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Have Changes in Acquisition Policy Influenced Cost Growth of Major Defense Acquisition Programs?

David L. McNicol—joined the Department of Defense (DoD) in 1982, where, from 1988 until 2002, he was a Deputy Director of Program Analysis and Evaluation (PA&E). Earlier, Dr. McNicol taught at the University of Pennsylvania and the California Institute of Technology. He holds a BA in Economics from Harvard and an MS (Management) and PhD (Economics and Finance) from MIT. Employed at the Institute for Defense Analyses (IDA) since his retirement from the DoD, he became director of the Cost Analysis and Research Division in 2006. Still at IDA, Dr. McNicol stepped down in 2012 to return to his previous role as a Research Staff Member. [dmcnicol@ida.org]

Abstract

This paper is part of a series, several previous papers of which explored whether unit cost growth for major defense acquisition programs (MDAPs) is statistically associated with changes in acquisition policy over the period FY 1965–FY 2009. The project is now substantially completed and is being assembled into a final report. This paper presents the project's three main conclusions on the effects of changes in acquisition policy on MDAP cost growth. First, changes to the acquisition process implemented in 1969 reduced average growth in unit cost. These changes remained in place through the end of the period considered in this study (FY 2009) and, taking changes in funding climate into account, average unit cost growth remained at about the lower level stemming from the 1969 reforms. Second, the OSD-level oversight process has not been fully successful in responding to the increased pressures on cost growth during bust—as opposed to boom—funding climates. Third, again taking account of bust and boom funding climates, the experiments undertaken post-1969 on different contract types and relaxation of acquisition regulations seem not to have reduced either the cost of systems or growth in unit costs.

Introduction

McNicol, Tate, Burns, and Wu (2016) and McNicol (2017a) explored whether unit cost growth for major defense acquisition programs (MDAPs) is statistically associated with changes in acquisition policy over the period Fiscal Year (FY) 1965–FY 2009. Parts of this work were presented to the NPS Acquisition Research Symposia in 2016 and 2017 (McNicol, 2017b; McNicol & Tate, 2016). The project is now substantially completed and is being assembled into a final report. This paper presents the project's main conclusions on the effects of changes in acquisition policy on MDAP cost growth.

Framework

An early discovery of the project was that average unit cost growth of programs that pass Milestone (MS) B during a bust period is significantly higher than that of programs that passed MS B during a boom climate (McNicol & Wu, 2014).[1] For that reason, the analysis distinguishes between bust and boom funding climates. During the 45 years covered by this study (FY 1965–FY 2009), there were two complete bust-boom cycles in Department of Defense (DoD) procurement funding: (1) The bust climate for modernization of weapon

[1] The most developed explanations of funding climate and acquisition policy configuration are provided in McNicol (forthcoming, IDA, Chapter 1).

systems that began in the mid-1960s and lasted until the Carter-Reagan buildup of the early to mid-1980s, and (2) the long post–Cold War bust climate followed by the post-9/11 boom.

Where a bust funding climate may provide an upward pull on cost growth, the acquisition oversight process should provide a restraining push. Accordingly, it is necessary also to recognize changes over time in acquisition policy and process configurations. Five policy and process configurations are distinguished:

- McNamara-Clifford (FY 1964–FY 1969);
- Defense Systems Acquisition Review Council (DSARC; FY 1970–FY 1982);
- Post-Carlucci DSARC (P-C DSARC; FY 1983–FY 1989);
- Defense Acquisition Board (DAB; FY 1990–FY 1993 and FY 2001–FY 2009); and
- Acquisition Reform (AR; FY 1994–FY 2000).

"Policy" and "process" tend to be intertwined; process typically is required to implement policy, and the most successful and durable policies tend to be embedded in process. For this reason, and to avoid constant repetition of "process and policy," the term *acquisition policy* is used here in a broad sense to encompass both policy on particular topics (for example, contract types) and the Office of the Secretary of Defense (OSD)–level oversight process (for example, definition of the milestones).

Finally, a measure of cost growth is required. The measure used is based on Program Acquisition Unit Cost (PAUC). PAUC is the sum of Research, Development, Test, and Evaluation (RDT&E) cost and procurement cost, divided by the number of units acquired. For this paper, PAUC growth is computed by comparing the MS B baseline value of PAUC in program base-year dollars—which can be thought of as a goal or a prediction—to the actual PAUC reported in the program's last Selected Acquisition Report (SAR) in program base-year dollars and adjusted to the MS B baseline quantity. Appendix B of McNicol (2017a) describes the conventions used in assembling the database, the sources of the data used, and the quantity adjustment computations. The unit cost growth estimates were updated to the December 2015 SARs. Only completed programs (defined as programs with an end date of FY 2016 or earlier) are used in this analysis because some costs associated with a program may not be fully reflected in its SAR until the program is completed. To be clear, in what follows, the term *PAUC growth* means PAUC growth as defined above, that is, growth from MS B through the end of procurement, adjusted to the MS B quantity.

Success of the Milestone Review Process

Studies done in the past 20 years found no evidence that changes in DoD acquisition policy made after 1970 reduced cost growth on major systems acquisitions[2] (Christensen, Searle, & Vickery, 1999; McNicol & Wu, 2014; O'Neil, 2011). The conventional wisdom

[2] Under Secretary of Defense (Acquisition, Technology, and Logistics; USD[AT&L]; 2016) reports evidence that growth in the RDT&E portion of MDAP costs was lower than would be expected for a bust period (see, in particular, p. 13). This report and the earlier reports in the series (USD[AT&L], 2013, 2014, 2015) provide a comprehensive review of MDAP outcomes and changes in acquisition policy over roughly FY 2010 through FY 2016.

seems to have transformed this finding into a much stronger assertion—that OSD-level oversight of MDAPs has had no effect on their outcomes, or at least on cost growth.

The studies cited do not in fact reach this conclusion and could not, if only because they do not consider data prior to FY 1970.[3] In July 1969, David Packard, then Deputy Secretary of Defense, introduced a set of reforms. These reforms may well have reduced PAUC growth and they did remain in place over time. At the cartoon level, the 1969 Packard reforms may then have been analogous to a light switch. Of course, light comes on only if the bulb is good and circuit hot—that is, that decision makers to a reasonable extent embrace the relevant acquisition policies.

The light switch metaphor of the 1969 Packard reforms is examined in this section, first statistically and then historically.

Statistical Analysis

The first of the questions posed by the light switch metaphor is whether average PAUC growth after the introduction of the Packard reforms in July 1969 (the start of FY 1970) was significantly lower than that of the preceding McNamara-Clifford period. During the 10 years following the Packard reforms (FY 1970–FY 1980), average PAUC growth was 37%; average PAUC growth for McNamara-Clifford was twice that, 74%. There is more to the issue than just this comparison, however. In addition to the 1969 Packard reforms, three other factors may have had significant effects on the difference in average PAUC growth between the two periods:

- Program duration,
- Funding climate at MS B, and
- Proportion of programs that passed MS B in the period that entered a boom funding climate post MS B.[4]

In fact, these factors do not explain the higher PAUC growth of the McNamara-Clifford period:

- MDAPs in the database for the bust portion of the DSARC period had a longer average duration (15.1 years) than did those of the McNamara-Clifford period (13.1 years).
- The comparison is between the bust phase of DSARC (FY 1970–FY 1980) and McNamara-Clifford (FY 1965–FY 1969), which also was a bust climate.

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[3] The key point is made most clearly in McNicol and Wu (2014): "We have no fully comparable [Program Acquisition Unit Cost] PAUC growth data for the periods before the DSARC was established. Consequently, the statistical analysis leaves open the possibility that the DSARC and its successors provided a useful discipline on acquisition programs" (p. 7). Dews et al. (1979, Chapter IV) found that the 1969 Packard reforms led to lower PAUC growth. Drezner et al. (1993, pp. 28–30) found that this conclusion did not hold when account was taken of program duration. Using a model that accounts for funding climate and time spent in boom and bust periods (and therefore program duration), McNicol (forthcoming, Acquisition Research Symposium) finds that PAUC growth during the decade following the 1969 Packard reforms was significantly lower than that during the McNamara-Clifford period.

[4] On this, see McNicol (2017a).

- A higher proportion of programs that passed MS B in the bust portion of the DSARC period later entered a boom period (42 of 49); in comparison, only four of 16 McNamara-Clifford programs went on to enter a boom period.

In addition, a model that includes acquisition policy, funding climate, duration, and boom effects finds that average PAUC growth in the DSARC period was significantly less than it was in the McNamara-Clifford period (McNicol, forthcoming, IDA).

The second question posed by the light switch metaphor is whether the effects of the 1969 Packard reforms persisted. The statistical results indicate that they did. In particular, the model mentioned in the preceding paragraph finds that the average PAUC growth in the bust funding climates of each of the acquisition policy periods after the DSARC (P-C DSARC, DAB, and AR) was significantly lower than that of McNamara-Clifford. Apparently, the light switch remained in the "on" position.

Finally, are there statistically significant differences in cost growth between DSARC, P-C DSARC, DAB, and AR? As is discussed below, some initiatives on contract policy and regulation did affect PAUC growth. These effects do not come through in the averages. The averages, however, do not present an entirely consistent picture. On the one hand, the model cited above does not show any statistically significant differences in average PAUC growth among the four post McNamara-Clifford policy periods. One the other hand, when the acquisition policy bins (DSARC, P-C DSARC, DAB, and AR) are dropped from the analysis, we find a statistically significant decreasing trend (of about four-tenths of a percentage point annually) in PAUC growth.[5] Taking all of the evidence together, the safe conclusion is that given funding climate, PAUC growth did not increase over the period FY 1970–FY 2009 and may have shown a modestly decreasing trend.

Historical Evidence

The statistical results present straightforward historical questions: (1) Did the 1969 Packard reforms differ substantially from what came before? (2) Did they persist through the end of the period considered in this study (FY 2009)? These questions require that we look at what came before Packard—what his reforms reformed, the substance of the Packard reforms themselves, and changes in the Packard reforms over the four decades that followed.

Although the fact seems to have been dropped from the historical memory of the DoD acquisition community, the 1969 Packard reforms were reforms to a process established in February 1964 by then Secretary of Defense Robert McNamara. The initial version of this process, set out in Department of Defense Directive (DoDD) 3200.9, *Project Definition Phase*,[6] specified only a single milestone. A revision of this directive issued in July 1965 established a second milestone.

The DoDD 3200.9 process was built around Total Package Procurement (TPP), the use of which the directive required whenever it was feasible. In instances in which TPP was judged to be infeasible, use of a Fixed Price (FP) development contract was strongly

[5] See McNicol (forthcoming, IDA, Chapter 3).
[6] For a discussion of DoDD 3200.9, see Glennan (1965, p. 12).

encouraged.[7] A TPP contract covered Engineering and Manufacturing Development (EMD), procurement, and usually some aspects of Operations and Maintenance (O&M), each on a fixed price basis. These contracts were awarded after a competition. Approval at the first of the revised DoDD 3200.9's milestones authorized the Component to fund engineering development work sufficient to define the project at a level of detail that permitted the contractors (usually at least two) to write TPP contracts for EMD, procurement, and—often—aspects of O&M as well. This limited engineering development phase was to last at most six months.[8] With the proposals then in hand, the Service would (at the second milestone) seek authority to select one of the competing contractors and award a TPP contract.

The 1969 Packard reforms retained the basic architecture of the DoDD 3200.9 process but made major changes in three aspects of acquisition policy that directly influence PAUC growth:

- Policy on contract types,
- Definitions of the milestones, and
- The OSD-level milestone review process.

In addition, Packard stated more clearly policies on realistic costing and full funding, and changed the OSD process for monitoring cost growth during program execution.

Packard ruled out use of TPP: "[New complex defense] systems will not be procured using the total package procurement concept or production options that are contractually priced in the development contract." Packard also discouraged the use of FP development contracts: "Cost type prime and subcontracts are preferred where substantial development effort is involved." As a general matter, Packard's policy was that "contract type shall be consistent with all program characteristics including risk."[9]

Absent the insistence on the use of TPP, DoDD 3200.9's two milestones no longer made sense. New milestone definitions were then required. Packard's reforms defined three milestones:

- MS I—authorization to begin technology development,
- MS II—authorization to enter EMD, and
- MS III—authorization to begin Full Rate Production (FRP).[10]

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[7] Fox (2011) reports that McNamara "abandoned the TPP concept in 1966" (p. 38). This may be the case, but the source Fox cites is for the facts stated earlier in the paragraph. There is some evidence that TPP continued to be used through the end of the McNamara-Clifford period (see Poole, 2005, p. 83).
[8] DoDD 3200.9 (July 1, 1965, p. 9, para. VI.F.7).
[9] DoDD 5000.1 (July 13, 1971, p. 5, para. C.7).
[10] DoDD 5000.1 (January 18, 1977) was the first to give the milestones numbers. DoDI 5000.2, issued October 23, 2000, formally established MSs A, B, and C (in place of MSs I, II, and III) as the main decision points for an MDAP. The definitions are such that MS B is placed several months earlier in the process than MS II. At different times, MS C has been defined as the start of Low Rate Initial Production (LRIP) (MS IIIa until 2000) or FRP (MS III.)

Technology validation (or technology development) was not a new activity. The change made by Packard was that entry into the Validation Phase (i.e., technology development) required Milestone Decision Authority (MDA) approval (what was then called MS I—MS A post-2000). The important point, however, was not the requirement for MDA approval as such, but that the purpose of the Validation Phase was to ensure the technologies that a system would use were sufficiently mature to proceed into EMD. One of Packard's signature policies was "fly-before-you-buy." He encouraged building and testing a prototype during the Validation Phase but did not require it. Nevertheless, it is a reasonable guess that on average, MDAPs devoted more time and funding to technology development than was the case before the Packard reforms. Introduction of the Validation Phase probably did then reduce the risk of programs that came forward for MS II. Moreover, under the Packard reforms, EMD became a contractually distinct phase that the firm(s) were required to complete before they could gain authority (at MS III) to enter FRP. This, again, had the effect of embedding an aspect of "fly-before-you-buy" into the acquisition process.

In addition to the basic policy changes on contracting and the milestone definitions, Packard sought to better codify and regularize the OSD-level acquisition process. An important part of this was his establishment of the DSARC. The DSARC replaced the more ad hoc coordination process of DoDD 3200.9. DoDD 3200.9 itself was replaced with DoDD 5000.1 (July 13, 1971), issued after Packard had left the DoD. In 1975, the first version of DoDI 5000.2, *The Decision Coordinating Paper (DCP) and the Defense Systems Acquisition Review Council (DSARC),* was released. This instruction served mainly to define the process in more detail.

The question is whether it is plausible to attribute the lower average PAUC growth during the 1970s to the Packard reforms. The answer to this question offered here is "Yes." The main factors were Packard's change in contract policy and his introduction of a more extensive technology development and risk reduction phase before MS II. This phase embedded in the milestone review process Packard's policy of "fly-before-you-buy," thereby presumably on average reducing the risks remaining in MDAPs that sought MS II authority.

The second historical question is whether the Packard reforms persisted. For the period covered by this study, none of the Packard reforms was reversed or reduced to a dead letter or overtaken by other changes. For example, like the original DoDI 5000.2, the version in force in FY 2009 (1) required a robust Technology Development phase, (2) required realistic costing of the program proposed at MS B and provided for an independent cost estimate by what is now CAPE-CA, and (3) required full funding at MS B of the cost estimate adopted by the MDA. Other examples could be provided. On a historical basis, then, it is not at all farfetched to conclude that the effects of the Packard reforms persisted because the reforms themselves continued in force.

This is a remarkable conclusion. There is a Darwinian "survival of the fittest" aspect to changes in OSD processes. Many changes do not survive the administration that introduces them. Those that do generally are abraded until they fit well with the other OSD processes. The DSARC/DAB process lost none of its parts, over four decades, and in fact was strengthened. The historical evidence is, then, consistent with the statistical finding that average PAUC growth (within a funding climate) has remained below its level in the McNamara-Clifford period.

Evidence of a Limitation of the Milestone Review Process

Consideration of PAUC growth in boom and bust funding climates points to a limitation of the OSD-level MDAP oversight process. Table 1 provides a summary of average PAUC growth of MDAPs that passed MS B in the bust and boom phases of each of

the two bust-boom cycles in the database. Average PAUC growth of MDAPs that passed MS B during the bust phase of the first cycle was about twice that of MDAPs that passed during the boom phase; the difference was nearly a factor of 10 for the second cycle. More intense competition for funding in bust climates is a major part of the explanation for these facts, as it would provide the Services with a stronger incentive to propose programs with relatively greater risk in their MS B baselines. It is not a sufficient explanation, however. DoDD 5000.1 and DoDI 5000.2 do not permit MDAPs that passed MS B in bust periods to be riskier, and therefore have higher PAUC growth on average than those that passed in boom periods. Accordingly, it is necessary to ask why the DSARC/DAB process did not prevent the higher average PAUC growth in bust periods.

Table 1. Average PAUC Growth in Boom and Bust Phases for Completed Programs

Cycle	Period (Fiscal Years)	Bust Climates	Period (Fiscal Years)	Boom Climates
First Bust-Boom Cycle‡	1970–1980	37% (49)	1981–1986	18% (35)
Second Bust-Boom Cycle	1987–2002	37% (45)	2003–2009	2% (11)

‡ Excluding McNamara-Clifford.

One possible explanation is that in bust periods, the greater frequency and severity of problems with programs that came to an MS B review pushed the OSD-level oversight process to a capacity constraint. For example, if the workload involved in milestone reviews increases significantly in bust periods, the staff could be stretched to the point that it fails to identify to the MDA significant problems in the proposed baseline.[11] A possibly more important constraint is the greater intensity of Service opposition to any changes in proposed programs that would delay programs or add to funding requirements.

Another possibility challenges the premise that the DSARC/DAB process failed to check the PAUC growth of MDAPs that passed MS B in bust climates. This challenge is prompted by the statistical finding that MDAPs that passed MS B in bust periods and later went into boom periods had significantly higher PAUC growth than those completed in a bust period. Stripped of all qualifications, the challenge is this: In bust periods, program ambitions are scaled back so as to be consistent with the tighter funding constraint and their PAUC growth is attributable to the costs of program changes—that is, enhancements—adopted in a later boom period. In this case, the DSARC/DAB process would be judged to be a success in that programs that passed MS B in bust climates had relatively modest ambitions and were structured as evolutionary acquisitions. In short, given the way the SARs and some statutes are structured, it is possible to have significant PAUC growth without failures in the acquisition process. This possibility is only a partial explanation, however, since less than one-third of PAUC growth of MDAPs that passed MS B in bust periods was due to program changes (McNicol, forthcoming, IDA).

[11] Fewer MDAPs tend to pass MS B annually in bust years, but they might each have a larger number of problems with their baseline.

Finally, there is a more subtle challenge to the premise that the DSARC/DAB process failed to check the PAUC growth of MDAPs that passed MS B in bust climates—that the MDA deliberately, with adequate information and at least tacit support from the Secretary of Defense, decided to accept greater risks in MDAPs that came to MS B reviews in bust climates. The underlying point here is that bust climates presented senior officials in the OSD and those in the Services with the same menu of unappealing choices. Case by case and overall, there was no option that did not have serious undesirable consequences.

Each of the Services has a portfolio of programs across mission areas and commodity types, extending from efforts in the technology base through programs nearing the end of production. When a program is completed, it opens a resource "hole" that programs emerging from EMD can occupy. In turn, programs earlier in the acquisition cycle can move forward. When funding for acquisition turns down, these holes get smaller, or close entirely, or require cuts in funding for ongoing programs. The alternatives available in this circumstance are cancellations of programs, delays in new starts, programs that are more austere than is cost-effective on a long-term view, stretches, and unrealistic baselines—in particular, unrealistic cost and schedule estimates. Taking DoDD 5000.1 and DoDI 5000.2 at face value, one role assigned to the DAB is that of precluding one class of options—unrealistic baselines. Doing so would not address the underlying problem, which is an inconsistency between force structure, the capabilities that the Department was expected to provide, and funding. These factors almost certainly were inconsistent during the 1970s and for more than a decade after the end of the Cold War. That inconsistency is the context in which high average PAUC growth and most cancellations arise, and presumably is a major factor to be considered in designing proposals for improved outcomes.

The three explanations offered here are not mutually exclusive. It seems likely that each is accurate in some cases but that none is clearly satisfactory as an overall explanation of why the OSD-level oversight process was not fully successful in limiting cost growth of MDAPs that passed MS B in bust climates.

Policy Initiatives on Contract Types and Regulations

Starting with the Reagan Administration in 1981, Secretaries of Defense early in their tenures typically announced changes in acquisition policy. Most of these were directed at objectives connected to PAUC growth only very loosely if at all. The main exceptions to these statements are changes in policy on contract types and experiments with relaxation of DoD acquisition regulations and, in some instances, both DoD acquisition regulations and some statutory provisions on acquisition of major weapon systems.

Initiatives on Contract Types

As was noted previously, McNamara required the use of TPP when it was feasible to do so and encouraged the use of an FP development contract when it was not. Packard reversed both of these policies, but both TPP and FP development contracts were again tried in the 1980s. During the AR period (FY 1994–FY 2000), several MDAPs were acquired using an approach called Total System Performance Responsibility (TSPR).

Table 2 lists the MS B year and the PAUC growth for completed MDAPs in the database acquired with TPP. Four McNamara-Clifford programs were acquired using TPP. Probably because they were grandfathered, three programs in our sample for the early 1970s used a TPP contract. The prohibition on TPP did not appear in the next update of DoDD 5000.1, dated January 18, 1977, and three additional programs in our sample that passed MS B in the Reagan boom years also used a TPP contract. Only one of these 10 MDAPs (AGM-65A Maverick [TV]) had a quantity-adjusted PAUC growth of less than 50%. The average PAUC growth of the 10 programs is 86.2%, and median PAUC growth is 68%.

This is among the clearest and strongest results to come out of the literature on cost growth of MDAPs and one for which the underlying causes are reasonably well understood (McNicol, Tate, Burns, & Wu, 2016, p. 7).[12]

Table 2. MS B and PAUC Growth for 10 MDAPs Procured With TPP Contracts

MDAP	MS B (FY)	PAUC Growth
C-5A Galaxy	1966	77%
AGM-65A Maverick (TV)	1968	1%
Landing Ship Assault (LHA) Tarawa class	1969	57%
SRAM	1967	263%
FIM-92 Stinger Missile	1973	110%
AGM-84A Harpoon	1973	56%
SURTASS/T-AGOS	1975	68%
T-45 Goshawk	1984	70%
JSTARS USAF	1985	123%
C-17A Globemaster	1985	57%

Note: The identifications are based on Tyson et al. (1992, Chapter X and Appendix A, Table A-10) and McNicol (2004, pp. 53, 57–59). Tyson et al. includes the Spruance Class destroyer among the TPP programs. The lead ship of the class may have been acquired on a TPP contract but the class as a whole seems not to have been.

The FP development contract was used in the 1960s and again in the 1980s. The conventional wisdom associates it with high PAUC growth, but this opinion is not supported by the data in Table 3. Note, however, that five of the six MDAPs identified as using an FP development contract passed MS B during a boom climate, which may account for their low PAUC growth. It is also relevant that the RDT&E portion of most MDAPs acquired with TPP contracts were fixed price, and growth in their RDT&E cost certainly contributed to their high PAUC growth.

[12] For further discussion of TPP and FP development contracts, see Tyson et al. (1992, Chapter X); McNicol (2004, pp. 53, 57–59); and O'Neil and Porter (2011, pp. 9–31).

Table 3. MS B and PAUC Growth for 10 MDAPs Procured With FP Development Contracts

MDAP	MS B (FY)	PAUC Growth	EMD Growth
F-14A	1969	29%	45%
E-6A	1983	0%	9%
JTIDS	1982	not available	not available
Stinger RMP	1983	not available	not available
T-AO 187	1984	-3%	24%
F-14D	1986	-6%	-2%

Note: The identifications are based on Tyson et al. (1992, Ch. X and Appendix A, Table A-10).

The third problematic contracting approach is TSPR, which was used primarily during the AR period and is one of the signature experiments of that period.[13] TSPR was a clause included in contracts; it was a way of structuring contracts, not a type of contract, and could be used with different contractual forms. The term *performance* in TSPR was understood in a specialized way. It referred to metrics that characterized the ability of the system to accomplish certain missions. For example, one aspect of performance of a cargo aircraft might be the tons of cargo of a specified type that a given number of the aircraft could deliver in 24 hours under specified conditions. The idea was to cast contracts in terms of such performance metrics, rather than the usual statements of work and technical specifications. The contractor would be responsible for delivering a system that met the performance specifications, while the government would do only a limited number of "inherently governmental" functions (primarily contract management, specification of the performance metrics, budgeting and financial management, and acceptance testing).

Table 4 provides a list of TSPR MDAPs. The list may not be complete—it can be hard to tell whether TSPR was used to acquire any particular system. For example, the Advanced Extremely High Frequency (AEHF) satellite is sometimes discussed with TSPR programs. Note that all but one of the MDAPs in Table 4 (AGM-158 Joint Air-to-Surface Standoff Missile) is a satellite system.

[13] AR also encouraged the use of three other contracting initiatives: Alpha contracting, Price-Based Acquisition (PBA), and Best Value contracting. Hanks et al. (2005) provides a useful listing of acquisition reform initiatives between 1991 and 2001 at least nominally accepted by the DoD. Contrary to what might be inferred from some descriptions of PBA, none of these was problematical insofar as PAUC growth is concerned. See Quander and Woppert (2010); Hawkins and Cuskey (2011, pp. 240–274); and Rapka et al. (2006, pp. 34–37). On PBA, see Lorell, Graser, and Cook (2005), especially Chapter 2.

Table 4. MDAPS Acquired Using a TSPR Strategy

MDAP	MS B	PAUC Growth
Global Positioning System IIF (GPS-IIF)[a]	1996	high[b]
Space Based Infrared Sensor-High (SBIRS-H (baseline)[a]	1997	299%
AGM-158 Joint Air-to-Surface Standoff Missile (JASSM)[c]	1998	73%
Evolved Expendable Launch Vehicle (EELV)[a]	1998	251%
National Polar-orbiting Operational Environmental Satellite System (NPOEES)[a]	2002	Cancelled

[a] GAO (2006, p. 8).

[b] GPS-IIF was not an MDAP; it was part of the NAVSTAR GPS program. GAO reported a program office estimate—apparently from about 2009—that implied a cost growth from the MS B baseline of 119%. See GAO (2009, p. 13). It is not clear that the program office estimate cited by GAO was adjusted for quantity changes.

[c] GAO (2010, p. 4).

It was anticipated that TSPR would reduce the number of people employed in government program offices,[14] but the main source of cost reductions was expected to stem from the freedom TSPR gave contractors to make trades that reduced cost while maintaining performance. Those expected cost reductions were built into the MS B baselines.[15] The savings failed to materialize and the result was high PAUC growth in five of the six cases (the sixth was cancelled). In 2002, the USD(AT&L) Aldridge stated that TSPR would no longer be used (Hanks et al., 2005, pp. 19–20). More generally, during 2001–2009, there were no further major experiments with different contracting approaches.

A TSPR arrangement provides the contractor with the authority to make trades that reduce cost while maintaining performance. Whether the contractor is incentivized to make these trades depends on the contract type. An FP contract does, among other things, provide such an incentive, but there is no reason to think that an FP TSPR contract for a major EMD effort would not have the same flaws as an ordinary FP development contract.[16] In contrast, a cost-type contract tends to incentivize a capability-cost spiral and for that

[14] For critiques of TSPR, see Defense Science Board (2003, pp. 3, 10); Lorell, Leonard, and Doll (2015, p. 31); Kim et al. (2015, pp. 33–34); GAO (2006, p. 10); and Temple (2013, pp. 269–271). In some cases, the government did not require the provision of the data needed to understand the state of a program. Moreover, government staff, particularly systems engineering staff, was reduced to a point that compromised their ability to establish baseline requirements and monitor the programs' progress. One major reason for failure of TSPR programs apparently was the lack of sufficiently strong engineering expertise in both government and industry.

[15] Apparently, in at least some cases, this was done over the objections of the independent cost analysts in the OSD and the Air Force. See, in particular, GAO (2006) and Defense Science Board (2003).

[16] On the limitations of FP development contracts in space programs, see Arnold et al. (2013). Lorell et al. (2015, p. 7) seems to equate TSPR with TPP. TPP does not imply a "hands off" stance, but the government probably did generally place total system responsibility on the contractor. TSPR, however, amounts to TPP only if it uses an FP contract that extends beyond EMD to production.

reason probably requires the government to exercise a degree of oversight that obviates the advantages sought by a TSPR arrangement.

To put these results in context, we have a PAUC growth estimate for 110 MDAPs that passed MS B in a bust climate and were completed by the end of FY 2016. Forty of these had a PAUC growth of at least 50%; one of these was a Defense Acquisition Pilot Program (DAPP) program and nine were acquired using a TPP or TSPR contract. Of the 46 MDAPs in the database that passed MS B during a boom climate, only the three early 1980s TPP programs and Titan IV had a PAUC growth of at least 50%. It is reasonable to conclude that high cost growth is more common for these TPP and TSPR acquisitions.

Relaxation of Regulations and Statutes

The Congress explored the consequences of relaxing acquisition regulations and statutes through the Defense Enterprise Program (DEP) and subsequently, the DAPP. Although Other Transaction Authority (OTA) was enacted for somewhat different reasons, its use of in the development phase of an MDAP acquisition also permitted relaxation of most acquisition regulations and statutes.

Table 5 shows for each DEP, DAPP, or OTA MDAP the fiscal year in which the program passed MS B and its PAUC growth. These will be discussed in the order stated.

Table 5. Fiscal Year in Which the Program Passed MS B and Quantity Adjusted PAUC Growth for DEP Programs, DAPP Programs, and Programs Acquired With OTA

MDAPs by Category	MS B (FY)	% PAUC Growth
DEP Programs[a]		
TOW II	1984	13%
Trident D-5 Missile	1984	15%
SSN-21†	1985	8%
Mobile Subscriber Equipment†	1986	1%
Army Tactical Missile System†	1986	13%
Medium Launch Vehicle	1990	n/a
SRAM II	1987	cancelled
T45-TS†‡	1984	70%
C-17‡	1985	57%
Titan IV	1985	212%
DAPP Programs[b]		
JDAM	1995	12%
JPATS	1995	42%
C-130J§	1996	83%
OTA Programs		
UCAV	*	n/a
RQ-3 DarkStar	*	n/a
Arsenal Ship	*	n/a
Evolved Expendable Launch Vehicle (EELV)#	1998	251%
Global Hawk	2001	n/a^
Future Combat Systems (FCS)	2003	cancelled
DDG-1000	2006	Truncated

[a] See footnote 19 for references that identify the DEP MDAPs.

[b] Federal Acquisition Streamlining Act of 1994, Pub. L. No. 103-355, Section 5064.

† Milestone funding authorized. National Defense Authorization Act (NDAA) for Fiscal Years 1988 and 1989, Pub. L. No. 100-180, Section 106, 101 Stat. 1019 (1987).

‡ TPP program.

§ Only DoD regulations waived.

* Did not pass MS B.

\# TSPR program.

^ The database does not include a cost growth estimate for Global Hawk that is quantity-adjusted and in common base-year dollars. It is clear from the SARs, however, that cost growth for Global Hawk was high.

DEP was established by the FY 1987 National Defense Authorization Act (NDAA).[17] DEP programs were exempt from DoD regulations other than those specified by the Service Acquisition Executives (SAEs). We do not know what DoD regulations the SAEs elected to retain. In addition, DEP programs could be granted Milestone Authorization, that is, for authorization of funding through the end of their then current acquisition phase.[18] Ten MDAPs were nominated by DoD as DEP programs; the Congress accepted all of these and granted Milestone Authorization to four of them.[19] No other programs were added to the DEP after this initial group.

The MS B baselines for DEP were established before the initiatives were built into the programs. Consequently, PAUC growth (adjusted for quantity change) is equal to the growth in the acquisition cost of the programs (in program base year dollars). Those who believe that acquisition regulations are a major contributor to both high weapon system cost and PAUC growth would expect the DEP programs should have below average PAUC growth. A skeptic who believes that the regulations waived served a good purpose would expect above average PAUC growth.[20]

Each of the DEP programs for which we have a PAUC growth estimate passed MS B during the Reagan boom climate. The average PAUC growth of the DEP programs was 48.6%; the average for all of the programs in the database that passed during the Reagan boom was less than half that, 20%. If the programs acquired with TPP are dropped, the average PAUC growth for the DEP programs was 42% and that for the Reagan boom climate programs, 12%. These data do not make a case for DEP. DoD found that the DEP programs "were more trouble than they were worth … and … allowed it [DEP] to lapse by 1990" (Fox, 2011, p. 159).

DAPP was established in the NDAA for FY 1991.[21] From the DoD's perspective, the key difference between the DEP and the DAPP probably was that the latter permitted the Secretary of Defense to waive not only DoD regulations but also acquisition statutes and regulations. The Federal Acquisition Streamlining Act of 1994 authorized five programs to participate in the DAPP.[22] Of these, four were MDAPs, but two of these did not continue as

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[17] NDAA for FY 1987, Pub. L. No. 99-661, § 905 (1986).
[18] Some accounts of the DEP state that its establishment was a recommendation of the Packard Commission. This is not accurate, in that the Packard Commission reports did not specifically include such a recommendation. The Packard Commission, however, did recommend the use of Milestone Authorizations. See President's Blue Ribbon Commission (1986, pp. xxiv–xxvii, xix).
[19] The requests were made in a letter from Deputy Secretary of Defense William H. Taft, IV to the Honorable Les Aspin, Chairman of the Committee on Armed Services of the House of Representatives, March 30, 1987 (following Radice, 1992). The Army Mobile Subscriber Equipment, Army Tactical Missile System, Navy's Trident II Missile, and the Navy's T-45 TS were granted Milestone Authorization. See the NDAA for FY 1988 and 1989, Pub. L. No. 100-180, § 106, 101 Stat. 1019 (1987).
[20] The one exception to this statement is Medium Launch Vehicle, for which we do not have a PAUC growth estimate.
[21] NDAA for FY 1991, Pub. L. No. 101-510, § 809, 104 Stat. 1594 (1990).
[22] Federal Acquisition Streamlining Act of 1994, Pub. L. No. 103-355, § 5064.

MDAPs after 1994.[23] Another MDAP was included in the DAPP in 1995 (Reig, 2000, Appendix A, p. 43).[24] Just when the DAPP ended is not clear, but no indication was found that any additional programs were added after 1995.

There does not seem to be anything to be made of the data for three DAPP MDAPs. PAUC growth for JDAM is notably low for a program that passed MS B during a bust climate, but PAUC growth figures for the JPATS and C-130J programs are somewhat high even for programs that passed during a bust climate. The average PAUC growth for the three DAPP programs was 45.7%. The average for completed programs from the AR period is 31%.

An Other Transaction (OT) is

> a special vehicle used by federal agencies for obtaining or advancing research and development (R&D) or prototypes. An OT is not a contract, grant, or cooperative agreement. … Only those agencies that have been provided OT authority may engage in other transactions. (Halchin, 2011, Summary)

MDAPs whose development was funded under OTA are included in this subsection because some procurement statutes do not apply to such arrangements and OTAs typically are not required to comply with DoD procurement regulations. The Defense Advanced Research Projects Agency (DARPA) was granted OTA in 1989.[25] The DoD as a whole received OTA in 1994.[26]

According to a RAND study, the DoD entered into 72 OTs during 1994–1998. Nearly 60% of these OTs had total funding of less than $10 million, and only seven had funding greater than $100 million. The study entailed a detailed assessment of 21 of the 72 OTs. Based on this assessment, Smith, Drezner, and Lachow (2002, pp. iii, 7, 31) offered a favorable assessment of OTAs; they were found to have limited risks and to provide broad benefits.

Table 5 includes only the seven OTAs with funding greater than $100 million; these programs were MDAPs or, perhaps with one exception, intended to become MDAPs. In contrast to the OTs that Smith et al. (2002) judged to work well, these seven projects had little or no commercial potential and to a substantial extent used technology developed by the companies involved under previous DoD contracts. They do not make a good surface case for OTAs for projects with those characteristics—two high cost growth programs, one cancellation, one truncation, and three programs that never went to MS B.

Concluding Comment

There is no difficulty in placing the TPP and FP development contracts within the context of the DSARC process. Packard reversed McNamara on the use of TPP and FP

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[23] The Fire Support Combined Arms Tactical Trainer seems to have been an ACAT II or ACAT III program. The Commercial Derivative Engine and the Commercial Derivative Aircraft appear to have been part of the 1994 competition of the C-17 and commercial derivative aircraft and probably did not continue after that competition was concluded.
[24] Hanks et al. (2005, p. 25, note 41) indicates that only regulations were waived for the C 130J.
[25] NDAA for FY 1990 and 1991, Pub. L. No. 101-189, § 251, 103 Stat. 1352 (1989).
[26] Federal Acquisition Streamlining Act of 1994, Pub. L. No. 103-355, 108 Stat. 3243.

development contracts, and that accounted for a substantial portion of the lower average PAUC growth of the 1970s. Packard's policy on TPP and FP development contracts was in turn reversed in the early 1980s, the Reagan boom climate. As a result, average PAUC growth during this period was substantially higher than it was for the subsequent post-9/11 boom. TSPR is more complicated. The high PAUC growth associated with the TSPR contracts seems to reflect some combination of flawed implementation and inherent flaws in the TSPR concept.

At the broad brush level, there also is an obvious connection between the comparative success the DSARC/DAB process had in maintaining PAUC growth below its level in the McNamara-Clifford period and the lack of success of the DEP and DAPP experiments and the use of OTA on large programs. From the start, the DSARC process was the actualization of regulations embodied in DoDD 5000.1, DoDI 5000.2, and subsidiary regulations. These became more extensive over time, and some were required or augmented by statutes. DEP, DAPP, and OTA all relaxed some regulations and, in the case of DAPP and OTA, some statutory restrictions. This did not result in lower PAUC growth, which seems to indicate that the regulations and statutes relaxed play a useful role in this respect. Although perhaps accurate, this argument is facile. To be convincing, it would be necessary to go much further than this paper has into just which regulations and statutes were relaxed and how those relaxations were connected to cost growth.

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