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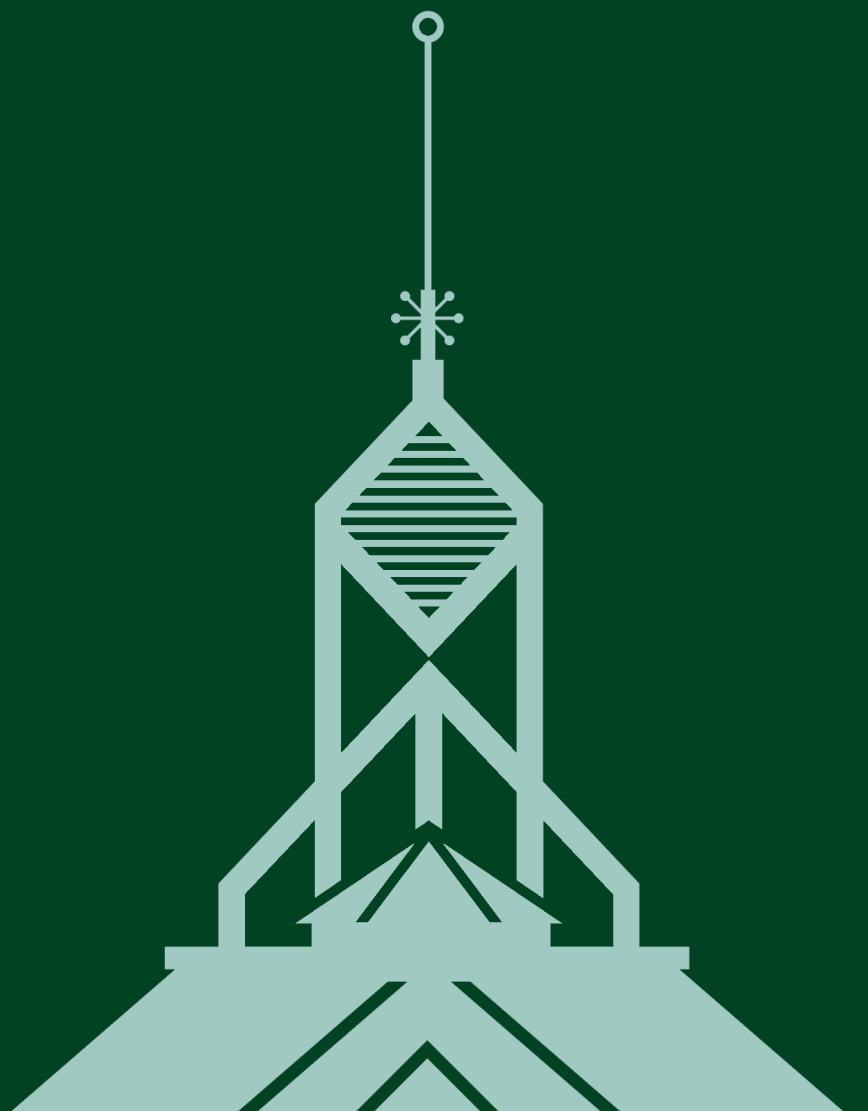
Execution Flexibility and Bridging the Valley of Death

AN ACQUISITION NEXT REPORT



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Government Contracting
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Execution Flexibility and Bridging the Valley of Death

AN ACQUSITION NEXT REPORT

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Report No. 4 October 21, 2022

Center for Government Contracting

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Executive Summary

While the platform-based defense budgeting system works well for large capital investments, many other capital investments such as the Joint All-Domain Command and Control (JADC2) concept require modular, cross-cutting technologies that do not fit well into program stovepipes. The cycle times of military feedback and product improvement for many electronics and software applications, for example, happen within the traditional budgeting and appropriations process.

Even when all stakeholders are aligned, there are precious few opportunities to get funding within the traditional resource allocation process. This creates a proverbial "valley of death" that frustrates everyone involved. While DoD's Adaptive Acquisition Framework has accelerated decision times, contract solicitations cannot be put on the street nor capabilities put into the field until funding is made available. Funding is the long pole in the tent.

What types of strategies can inject the execution flexibility necessary to bridge this valley of death and get capabilities in the hands of warfighters?

Execution flexibility is DoD jargon for delegated authority to move money. It is the most direct way to increase decision speed. Since 1960, execution flexibility has dramatically decreased in Research, Development, Test, and Evaluation (RDT&E) and Procurement. DoD saw a ten-fold increase in the number of budget line items, a four-fold decrease in reprogramming, and the elimination of unobligated balances.

This study investigated four potential sources of execution flexibility available—innovation funds, Program Element (PE) consolidation, reprogramming, and expired funds—and found the following:

This study characterized several types of innovation funds. Those tailored to technology transition like the Joint Capabilities Technology Demonstration (JCTD), Rapid Defense Experimentation Reserve

The authors wish to thank current and former Department of Defense officials, congressional staffers, and industry executives who accepted requests for interviews and shared their insights for this report. This research has been facilitated by a donation in support of defense acquisition research from Lockheed Martin Corporation.

(RDER), and Rapid Prototyping Program are called the "core" innovation funds. "Core" funds totaled $436 million in FY 2022 (0.4 percent of RDT&E), down from a peak of $843 million in FY 2017. Other budget lines have varying degrees execution flexibility and applicability to the discussion. The total of identified flexible budget lines is about $7 billion in FY 2022, less than one percent of DoD's topline.

Program Element consolidation is another way to increase the ability of defense officials to move funds to support execution flexibility. This occurs by grouping multiple well-justified efforts under a single PE. DARPA's program elements, for example, consolidate many projects, the median size in FY 2022 standing over $200 million. The Army's Family of Medium Tactical Vehicles (FMTV) includes several separate vehicles procured under one line. Offices like Defense Innovation Unit, the Strategic Capabilities Office, and the Chief Data & AI Officer have dedicated PEs with greater flexibility to select projects in the year of execution.

As opposed to flexible budget lines, reprogramming provides a method for moving funds between line items. Above threshold reprogramming grew during the Global War on Terror, reaching a high of 3.2 percent during the Iraq Surge in FY 2008. Since then, reprogramming has declined to less than one percent of DoD funding. Including both above and below threshold reprogramming, total flexibility within the RDT&E title was 2.5 percent in FY 2020 compared to 4.5 percent in FY 2012.

Roughly $5 billion from the RDT&E and Procurement titles expired each year between FY 2018 and FY 2021. Since FY 1995, DoD has had authority to transfer up to $1 billion of expired funds to the Defense Modernization Account. Center researchers did not find evidence that this authority has ever been used.

RECOMMENDATIONS

Increasing execution flexibility does not require major overhauls of laws or regulations

The ability to define the content of budget line items is completely within the control of Congress and DoD if they can work together. The general direction of action is clear: Larger and more broadly justified budget line items that contain a portfolio of efforts, along with timely access to lower-level execution metrics.

Innovation Funds

The first recommendation is to create a cohort of warfighting exercises resourced by innovation funds. The goal should be operationalizing prototypes and validating requirements. A merit-based selection process such as commercial solutions opening should be used by chief technology officers to allocate component-specific funds of roughly $100 million each. Congress could create "boards of advisors" to monitor use of the funds in the year of execution.

PE Consolidation

The second recommendation provides a means for the program offices to receive these efforts across the valley of death through some level of PE consolidation. This can be done through two principal approaches. First, propose certain PEs with more flexibility to expand the scope of projects without a new start. Second, group well-defined programs under a single PE to help balance execution. The most logical method for consolidating PEs is by capability area, mission thread, or program within each Program Executive Office (PEO). The services could each select two or three pilot consolidated PEs from PEOs for congressional consideration, for

example. A rule of thumb such as a $20 million minimum PE size can be encouraged for these pilots.

New Starts

The third recommendation is to continue the prior approval process for new starts and terminations at current thresholds, but tweak the definition such that prior approval is only required if the effort is above threshold for the fiscal year, rather than for the life of the effort. Only a small development program is fully completed within $10 million. However, $10 million within a fiscal year with the potential for follow-on funding provides an important source of execution flexibility. Letter notification will still be maintained, providing Congress 30 days to deny the action. This change could be enabled by an administrative update to Volume 3, Chapter 6 of the DoD Financial Management Regulation, replacing "for the entire effort" with "for the fiscal year."

Reporting

The fourth recommendation is to improve transparency through real-time reporting capabilities that provide insight below the PE level. This is a common thread for the above recommendations, to assure accountability is maintained and Congress can communicate its interests. This requires modernization of reporting systems from both DoD and Congress, efforts already underway. Obligations at the lowest level should have multiple tagging formats and be linked to contract data to provide end-to-end visibility. They should be indexed to documentation, test reports, and analysis.

After conversations with officials from various perspectives, Center researchers do not believe that increases in reprogramming thresholds or the use of expired funds provide a feasible near-term path to execution flexibility. Both present more challenges than opportunities, particularly because they have been abused in the past, undermining trust.

With better approaches to innovation funds and PE consolidation, DoD and Congress have the opportunity to inject increased flexibility into the resourcing process. It does not require new laws or extensive re-writes to regulations, manuals, and implementation guides. Instead, by linking innovation funds to operational exercises, consolidating program elements, broadening the work scope, and bolstering oversight, the Department of Defense will have more of the execution flexibility it needs to harness the creativity and skill of its people to outcompete China.

Study Approach

RESEARCH QUESTION

While the platform-based budgeting system works well for large capital investments, many other capital investments such as the Joint All-Domain Command and Control (JADC2) concept require modular, cross-cutting technologies that do not fit well into program stovepipes. The cycle times of military feedback and product improvement for many electronics and software applications, for example, happen within the traditional budgeting and appropriation process. What types of strategies can inject the execution flexibility necessary to bridge this valley of death and get capabilities in the hands of warfighters?

METHODOLOGY

As the congressionally appointed Commission on Planning, Programming, Budgeting, and Execution (PPBE) Reform begins an extensive review of the defense resourcing process in FY 2022, this paper aims to address near-term opportunities to increase execution flexibility.

The research team started by identifying and quantifying the current sources of execution flexibility, including innovation funds, program element consolidation, reprogramming, and expired funds.* Researchers then interviewed more than two dozen individuals from a variety of backgrounds in the Pentagon (civil and military), industry (traditional and nontraditional), and the Hill (authorizers and appropriators). Twenty-two of the interviewees returned for a roundtable event to openly discuss preliminary findings and feasible solutions.

Center researchers determined that impactful recommendations may not require new laws. Instead, changes in norms, and perhaps one change in regulation, can unlock most of the flexibilities DoD needs to regain overmatch against China inside the turn of the Future Years Defense Program (FYDP).

OUTLINE

This report can be read in its entirety or as three sections of issue papers.

The Challenges—four issue papers that define the problem, including:

1. The strategic narrative
2. What do you mean, "Valley of Death?"
3. The decline of execution flexibility
4. The conversation we're hearing

Potential Sources of Executive Flexibility—four issue papers that outline key challenges and recommendations with current sources of execution flexibility, including:

1. Innovation funds
2. Program element consolidation
3. Reprogramming and
4. Expired funds

This study did not include several areas of execution flexibility in the scope of effort. Other areas for future research include: (1) Flexible wartime accounts like Iraqi Freedom Fund or Overseas Contingency Operations, which supported transfers for rapid acquisition; (2) Matching funds or follow-on funds provided by program offices in support of Defense Innovation Unit, AFWERX, XTechSearch, and other innovative efforts; (3) The "colorless" Budget Activity 8 pilot program for software which adds flexibility across the program lifecycle; and (4) The services' rapid capability offices, which may not have dedicated and flexible funds but enjoy direct access and support from leadership.

Data—an appendix of five issue papers that contain budget and reprogramming data, segregated into:

1. "Core" innovation funds
2. "Secondary" innovation funds
3. Non-program of record prototype funds
4. SBIR/STTR funds and
5. Reprogramming Trends

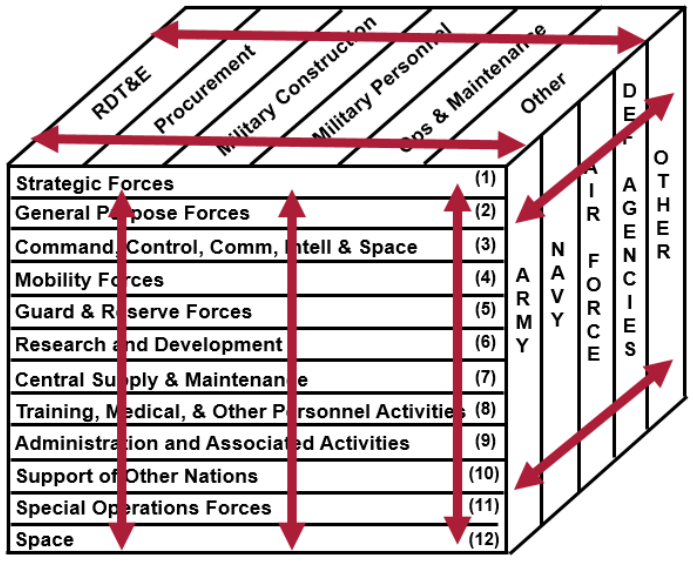
The Challenges

THE STRATEGIC NARRATIVE

Innovation and speed have been a persistent focus in defense acquisition for almost a decade. From the creation of the Defense Innovation Unit in 2015 and Army Futures Command in 2018 to today's Rapid Defense Experimentation Reserve (RDER) and the JADC2 implementation efforts, defense officials recognize the need to inject emerging technologies into military systems. The 2022 National Defense Strategy reinforced this need for the Department to work "seamlessly across warfighting domains" and build enduring advantages to "accelerate force development" and get "the technology we need more quickly" to face the pacing challenge of China and acute threats from Russia and elsewhere.

Important strategic concepts like Integrated Deterrence and JADC2 are essential in today's national security environment. Translating those concepts into capabilities remains a significant challenge for the current defense acquisition system. For example, JADC2 requires networking the Department's disparate weapons platforms into a common operating picture. It defies traditional methods of resourcing programs. Rather than a single program, JADC2 addresses the gaps and seams between stovepiped systems. It makes no distinction whether a sensor or effector is Army, Navy, Air Force, or otherwise because the combatant commander must compose joint forces from all domains. Moreover, as a software-intensive effort, JADC2 is "never done." Its continuous development and deployment of capability to the field blurs the lines between development, procurement, and sustainment. Putting this all together, JADC2 efforts cross-cut all appropriation titles, military components, and major force programs (Figure 1).

Figure 1. JADC2 Crosses All Categories of the Budget



The Need for Execution Flexibility

Combatant commanders and defense leaders have made clear the imperative to accelerate the development and deployment of capabilities. The complexity and process time to get funding allocated makes this exceedingly difficult, however. All steps are sequential in nature, resulting in lengthy process charts that are commonly used on social media to show how byzantine the system is. Hundreds of people's hands touch program documentation, each bringing their own demands for procedures. Every program is analyzed and baselined as a self-contained entity, resulting in stovepiped systems that lack interoperability.

To speed up development and deployment, defense officials have created innovation funds and established offices such as those described in this report to accelerate the delivery of capabilities, these efforts have led to many large field experiments and successful prototypes, but the challenge has been transitioning these emergent capabilities into the defense budget, which is comprised largely of programs of record that had already passed the multiyear process of documentation and approval.

The experience of innovation funds and similar efforts described in this report illustrate that getting more flexibility within the budget cycle and scaling the results of non-programs of record is extremely challenging. Successfully integrating commercial technologies into military systems means matching cycle times found in the commercial sector. Even though advances in platforms like ships, airframes, and propulsion systems occur at slower timeframes, computing and electronics are still churning out new generations every 18–24 months, while software applications can unlock new capabilities within a few weeks or even every day. Just as importantly, focusing on enabling technologies like mesh networking, cloud infrastructure, software development pipelines, zero trust architectures, and so forth can accelerate program delivery. These efforts too often get built and rebuilt for a specific program rather than leveraging the efficiencies of enterprise tools.

Despite the challenges, there are potential paths toward increased flexibility even without structural budget reform. We will outline some of these paths in our conclusion.

Lessons Learned

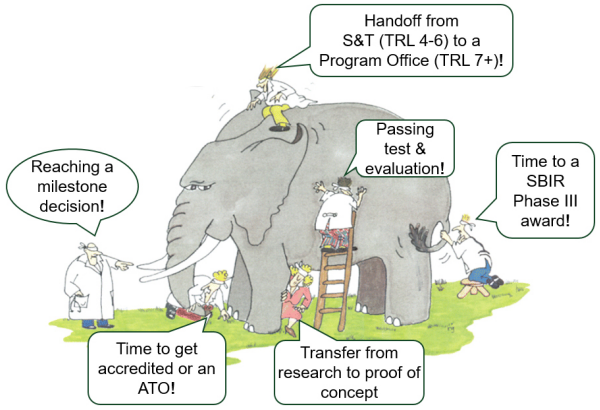
- The pacing challenge of China in the 2020s means that time to field is the priority risk
- DoD must speed decision cycle times to achieve marked change within the FYDP
- Acquisition must match the pace of technology developed in the private sector
- Need other budget models for systems that are ill-suited to the traditional Program of Record model

WHAT DO YOU MEAN, "VALLEY OF DEATH?"

The "valley of death" means many things to many people, but its origins are generally attributed to Geoffry Moore's 1991 book *Crossing the Chasm*. It referred to problems faced by companies expanding product sales from early adopters (the first 10–20 percent of the market) to early majority customers. Since that time, the term's prevalence in books indexed by Google has dramatically increased. It has been tailored to a number of industry and laboratory contexts such as biotech, oil and gas, electric vehicles, and cybersecurity.

The Department of Defense and industry also use the term in a number of very different contexts, represented in Figure 2. For the purposes of this paper, *the term "valley of death" will focus cycle time between evidence of a desirable effort and allocation of funds* to a program of record.

Figure 2. Here's the Valley of Death!



This selective definition has been cited in guidance. For example, the 2005 *Manager's Guide to Technology Transition* defined the valley of death as "shifting from one type of fund to another [that] can result in a gap in funding." It explained:

> "The PPBE process requires a nominal two-year lead-time for funding to be approved. As a result, accommodating fast-changing S&T developments in acquisition programs can be a challenge. The PM community cannot always predict the pace of innovation two years in advance, and funding may not be available for fast-moving S&T projects that are ready for transition. Therefore, a desirable S&T project may stall for 18 to 24 months awaiting funding. This gap is sometimes called the 'valley of death.'"

More recently, the 2021 *Department of Defense Prototyping Handbook* offered a similar discussion and said of the valley of death, it is "the gap between technology development and production where promising technologies often 'die' due to inappropriate or insufficient funding." There are three key aspects of the definitions provided here:

1. Appropriations of funds
2. Two-year cycle time
3. Desirability of the project

Appropriation of Funds

From a Big "A" Acquisition perspective, all of the authorities to move fast and adopt new technologies already exist except one: Resourcing. Besides a handful of niche funds, it takes an act of Congress to fund the money to start anything new. This barrier clearly adds to the valley of death in defense compared to other contexts.

- **Contracting:** Other Transactions, Commercial Solutions Openings, Modular Contracting
- **Acquisition**: Software Acquisition Pathway, Middle Tier of Acquisition, Urgent Acquisition
- **Requirements**: Urgent/Emergent Operational Needs Statement; Middle Tier of Acquisition
- **Resourcing**: FY2022 NDAA created the Commission on PPBE Reform

Two Year Cycle Time

Companies commercialize their basic prototypes within two years, even for deep tech sectors like drones, robotics, AI/ML, electronics, biotech, and advanced materials. Most start up companies will require another next funding round within eighteen months. If they haven't shown revenue from commercialization, fund-raising gets difficult. All this happens within the cycle time of DoD resource allocation process. From the time the POM is submitted to headquarters in the Spring to the time a continuing resolution ends in Winter of the next year, the product could already have been operationalized. This deliberate gap puts DoD perpetually behind the pace of technology available to commercial companies and adversary nations.

Desirability of the Project

This use of the term "valley of death" suggests a systematic failure to pursue higher-value projects due to funding being tied up in other projects. The selected definitions describe a project stuck in the

valley as "desirable" or "promising." For example, a new system from IRAD, SBIR, S&T, or Commercial sources could have been successfully demonstrated at a warfighting exercise. If stakeholders agree that they would be willing to seed the next stage by pulling from another effort, but could not move resources in a timely way toward that end, there is a likely case of the valley of death. Not only must the project be desirable, stakeholders must be willing to forego other efforts. DoD's budget is zero-sum.

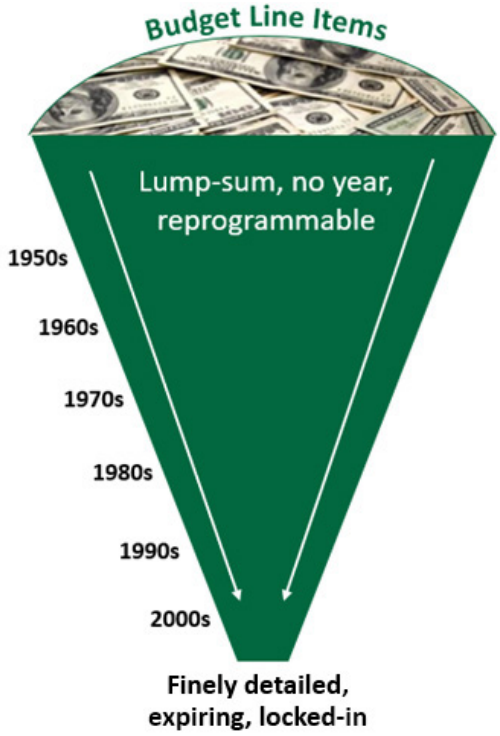
Lessons Learned

- "Valley of Death" has many valid meanings, but the focus for defense acquisition is on funding flexibility
- Niche funds and stopgaps have not bridged the "valley," only delayed it
- Commercial companies build, deploy, and fundraise within the multi-year cycle time of DoD resource allocation
- There is no definitive answer to the question, "how many projects *actually* died in the valley of death?"

THE DECLINE OF EXECUTION FLEXIBILITY

Through the 1960s, defense officials enjoyed execution flexibility that would make their modern counterparts' eyes water. Funds could be characterized as lump-sum, no-year, and reprogrammable. For example, the Army requested no new funding for "Major Procurement and Production" for FY 1956 because it had over $5 billion in unexpended balances from the Korean War. The appropriation only had 11 program line items including $713 million for "Support Vehicles" and $2.1 billion in "Ammunition." Not only could funding be moved between projects within a line item, the Department could also quickly reprogram funds between line items. The Legislative and

Figure 3. Reduction in Execution Flexibility Funnel



Executive branches maintained trust by:

1. Coordinating program plans through extra-budgetary means such as legislation, task forces, and administrative actions
2. Performing rigorous oversight on program outcomes instead of documentation inputs

Over the next several decades, Congress began locking funds into finely detailed line items which expired after a set number of years (Figure 3). For example, the "program element" structure exploded the number of RDT&E budget lines by ten-fold and restricted cost-schedule-technical trade-offs. Table 1 shows a timeline of major events that have constrained the vitality and initiative of DoD. The internal controls created by PPBE were adopted by Congress and enhanced in reaction to bad actors, such as those highlighted in Table 1.

Table 1. Reduction in Execution Flexibility Timeline

FY 1951	**Colors of Money.** National Security Act Amendment of 1949 creates modern appropriations, moves away from organizational structure that did "cradle to the grave" ownership of systems and increases multiple funding of a program by crossing RDT&E, Procurement, and O&M.
Oct 1959	**Reprogramming.** All DoD reprogramming actions greater than $1 million in RDT&E and O&M, $5 million in Procurement, require prompt notification to Congress who could reject within 15 days.
FY 1963	**Program Elements.** First fiscal year of Planning Programming Budgeting System. Though President's Budget keeps traditional format, additional program structure adds detail to planning and budgeting.
FY 1965	**RDT&E Budget Activities.** Linear budget activities added to distinguish RDT&E phases from basic research through test & evaluation. Leads to multiple funding of programs, longer planning lead times, and restricts execution.
FY 1971	**Expiration of Funds.** RDT&E and Procurement titles had been "no year" funding until it was discovered the Navy reprogrammed large amounts of leftover funds from Polaris submarines. Appropriations could no longer be used for new obligations after defined number of years.
FY1972	**Detail Added to President's Budget.** Program elements added to President's Budget, resulting in a reduction of execution flexibility within budget accounts. For example, the Army's RDT&E justification grew from 8 program and 10 object line items in FY1971 to 173 program elements in FY 1972. Congress rejected an attempt to consolidate line items down to 85 the next year.
FY 1973	**Innovation Fund Eliminated.** The "Emergency Fund" used to exploit S&T breakthroughs and averaged roughly TY$150 million a year was eliminated, citing the sufficiency of reprogramming for the task.
FY 1993	**Merged Surpluses and "M" Accounts Closed.** Congress discovered $1 billion of expired funds used for B-1B modification and GAO reports revealed more than $40 billion of balances. Congress subsequently cancelled use of merged surplus and M accounts, reducing DoD's ability to maximize budget authority and make tradeoffs.
Aug 2000	**Expansion of Prior Approval.** Financial Management Regulation expands prior approval of four congressional committees over thresholds that had previously only required Secretary of Defense approval and congressional notification. Increases time and effort to approve each reprogramming

Timeline Key: **Budget Structure**; **Reprogramming**; **Innovation Funds**; **Expired Funds**

Lessons Learned

- Execution flexibility is consistent with the United States tradition of liberal democracy and Congressional power of the purse
- Due to breaches of trust and the introduction of PPBE, execution flexibility has dramatically decreased since the 1950s

THE CONVERSATION WE'RE HEARING

Here is a fictional conversation between officials representing Congress and the Pentagon.

Congress	Pentagon
You want year-of-execution money to do prototyping but are not willing to plan for it, make tradeoffs, and POM for it in the next cycle. We need to see the future implications of today's choices, hammer out transition agreements, and perform the traditional documentation or nothing will cross this valley of death.	We don't know what precisely threats will appear in five years or which company may present a cutting edge solution. We want to prototype and create options, but are not willing to prematurely commit to production on any single idea. We need to be agile, continuously learn from operational experimentation, and move at relevant cycle times. We need to do business like to commercial tech sector.
We've given you all necessary authorities in the past, and we don't get an understanding of how these funds are used. We have no evidence these things are working.	These authorities often come with more scrutiny and extra work that makes us risk averse should something not succeed. It's easier to dump everything into a Major Defense Acquisition Program (MDAP) at the expense of a more networked and attritable force structure based on emerging tech paradigms.
Most of that risk aversion comes from your own processes, not ours. And your personnel turn over too fast to have strategic insight or be held responsible. That's why we need concrete, well-justified initiatives.	Where we fall short is not hardware outputs with defined specs, but cross-cutting enabling capabilities. 99% of us are honest and dedicated enough to move at the speed of trust.
We trusted you before and look where that got us. This is taxpayer money. It's different.	The threat is real. We need speed. Can we modernize reporting to give you that oversight?
It's not just about oversight, it's our interests and constitutional duties.	Yeah but . . .

Trust and Comity

Many of the rules around budget lines, reprogramming, and the scope of activities are not written in law but are found in customs or regulations. As former HASC chair Melvin Price remarked, reprogramming is a "gentleman's agreement" and a "pretty fragile process." Certainly the border wall incident has fractured trust, as expressed in the FY 21 House Appropriations report:

"The granting of additional budget flexibility to the Department is based on the presumption that a state of trust and comity exists between the legislative and executive branches regarding the proper use of appropriated funds. This presumption presently is false."

Both sides have a common goal and it should be stated aloud: to compete against China. Adding controls, reports, and baselines have failed to improved trust between the parties, have not led to better-faster-cheaper, and have not incentivized the workforce. Doing more of the same will not create different outcomes. A new path can only be worked out under a cooperative spirit. If competing against China requires a bias for action, then the current system of verifying lifecycle documentation before trusting senior materiel leaders with funding must be flipped around. Entrust leaders with funds, but verify the test results, the cost-effectiveness, and the user demand.

Lessons Learned

- DoD and Congress are on the same side
- The stakes are high and risk must be taken to accelerate the needed capabilities
- Congress doesn't only care about insight and oversight, but control of resources
- The Pentagon is not as transparent as it could be
- Improved execution metrics are necessary but not sufficient to Congress trusting DoD and delegating execution flexibility
- There is no technical fix to an issue dominated by fear and emotions

Potential Sources of Execution Flexibility

INNOVATION FUNDS

Innovation funds allow defense officials to resource projects in the year of execution. This may include projects without an approved requirement, program of record, or new start. These funds come in many forms. Some use S&T accounts like the Joint Capability Tech Demo (JCTD) to field urgent but unfunded requirements. Others use BA 6.4 prototyping accounts like Army Technology Maturation Initiative (TMI). Others focus on accelerating procurement like Agile Procurement Fund (APFIT). Others are not a budget line item, like the now defunct Rapid Prototyping Fund (RPF) which was credited with 3 percent of cost overruns.

Most innovation funds have limits on project funding or duration. They often take projects past S&T activities. Selections may take 7 to 12 months or more based on a competitive process to a centralized decision agent or body. An overview of innovation funds is provided in the data tables below. This study categorized select funds into "core" sources

like JCTDs, RDER, APFIT, and the currently inactive Rapid Innovation Fund (RIF); "secondary" sources like Manufacturing Technology (ManTech), Combatting Terrorism Technical Support Office (CTTSO), and Foreign Cooperative Test (FCT); non-program of record sources like Army TMI and Air Force Technology Transition; and finally SBIR/STTR.

Congress has supported several generations of innovation funds, even initiating its fair share. However, members are frequently concerned about whether funded efforts are operationally effective and have a transition plan including logistical and financial resources. Senate Appropriators, for example, questioned several "inadequately justified and open-ended 'Funds'" in their recent FY 2023 Report. Still, these funds play a crucial role to fill the gaps that arise in the multi-year budget cycle. PPBE co-founder Roland McKean believed that the FYDP could presume too fixed a future. It is wise to keep some parts of the budget "to be scheduled."

Challenges

Despite recent interest in innovation funds, DoD and Congress face a number of challenges. First, the funds can push the valley of death to the right rather than solve it. This is because service program offices and resource sponsors may not be invested as a partner. Thus, unless the effort is quickly worked into the next cycle, the innovation fund becomes a bridge to nowhere. Programs offices are measured on performance to baseline. They are not incentivized to adapt their plans or respond to new opportunities. These incentives can also lead to the "gaming" of innovation funds. A service may pull from the budget request of one program where they expect to gain from an innovation fund. This subverts the intention of exploring new concepts.

Innovation fund authorities present another challenge. Project selection often resides with top leadership which limits speed and scalability of these funds. Each fund has its own process outside the regular system. Applicants feel their proposals go into a black hole or as if they're playing the lottery. Due to high demand, innovation funds tend to be spread thinly across a large number of efforts rather than adequately resourcing the most promising efforts.

Recommendations

Here's the Catch-22 of innovation funds. The purpose is to experiment, create options, and scale what works in a timely manner. However, if it isn't known ahead of time which effort will succeed, then program funds won't be available to receive the winners. If only efforts with transition plans are selected, then the funds lose their purpose. The services are unlikely to trade-off funding from an approved program in the hopes that a new effort could prove successful.

One way out of the Catch-22 is to align innovation funds with operational exercises at the service and joint levels. Warfighters, program officials, resource sponsors, and S&T should all participate in design thinking sprints to source problems and potential solutions for the exercises. Companies will self-fund demonstrations if they know success will be rewarded. Exercises could be followed by quick, merit-based selections, such as using Commercial Solutions Openings. The purpose of these innovation funds is to find product-mission fit and quickly provide resources to hold the effort over while the after action report starts the clock on requirements and resourcing.

By focusing on operationalization through warfighting exercises, activities covered by innovation funds should cross appropriations. Standard report back procedures should be established to keep Congress apprised. To further assure Congress, each

fund could have a "board of advisors" to monitor execution and transitions. Modest innovation funds of roughly $100 million per component dedicated to promising efforts in warfighting exercises provides an empirical method for selecting and scaling solutions that are operationally effective and operationally suitable.

PROGRAM ELEMENT CONSOLIDATION

Program Element consolidation is another way to increase the ability of defense officials to move funds to support execution flexibility. This occurs by grouping multiple well-justified efforts under a single PE. It can also occur by justifying a PE broadly to capture a wider range of efforts or multiple increments of upgrades. Like innovation funds, consolidated PEs do not equate to a "slush fund." A slush fund is off the book. Broader PEs can still maintain transparency and accountability. O&M accounts, for example, are already flexibly justified. The median O&M budget line item enacted in FY 2022 was $263 million. They outline general activities such as "Weapons Maintenance." Compare that to the RDT&E title with 943 unclassified line items, the median being just $35 million.

DARPA's program elements, for example, consolidate a large number of projects, the median size in FY 2022 standing over $200 million. The Army's Family of Medium Tactical Vehicles (FMTV) includes a number of separate vehicles procured under one line. Offices like Defense Innovation Unit, the Strategic Capabilities Office, and the Chief Data & AI Officer have dedicated PEs with greater flexibility to select projects in the year of execution.

In FY 2021, the Air Force attempted to consolidate PEs in BA 6.3 down to just 5 elements between $100 and $200 million. House Appropriations recognized this increased the Air Force's ability to "realign funding" among activities "without prior congressional approval." Although they didn't reject it outright, a deficit of trust made it an inopportune time. The Space Force also proposed a set of "capability" budget portfolios, but failed to gain traction even in the Executive branch.

Challenges

One of the primary challenges to PE consolidation is that Congress requires both transparency and control in order to fulfill their duties. Current data reporting tools do not readily provide insight into obligations and expenditures below the PE level. Even if Congress had access to improved reporting, it would lose the most important tool for protecting its equities in certain projects. Congress often breaks efforts out from consolidated PEs, just a couple examples being separation of medium and large unmanned surface vessels in the Navy, separation of hypersonic missiles in the Air Force, and a proposed breakout of the Space Force's Next-Gen Overhead Persistent Infrared program for FY 2023 into four PEs including Polar and Ground.

PE consolidation does not solve requirements or new starts issues on its own. The PE must be written in such a way to permit a broad range of activities but not too vaguely. Not only may Congress push back, it opens the door to the services simply filling gaps in existing programs and not transitioning new systems.

Recommendations

The services could identify flexibly justified PEs that include year-of-execution reporting mechanisms. These could be agreed upon with Congress in advance of submission. DoD has learned that insufficiently detailed justifications are likely to be cut; it would not risk proposing an easy target when other programs are clamoring for the funding.

For crossing the valley of death, a broadly defined budget line unassociated with programs of record provides a "catcher's mitt" for program offices to match innovation funds in relevant cycle times while program funding is worked into the POM. These consolidated PEs should be aligned with the PEOs or program offices that will execute the funds to align responsibility and authority. Greater consideration should be given to aligning each consolidated PE with what former DIU Director Mike Brown called a "capability of record" that may cover a range of individual efforts from the adaptive acquisition pathways. As former Air Combat Commander General Mike Holmes said, "every time I do a new variation of the platform, new variation cannot equal new program." A continuous stream of capability development across multiple lines of effort should be possible within a single PE.

PE consolidation, like innovation funds, is best paired with a real-time reporting tool for execution metrics below the budget line item level, connected to contract data where possible. Logical patterns for consolidation along program office or PEO lines could use a rule of thumb for minimum PE sizes, such as no element under $20 million. If applied across the board, this rule would have reduced the number of PEs in the FY 2022 RDT&E title by 38 percent.

REPROGRAMMING

Reprogramming is a general term that refers to several actions. A transfer occurs when moving funds across appropriations. All transfers requires congressional approval. Reprogrammings include transfers, but also moving funds between budget lines within an appropriation. Movements "above threshold" require prior approval. Finally, new starts and terminations occur below the budget line item and require prior approval if the entire effort is greater than $10 million (RDT&E) or $20 million (Procurement). A typical reprogramming action can take several months to clear 12 layers of approval in DoD and then OMB and four congressional committees.

The custom of reprogramming first appeared in 1955 and largely relied on congressional notification. In FY 1961, reprogramming were quickly approved by DDR&E and reached 20 percent of the RDT&E title. However, a string of events led to a dramatic reduction in prior approval reprogramming in FY 1973 which continues to this day.

DoD's total below threshold reprogramming (BTR) hovered around $1 billion a year between FY 2012 and FY 2020 for RDT&E. Procurement trended down from roughly $2 billion to $1 billion. For these titles, DoD tends to only use between 15 and 30 percent of its potential BTR authority (if all PEs used the maximum BTR allowable). Total RDT&E reprogramming, both below and above threshold, has been between 2.5 and 4.5 percent of enacted funds FY 2012 to FY 2020. More data on reprogramming is provided below.

Challenges

A frequently cited challenge to increasing thresholds is the border wall controversy. Despite the exit of the Trump administration, the incident reminded Congress that reprogramming within General Transfer Authority are under the Executive's control. Prior approval is a norm and regulation, not a law. This precedent was first upheld in 1975 when the Navy chose not to select the winner of the Lightweight Fighter Competition, the F-16, and instead went forward with the prototype that became today's F/A-18. Breaches of reprogramming norms do not lend confidence to threshold increases, however, and instead could lead to tighter appropriations language. Thresholds for Procurement and O&M were

both decreased from $20 million in FY 2018 to $10 million in FY 2020.

Another challenge is proving the effectiveness of special reprogramming authorities. DoD already has transfer authorities including for rapid acquisition and C4ISR. There isn't much public information on how these authorities are used, however.

Increased reprogramming is also an admission that the programs are not executing to the plans justified in the budget request. It provides a process for reacting to change, but does not address the cause of the mismatch between budget plans and execution realities that stem from: (1) long cycle times; and (2) overly-specified line items. Outside of wartime emergencies, reprogramming is unlikely to reach the size or speed necessary for DoD to make substantial progress on modernization.

Recommendations

Despite difficulties, reprogramming can inject execution flexibility into the defense enterprise. Resetting the thresholds back to what they were in 1963 on an inflation-adjusted basis, for instance, would put Procurement around $40 million and RDT&E at $16 million. This proposal would be more likely to be well received if designed strategically. For example, DoD could create portfolios of PEs and allow for increased BTR thresholds so long as the source and recipient were in the portfolio. This could be outlined in the quarterly DD-1416 reports. This portfolio concept could be used in a different way. Instead of raising thresholds, above threshold actions that occur within portfolios could move from prior approval to a letter notification process.

The lack of trust between Congress and the Executive Branch unfortunately does not augur well for near-terms actions on reprogramming.

One potential area of reprogramming, however, that could be low-hanging fruit is new starts. The RDT&E threshold of $10 million, for example, pertains to the "entire effort" including future year funding. This definition could be changed update to Volume 3, Chapter 6 of the DoD Financial Management Regulation, replacing "for the entire effort" with "for the fiscal year," to allow new starts so long as they do not exceed $10 million for the "fiscal year" instead. This would allow DoD to start a much wider range of activities, including those that could scale into programs. Congress retains at least two methods of control. First, it can deny the new start using the 30-day letter notification process. Second, it can adjust the effort's funding in the next year's request. This change, not to the threshold but the new start definition, would complement efforts like PE consolidation to bridge the valley of death.

EXPIRED FUNDS

Appropriations are available for new obligations for a defined number of years, after which time they expire and can only cover adjustments like contract claims. Five years later, they are cancelled and returned to the Treasury. Until FY 1971, RDT&E and Procurement accounts did not expire. After that time, expired funds could be swept into "colorless" accounts and used to cover valid obligational adjustments to maximize use of available funds or even free up sources for a reprogramming. These accounts were permanently closed in FY 1993 and the Defense Modernization Account was later created allowing up to $1 billion to be used on previously justified programs. While the DMA has been extended repeatedly including in FY 2017, Center researchers have not found any evidence that it has ever been used. Common reasons cited include Comptroller and Appropriator disapproval.

Between FY 2016 and FY 2021, about $5 billion in unobligated RDT&E and Procurement funds

expired each year. Expired funds are far more likely to occur in O&M accounts, totaling $15 billion or more a year, since O&M expires after just one year.

The benefit of expired funds to transitioning new programs is indirect unless authority is expanded to cover activities not justified for the appropriation. It is in part for this reason as well as the difficultly of traceability and past "bad actors" that the use of expired funds is often met with skepticism. Its opportunity seems more relevant for readiness or going around Programs of Record into operations with as a service purchasing. For RDT&E and Procurement, more direct and transparent sources of execution flexibility are available.

Challenges

Much of the discourse on expired funds has centered on O&M and improving readiness rather than modernization. The DMA's lack of use points to several issues. First, the criteria for contributing to DMA, such as verified cost savings, limits the size and adds to administrative burden. Second, the services don't want any contributions from their expired funds to go into a joint account and potentially "stolen" by another services. Third, the services already manage obligation rates closely. Programs are not incentivized to save funding because they are unlikely to benefit from it the next year. More likely, under-execution leads to a cut in next year's request. Finally, expired funds do not address new starts or helping efforts across the valley of death. The most it can do is cover current spending to free up money to source a new start through prior approval.

Congress has also been burned on expired funds in the past, leading to the restrictions of the 1990s. Expired funds get swept into special accounts that lose the ability to track the origins of the funds. This can circumvent congressional oversight if expired funds are used to fill gaps in programs cut by Congress or are used to maximize budget authority and enable reprogramming.

Recommendations

The Defense Modernization Account is an existing authority and its use could be encouraged. This could be bolstered by a simplified contributions process and the creation of service-specific accounts. Creating a new carry over mechanism, such as retaining a maximum of 5 percent into the next fiscal year, is likely best suited for O&M accounts and could help free up funds for "as a service" purchasing or for rapid acquisition authorities. Like with reprogramming, unfortunately, the lack of trust between Congress and the Executive Branch does not augur well for near-terms actions on expired funds.

Conclusion

The need for execution flexibility in defense acquisition is clear. While structural reform of the PPBE process would certainly be beneficial, this report has shown several steps that DoD and Congress can take now to help bridge the valley of death regarding the cycle time from demonstrated effect to resource allocation.

Innovation funds and PE consolidation are two viable paths forward. They both achieve similar purposes. By removing granularity from the budget and delegating decisions to the point where knowledge of requirements and technology is greatest, resources can more rapidly respond to real world demands. Leveraging innovation funds

and PE consolidation does not require new laws or regulations. However, PE consolidation in particular could benefit from a change to the new start regulation. New starts are controlled at the project level below program elements. Changing the prior approval requirement from "for the entire effort" to "for the fiscal year" could accelerate promising systems.

Reprogramming and expired funds, however, do not seem to be good candidates for year-of-execution funds to bridge the valley of death. After conversations with officials from various perspectives, Center researchers do not believe that either provide a feasible near-term path to execution flexibility. Both present more challenges than opportunities, particularly because they have been abused in the past, undermining trust.

Finally, increased execution flexibility requires improved reporting and oversight. This is a common thread for the above recommendations, to assure accountability is maintained and Congress can communicate its interests. This requires modernization of reporting systems from both DoD and Congress, efforts already underway. Obligations at the lowest level should have multiple tagging formats and be linked to contract data to provide end-to-end visibility. They should be indexed to documentation, test reports, and analysis. This level of reporting will provide greater transparency into spending.

With better approaches to innovation funds and PE consolidation, DoD and Congress have the opportunity to inject increased flexibility into the resourcing process. By linking innovation funds to operational exercises, consolidating program elements, broadening the work scope, and bolstering oversight, the Department of Defense will have more of the execution flexibility it needs to harness the creativity and skill of its people to outcompete China.

Data

Data Source: GMU analysis of DD 1416 reports through FY 2021 and budget justification documents of the President's Budget requests for FY 2022–FY 2023.

"CORE" INNOVATION FUNDS

"Core" sources of transition funding are those subjectively selected by this study that are best suited to funding new efforts in the year of execution. While funds have come, gone, and evolved over time, the current base of programs like JCTD and Emerging Capabilities Technology Development (ECTD) evolved from the ACTD program created in 1995. ACTDs allowed the Secretary of Defense to resource projects sponsored by the commands with the goal of leaving behind operational capabilities. All the "core" funds are held by the Office of the Secretary of Defense and have competitive proposal processes that can range several months to more than year. The programs tend to be oversubscribed. For example, the Rapid Tech Transition Office, which manages the ECTD, Quick Reaction Special Projects (QRSP), and Rapid Prototyping Program (RPP), had 836 companies apply in 2019 and only 38 selected for follow on discussions. In FY 2022, USD R&E initiative for RDER received "thousands" of submissions, 200 "decent" proposals, and 32 selections. The selected projects are then executed by the service program offices. While Congress has tended to add funds to the PB request for these "core" sources, the loss of the RPF and RIF in FY 2020 has left a deficit that APFIT and RDER are attempting to fill in FY 2023.

Figure 4. "Core" Innovation Funding

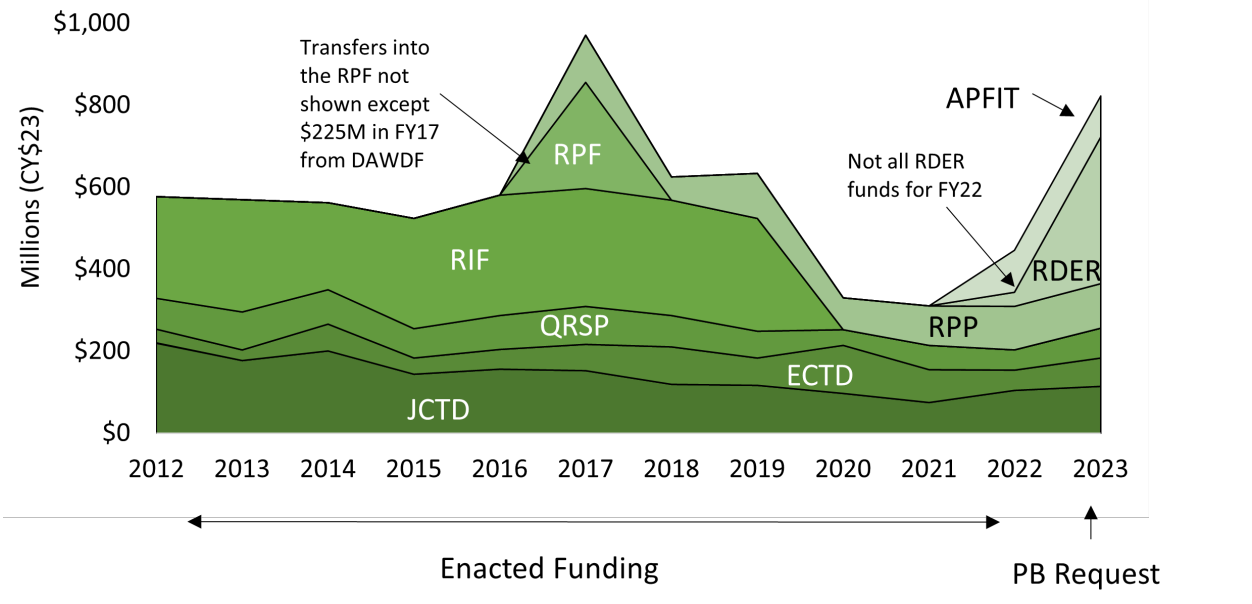
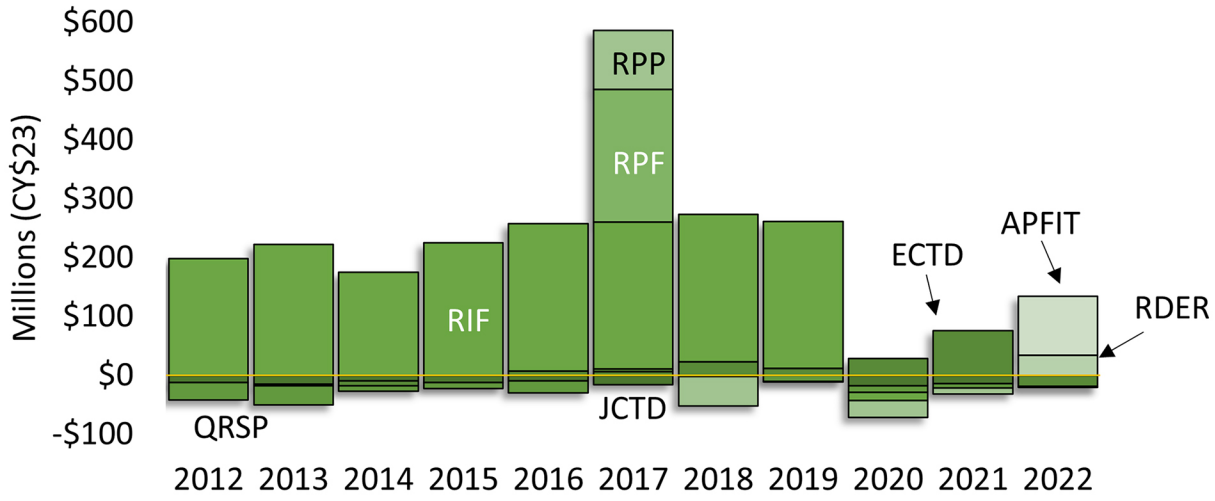


Figure 5. Congressional Adds/Cuts to "Core" Funds to the President's Budget Request



Reference Tables

Rapid Defense Experimentation Reserve (RDER) **FY 2022 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
$358M request in FY23, SAC-D recommends half that	Joint experimentation linked to 4 key concepts, BA 6.4	Competitive proposals to USD R&E	Unknown. Announced in Jun-21, 32 projects selected in Jan-22, most awards by Dec-22 if no CR		USD R&E initiative, 32 proposals accepted for FY22 out of 200+ total	PE#: 0604331D8Z/073; 0604020A/DC8; 0604858F/645350; 0604030N; 0604320M; 0604826J/004

Rapid Prototyping Program (RPP) **FY 2018 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $100M per year, avg. $10M per project	Accelerate transition of fieldable prototypes, BA 6.4	Competitive proposals to USD R&E, RRTO	4+ months. Submit in June for funding next FY.	$10M per project, 24 months		PE#: 0604331D8Z/638

Agile Procurement Transition (APFIT) **FY 2022 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
$100M per year, avg. $10M per project	Procurement, Scale pilots/ prototypes to fielded capability	Competitive proposals to SecDef	~ 4 months. APFIT created Mar. 2022, awards made in July	Awards $10M to $50M for companies <$500M in cumulative DoD revenue	FY22 funded by SBIR/ STTR transfers, FY23 in request. Initiated by Congress	P.L. 117-81, Sec. 834; PE#: 0608775D8Z

Joint Capability Technology Demo (JCTD) **FY 1995 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $100M / yr, avg. project size varies	TRL 6-9, BA 6.3, Test prototypes in operational settings, Chairman’s capability gap assessment	Competitive proposals to USD R&E, JCTD office	8+ months. Project call Spring, final approval by Feb. next FY	$100M per project and 48 months	In 2006, JCTD reformed the Advanced Concepts Tech Demo (ACTD) created in 1995	PE#: 0603648D8Z

Emerging Capabilities Technology Development (ECTD) **FY 2012 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $50M / yr	BA 6.3, Risk-reduction on prototypes and operational demos for emerging need	Competitive proposals to USD R&E, RRTO	Within year of execution, proposals accepted any time	$6M per project, 36 months		PE#: 0603338D8Z/ 721 0603699D8Z

Quick Reaction Special Projects (QRSP) **FY 2003 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $70M / yr, avg. $1M per project	TRL 6-8, BA 6.3, Fast operational prototypes from nontraditional/ small business	Competitive proposals to USD R&E, RRTO	Within year of execution, proposals accepted any time	$2M per project, 18 months	Evolved from Rapid Reaction Fund, Quick Reaction Fund, and Tech Transition Initiative	PE#: 0603338D8Z/ 722 0603826D8Z

Mission-Based Rapid Acquisition Account **Not Yet Created (Proposed for FY 2023)**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $70M / yr, avg. $1M per project	TRL 6-8, BA 6.3, Fast operational prototypes from nontraditional/ small business	Competitive proposals to USD R&E, RRTO	Within year of execution, proposals accepted any time	$2M per project, 18 months	Evolved from Rapid Reaction Fund, Quick Reaction Fund, and Tech Transition Initiative	PE#: 0603338D8Z/ 722 0603826D8Z

Rapid Innovation Fund (RIF) **FY 2011 – FY 2019** (inactive)						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $250M per year, $1M to $3M per project	TRL 6-9, BA 6.4, small business preference	Competitive proposals to USD R&E	8–11 months. Submit Nov-Feb, award usually end of FY	$6M per project (Sec. 878 FY20 NDAA, from $3M) and 24 months	Initiated by Congress. Not funded FY20-22, but included in FY23 NDAA bill	10 USC 4061; PE#: 0604775D8Z; 0604775BR

Rapid Prototyping Fund (RPF) **FY 2017 to FY 2019** (inactive)						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
Not a line item, funded by crediting 3% of over-runs, $225M from DAWDF in FY17	BA 6.4, Created to fund MTAs	Competitive proposals to Joint Advisory Board	<7 months. Submit Feb. 25, obligate before FY end	$20M per project, 12 months	Initiated by Congress. Cancelled in FY20 NDAA	P.L. 114–92, Sec. 804 & Sec. 828; Repealed in P.L. 116–92, Sec. 805. No PE assigned

"SECONDARY" INNOVATION FUNDS

"Secondary" sources are those funds that provide flexibility in the year of execution, but are not designed or optimized for transitioning efforts into programs of record. The Manufacturing Technology program, started in FY 1956, is by far the largest and most supported by Congress. It focuses on advancing manufacturing equipment and processes as opposed to warfighting systems themselves. While ManTech funds are flexible, they are generally programmed as part of component budget submissions, undermining this flexibility. CTTSO does focus on warfighting systems, but is focused on counter-terrorism efforts. The FCT and CWP programs are relatively small and designed for projects with allies and partners. Tech Innovation is a relatively new OSD effort to advance commercial technology. It was included by the Center, although not much is known about it. Finally, another potential source of transition funding is the J7 Warfighting Lab Incentive Fund. It is not found in the budget, but allows for reprogramming to support field experiments and is approved by three senior defense officials.

Figure 6. "Secondary" Innovation Funds

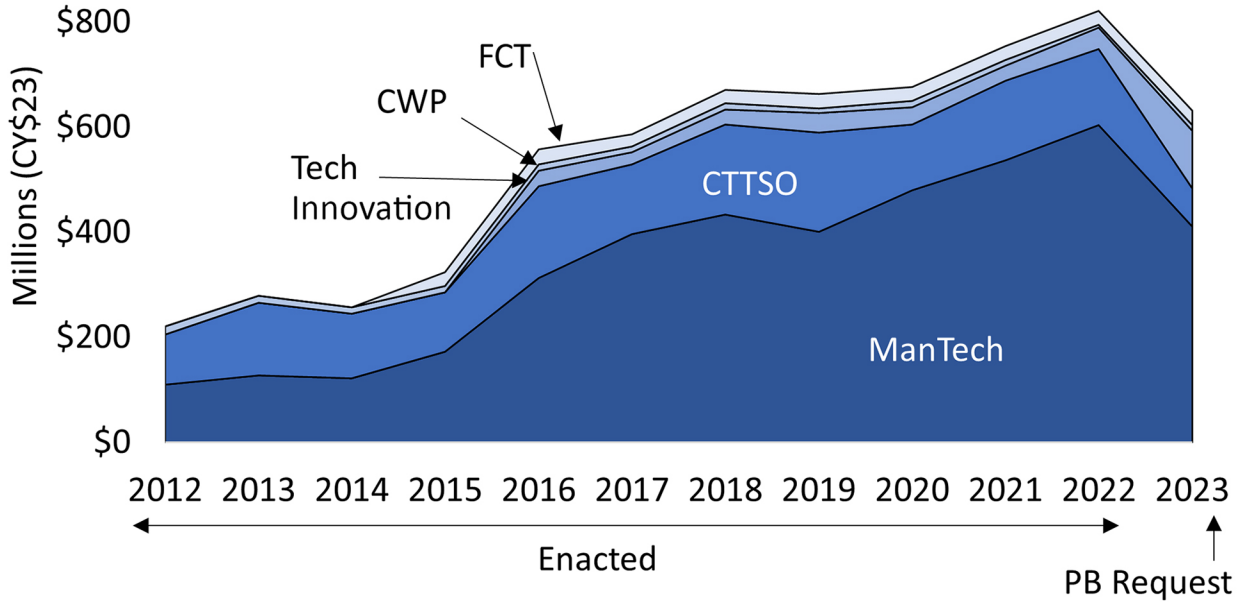
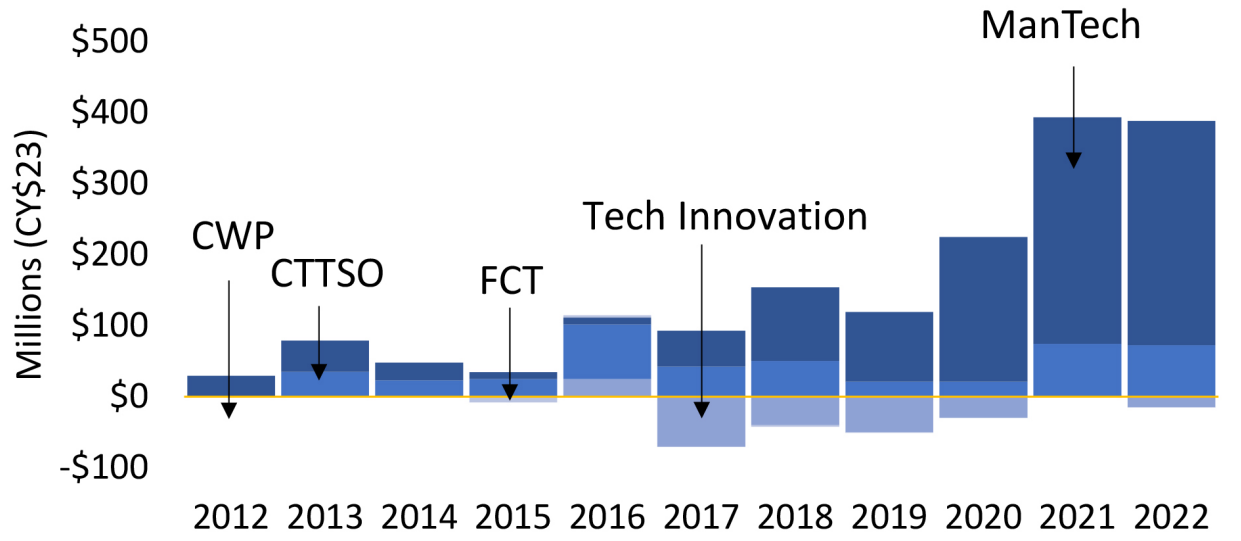


Figure 7. Congressional Adds/Cuts to "Secondary" Funds to the President's Budget Request



Reference Tables

Manufacturing Technology Program (MANTECH) FY 1956 – Present						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $350M / yr, $1M to $10M per project	TRL 3-9, BA 6.3, Advance manufacturing by funding projects, institutes, and workforce	Competitive proposals to Joint Defense Manufacturing Technology Panel	6+ Months. Submit by Mar.-Apr., selection July, award in next FY		Created in 1956, Congress has often increased the request; DFARS 235.006-70	10 USC 2521; DoD 4200.15; PE#: 0603680D8Z; 0603680F; 0603680N; 0603680S

Combating Terrorism Technology Support FY 1999 – Present						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $30M / yr	BA 6.3, Commercial advanced tech demo projects	Competitive proposals to ASD SO/LIC	7+ months. Sep. industry day, submit in Feb.-Mar., award by end of FY		Created to consolidate anti-terrorism RDT&E efforts	PE#: 0603122D8Z

TECHNOLOGY INNOVATION **FY 2015 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $30M / yr	BA 6.3, Commercial advanced tech demo projects				Initiated with $3M BTR and $7M ATR, first requested in FY 2017 but Congress often decreases	PE#: 0603375D8Z

Coalition Warfare Program (CWP) **FY 2001 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $10M / yr, $1M per project	BA 6.3, Cooperative RDT&E with foreign partners	Competitive proposals to USD A&S	8+ Months. June start, submit by Aug., selection announced in Mar.	$2M per project, 36 months	Requires matching funds from the program office & foreign partners	PE#: 0603923D8Z

Foreign Comparative Testing **FY 2015 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $20 / yr, FY15-FY22, avg. of $500K per project	TRL 6-9, BA 6.3, for SOCOM and service for experimenting with foreign partners	Selections managed by USD R&E and service CTOs	6+ months. Submit in Apr. for funds next FY (Navy submissions due earlier in Nov.)	36 months	Over 41 years, transitioned 45% of 637 projects to procurement	10 USC 2350a PE#: 0603133D8Z

J7 Warfighting Lab Incentive Fund (WLIF) **FY 2016 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
Not a line item, <$10M / yr total	O&M funds for field experiments in support of new CONOPS	Competitive proposals approved by DSD, VCJCS, & CAPE	7+ months. Submit by Apr. 1, selection July, funds available starting Oct. (next FY)		Created by DSD Memo May 5 2016	DSD Memo OSD005042-16/CMD006508-16

NON-PROGRAM OF RECORD PROTOTYPE FUNDS

While Budget Activities 6.1 to 6.3, generally referred to as the S&T accounts, are not tied to acquisition programs of record, generally BA 6.4 prototyping efforts are. BA 6.4 refers to maturing technology prior to a major program, but these efforts must show full-funding in the FYDP for the eventual development and production of the program. Therefore, the transition is "baked in."

The services have a some flexibilities within BA 6.4 efforts to seed new efforts related to more broadly defined Initial Capabilities Document requirements. They also have designated program elements that are not tied to programs of record. For example, the Army's TMI program is its only non-program of record BA 6.4 effort. Selection of projects within the TMI is overseen by a two-star Technology Maturation Executive Steering Group. The Air Force similarly has a sizable Tech Transition program element. The "Experimentation Campaign" project in FY 2021 included $81.5 million and was justified broadly, stating that "specific plans are not detailed to prevent locking into an approach that will likely shift." This language was removed in FY 2022 in favor of more detailed justifications. SOCOM's ATD is actually a BA 6.3 account but serves a similar purpose. Navy and Marines have small BA 6.4 non-program accounts, which have been co-opted by RDER in FY 2023 (along a portion of the Air Force Tech Transition element). With detailing of RDER efforts in the justification, the program elements start to look more like traditional BA 6.4 elements.

Figure 9. Funding for Non-PoR Innovation Funds

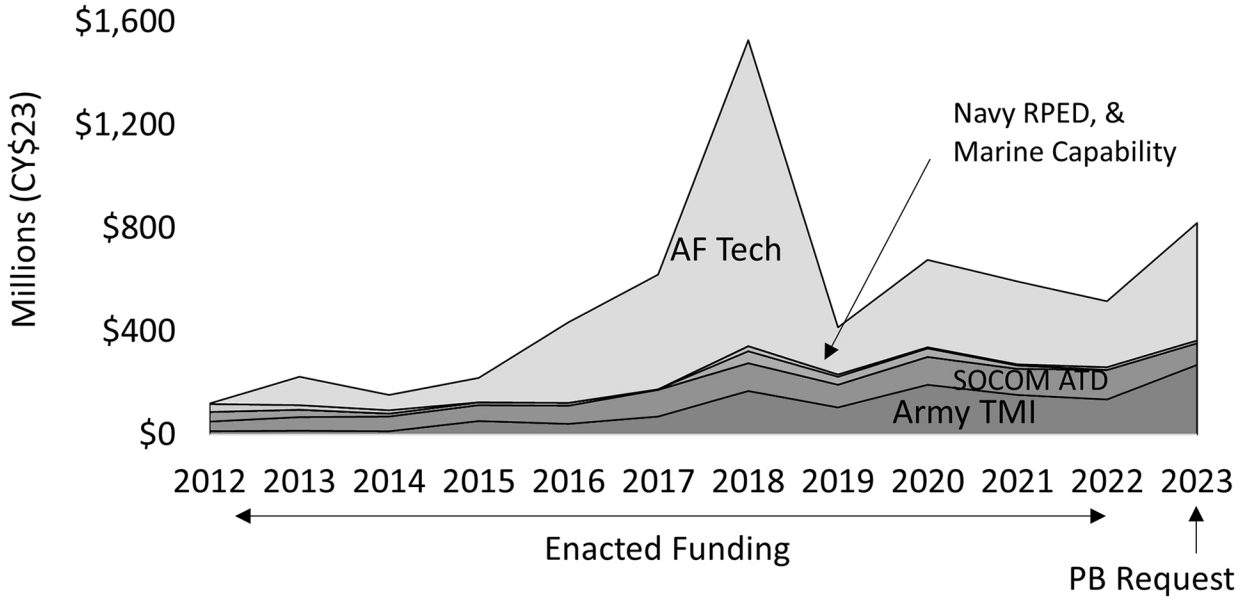
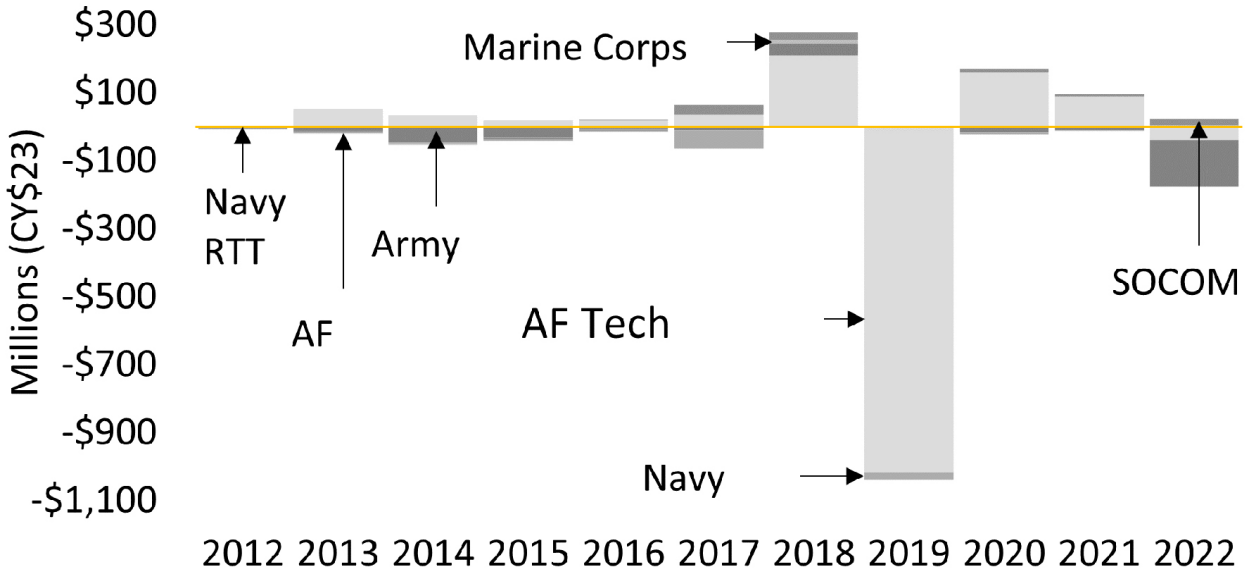


Figure 10. Congressional Adds/Cuts to "Secondary" Funds to the President's Budget Request



Reference Tables

Army – Technology Maturation Initiative (TMI) **FY 2012 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $150M / yr	Mature S&T efforts to TRL 7, drive down risk after WSARA	Competitive selection by Technology Maturation Executive Steering Group			Only Army BA 6.4 account not a PoR, part of S&T	PE#: 0604115A

Air Force – Tech Transition Program **FY 2011 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $250M / yr	Mature S&T efforts to TRL 7, drive down risk after WSARA	Direct funding competitive selection process			Includes $64M for 4 RDER projects in FY23 ($11M to $20M)	PE#: 0604858F

Navy – Rapid Prototyping, Experimentation & Demo (RPED) FY 2011 – FY 2021						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
$0 in FY22 and FY23, ~ $20M / yr FY17 to FY21	TRL 7+, BA 6.4, now used for Rapid Defense Exp. Reserve (RDER) projects	Competitive proposals or competitions to DASN R&T, USD R&E		18 months	RPED org. created in 2015, not funded FY22, PE used for RDER in FY23	PE#: 0604030N; 0603382N/ 0385 0603382N/ 0399

Marine Corps – Rapid Technology Capability Prototype FY 2018 – Present						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $10M / yr FY18 to FY22	TRL 7+, BA 6.4, operational prototypes	Direct funding competitive selection by MCRCO and Board of Directors	6 Months. Initial taskings start of Q4, award in Q2 (as of FY18)		Starting in FY23, $51M in this PE is used for RDER	PE#: 0604320M

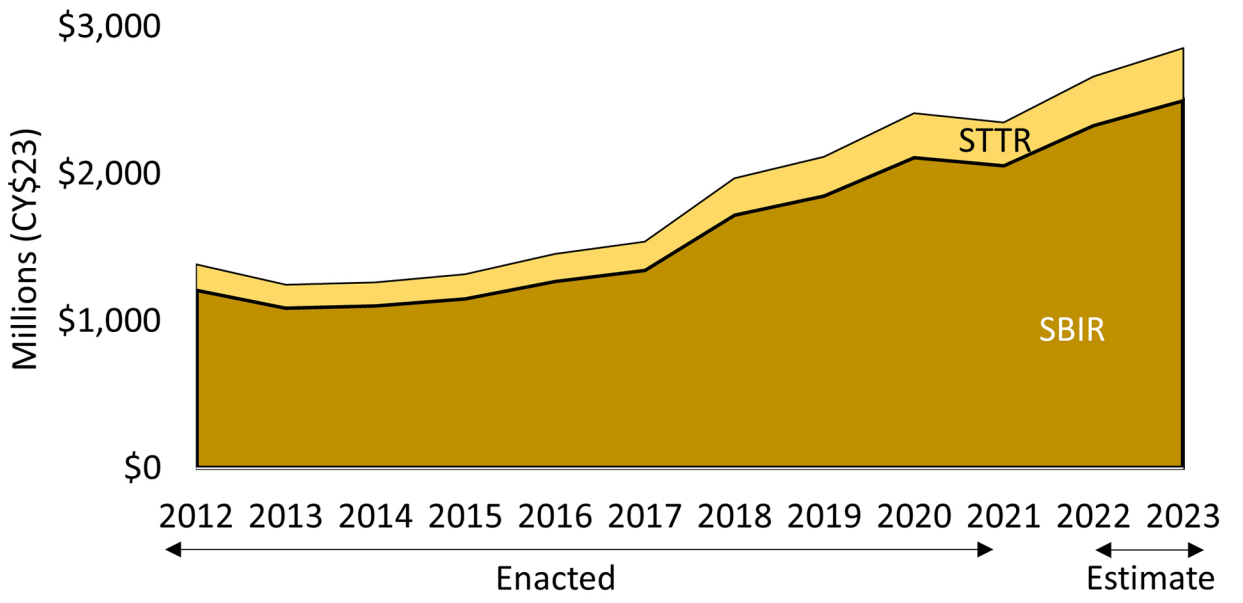
SOCOM – Advanced Technology Development FY 2001 – Present						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $90M / yr FY17 to FY22	TRL 5-7, BA 6.3, emerging tech demos in operational environments	Includes BAA solicitation, prize challenges by SOF AT&L	5+ Months. BAA posted in Apr., submit in May, funded in next FY		SOCOM's part of ACTD and JCTD, has 6 capability focus areas	PE#: 1160402BB

SBIR/STTR FUNDS

The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are not designed to transition efforts into programs of record. SBIR and STTR are funded by withholding a percentage of extramural RDT&E funding for the larger agencies. The programs are more suited to research and proofs of concept. Phase I efforts are less than $250,000 while Phase II efforts are between $750,00 and $1.8 million unless a waiver is granted. Phase III, by contrast, are for commercialized products and are funded by program dollars rather than SBIR or STTR. The gap between SBIR/STTR Phase II and Phase III dollars is often referred to as a "valley of death."

The Air Force's AFWERX office has used the SBIR/STTR funds innovatively to help transition technologies. Their STRATFI and TACFI programs provide a handful of companies significantly larger dollars from SBIR/STTR to bridge into a program of record. The STRATFI/TACFI awards can use $15 million of SBIR/STTR funding, but require matching funds from a program office that agrees to transition the effort as well as matching investment from private sources. USD R&E Heidi Shyu indicated in FY 2022 her interest in a SBIR "2.5" to provide larger award sizes to support scaling into programs of record.

Figure 11. STTR and SBIR Funds



Small Business Innovation Research (SBIR) **1982 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $1.7B / yr, $50K to $250K for Phase I, $750K - $1.8M for Phase II	TRL 1-7, small business commer-cial-ization and meeting agency needs	Competitive proposals	~ 6 months RFP close to award for conventional, as little as one month for open topic Ph. I (GAO-22-105223)	Up to $250K (Ph. I) or $1.8M (Ph. II) unless author-ized by SBA, 42 months or less	3.2% withhold from extramu-ral RDT&E. Funds Phase I & II only, another $1B to $2B of Phase III follow	15 USC 638; Created by P.L. 97-219 PE#: 0605502A, N, F, SF, BP, BR, C, D8Z, E, S, SDA; 0605790D8Z; 1160279BB

Small Business Technology Transfer (STTR) **1992 – Present**						
Funding	**Uses**	**Selection**	**Timeline**	**Limits**	**Notes**	**References**
~ $300M / yr, $50K to $250K for Phase I, $750K - $1.8M for Phase II	TRL 1-7, small business required to partner with universities, FFRDCs, or non-profit	Competitive proposals	~ 6 months from RFP close to award for conventional in USAF, one month for open topic Ph. I (GAO-22-105223)	Up to $250K (Ph. I) or $1.8M (Ph. II) unless author-ized by SBA, 42 months or less	0.45% with-hold from extramural RDT&E. Funds Phase I & II only, another $1B to $2B of Phase III fol-low on awards by programs	Title II of P.L. 102-564 PE#: 0605502A, N, F, SF, BP, BR, C, D8Z, E, S, SDA; 0605790D8Z; 1160279BB

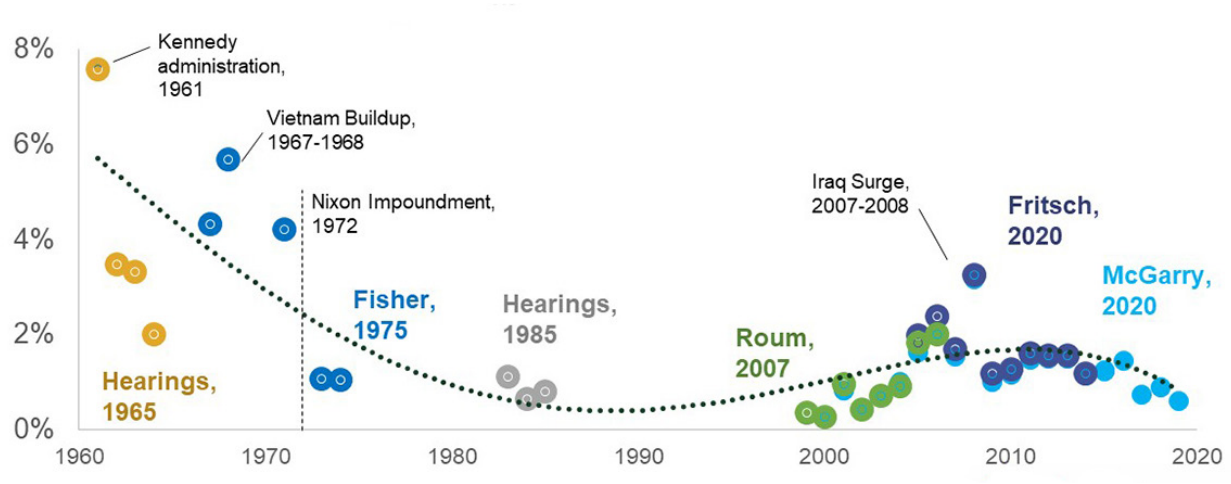
REPROGRAMMING TRENDS

A history of approved reprogrammings submitted to Congress is shown in Figure 12 below. It was created by pulling together six different sources and normalized into a percentage of DoD's topline funding. In the 1960s, above threshold reprogramming totaled between two and eight percent. It dropped to roughly one percent after President Nixon impounded environmental funds, and stayed low until the Global War on Terror where ATRs reached a high of 3.2 percent in FY 2008. ATRs have since declined and fell below one percent in FY 2017. When reviewing reprogramming figures over time, it is important to note that the scope of congressional prior approval increased over time, suggesting a more pronounced reduction in flexibility than otherwise suggested in Figure 13:

- 1955–1961: Reprogramming controlled at the budget activity level, notification to Congress who could reject within 15 days.
- 1961–2000: Reprogramming lowered to program level. Certain actions require prior approval in DoDD 7250.5, but DoDI 7250.10 thresholds continue to require congressional notification.
- 2000–Present: Thresholds in FMR Volume 3 Chapter 6, which replaced DoDI 7250.10 in 1996, changes thresholds from notification to prior approval.

More granularity is available through the DD1416 reports analyzed for this study (Figure 13 and Figure 14). While ATRs require congressional prior approval, BTRs do not. The total value of BTRs is usually less than ATRs. Putting them together over the life of an appropriation provides the total flexibility DoD has to realign resources. Procurement has trended downward, with total reprogramming between three and five percent of enacted funds. RDT&E has also trended downward to between two and three percent of enacted.

Figure 12. Total Above Threshold Reprogramming (ATR) as a Percent of DoD Topline Budget



The data is available for download.

Figure 13. Reprogramming by DoD Component in RDT&E and Procurement Titles

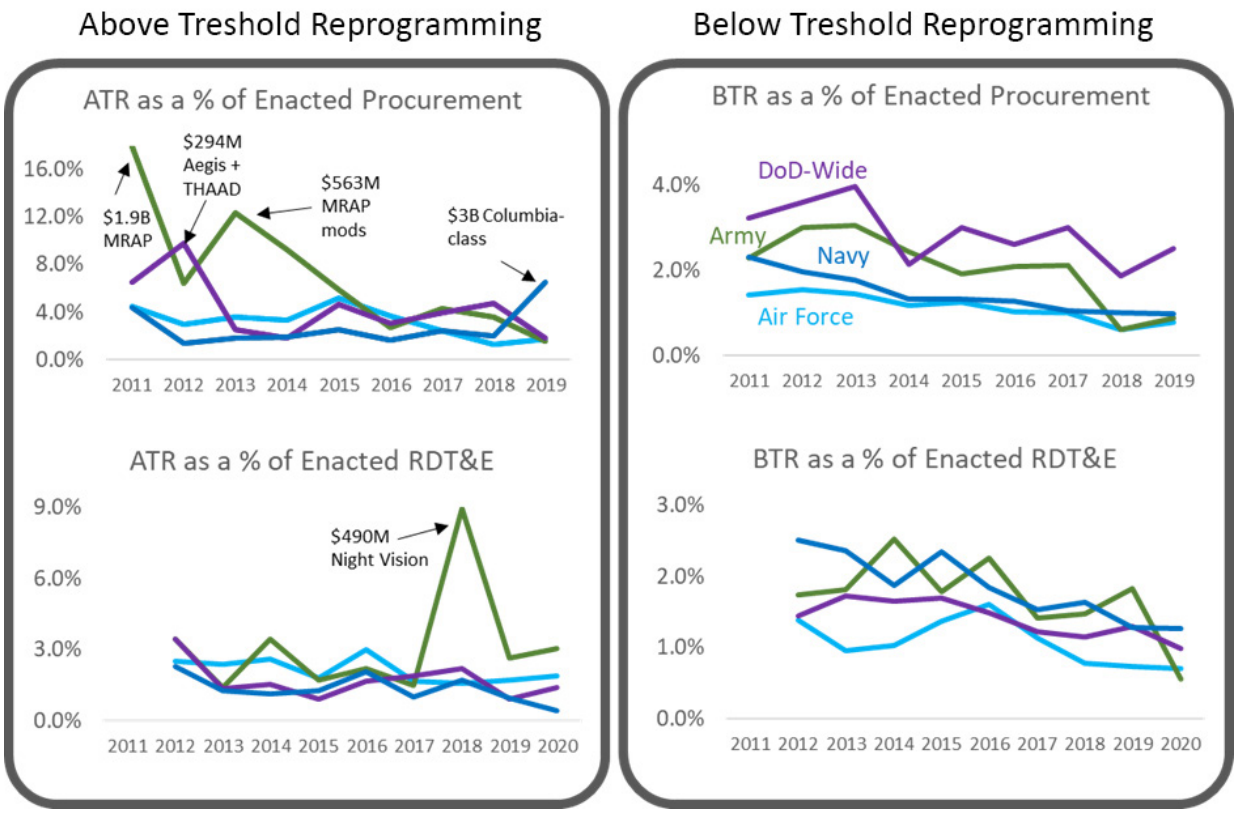
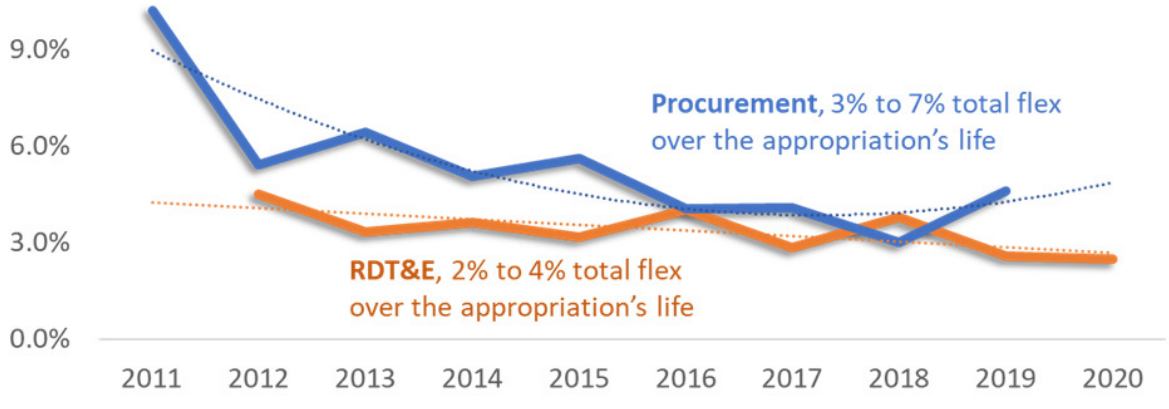


Figure 14. Total ATR + BTR as a % of Enacted RDT&E and Procurement Titles



About the Authors

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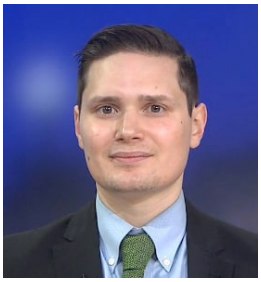
Executive Director

Dr. John G. (Jerry) McGinn is the Executive Director of the Center for Government Contracting in the School of Business at George Mason University (GMU), where he is responsible for establishing the first-of-its-kind university center for research, education and training, and collaboration on issues facing the $500B government contracting industry.

Prior to joining GMU, McGinn served as the senior career official in the Office of Manufacturing and Industrial Base Policy in the Department of Defense, leading a staff of 80 personnel and managing an annual budget of approximately $200 million in efforts to analyze the capabilities, overall health, and policies concerning the industrial base on which the Department relies for current and future warfighting capabilities.

Previous to DoD, he spent a decade in senior defense industry roles at McGinn Defense Consulting LLC, Deloitte, QinetiQ North America, and Northrop Grumman. Before industry, McGinn served in DoD as Special Assistant to the Principal Deputy Undersecretary (Policy) and as a political scientist at RAND. He has published numerous influential articles and monographs, testified before the U.S. Congress and the United Kingdom House of Commons, presented to senior government and industry audiences around the world, and is regularly interviewed on critical national security issues.

McGinn was commissioned into the U.S. Army and served with distinction as an infantry officer and is a graduate of Ranger and Airborne Schools. He holds a Ph.D., M.S., and M.A. from Georgetown University and a B.S. from the United States Military Academy.



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Eric Lofgren is a Senior Fellow at the Center for Government Contracting within the School of Business at George Mason University where he performs research writes and leads initiatives on business, policy, regulatory, and other issues in government contracting. He manages the daily blog Acquisition Talk and produces a podcast with the same name where he speaks with leading experts in the field.

Lofgren was an Emergent Ventures Fellow at Mason's Mercatus Center. Prior to joining Mason, he was a senior analyst at Technomics, Inc., supporting the Defense Department's Cost Assessment and Program Evaluation office. There, he participated in dozens of major defense program cost estimates, led policy development the Contractor Cost Data

Reporting system, supported economic studies such as for the Space Industrial Base, Better Buying Power, and uses of inflation and escalation. He has also supported government analyses for the Government Accountability Office, NAVSEA, Canada Public Works, and the Deputy Assistant Secretary of the Army (Cost and Economics).

Lofgren is an expert in cost estimation and defense contract business data. He has won five best paper awards at the International Cost Estimating and Analysis Association including best paper overall. During his time at George Mason, he has written five reports on the federal contracting data and policies related to the COVID-19 response, a Naval Postgraduate School symposium paper on acquisition reform, and a book manuscript on the history of weapon systems acquisition. He has appeared on Government Matters three times and published several articles in Defense News and the Federal Times.

Lofgren earned his BA in history and economics from Virginia Polytechnic Institute and State University, and his MA in economics from George Mason.

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Everhart is an enterprising professional with experience as a federal contractor supporting the Environmental Protection Agency, the National Institutes of Health, and the Military Health System/Defense Health Agency. He also has experience working in the finance office of a small government contractor. In addition to the government contracting space, Everhart has experience in the investment management industry. Outside of his professional experience, he is a trained financial analyst and has conducted novel research related to investment performance.

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