Incentives For Constraint
Within Defense Acquisition Programs

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Constraints work.

Earlier this year a study in the Oxford Journal of Consumer Research looked at the way "resource availability" affects behavior and concluded that scarcity promotes creativity. That is, when people have fewer resources, they tend to exhibit more creative behaviors. The researchers explained that having less helps to foster a "constraint mindset," which leads to more innovative outcomes. Abundance on the other hand is correlated with *less* creative behaviors. The implication is that if we want to foster creative, innovative approaches, we should start by restricting resource availability.

The results of this study match my own experience serving for more than 20 years as an Air Force acquisitions officer, where I observed that limited resources tend to drive innovative outcomes. This study and my experience are also consistent with large body of data on the effectiveness of technology development programs in general and defense acquisition programs in particular. This data shows that small teams with short schedules, tight budgets, and deep commitments to simplicity – in other words, teams with a constraint mindset – are not only more creative but also more effective. Small teams consistently outperform large, unconstrained teams who pursue complexity and adopt a "take your time, spare no expense" mentality.

In other words, we tend to do the most when we have the least.

This is particularly true in the Defense Department. Time and again, military program offices working under tight constraints reliably hit their budget and schedule targets while the technologies they produce contribute significantly to achieving operational objectives in the field. In fact, the military's most important, impactful, and innovative systems tend to come from these small, thrifty, speedy teams. In contrast, when a cast of thousands spends billions and decades, the result inevitably costs more, takes longer, and does less than promised.

It bears repeating: constraints work. They help acquisition professionals deliver affordable world-class technologies that are available when needed and effective when used.

Despite overwhelming evidence that focusing on speed, thrift, and simplicity leads to positive programmatic outcomes *and* outstanding operational performance, the DoD continues to foster an environment where expansive budgets and long timelines are rewarded, pursued, and valued.

The predominant culture treats budget overruns and schedule delays as inevitable attributes of advanced technology development programs, if not desirable attributes. This is a flawed belief, based on incorrect assumptions rather than actual data. The truth is that constraints are an important precursor to creativity and innovation. This also means that fiscal responsibility and technical excellence are not incompatible goals.

Specific examples of these dynamics within defense acquisition programs are easy to find and well documented. While this statement does not aim to provide a comprehensive summary of the data, I will briefly refer to a handful of examples while primarily focusing on the overall trend, then provide a specific recommendation for an initiative that would encourage and incentivize a constraint mindset.

Let's begin with a brief look at how constraints work:

1. **Constraints foster creativity**. When time and money are limited, status quo solutions are off the table. Program teams must instead pursue alternative solutions. For example, in 2010 the Air Force Research Laboratory built a 500 TFLOPS supercomputer named the Condor Cluster. When it was delivered, it was the fastest supercomputer in the entire DoD. Remarkably, it cost less than one-tenth the price of a comparable machine and used one-tenth the electricity of a traditional supercomputer. How did AFRL manage to produce a best-in-class technology on such a shoestring budget? They built the Condor Cluster out of 1,760 PlayStation 3's.

   The reason they took this approach is clear: they had no other option. They were operating under strict financial constraints. If the scientists and engineers at AFRL had a large budget, they would have simply bought a standard, expensive supercomputer… which would have been less capable than the system they actually developed. Instead, their small budget forced them to pursue a different path – which not only saved a significant amount of money, it also outperformed every other supercomputer in the Pentagon's inventory. And that is key. The fact that a constraint mentality helps us save some money is only a secondary objective. The primary objective is to ensure we deliver best-in-class capabilities.

2. **Constraints foster focus**. When time and money are limited, a program team is forced to prioritize and restrict their requirements. They simply cannot afford to do everything and are unable to accommodate requirement creep. This leads to a more focused approach on requirements that matter the most and have the largest impact on operations. There is less clutter (organizationally, procedurally, and technically), less passive engagement, and less social loafing.

   For example, the JDAM famously had just three requirements from the Air Force Chief of Staff ("It should work; it should hit the target; and it should cost under $40,000 each."), an approach that provided a very useful sense of priorities and focus to the

development team. The resulting system performed admirably and ended up costing approximately $17,000 each, well under the $40,000 requirement.

Feedback from the field shows that simple, focused systems tend to do more than they were designed to do, while complicated systems with long lists of features tend to underperform. Simple systems tend to be more reliable and less fragile, easier to use and easier to maintain.

3. **Long timelines increase exposure to change**. Over time, new threats emerge and old threats go away. New technologies are developed, new political and economic situations unfold, and new leadership comes on the scene. All of these changes contribute to increase the odds that the product under development will be operationally irrelevant, technologically obsolete, or both by the time it is delivered.

   For example, the F-22 Raptor was intended to counter the Soviet Air Force. However, the USSR collapsed 15 years before the Raptor program declared its Initial Operational Capability (IOC). Because so many things in the world changed between program inception and IOC, the final product was ill-suited for the military's actual combat needs and the F-22 did not fly a single combat mission in Afghanistan, Iraq or Libya. It was even declared "not relevant" by the Secretary of Defense himself.

   In contrast, shorter timelines increase the odds of a close alignment between the state of the art and the user's needs. For example, an ISR aircraft known as the MC-12W Project Liberty flew its first combat mission a mere 8 months after receiving funding, then went on to fly thousands of missions in Iraq and Afghanistan.

   By constraining the development timeline, programs present a smaller target to the forces of change and increase the likelihood of alignment between what the system can do and what the users need it to do. Long timelines, in contrast, rely on long-term predictions about future needs and amplify any predictive errors.

4. **Delays foster delays**. Extending a program's development schedule or slipping the delivery date creates a vicious circle that necessitates additional delays, because the more time a program spends in development, the more changes it is exposed to (see #3 above). It takes time to respond to these changes, but the world does not stand still while the program office responds. The net result is that *delays cause delays*, and the program ends up presenting a larger target to the forces of change. This ends up adding to the cost and complexity of the system as well as adding to the schedule.

   In contrast, speed fosters speed, and programs which set aggressive delivery timelines have a remarkable tendency to deliver ahead of schedule. For example, the US Navy's Virginia Class Submarine program set an aggressive goal of delivering two submarines for $2B each, every two years (referred to as "2 for 2 in 2"). These firm constraints

> helped shape the program office's behavior across the whole spectrum of decision making, and the result is that the Navy consistently delivers Virginia submarines months ahead of schedule and tens of millions of dollars under budget. Specifically, in 2008 the USS New Hampshire was delivered 8 months early, $54 million under budget. In 2011 the USS Mississippi was a year ahead of schedule, $60 million under budget. In 2014 the USS North Dakota continued the trend, delivering on time and under budget. This is a remarkable achievement and a stark contrast to the previous Seawolf program, which was terminated in 1995 after delivering only three of the planned 29 submarines, each of which cost $4.4B.

Given this reality, why do so many defense programs continue to operate in an unconstrained manner? In large part this is caused by the presence of perverse incentives and an absence of positive incentives. The defense acquisition community tends to be skeptical of constraints rather than guided by the idea that constraints foster quality. The prevailing mindset views complexity as a sign of sophistication, long timelines as a sign of strategic genius, and large budgets as signs of prestige. Quick, simple, low-cost solutions are dismissed as simplistic, hasty, and cheap.

The result is an acquisition environment where large budgets and long timelines are viewed as inevitable attributes of advanced technology programs, and adding time and money to a program is a common problem-solving strategy. While some organizations within the military take pride in accomplishing a lot despite minimal resources (e.g. SOCOM), they are a distinct minority.

Further, the acquisition environment does very little to reward program offices for delivering under budget or ahead of schedule. If a thrifty program ends up with unspent funds, either at the end of the fiscal year or at the end of the program, these dollars are generally transferred to some other project (usually one that is overspending). The team who worked hard to save money receives virtually no benefit aside from a single line in an annual evaluation. The team which is overspending ends up receiving more money.

The good news is that we can improve this situation without having to completely recreate the entire enterprise. In a broad sense, congressional and military leaders can make a concerted effort to seek, support, and celebrate the organizations, programs, and individuals who exhibit this constrained mindset. Find the teams which are already delivering ahead of schedule and under budget, encourage them to continue along that path, and celebrate their achievements in public. Point to them as an example of what right looks like, hold them up as exemplars for other programs to follow, as viable and valuable alternatives to the status quo. Identifying these teams as the top performers can provide a strong incentive to the rest of the acquisition community to follow suit.

Let's look at one specific way to do this, which is entirely allowable within the current regulations. A few small policy adjustments would be sufficient to get things started, and a minor legislative effort could boost it considerably.

Give Program Offices "A TIP"

I propose creating an Acquisition Thrift Incentive Program (A TIP), through which Pentagon leaders give program offices a "tip" for good performance. This could be initially implemented on a small number of programs, then expanded to the wider enterprise if proven successful. Here is how that would work.

When a program office delivers a new capability under budget, a portion of the saved funds (nominally 10%) would be formally set aside for the team to spend on a project of their choosing. They would be granted considerable freedom and autonomy in deciding how to invest these funds. The available options would vary depending on how much money is involved, but might include the following:

1. Establish an incentive prize on Challenge.gov to fund a relevant technology contest
2. Fund a Small Business Innovation Research (SBIR) effort at SBIR.gov
3. Sponsor a small research project with a university
4. Purchase the necessary hardware (3D printers, etc) to set up and maintain a Maker Space on their local base

The A TIP initiative would grant top performers an opportunity to do more of what they are good at and would equip front-line practitioners the freedom to explore alternatives which might otherwise be overlooked. It would also reward speed, because the longer the program takes to complete, the less likely there will be money left over and the less likely the people involved early in the program will still be involved as the program ends. Focusing on speed, thrift, and simplicity (i.e. adopting a constraint mindset) would maximize the team's odds of receiving A TIP funds. Any funds spent on an incentive prize or SBIR award would likely produce additional low-cost solutions to important needs and would help fill gaps in current plans.

It would be difficult to game this system by inflating initial estimates and budgets, because all the existing incentives would still apply (i.e. low bidders tend to win, etc). The A TIP concept directly incentivizes the desired outcomes (not merely the desired behavior), as it encourages program teams to deliver capabilities under budget and ahead of schedule.

One important aspect of A TIP is not to add new reporting requirements or excessive restrictions on how the funds will be spent. The mechanisms, reporting requirements, and controls already in place for managing government incentive prizes or SBIR programs should be sufficient. Senior executives should refrain from dictating exactly which program, technology, or endeavor to fund. The idea is to allow the front-line practitioners to decide as a team which areas to pursue.

This is a sensible position to take because if the team was efficient enough to come in under budget in the first place, it is reasonable to suggest that they would be similarly efficient and effective with the A TIP funds. The program will still comply with all the accountability requirements associated with the particular contracting vehicle or channel, but should be given wide latitude within those boundaries.

Let's consider an actual example. From January through November of 2014, I was the program manager for the Dismount Detection Radar (DDR) program, an $84M effort to develop a new radar system. When we finished the effort and closed out the contract, our thrifty approach meant we had $8M in unspent funds to return to the government. Under an A TIP initiative that provides 10% of the savings to the program office, the DDR team would receive $800,000 to invest and manage (approximately 1% of the program's original budget), while the Air Force would retain $7.2M. This is the very definition of a win-win-win situation.

With $800,000, my team could have funded several small experiments via SBIRS, as well as a handful of incentive prizes at Challenge.gov. There would likely have been money left over to send the whole team to a technology conference or to pay for formal training at a place such as the University of Tennessee's Aerospace and Defense division or Georgia Tech's Contracting Education Academy.

The benefits of this program include:

1. Increased incentives to adopt a constraint mindset.
2. Increased incentive to complete programs under budget and ahead of schedule.
3. Increased morale among program offices as they are granted autonomy to experiment with the A TIP funds.
4. Increased training opportunities for the workforce with no additional funds needed.
5. Increased opportunities to pursue disruptive innovations and alternative technologies, suppliers, and methods via SIBR.gov and Challenge.gov.
6. Increased access to innovative solutions (incentive prize winners and SBIR awards).

One potential barrier to implementation is the legislative restriction based on "color of money" and fund expiration dates, but this is easily overcome. For starters, there are plenty of opportunities to use the saved funds within the original funding category and timelines. A team that saves R&D funds could simply put their 10% towards an additional R&D effort, staying within the category of the original budget. The fact that they are not allowed to spend those funds in a completely unrestricted manner would likely have a minimal impact on the incentive nature of the A TIP initiative. However, it would also be possible to establish a simple mechanism to convert the A TIP funds (which will inevitably be a small portion of the original program budget) into "colorless money," which does not expire and could be used in a wider range of situations.

Conclusion

There are many ways for military and congressional leaders to provide a strong, creative, empowering incentive to encourage acquisition professionals to adopt a constraint mindset. The A TIP idea is one such method that seems particularly promising. It is designed to help our best performers do more of what they are good at and is likely to convey a rich benefit to the acquisition workforce and the armed forces as a whole.

Launching such an initiative would be a matter of issuing a Department-level policy, as the majority of the actual mechanisms necessary are already in place. The first step is to launch A TIP as a small pathfinder program, available to a select group of programs. If it succeeds in delivering the desired results, it could then be rolled out on a larger scale. The initial A TIP programs might focus on leveraging existing legislative mechanisms, and over time additional opportunities could be introduced through the legislative process (i.e. changing color of money).

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