertol meant that there was no definitive say between two very different companies. This concern was articulated by Navy Secretary Gordon England:

> The Osprey's biggest problem . . . had been poor management. . . . Bell-Boeing's 50-50 partnership, which left neither company in charge, had led to bad or tardy decisions when disputes couldn't be settled. [Accordingly, the Marine Corps' program manager] ordered Bell and Boeing to move their Osprey office to Pax River . . . [where] company and Navair engineers would work in "Integrated Product Teams" with adjoining offices.[66]

Lehman complicated the management issues even further when he insisted on breaking up the partnership and forcing the companies to eventually compete with each other. That sounds great in a vacuum, but any such decision leads to unintended consequences.[67] Describing the 1980s procurement reforms, around the time of the Competition in Contracting Act (CICA) and the Ill Wind Debacle, Whittle explains:

> One of Lehman's big ideas for the Osprey program was to use it as a test case for his belief that free market competition could cure the ills of military procurement. Four years into the Reagan administration, it was clear to everyone who was paying attention that the defense procurement system was riddled with waste, fraud, and abuse. . . . Lehman wasn't the only one who thought competition was the cure for this cancer. . . . Congress passed a range of . . . reforms largely aimed at injecting more competition into military contracting. More competition . . . would keep contractors honest, hold prices down, and stop cost overruns. . . . [So,] Lehman decided to split the two companies up after they had designed and built a dozen or

65. *Id.* at 307.

66. *Id.* at 349.

67. *See generally* J.B. Ruhl, *Law's Complexity: A Primer*, 24 GA. ST. U. L. REV. 885 (2008); Eric Kades, *The Laws of Complexity and the Complexity of Laws: The Implications of Computational Complexity Theory for the Law*, 49 RUTGERS L. REV. 403 (1997); J.B. Ruhl & Harold J. Ruhl Jr., *The Arrow of the Law in Modern Administrative States: Using Complexity Theory to Reveal the Diminishing Returns and Increasing Risks the Burgeoning of Law Poses to Society*, 30 U.C. DAVIS L. REV. 405 (1997); J.B. Ruhl, *Complexity Theory as a Paradigm for the Dynamical Law-and-Society System: A Wake-Up Call for Legal Reductionism and the Modern Administrative State*, 45 DUKE L.J. 849, 906 (1996).

> so Ospreys and make them compete with each other for production contracts[,] . . . [which he] called his "leader-follower" policy. . . . *Lehman's decision . . . drove a wedge between the companies.* Executives and engineers at both became wary of sharing all the information they should with a partner they would have to go head-to-head against in just a few years. . . .[68]

At the end of the day, the product's quality suffered, and a review commission found

> a lot of things wrong with the Osprey. The nacelles were "extremely poorly engineered," . . . [former Lockheed Martin CEO] Norm Augustine [said]. . . . "Just Engineering 101 failings." There had been too little flight-testing before Marines were allowed to ride in the back, and despite the billions spent, the Osprey had been "funded on a shoestring," Augustine said, creating parts shortages that helped explain its poor maintenance and reliability record.[69]

VII. THE TYRANNY OF (UNREALISTIC, ARBITRARY) SCHEDULES: THE PRICE OF FREEDOM?

The combination of suboptimal management, willingness to push limits to meet arbitrary schedules, and periodical eschewing of precautions to cut expenses ultimately exacted a fatal price. One of the earliest signs of trouble arose in 1991, when Aircraft 5 lifted off the ground for its first flight test:

> Five seconds into the flight, by the time they were ten feet in the air, test pilot Grady Wilson knew he had a tiger by the tail. A minute and a half later, he was sure he and his copilot were about to meet their maker.[70]
>
> Aircraft 5 heaved into the air unsteadily, wobbling from side to side like a patient standing up after months of being bedridden. Wilson couldn't make it do what he wanted. The stick felt sluggish, unresponsive. . . .
>
> The more Wilson tried to control it by moving the stick, the more out of control the Osprey got. . . . The wrestling match didn't last long. The Osprey's wing rolled wildly to the left, then wildly to the right, then back to the left so far that the left rotor dug into the concrete, spewing chunks of composite as its blades disintegrated. With the right rotor still intact and whirling, the Osprey performed a ghastly pirouette on its left nacelle, heeled over like a sinking ship, burrowed its nose into the runway, then plowed along with flames and black smoke pouring from underneath until it skidded to a stop.[71]

The incident investigation revealed an embarrassing lack of safety protocols at the Boeing facility in Wilmington:

> Workers at Wilmington showed signs of being rushed. Government inspectors had been complaining for months about sloppiness at the facility. The inspectors kept finding FOD—foreign object debris—in and around the Osprey prototypes there. FOD, which rhymes with *sod*, is anything that might damage an aircraft. . . .

68. WHITTLE, *supra* note 1, at 146–47 (emphasis added). *See also* ANDY PASZTOR, WHEN THE PENTAGON WAS FOR SALE: INSIDE AMERICA'S BIGGEST DEFENSE SCANDAL (1995).
69. WHITTLE, *supra* note 1, at 325.
70. *Id.* at 196.
71. *Id.* at 198–99.

> FOD sucked into a turbine engine can cause thousands of dollars worth of damage, even a crash. . . .[72]

> Aircraft crash for many reasons, often because of mundane things like FOD set in motion a sinister chain of events. FOD didn't cause Aircraft 5 to crash, but inattention akin to what led [to] the FOD problem at Boeing's flight test center did.[73]

The investigation found that two of the three roll-rate vyros, aspects of the Osprey's electronic flight controls, were wired in reverse. After Boeing fixed that initial problem with the vyros in 1988, whoever rewired the vyros failed to fill out the paperwork showing that the task was completed. Months later, workers found an open order to reverse two of the vyro wires and, in doing so, undid the correction done previously.[74]

While the crew in Aircraft 5 walked away relatively unscathed, not all of the Osprey's victims would be so lucky. One of the most haunting Osprey disasters took place during a mock embassy evacuation at the Marana, Arizona, airport, the very type of mission for which Spivey and other believers had long touted the tiltrotor as ideal:

> After the first two aircraft approached the airfield and tilted their rotors upward to land, a nightmare began. Without warning, the second Osprey snapped into a right roll and plowed into the ground with its belly up. It exploded into a fireball that lit the evening sky for miles. Rock saw the orange flames in his rearview mirror as his Osprey circled five miles away. Four of Rock's squadron mates and fifteen other marines riding in the back of the Osprey that went down were killed instantly.[75]

Many thought the Osprey would never recover from the accident at Marana:

> Reduced to reviewing and revising maintenance manuals . . . Osprey pilots began to fear they might never fly the tiltrotor again—might even be tainted by having flown it at all. Critics were calling the Osprey a boondoggle and a death trap, a "widow-maker." They said the marines were foolhardy at best and delusional at worst for wasting so many taxpayer dollars and so many promising lives on such a Rube Goldberg contraption. The Osprey's foes urged the Pentagon and Congress to destroy the beast before it killed again.[76]

Due to the ongoing presidential campaign, the political fallout from the Marana crash was relatively short-lived,[77] but pressure from management to perform at all costs increased significantly. On July 20, 1992, Aircraft 4 skipped its planned refueling in Charlotte to make sure it arrived in D.C. on schedule; mechanical problems earlier that day had forced the crew to depart a few hours behind schedule. Little did anyone know that an improperly installed oil seal was allowing fluid to leak and pool at the bottom of one of the Osprey's engine cowlings. The Osprey arrived in D.C. well ahead of

72. *Id.* at 197.
73. *Id.* at 201–02.
74. *See id.* at 202.
75. *Id.* at 3.
76. *Id.* at 4.
77. *Id.* at 288.

schedule, but as soon as the pilot, Pat Sullivan, tilted the nacelles up to land, the fluid ignited, setting off a chain reaction that sent Aircraft 4 plummeting into the Potomac and taking the lives of all on board.[78] The resulting investigation led some to blame Boeing management for putting an unsafe amount of pressure on the crew to arrive on time.

> Many who studied the accident said it might not have happened if Aircraft 4 had landed in Charlotte as planned. By then, too little fluid might have pooled in the right nacelle's cowling to start a fire when it drained into the engine. Many also said [that pilot] Pat Sullivan surely would have landed in Charlotte if he hadn't felt pressured to get Aircraft 4 to Quantico so the generals could see it. The Naval Court of Inquiry concluded, "There was tremendous pressure on Mr. Sullivan to get the aircraft to Quantico at the proper time on Monday, 20 July."
>
> Boeing denied that management pressure was a factor. In a ground-breaking investigation of the crash published on November 14, 1993, however, reporter Nathan Gorenstein of the *Philadelphia Inquirer* cited contrary evidence in an "internal Boeing review of the company's test flight operations" he had obtained. The review, Gorenstein reported, "concluded that the V-22 and other Boeing Helicopters test flight programs had a 'high probability of safety being compromised due to budget and schedule pressures.'"[79]

VIII. V-22 PROGRAM: SUCCESS, FAILURE, OR TOO EARLY TO TELL?

Despite the problems the Osprey experienced and the numerous obstacles it overcame, the final chapter of Whittle's book, detailing the Osprey's success in Iraq, suggests the potential for a happy ending. Of course, even in fiction, we've learned to take "happily ever after" with a grain of salt. But it comes as no surprise that the Osprey's Phoenix-like ability to survive ultimately hinged upon the ever-shifting winds of political reality.

> 9/11 had changed the defense debate in Washington. . . . Now the nation was at war and Congress wanted U.S. troops to have whatever weapons could help them win. . . . [T]hat December, Congress . . . appropriated $1.3 billion to build eleven new Ospreys in the next fiscal year and fund the redesign and retesting Navair . . . wanted to do.[80]

Given the number of crashes in development and, specifically, the high number of fatalities associated with those incidents, the author cannot avoid the human costs associated with developing sophisticated weapons systems.

> [Marine Corps Commandant General James Conway said,] in March 2007, that the Osprey might go to Iraq and do well there, then added: "I'll tell you, there is going to be a crash. That's what airplanes do over time. We're going to have to accept that when it happens."
>
> Conway was stating the obvious—virtually every aircraft crashes at some time—and apparently trying to prepare the public for the blow should an Osprey go down in Iraq.[81]

78. *Id.* at 217–35.
79. *Id.* at 236.
80. *Id.* at 341.
81. *Id.* at 376.

Once finally deployed, however, the Ospreys appear to have met, if not exceeded, expectations. On the one hand, the Ospreys arrived in Iraq after the Marines in Anbar had already finished most of the fighting. Mechanical problems initially lowered the squadron's readiness rate, but ultimately those problems only prevented the squadron from flying in five of the five hundred missions assigned over the seven months they were deployed. Moreover, the five "dropped" missions, all in the first two months, can be written off as growing pains.[82] The squadron ultimately "ended up carrying 18,000 passengers and 1.4 million pounds of cargo during its seven months in Iraq[.]"[83]

> By mid-2009, two more Marine Corps squadrons had used the [same] Ospreys . . . in Iraq for seven-month deployments. . . . The three squadrons combined had flown more than eight thousand combat hours . . . moving thousands of passengers and thousands of tons of cargo without a crash or a serious mishap. The Air Force had flown four other Ospreys 5,300 miles across the Atlantic . . . using midair refueling, used them to carry troops on mock special operations missions during a fifteen-nation military exercise in the Sahara, then flown the Ospreys back the same way. The Air Force Special Operations Command later put the few Ospreys it had into service.[84]

Overall, the Osprey appears to have proven extremely reliable during its service in Iraq. Still, as forecast above, aircraft did crash. Two Ospreys—the Air Force variant—were lost in Afghanistan[85] and closer to home, in Florida.[86]

---

82. *Id.* at 380.

83. *Id.* at 382. In the spring of 2011, the Government Accountability Office (GAO) reported that the program projected reaching 100,000 flight hours in early 2011. GAO-11-233SP, *supra* note 58, at 151.

84. WHITTLE, *supra* note 1, at 391–92.

85. *See* Mark Thompson, *So Why Did That V-22 Crash?*, TIME (Dec. 18, 2010), http://nation.time.com/2010/12/18/so-why-did-that-v-22-crash/. The author of this article, Mark Thompson, features prominently in the book for his report *V-22 Osprey: Wonder Weapon or Widow Maker?*, TIME (2007). *See* WHITTLE, *supra* note 1, at 377–79.

> In April 2010, a CV-22 crashed on an infiltration mission in support of ground forces in Afghanistan. . . . [T]he Air Force Accident Investigation Board reported that there were 10 substantially contributing factors to the accident and that they fell into four categories: mission execution, environmental conditions, human factors, and aircraft performance.

GAO-11-233SP, *supra* note 58, at 151. Thompson's article comments,

> [The crash] near Qalat, Afghanistan, . . . [killed] four of the 20 aboard, including the chief pilot. The . . . V-22 had to make a fast landing and flipped after its nose gear collapsed when it ran into a ditch. . . . [The Air Force's] decision largely shifts responsibility for the accident onto the shoulders of the dead pilot and his crew.

Thompson, *So Why Did That V-22 Crash?*, *supra*.

86. Richard Whittle, *Crash Drives Air Force to Restart CV-22 Pilot Formation Training: EXCLUSIVE*, AOL DEF. (Oct. 17, 2012), *available at* http://breakingdefense.com/2012/10/crash-drives-air-force-to-restart-cv-22-pilot-formation-training/.

> The Air Force plans to reinstate substantial formation flight training for . . . Osprey pilots that it eliminated four years ago. . . . Reinstatement of the training . . . is an implicit admission, V-22 aviators said, that better training might have prevented the June 13 crash. . . .
>
> The . . . accident near Eglin Air Force Base injured all five crew aboard, destroyed their $78.5 million aircraft and cost their squadron commander his job. The CV-22B crashed after its pilot flew through the rotor wake of an Osprey he was following in formation.

Id.

Another Marine Osprey crashed in 2012 in Morocco.[87] Despite this, many readers might be surprised to find that the author's most assertive statement of the aircraft's reliability can be found after both the book's publication and the three subsequent crashes. Although Whittle acknowledges, throughout the book, that helicopters are statistically (or empirically) less safe than fixed-wing aircraft, he never drives home this point in the stark terms he used after the book's publication. In July 2012, Whittle pulled no punches:

> Even counting two crashes of Air Force [version of the V-22] in the past two years, the Osprey's safety record has been exceptionally good since the aircraft was redesigned and retested a decade ago. Since Oct. 1, 2001, three Ospreys have crashed with a loss of six lives. During the same period, the U.S. military has lost 414 helicopters at a cost of 606 deaths.[88]

The saga of the Osprey, given the useful life of military airframes,[89] is just beginning. When Typhoon Haiyan devastated the Philippines in November 2013, the V-22 proved versatile, permitting the United States to provide tsunami relief deeper inland, rather than being limited to the coastal regions.[90] A V-22 recently completed a long-range transport from Spain to Senegal, totaling more than 1500 nautical miles and providing the Osprey's first appearance in West Africa. The Ospreys have been used in training with the Foreign Legion, and one successfully landed on a Japanese warship in the Asian Pacific Region.[91]

Beyond improving its track record in U.S. missions and, arguably, more important for its economic viability, the V-22 recently enjoyed its first sale

87. Richard Whittle, *Marines Peg "Bad Flying" as Cause of April V-22 Crash in Morocco*, AOL DEF. (July 9, 2012, 6:50 PM), http://breakingdefense.com/2012/07/marines-peg-bad-flying-as-cause-of-april-v-22-crash-in-morocco/.

> [T]he two pilots . . . were strapped into their seats and survived, though with severe injuries. The two enlisted crew chiefs . . . were killed. . . . [C]rew chiefs, like those on Marine Corps helicopters, ride in the back cabin and often stand during flights, secured only by a long strap attached to the aircraft to keep them from falling out if the back ramp is open.
>
> Despite being loaded with more than half [its fuel capacity] . . . the Osprey didn't catch fire after crashing, and its Crash Survivable Memory Unit, or "black box," was recovered . . . [and] showed conclusively that there were no mechanical problems with the aircraft.

Id.

88. *Id. See also* Military Channel Documentary, *available at* http://www.youtube.com/watch?v=PfDL_cqjD3o&feature.

89. To compare another airframe recently in the news, see Dion Nissenbaum, *Admirers Join Forces to Save "Warthog" Jet*, WALL ST. J. (Jan. 14, 2014, 7:33 PM), http://online.wsj.com/news/articles/SB10001424052702304887104579302180502232524 ("For more than two decades, the A-10 Thunderbolt II has provided aerial protection to ground troops"). The A-10's first flight was in 1972, more than 700 of the aircraft were manufactured through the mid-1980s, more than 350 remain in active service, and their current useful life is projected between 2020 and 2040. *See id.*

90. *See* Seth Robson, *Marine Ospreys Proving Their Worth in Phillipines*, STARS & STRIPES (Nov. 21, 2013), http://www.stripes.com/news/marine-ospreys-proving-their-worth-in-philippines-1.253818.

91. *See SP-MAGTF Deploys to Senegal*, SECOND LINE OF DEF. (Nov. 22, 2013), http://www.defenceweb.co.za/index.php?option=com_content&view=article&id=32788:sp-magtf-deploys-to-senegal&catid=56:diplomacy-a-peace&Itemid=111.

in the foreign military sales (FMS) program, and it looks like more sales are in the works. In April 2013, Defense Secretary Chuck Hagel announced an initial, relatively modest, sale to Israel,[92] with Japan committing to acquire seventeen Ospreys soon after.[93] Future sales may be on the horizon, as four Ospreys flew at the Dubai Air Show, and briefings on the Osprey were given to Australia, Brazil, Canada, Colombia, Italy, Qatar, Saudi Arabia, Singapore, and the United Arab Emirates (UAE).[94]

IX. CONCLUSION: MEASURING WHAT MATTERS

Conventional acquisition metrics deem the V-22 a classic defense acquisition horror story. The aircraft took too long to produce, it cost far more than its initial estimates, and it does not meet all of its promised performance specifications. Unfortunately, DoD's recent data-driven exercise suggests that the V-22 is not atypical (except for its resilience in the face of systemic adversity), all of which paints a rather dismal picture of defense weapons system acquisition.

Whittle's examination of the V-22, however, shines a light on important consumer metrics that Congress and, all too often, DoD fail to address. For example, pilots—what economists might call *end users*—appear to love the aircraft. Similarly, combatant commanders and relief organizations seem impressed with the V-22's ability to perform functions such as delivering personnel or supplies further inland from distant offshore (and, thus, less-exposed) naval platforms. Such efforts would either be impossible, infeasible, or dramatically more difficult or time-consuming if only conventional airframes and helicopters were available.[95] Sadly, the actual *utility* of the weapon system appears to be an afterthought when discussing acquisition performance. In other words, one of the most fundamental aspects of consumerism, *customer satisfaction*, remains starkly absent from DoD's performance assessment of the acquisition process. That is no small oversight.

92. *See* Andrea Shalal-Esa, *U.S. Military Sees Growth in Foreign Sales of V-22 Osprey*, REUTERS (Nov. 18, 2013), *available at* http://uk.reuters.com/article/2013/11/18/uk-airshow-dubai-osprey-idUKBRE9AH0A120131118 (six aircraft at an estimated price of $70 million each, plus the long-term potential of as many as a dozen more).

93. *See* Seth Robson, *Reports: Japan to Buy Ospreys, Global Hawks*, STARS & STRIPES (Dec. 16, 2013), http://www.stripes.com/news/reports-japan-to-buy-ospreys-global-hawks-1.257894.

94. *See* Shalal-Esa, *supra* note 92.

95. It seems tautological that—in determining whether the government received value for its money spent on a weapon system—that DoD must consider what missions it would have forgone (or how expensive the alternative solution would have proven) had the expenditure on the weapons system not been made. Secretary of Defense Rumsfeld quipped: "You go to war with the army you have, not the army you might want or wish to have at a later time[.]" Eric Schmitt, *Iraq-Bound Troops Confront Rumsfeld over Lack of Armor*, N.Y. TIMES (Dec. 8, 2004), http://www.nytimes.com/2004/12/08/international/middleeast/08cnd-rumsfeld.html?_r=0. But that does not mean DoD cannot or should not engage in retrospective cost-benefit analysis of that deployment and the tools employed if it wants to accurately assess the performance of the defense acquisition regime.

To that end, we hope that *The Dream Machine* plants the seed of another story line. Despite the newsworthy (and, now, book worthy) *procedural* failures associated with the V-22's evolution, the exercise generated a successful, unique, and potentially industry-altering military platform that may, in time, lead to significant commercial applications. Maybe—just maybe—the never-ending search for technological superiority on a constantly evolving battlefield must tolerate an inherent disconnect between the imagination of scientists and engineers seeking to advance the state of the art; the realities confronting manufacturing concerns that must produce and maintain these complex devices; and the highly complex, disaggregated, unpredictable, and often internally inconsistent customer that must make staggering, long-term economic investments to turn these dreams into reality.[96] Maybe it is short-sighted to obsess over developmental metrics (such as cost, schedule, and initial performance specifications) without consideration and longer-term analysis of (1) life-cycle costs (or total costs to purchase, field, deploy, arm, maintain, improve, sustain, and ultimately retire a weapon system), (2) effectiveness and utility, (3) opportunity cost (or, more specifically, some recognition of alternative investments not made as a result of a given acquisition strategy), and (4) customer (or end-user) satisfaction. In other words, a rarely used (or, worse, ineffective) weapon system delivered on time for a promised price that meets all of its contractual requirements is no bargain for taxpayers or the Defense Department.

As a result, it seems odd that DoD could embark upon such an ambitious assessment of the defense acquisition system's performance without embracing a prior, and seemingly relevant and critically important, DoD initiative: total ownership cost (TOC).[97] A simple anecdote speaks volumes on this topic:

96. Could it be that one pernicious externality of transparency is that we have become unduly focused on failure, focusing inordinately on the sunk costs of canceled programs, rather than properly accounting for the cumulative or all-encompassing costs of successful programs? Technological failures and false starts are common in the private sector, but these failures are rarely brought to market, nor are they subject to congressional oversight. Similarly, how does DoD's performance assessment account for the incremental advances achieved in pursuit of a canceled program that nonetheless reduce the risk of the subsequent developmental effort?

97. "Total Ownership Cost [(TOC)] includes all costs associated with research, development, procurement, operation, logistical support and disposal of an individual weapon system including the total supporting infrastructure that plans, manages and executes that weapon system program over its full life." Marion Eggenberger, Branch Head, DoD(ATL), Presentation on "Affording the U.S. Navy of the Future" (July 29, 2010) (referencing a July 29, 2009, joint letter from the Vice Chief for Naval Operations and the Assistant Secretary of the Navy for Research, Development, and Acquisition, and the Assistant Commander of the Marine Corps), *available at* http://www.nps.edu/Academics/Institutes/Meyer/docs/Eggenberger%20Monterey.pdf. The TOC discussion frequently begins with GAO's observation that, among other things:

> [DoD paid] little attention to operating and support costs and readiness at the beginning of development. . . . [DoD]'s organizational structure . . . limits collaboration and feedback among organizations charged with requirements setting, product development, and maintenance. . . . [But] in contrast, commercial companies . . . considered operating and support costs to be integral to their new product development decisions.

> [T]he SR-71 Blackbird was an extremely effective reconnaissance aircraft, but the Air Force was happy to retire the last of the fleet primarily due to the system operation cost, which was purported to be as high as $200,000 per hour in [total ownership cost] terms. As shown by this example, the excessive TOC burden of even the most capable weapon system becomes unbearable.[98]

Viewed through this lens, an unwavering focus on the three conventional acquisition metrics—contract cost, schedule, and performance metrics—seems antiquated, if not misguided. Whether calculating DoD's "bang for the buck" under the rubric of life-cycle costs, total ownership cost, or any of the other rubrics employed by DoD,[99] it seems inherently obvious that purchase price is just one of many factors and, in practice, may prove to be one of the least important over the life of a weapons system. As noted above, delays in months or years in delivering prototypes or early production aircraft seem relatively insignificant when an airframe's useful life might span three decades or more. As airframes are re-winged and new technologies are constantly introduced into weapons systems, the prototype's original performance specifications become increasingly trivial.

If our hypothesis is valid, DoD would be well served by trying to determine how to use the decades of data it has collected to better manage expectations, specifically, the all-too-often irrational optimism required to facilitate the pathologically inefficient courtship ritual involving contractors, government customers, congressional appropriators, and ever-proliferating oversight entities. The nature of research and development—the foundation upon which new acquisition programs are built—is inherently risky, unpredictable, and defined by error and adjustment, impediment identification and solution, and monk-like patience in overcoming seemingly impossible odds.

U.S. Gov't Accountability Office, GAO-03-57, Best Practices: Setting Requirements Differently Could Reduce Weapon Systems' Total Ownership Costs (2003). *See also* Dep't of Def., Report to Congress, Implementation of Recommendations on Total Ownership Cost for Major Weapon Systems 1 (2009), *available at* http://www.acq.osd.mil/se/docs/Rpt-to-Congress-Implemention-of-TOC-Sept2009.pdf; Danny L. Reed & Leon S. Reed, Inst. for Def. Analysis, Reduction of Total Ownership Costs (R-TOC) Best Practices Guide ES-1 (2003), *available at* http://www.theriac.org/pdfs/RTOC Guide.pdf.

98. Michael W. Boudreau & Brad R. Naegle, *Total Ownership Cost Considerations in Key Performance Parameters and Beyond*, 38 Def. Acq. Rev. Q. 109 (Feb.–Mar. 2005), *available at* http://www.dtic.mil/dtic/tr/fulltext/u2/a432879.pdf.

99. *See*, *e.g.*, Office of Cost Assessment & Program Evaluation (CAPE), Dep't of Def., FY 2012 Annual Report on Cost Assessment Activities apps. B & D (2013), *available at* http://www.cape.osd.mil/files/Reports/CA_AR_20130510.pdf (explaining: "Since 1982, the Congress has required DoD to track and report on the unit cost for most MDAPs."). The CAPE report assesses relevant metrics such as (1) program acquisition unit cost (PAUC) ("the total program acquisition cost (sum of research, development, test, and evaluation plus procurement plus military construction) divided by the total program quantity of fully configured end items"), (2) average procurement unit cost (APUC) ("the program procurement cost divided by the procurement quantity"), and (3) individual agency visibility and management of operating and support costs (VAMOSC) systems, which collect historical operating and support (O&S) costs for fielded major weapon systems. *See also* U.S. Gov't Accountability Office, GAO-09-3SP, GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs (Superseding GAO-07-1134SP) (2009).

If DoD's data analysis can help the government anticipate, quantify, and plan for that type of uncertainty and inefficiency, the exercise will pay significant dividends.[100]

Of course, the alternative is to continue to attempt to eliminate (or dramatically reduce) risk from the defense acquisition process. We know that it's easier, faster, less expensive, more predictable, and, in the end, more administratively efficient to buy today's commercial technology off the shelf. To the extent that those who seek to harm the nation have access to the same technology, that's not a satisfactory solution.[101] Maybe DoD's efforts will help temper expectations and put a price tag on the inefficiencies inherent in technological evolution. We don't know if quantifying such a price premium makes the inefficiency pill any easier to swallow, but we think it's a step in the right direction.

100. Which, of course, begs the question: "Does the DoD leadership have the will to demand that TOC [or, for that matter, any meaningful performance measures] be addressed seriously?" Boudreau & Naegle, *supra* note 98, at 118.

101. Then again, maybe the era of major defense systems has run its course. The military's most intimidating (and expensive) weaponry frequently took a back seat over the last decade in Iraq and Afghanistan. At the same time, legacy systems such as aircraft carriers, nuclear submarines, bombers, and fighter jets seem more likely to be targets than defenses against cyber attack. But the reality remains that the U.S. Government will continue to invest billions of dollars in sustaining and improving the nation's conventional military assets.