Value of Time Matters

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The Value of Time Matters

Acquisition Cycle Times = Cost

The U.S. Department of Defense's (DoD's) acquisition cycle times, like those in many parts of the U.S. Government, are too long, especially when compared to the amount of time needed to make decisions and execute programs for similar projects in the commercial sector. The technical and requirement risks associated with DOD's ACAT I programs coupled with the financial risks associated with not budgeting for those risks accordingly result in targeted schedules that are unrealistic and lead to long delays.

Much of this cycle-time extension stems from the fundamental disconnects between the DoD management system and Congressional oversight. Their competing values and objectives, for example, create a significant, unnecessary, and unrecognized government-induced lengthening of the acquisition process.

Feeling this inadequacy, DoD and Congressional leaders, as well as staff members at all levels, react by becoming even more involved with the projects. Over the years this has led to an increase in regulation and oversight, an action that, instead of solving the problems, often complicates them with budget, schedule, or requirement adjustments that add serious costs and significantly lengthen development and production cycles.

These long acquisition cycles times have a number of undesirable results, among them are:

- Excessive costs for products and services
- Lack of value chain flexibility to meet uncertain capability demands
- Delays in delivering capabilities to the warfighter
- Increased uncertainty in the supply base
- Distraction of time and attention from Defense and contactor program managers' work on managing program execution
- Increased government personnel costs from low-value-added bureaucracy

This DoD approach to product development compares unfavorably with that used by highly successful commercial enterprises, including those that develop aircraft, satellites, and other products comparable to those developed by the DoD for our armed forces. Commercial enterprises understand that the value of time matters, and when they lengthen development and production schedules, they devalue the worth of their products by introducing higher costs and delayed time to market, which are unacceptable outcomes for these for-profit companies. That's why they implement a streamlined approach to the product development process, a proven approach that reduces schedule risks and associated costs.

The DoD and the U.S. Congress need to reconsider their disconnects that add costly oversight and time to product development. Further, the DoD needs to borrow the commercial sector's product development best practices in streamlining the acquisition cycle time.

Defense Acquisition Cycle Times Exceed Commercial Cycle Times

A comparison of recent acquisition cycle times experienced by Defense and a commercial company to produce complex aircraft shows the disparity between the two approaches to product development. In this comparison (see Figure 1), cycle times were examined for seven ACAT I programs and for three separate commercial aircraft programs by commercial firms recognized as being among the best in developing and manufacturing new products.

ACAT I Programs (IC and ID) – Aircraft Vehicles	Targeted Acquisition Cycle Times (months)[1]	Estimate of Actual Acquisition Cycle Time[2] (as of 8/2011)
E-2D Advanced Hawkeye	95	136
Global Hawk	55	125
Gray Eagle Unmanned Aircraft	50	TBD
KC-46 Tanker Modernization	78	78
MQ-4C Broad Area Maritime Surveillance	92	92
P-8A Poseidon	160	160
Reaper Unmanned Aircraft System	86	94
ACAT I Aircraft Program (Average)	**88**	**114**
Commercial Aircraft Programs		
Boeing 777 Commercial Aircraft (actual)	60	60
Airbus A-380 (actual)	44	49
Boeing 787 Commercial Aircraft (actual)	65	83
Commercial Aircraft Program (average)	**56**	**64**

Note: "Acquisition cycle time" refers specifically to the elapsed time, in months, from the time a program is initiated until a system attains initial operational capability.
[1] The target cycle times were set at the beginning of the programs by the DoD and do not reflect any delays experienced during development or post delivery.
[2] The estimated acquisition cycle times reflect the time for development when delays are calculated.

Figure 1. Acquisition Cycle Time Comparison Between ACAT I and Commercial Aircraft Programs

Military Satellite Programs	Estimate of Actual Acquisition Cycle Time (Years)
Space-Based Infrared System (SBIRS)	9.8
Advanced Extremely High Frequency (AEHF)	6.2
Mobile User Objective System (MUOS)	4.0
Global Positioning System (GPS) IIF	7.8
Military Satellite Program (Average)	**6.9**
Commercial Satellite Programs	
Galaxy 3C (702 Mod)	4.8
Asiasat 4 (601 HP)	2.6
e-Bird 1 (376 HP)	2.6
Galaxy 13 (601 HP)	2.1
Superbird-6 (601)	2.6
SkyTerra 1 (702HP)	4.8
Echostar 8 (LS-1300)	3.0
Intelsat 906 (LS-1300 HL Ext)	2.5
Intelsat 907 (LS-1300 HL Ext)	2.7
Optus C1 (LS-1300)	3.1
Echostar 9 (LS-1300 HL Ext)	3.5
Commercial Satellite Programs (average)	**3.1**

Figure 2. Acquisition Cycle Time Comparison Between Military and Commercial Satellite Programs

On average, the Defense-targeted acquisition cycle time for developing aircraft systems is over two-and-a-half years longer than that for an equivalent commercial program; and over four years longer when actual delays are considered. For satellite programs, Defense satellite acquisition cycle times are more than twice as long as for an equivalent commercial satellite program (Figure 2).

This prolonged DoD cycle time results in huge standing army costs, costs resulting from bottlenecked prime contractor workers (and often sub-contractors) who cannot proceed with projects until delay issues are resolved. The estimated annual cost savings opportunity associated with reducing the longer defense product development time to the shorter private-sector timelines (Figures 1 and 2) if applied across all ACAT I programs is between $10B to $12.4B[1]. While we aren't suggesting that all ACAT I programs can be compressed to private-sector timelines, the opportunity is significant. Within the context of the $54.7B pending BCA-2 cuts or simply from budget restructuring to a lower top-line, significant inroads could be made by eliminating or substantially reducing standing army costs on ACAT I programs.

Unfortunately, Defense and Congress do not consider the cost implication of time; they don't associate development and production cycle times with the opportunity costs of not completing these programs as quickly as possible. Instead, the regulations that are in place, create a continuously circling loop of checkers that check the checkers which greatly adds to the lengths and costs of the acquisition cycle time.

[1] Assume 10% – 16% of the annual ACAT I program cost is direct program labor cost for products at the Engineering and M anufacturing Development stages. Cost savings are associated with reducing the acquisition cycle time of ACAT I programs to those equivalent to the private sector, thereby, reducing the direct labor costs.

This government lack of concern for the time value of money contrasts starkly with that of the commercial sector, where the time value of money directly impacts profitability and the balance sheet. Effectively and efficiently employing invested capital to develop, produce and deliver their goods to market as quickly as possible is the essence of survival and growth in the commercial sector.

The DoD Acquisition Process Faces Unique Obstacles

The Defense acquisition process faces four main obstacles that are not typically evident in the commercial sector.

- Use of immature and high risk technology
- Changing requirements
- Regulatory burden
- Multiple and disjointed decision support systems

The first two obstacles relate directly to how the products are developed. The latter two reflect the burden of government bureaucracy.

Use of Immature and High Risk Technology. Occasionally, the DoD acquisition cycle for weapons includes technology development as part of the product development and production process, an approach that significantly increases overall risk. However, the technical requirements are not bounded by technology and financial risk at the outset. Too often, the program begins with a set of untradeable requirements that induce risk that is not fully valued in either time or money. With this simultaneous development of technology, DoD moves programs forward with much less knowledge about the products and with a lot more risk around required technologies, design capability, and manufacturability.

For example, such was the case with the development of both the C-17 and the F-22 aircraft. For these programs, DoD did not attain the same level of knowledge of the design's ability to perform or be produced until late in development or early production. The DoD remained uncertain whether it could match the product design with customer requirements until testing was completed late in development. Neither practice is acceptable in commercial product development.

The delays brought about by the use of immature technologies also prompt changes or additions to the requirements during the lengthened program, while at the same time putting budgetary pressures on the program due to under-performance. An example of this is the Joint Tactical Radio System (JTRS) program which was meant to be a centerpiece of U.S. military transformation that would enable units to communicate seamlessly via equipment that would use software-defined electronics to "translate" different communications waveforms. However, the technical difficulties associated with moving from a radio to a mobile ad hoc network capability were formidable, made more so by rising requirements demands from the U.S. military. At the same time, the program did not receive the necessary funding for research and development. Eventually, the difficulties forced delays, which promoted more oversight, and affected combat commanders, raised costs, that finally created a breakdown.

Changing Requirements. DoD frequently makes changes to key performance requirements of ACAT I programs after development is under way. This action drives higher cost growth and longer schedule delays than are experienced by programs whose requirements remain unaltered. The more requirements change, the longer development and production take, and the more opportunity for more requirements being added on to the program – which further increases cost and schedule delays.

When requirements are changed, instability often is created; this instability, in turn, can adversely affect program outcomes. In some cases, programs experiencing poor results may have their requirements cut, as steps are taken to prevent further cost growth. Whether changes add requirements or reduce them, programs with modifications to performance requirements experience four times more growth in R&D costs and three-to-five times greater schedule delays compared to programs with unchanged requirements. (Figure 3)

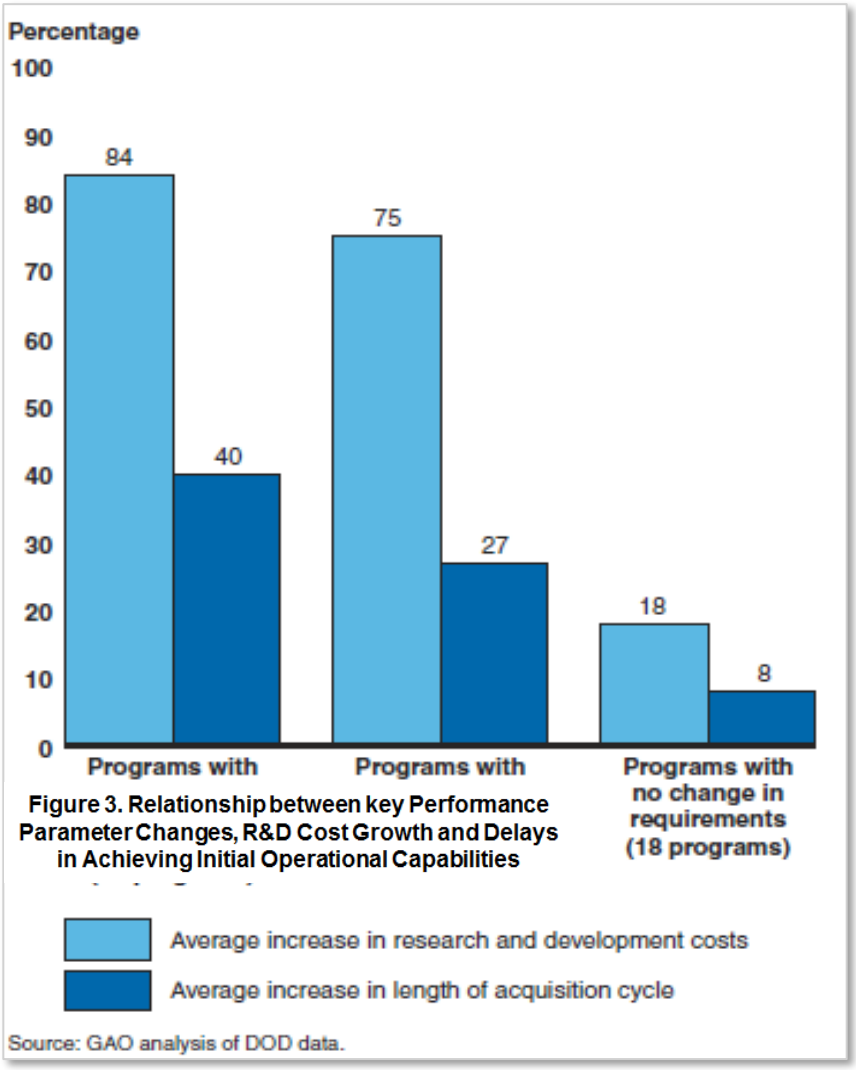


Figure 3. Relationship between key Performance Parameter Changes, R&D Cost Growth and Delays in Achieving Initial Operational Capabilities

Regulatory Burden. The sheer volume and complexity of the regulatory environment are so overwhelming they make it difficult for most experts to identify the regulations that have the greatest impact—positive or negative—on weapon system programs.

The DoD acquisition process tends to be a "one size fits all" approach that reflects long development and production and slow approval processes - remnant of the Cold War era. The principal adversary during that period was a slow-moving centrally-planned economy. Today's adversary uses non-traditional tactics, such as low-cost and rapidly developing COTS-derived weapons to operate against us. As such, the DoD acquisition process is no longer adequate for today's demand.

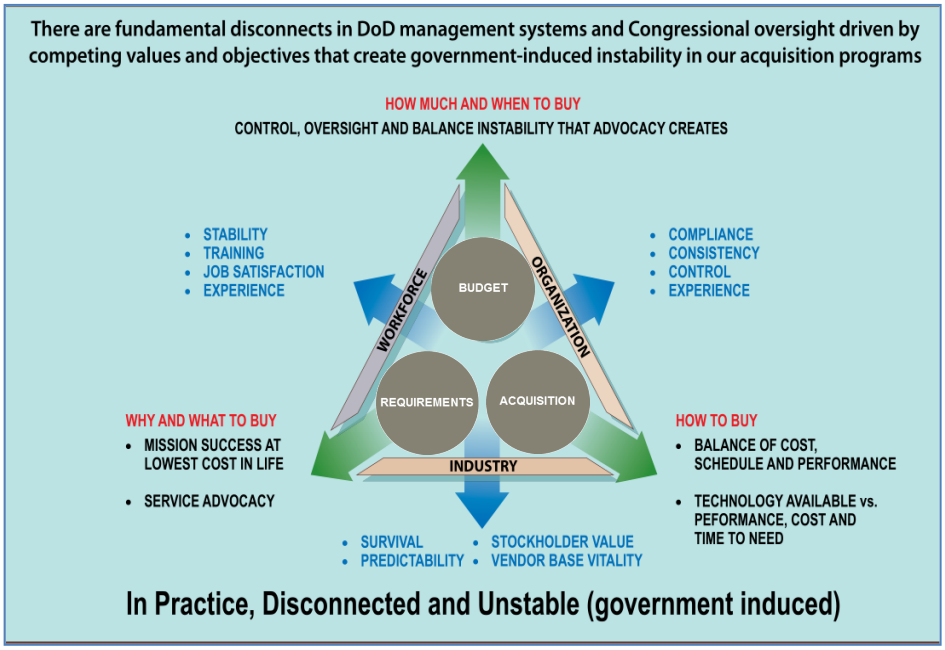
Understandably, many of these regulations are necessary and were instituted to prevent fraud and abuse, such as the Boeing KC-767 Pentagon scandal which would have resulted in the DoD paying Boeing $11B more for the price of the 100 planes on contract. Nevertheless, the burden imposed by regulations must be weighed against their costs.

Unfortunately, the DoD management model is based principally on providing oversight. For example, Program Managers do not have accountability and authority to make the critical development and production decisions without first running a gauntlet of approvals. In the private sector that's not the case. Rather, Program Managers are typically given a large degree of managerial discretion within prescribed and stable cost, schedule and performance boundaries.

The cost of this regulation has been emphasized by a number of studies. One identified a DoD regulatory cost premium of between 13 percent and 40 percent of the defense activities examined[2]. A RAND Corporation study looked at how DoD costs would be affected if a selected set of R&D and production programs were restructured along commercial lines. It identified potential savings ranging from 3 percent to 34 percent for R&D programs and from 7 percent to 60 percent for production programs[3].

Although these regulations are well intended, they have clear costs that must be considered, as must their overall value. Decades of audits and reports have shown that the vast majority of companies are honest and that waste, fraud and abuse constitute a relatively small "tax" on defense spending[1]. It's time to consider that the low amount of waste, fraud, and abuse that may occur constitutes a small "tax" on defense spending. It's time to understand where the cost of compliance is much greater than this tax, burdening companies working on defense systems as well as the DoD. It's time to scrutinize the cost of compliance as an area in which potentially significant budget savings could be found.

Multiple and Disjointed Decision Support Systems. The Defense acquisition process is disconnected across three important decision-support systems: requirements, acquisition, and budgeting. (Figure 4) These three sub-systems do not report to, or fall under, a single overarching "system," nor do they operate in a manner similar to a "system of systems." Instead, they function rather independently of one another, each



Source: *Defense Acquisition Performance Assessment*; Report by the Assessment Panel of the Defense Acquisition Performance Assessment Project For the Deputy Secretary of Defense, January 2006

Figure 4. The Acquisition System and the Differing Organizational Values3

[2] "*Why the Pentagon Wastes Money and How to Fix the Problem*", Lexington Institute, June 2012

[3] Mark Lorell and John Graser, *An Overview of Acquisition Reform Cost Savings Estimates*, RAND Corporation, January 200, p. 120

pursuing its own goals without considering the impact on the others. As a result, there is no integrated investment process where requirements are checked against financial or technical and programmatic risk. To further exacerbate the problem, resources can and do change annually without regard to programmatic effect.

The differences in organizational values among the various process owners and participants, including those who oversee these decision-support systems, cause incompatible actions.

Although each of these sets of values is legitimate, pursuing one without consideration of its impact on the other processes adds instability to the overall acquisition process. The lines of responsibility, accountability and authority need to be aligned – however, in the DoD it is interrupted by the different warrant holders; any one of which can delay the program or stop it altogether.

Furthermore, this disconnect in values leads to a longer decision-making process and to a much larger number of acquisition-related activities, many of which are low value-added (e.g., inspection, review, and decision points) compared to the activities in commercial best practices. As shown in Figure 5, the number of activities in a typical DoD acquisition program, for example, is 228, more than four times the activities in a similar best-practice commercial program.

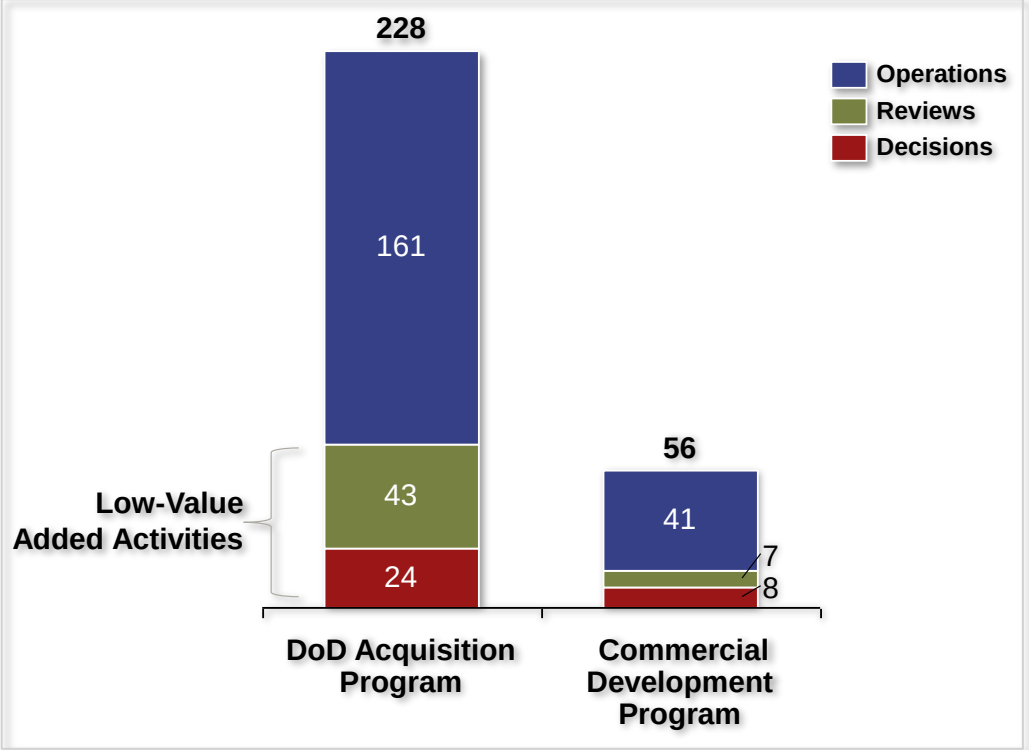


Figure 5. Number of Activities in a DoD Acquisition Program vs. Commercial Development Program (Best Practice)

Commercial Best Practices Provide Useful "Lessons Learned"

The DoD product development approach, which is hampered by these four obstacles, compares unfavorably in costs and acquisition cycle time with the approach taken by commercial enterprises that represent the best practices in the private sector. Defense would be wise to consider commercial best practices as it looks for ways to reduce technology risks, limit product changes, and minimize bureaucratic hurdles.

Defense, as noted, occasionally injects the use of immature and high-risk technology into its product development. Commercial firms, on the other hand, gain detailed knowledge about a product's needed technology, performance, and manufacturability very early in the product development process (Figure 6).

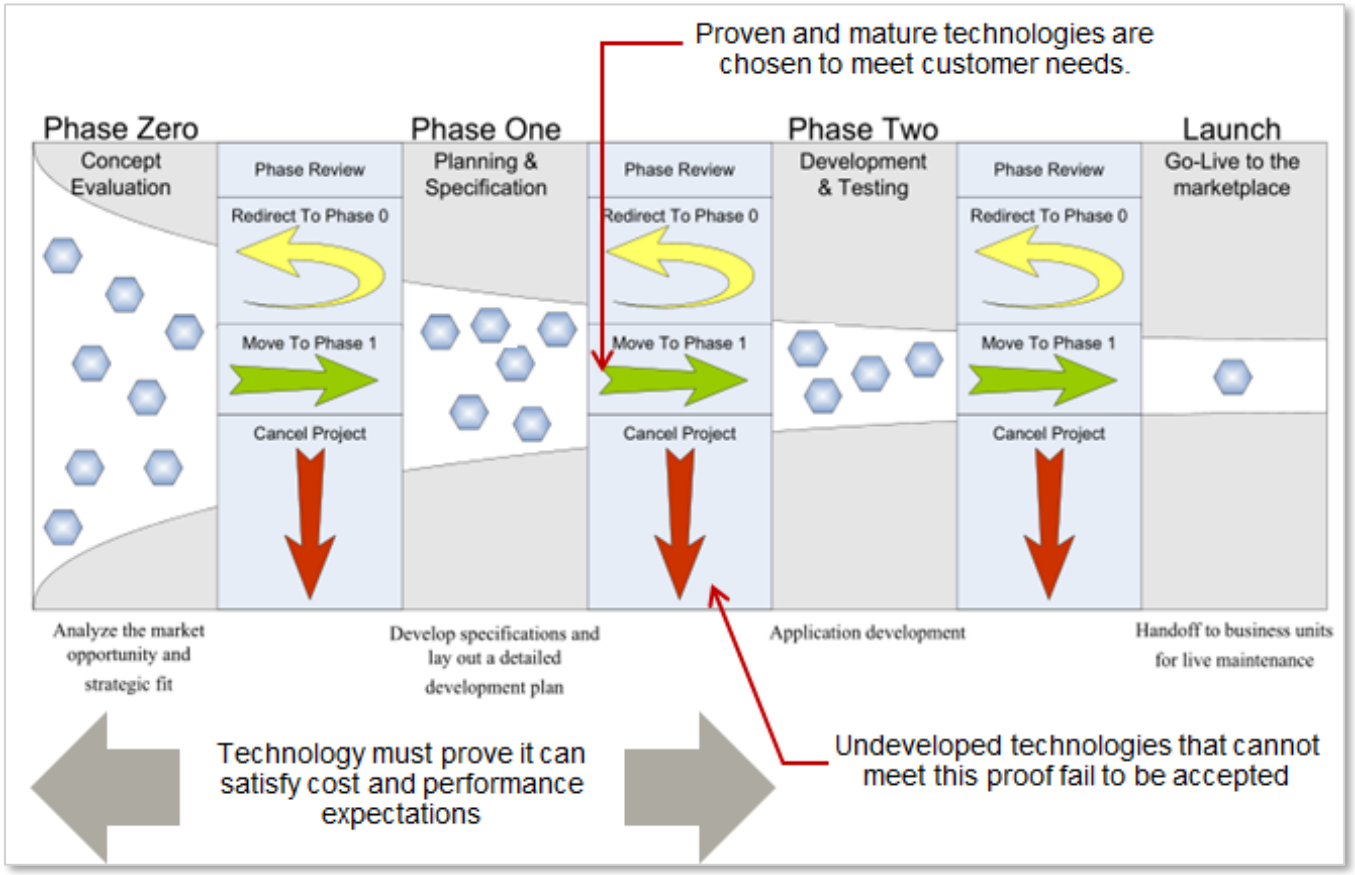


Figure 6. Commercial Phase Review Process

Boeing, for example, had initially decided to use aluminum lithium, a new, unproven alloy that the program favored for its strength and weight savings in its 777-200 aircraft. However, Boeing rejected the alloy early in development because it was expensive, its manufacturing processes were not well understood, and its availability was limited. The company would not assume these issues would improve during the aircraft's development.

Occasionally, a commercial firm will develop technology in parallel with product development, but the technology is developed separately from the product development process. In such cases, the commercial enterprise launches an initial product using a mature technology that meets initial customer needs. Then, as other technologies are proven on a separate track, they are incorporated into the product, meeting even greater customer requirements. When developing the HS-702 satellite, Hughes Space and Communication used separate technology and product development processes and was able to move new technologies from concept into the product development program, making notable performance increases along the way.

DoD and commercial enterprises have different criteria for judging a product's success. The success of a commercial product is determined by whether the company can produce and sell the product at a reasonable profit. Therefore, before a company begins developing a product, it first determines the business case that considers production realities and builds in natural barriers to overreaching for performance, cost, and schedule. This business case provides a solid decision-making framework used at the outset and throughout the program.

Best-practice commercial companies use a stage-gate process of product development. But when compared to the stage-gate approach employed by the DoD, the commercial version is highly streamlined and geared toward making decisions much faster. This process enables commercial companies to move quickly and effectively through their process. Boeing, for example, put its 777-200 aircraft into production less than five years after development began—a highly favorable timeframe compared to the 136 months needed by Defense to develop the E-2D Advanced Hawkeye. Furthermore, the company reduced this 777-200 development time by 40 percent when it developed the next version of the aircraft, the 777-300.

By contrast, the DoD's stage gate process is more focused on compliance with documentation and other requirements. Numerous statutory, regulatory and policy documents are required at stages in the DoD program. Add to that the various approval process needed at the OSD/Joint Chiefs of Staff, Service Secretaries and Under Secretaries of Defense level – and the approval process through the Defense Acquisition Board takes over a year.

However, commercial enterprises rely on a single entity stakeholder, such as a Product Approval Committee (PAC), a Core Team, and a Project Team to work closely together to drive the stage-gate process and to significantly reduce the time needed to complete the product development cycle (Figure 7).

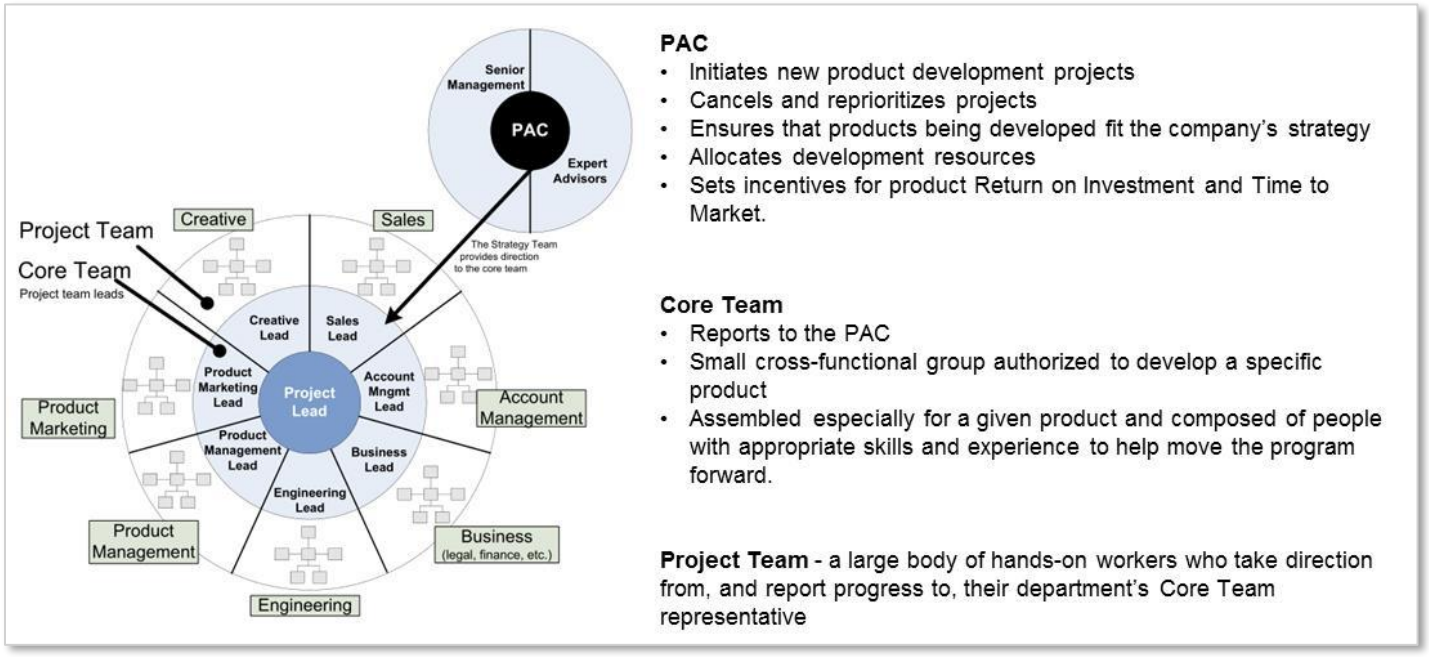


Figure 7. Commercial Product Development Best Practice

As the commercial streamlined project indicates, a critical element driving commercial management decisions around product development is the time value of money. More than the DoD and Congress, commercial enterprises understand the fiscal value of quickly completing development programs and getting products in the market, where they can generate revenue and prove their worth. That's why these companies build relatively short cycle times into their decisions as they begin a product's development. Such timeframes encourage program managers to identify risks and enable them to say "no" to pressures to accept unknowns.

Applying Commercial Best Practices to ACAT I Programs

Today, Defense has under way several commercial-like initiatives—such as using cost or price to force technology tradeoffs—that it believes show promising results. These initiatives are a welcomed start to applying commercial best practices to ACAT I programs. The DoD now should continue down this path.

To do so, it should further implement commercial best practices as a way to reduce acquisition cycle time. For such practices to work on a broad scale, however, the DoD environment must become open to such practices and encourage their use—a major change in the DoD mindset.

The best way for the DoD to create such an environment is to begin by applying commercial best practices to a few ACAT I programs that can serve as pilots—proof of concept. This gradual introduction can break the traditional mode and open the door to further changes.

However, to be successful, these few selected programs must be given waivers to lean out the acquisition process and reduce the acquisition cycle time. Such authorization would not be new to Defense. The military acquisition reform initiatives in the 1990s afforded early statutory and regulatory relief for reform initiatives, including those of the Defense Acquisition Pilot Programs. One of these programs was the Joint Direct Attack Munition (JDAM), which significantly reduced the amount of military specifications and standards. JDAM has eliminated all 87 of the military specifications and standards that were in its baseline contract in favor of commercial practices. It has been one of the more successful acquisition reform programs.

Just as the DoD would be best to begin with only a few ACAT I programs, it should start by implementing three of the many commercial best practices—but these are the critical practices that could have the most impact on DoD acquisition cycle times.

- Establish the technology maturity threshold
- Freeze requirements at a decision point
- Establish milestones and reward the program

Establish the Technology Maturity Threshold. Though the DoD has introduced a new approach for developing new weapon systems called evolutionary acquisition with spiral development, it has done so on a somewhat limited basis.

If the DoD is to achieve a shorter production cycle time, it must apply spiral development more broadly and separate technology development from weapon system development and aggressively pursue new technologies outside the realm of the broader program. Doing so will enable the DoD to move ahead more quickly with development using mature technologies (e.g., COTS) or incorporating incremental technology advancement throughout the weapon system development.

Along with these separate programs, DoD should establish higher standards for knowledge about each weapon system program—standards such as, release of engineering drawings, identification of key production processes, demonstration of

risky or new production processes, and achievement of statistical process

control—that will lead to better results when the development program transitions to production. Also, it should take steps to ensure that standards are put in place for applying knowledge of production-related timing and quality, and that this knowledge is used for assessing production risks.

Freeze Requirements at a Decision Point. Performance requirements need to be frozen much sooner in development if the DoD is to curb cost growth and schedule delays, as well as prevent changes to key performance requirements after development.

To do this, DoD must employ a disciplined process to match requirements with the available technological capability before the weapon system development process begins. And it needs to bring to this requirement process proven technological knowledge from sources such as the following:

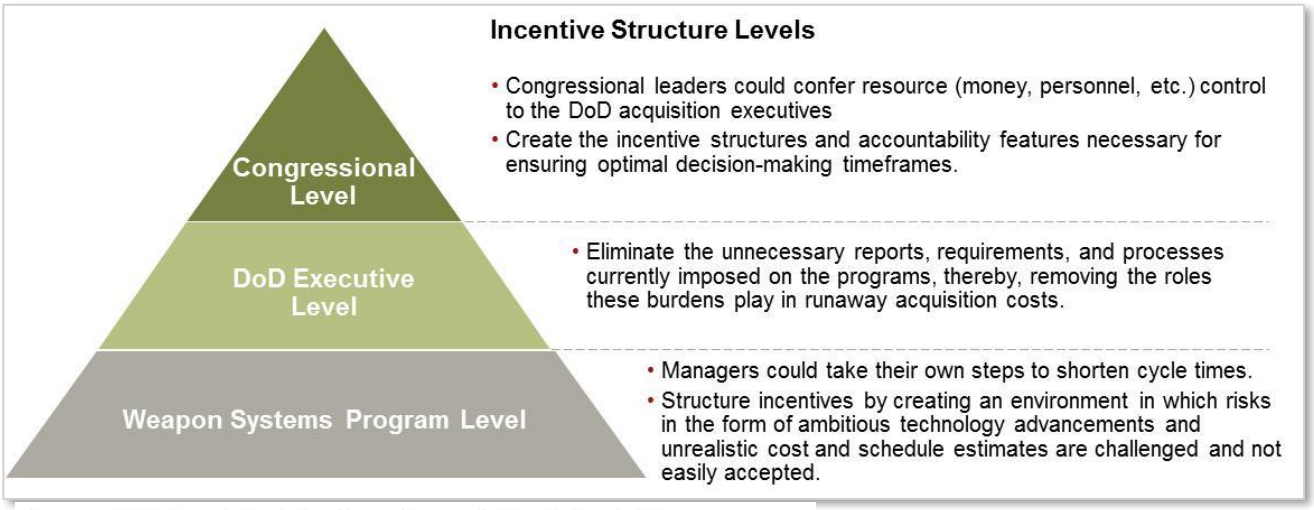
- Current information from predecessor programs
- People with firsthand experience on those programs
- New technologies deemed mature as a result of having "graduated" from a disciplined technology development and screening process

Finally, to make sure these requirements are set and not changed, DoD must communicate extensively with customers to match their wants and needs to the contractors' available technology and their ability to manufacture the desired products.

Establish Milestones and Reward the Program. To improve acquisition decision making, the DoD must begin to recognize that the value of time matters because it is directly associated with increasing costs. It must begin to realize that the current decision-support disconnects are contributing to weapon-systems costs overruns and schedule delays. It must re-examine with a "lean" mindset the approval authorities and timing along the MDAP process.

Furthermore, the DoD should reestablish the linkages between the requirements, budgeting, and acquisition decision-making systems, which as mentioned earlier, are now practically independent systems. It should modify the planning phase of PPSE. Then, within the timeframe of that phase, it should make the necessary decisions on weapon system requirements, multiyear budgeting, and acquisition program continuation or termination.

Also, both government and contractor Program Managers need real incentives for compressing cycle times, while still being given reasonable oversight and fiduciary control constraint. In effect, they should be given latitude to manage programs within such constraints, while being held accountable for results (Figure 8).



Source: *GAO Report, "Best Practices – Successful Application to Weapon Acquisitions Require Changes in DoD Environment, GAO/NSIAD-98-56*

Figure 8. Incentive Structure to Drive Down Cycle Time

Finally, and most importantly, to translate top-level policy and dialogue into tangible actions, it is essential for both government (Congress and the DoD) to establish trust-based, transparent and collaborative relationships at the program manager level. Program managers on both sides need this top-level guidance and authority. In addition, joint process improvements and joint solutions occur at the working level, so collaborative working relationships at this level need to become the norm, not the exception.

This fundamental change in buyer/supplier relationships cannot be accomplished by writing new policies. Rather, it requires a top-level commitment to working together differently and to an empowerment on both sides at the working level. The DoD could make this happen by implementing a selective pilot—with an actual product or service acquisition or sustainment program—to demonstrate the process and benefits, and to provide a "template" for broader adoption.

Conclusion

By using a streamlined stage-gate process and taking advantage of other time- and cost-saving actions, best-practice commercial enterprises develop large, complex products—comparable in many aspects to those developed by the Department of Defense—in a fraction of the time needed by DoD, saving them and their customers a significant amount of money, while getting their products to market much sooner. DoD can gain a lot by adopting the way these companies approach and execute product development.

Furthermore, Defense and the Congress need to adopt the commercial sector's understanding of the value of time, recognizing that their disconnects of requirements, acquisition, and budgeting add costly oversights and time to product development—costs and time wasted as standing armies of workers sit idle or underutilized while regulations and processes are addressed.