



PPBE Impact on Technology Transition

Findings and Recommendations

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EXECUTIVE SUMMARY

The \$850 billion U.S. Defense budget is formulated, vetted, debated, and spent through the Planning, Programming, Budgeting, and Execution (PPBE) process. The funding for every warfighting and deterrence capability developed and deployed by the Defense Department goes through this process. In turn, PPBE is at the center of the discussions concerning defense spending and defense capabilities alike.

This paper discusses the findings and recommendations stemming from six case studies exploring the impact PPBE has on defense programs adopting new technologies. This is a distillation of a longer report prepared for the Congressionally-mandated Commission on PPBE Reform, *Case Studies of Technology Transition* (McGinn, Hyatt, Letts, & Kojac, 2024).

The cases examined provided several take-aways. On one hand, technology adoption programs can be successful in navigating PPBE when they are championed by senior leaders, see informed Congressional engagement, enjoy coordination and collaboration internal and external to their military service, are affiliated with a prior existing program, or implement authorities or innovative practices suited to creating new capabilities. On the other hand, technology adoption programs can become a casualty in the PPBE process. In some cases, tech-

nology transition program investment is displaced by existing programs which are defended by established stakeholders. Equally, new technology programs are vulnerable in budget execution, when their need for fiscal flexibility is greatest to accommodate events and rapidly respond to opportunities and challenges. They can also be disrupted or delayed by legislative and policy barriers to transferring funding within programs or between interdependent initiatives, despite their budget plans being created years before execution.

These case findings lead to the following recommendations:

- Offices responsible for the adoption of new technologies benefit from a consolidated budget structure allowing rapid reallocation of funding within a program
- The thresholds for reprogramming requests to Congress should be raised
- Program funds should be allowed to carry over into the next fiscal year if they are spent before the next year's appropriations are enacted
- Reallocating money among appropriations categories should be allowed within programs
- Continuing Resolution prohibition on new starts should be altered to answer urgent and emerging needs
- The practice of imposing linear obligation benchmarks on programs should end

- Program office coordination and collaboration with Congress and external entities should be increased

- Programs should harness existing rapid acquisition authorities and contracting strategies intended to assist technology transition

- PPBE workforce training should be institutionalized

Just as the findings were reported to the Commission on PPBE Reform, so too the recommendations developed from these findings mirror and reinforce the Commission's recommendations in their Final Report [citation].

INTRODUCTION

PPBE is the calendar-driven process used by the Department of Defense (DoD) to allocate funding in support of defense capabilities. Secretary of Defense Robert S. McNamara established PPBE (formerly the Planning, Programming, and Budgeting System or PPBS) in 1961 based on business planning models he had implemented at Ford Motor Company in the 1950s to align DoD's strategic needs with capabilities and to fund priorities while reducing inefficiencies in the defense budget.

At the time of its start, the PPBS was described by advocates as innovative in merging strategic long-term planning and budgeting with the annual Congress-

sional appropriations process. Concurrently, defenders of the status quo within the military services, the defense industrial base, and Congress saw PPBE as an infringement upon their decision-making.

Today, a different set of critics stipulate that the military services, defense industrial base, and Congressional prioritization of large programs of record, near-term capacity, and readiness over new technology adoption is a consequence of PPBE (e.g., MacGregor et al., 2022). On the other hand, stewards of PPBE offer that the steps and time involved in DoD's formulation and vetting of the budget as well as Congressional scrutiny and debate are appropriate and Constitutional (e.g., the Joint Explanatory Statement to Defense Appropriations in the Further Consolidated Appropriations Act of 2024, H.R. 2882, P.L. 118-47).

For context, PPBE steps span over two and a half years from the time a program office drafts an annual spending plan before that office receives the funds. With PPBE, the program office's budget must make its way through vetting inside that military service, then through review by the Office of the Secretary of Defense (OSD), specifically the Office of Cost Assessment and Program Evaluation (CAPE), and then through Congressional marks, debates, and the habitual Continuing Resolution, which has occurred twenty-four of the past twenty-five years. The PPBE process also allows for monies to be reprogrammed in their year of execution, albeit with limits and endorsement rules. The period of execution for different appropriations categories within a fiscal year varies between one and five calendar years.

Of note, PPBE is not a standalone process that impacts the development and delivery of operational capabilities. PPBE is interwoven with DoD's Joint Capabili-

ties Integration and Development System (JCIDS) process for defining capability requirements as well as the Defense Acquisition System (DAS) governing the research & development and procurement of capabilities.

Businesses offering advanced technology and looking to enter the defense industrial base can be frustrated if they are not familiar with PPBE, JCIDS, and the DAS, which are the foundation for contracts. On the government side, DoD program offices are responsible for working with those businesses to transition that technology to military capabilities.

Research Question and Methodology

This paper examines a sample representative experience of offices directly responsible for transitioning technology to defense capabilities.

Congress, in Section 1004 of the 2022 National Defense Authorization Act (NDAA) (S. 1605, P.L. 117-81), established the Commission on PPBE Reform to assess budgetary processes affecting defense modernization. Per the request of the Commission, the George Mason University Baroni Center for Government Contracting at the Costello College of Business conducted a set of case studies concerning program office experiences with technology transition in relation to PPBE.

The research team conducted a literature review and confirmed the steps and actors in PPBE as well as previously raised matters of debate concerning PPBE. The team conducted interviews with government and industry personnel associated with six programs germane to the question of the effect of PPBE on the transition of technology to answer capability needs. The research abided by the Chatham House Rule whereby all interview participants are anonymous.

This paper is a distillation of the case

study findings as provided to the Commission and published in a report entitled, *Case Studies of Technology Transition* (McGinn, Hyatt, Letts, & Kojac, 2024). The conclusions and recommendations presented in this paper are also derived from an exploration of the case studies in an additional paper—*PPBE, Technology Transition, and the Valley of Death* (McGinn, Hyatt, & Letts, 2024)—published and presented among the Naval Postgraduate School's 21st Annual Acquisition Research Symposium proceedings. Additionally, this paper provides recommendations generated by the case studies.

CASE STUDIES

The cases were chosen for their current relevance and dependence on the adoption of advanced technologies to meet operational needs.

Case Study 1: Air Force Collaborative Combat Aircraft (CCA)

This program's unmanned combat air vehicles are capable of operating autonomously or in combination with manned combat aircraft. CCA is part of the Next Generation Air Dominance initiative to deploy sixth-generation jet fighters.

Case Study 2: Space Development Agency (SDA)

This program adopts advanced commercial technology to field satellite constellations providing navigation, surveillance, deterrence, defense, and communication capabilities. SDA uses innovative approaches to field the constellations rapidly in two-year cycles.

Case Study 3: Joint Rapid Acquisition Cell (JRAC)

JRAC uses the Rapid Acquisition Authority (RAA) for the adoption of technology

to meet urgent operational needs. The technology must be already under development by DoD or available from the commercial sector; require only minor modifications, or; be developed or procured under the rapid fielding or rapid prototyping acquisition pathways under Section 804 of NDAA 2016 (S. 1356, Public Law 114-92). The Secretary of Defense or Deputy Secretary of Defense making an RAA determination may use any funds available to the DoD.

Case Study 4: Army Robotic Combat Vehicle (RCV)

The program develops autonomous and semiautonomous prototypes with advanced autonomy and artificial intelligence algorithms. RCV is part of the Next Generation Combat Vehicles family of ground combat vehicles.

Case Study 5: Tactical Intelligence Targeting Access Node (TITAN)

The program uses artificial intelligence to fuse massive amounts of multi-sensor data. TITAN's next-generation intelligence ground system involves automated target recognition, identification, and geolocation, in support of situational awareness and long-range precision targeting.

Case Study 6: Navy Large and Medium Unmanned Surface Vessels (LUSV/MUSV)

LUSV and MUSV are unmanned surface vessels intended to expand the size and capability of the Navy's fleet with low-cost and adaptable vessels. Both programs have benefited from the progress of previous research programs at the Defense Advanced Research Projects Agency, the Office of Naval Research, and the Strategic Capabilities Office.

KEY FINDINGS

Finding 1: Senior leader advocacy is a key contributor to success in PPBE

Interview participants attributed a substantive part of program success to advocacy by top-level leadership. Military service department political appointee senior leadership sponsorship was specifically identified as crucial. For example, an initiative developing an autonomous uncrewed capability with advanced software was not accepted as a program of record—the military service's explanation being that funds were prioritized for manned capabilities with proven technology—until the service department's senior leadership intervened.

Finding 2: Program Element (PE) consolidation fosters project success in PPBE

Interview subjects noted consolidated PE budget structure enables flexibility, making it easier to shift funds. This agility allows a program to timely respond during budget execution to the inevitable changes in circumstances that cannot be foreseen in the years prior when the budget was formulated. For example, uneven progress in hardware and software, contractor issues, Congressional marks, and changed requirements for interdependent projects can demand year-of-execution funding changes.

Finding 3: Barriers between PPBE “colors of money” can disrupt program progress

Interview participants observed the barriers to easy movement of funds between different appropriation categories (colors of money)—e.g., Research, Development, Test, & Evaluation (RDT&E) and Procurement—have the potential to delay and disrupt program progress. For example, in one case a program erred

by budgeting too early a shift from RDT&E to Procurement funding, and lengthy coordination across the service, OSD, and Congress was required to fix the issue. In another example, Congress directed the acceleration of a program with the funding of additional RDT&E, but did not provide added Procurement monies necessary to meet the timeline of Congressional intent. In both of these cases, rules forestalling money shifts between the colors of money delayed the programs resolving issues.

Finding 4: Linear obligation benchmarks and annual close-out constraints have unintended negative consequences

Interviews revealed that program offices are subject to benchmarks prescribing a consistent rate of spending. These linear obligation benchmarks were found by research to be a long-time practice, rather than the product of any statute, regulation, or policy. This practice was observed to be ill-aligned with the past twenty-five years of experience which have seen Congressional Continuing Resolutions for all of those fiscal years except 2019. Program office spending plans are inevitably disturbed by each year's distinct timing of Continuing Resolutions and threatened or actual government shutdowns. Program spending rates are also impacted by exogenous contracting offices, and industry vendors, as well as the uneven progress of development and evaluation. In these common circumstances, interviewees noted programmers, budgeters, and legislators can threaten program cuts if there is not a constant spending rate regardless of context.

Similarly, interviews offered that program offices are required to have money obligated by the end of a fiscal year. This is the DoD practice despite there being statutory allowance for management reserve (10 U.S.C. §3136 Defense Modernization

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Account), annual appropriations to be retained by the DoD for five years (31 U.S.C §1553), and for “no-year” accounts with an indefinite period of availability money (31 U.S.C. §1555). Comptrollers desire obligations to be completed in early September, to accomplish close-out procedures by the end of the month. Consequently, offices complete their obligation by Labor Day, otherwise they may see future funding cuts. The pressure to spend is even greater in years beginning with extended Continuing Resolutions when there is less time for the obligation of new monies—albeit that close-out will be followed by another Continuing Resolution. This drives behavior focused on timeliness rather than effectiveness of obligation.

Finding 5: Congressional actions within PPBE have significant impacts on program progress

Interviewees underscored that Congressional Continuing Resolutions delay the initialization of new starts and timely annual increases to funding. Also, participants shared the disruptive impact of the department’s constraints on obligations due to Continuing Resolutions and the perennial threat of a government shutdown in the first quarter of each fiscal year.

Program offices identified the disproportionality between the overall defense budget size and Congressional oversight required for reprogramming amounts over \$10 million. Congress lowering the Below Threshold Reprogramming ceiling from \$20 million during 2020, in response to a particular action by that administration was stipulated by interviewees as having had unnecessary restrictive impacts on programs across the board since then. Interviews offered that the ceiling should be raised proportionately to the growth of the budget

since 2019 and the effect of inflation on purchasing power.

Additionally, interview subjects emphasized the PPBE process can be used by a member of Congress or committee staff to accomplish legislative goals that contradict objectives vetted and agreed upon by a broad set of stakeholders within DoD. The impacts of these actions, in most cases marks made to redistribute funds elsewhere, were described as disruptive and delaying program performance. More so, it was said that in many circumstances, the effects extended beyond the program marked, and that usually the changes did not accomplish what was putatively intended nor was the negative impact ever acknowledged.

Finding 6: Effective communication with Congress facilitates program success in PPBE

Interviews consistently identified frequent communication with Congress as important for updating authorizers and appropriators on evolving program strategy, contractual matters, and rapidly changing developments. Interviewees observed significant changes could occur in a program in the nine months between the springtime submission of budget exhibits, summer committee mark-ups, and winter House-Senate conferences. A single annual meeting with committee staff was deemed insufficient for programs to provide updates on new technology adoption and integration. Interview subjects stated thorough preparation, personal availability, presentation of comprehensive, accurate information, and tolerance for criticism are required. Without meaningful and positive engagements, a program was said likely to suffer.

Finding 7: Program office PPBE collaboration with external partners facilitates success

In direct relation to PPBE, interviewees noted the imperative of coordination with service requirements offices, resource sponsors, budgeters, and advocates, as well as with the military service secretariat decision authority. Interviewees also highlighted the value of collaborating with defense agency science & technology partners from whom developmental technology was inherited, program offices from other services with related programs concerning interoperability standards, with industry vendors on how capabilities are publicly advertised, and with OSD research & development and acquisition & sustainment offices as well as CAPE on program cost, schedule, and performance. Internal coordination within the service was commonly noted as not always straightforward due to differing personalities and perspectives. External-to-the-service collaboration was described as challenging due to institutional divisions. Nonetheless, interview subjects observed that external familiarity and connection profited their programs across the stages and stakeholders in the PPBE process.

Finding 8: Programs accelerate progress by leveraging authorities outside PPBE

Interviewees observed that requirements and acquisition factors impact the progression of programs. For example, one program’s major programmatic changes which created setbacks were attributed to requirements decisions. Other technology transition initiatives were delayed because requirements analysis lacked an understanding of the technology. Likewise, another program’s research & development discoveries were the basis for significant changes to both the program acquisition strategy and the office’s organizational structure, which affected the program’s schedule.

Several program offices made the point

that existing authorities allow for the progress to be accelerated vis-à-vis requirements and acquisition. For example, interviewees noted the Middle Tier of Acquisition (MTA) pathway permits immediate prototyping. This allows progress to be made without waiting on requirement offices to formulate, document, and garner endorsement for detailed stipulations which are often superseded by experimentation and testing. Program offices also stated the utility of using Other Transaction Authority (OTA) contracts, un-constricted by the Federal Acquisition Regulation, as a means to speed competitive prototyping efforts during research & development. Innovative business strategies were additionally mentioned as helping to speed program work. For example, Modular Open Systems Approach (MOSA) was referenced by multiple offices as a means to iteratively incorporate evolving technologies at speed and avoid proprietary constraints. Likewise, SDA uses the agile acquisition “spiral model” prototyping and fielding to immediately make use of what is learned from the previous satellite tranche launches. SDA also bypasses research & development steps by directly adopting commercial technology solutions.

Finding 9: Programming can occur before planning to speed program progress

To accomplish its mandated two-year cadence of satellite tranche fielding, SDA conducts programming-before-planning. This is unusual. PPBE’s construct is planning-followed-by-programming. However, SDA’s requirements are determined six months before acquisition. With this compressed schedule, SDA must build its budget for each tranche years before actual requirements are known. SDA works with Congress to justify funding before the actualities are known. SDA provides detailed cost and work struc-

ture breakdowns, including comparisons between original cost estimates and actual cost outcomes for each tranche and contract to Congress, and updates committee staff as requirements become known and development and delivery steps are accomplished. The collaboration between SDA and Congress, with support from the service department and OSD, is intensive but allows for the program office to garner funding for near-immediate capability deployment.

Finding 10: Association or lack of association with a prior funding line can determine program progress

TITAN personnel explained that the program has faced fewer challenges in the PPBE process in part due to being derived from the legacy Tactical Exploitation of National Capabilities (TENCAP) program. As such, TITAN inherited a consolidated budget structure understood and supported by the Army and Congress. Equally, the program benefited by inheriting personnel from TENCAP. This allowed the program to make immediate progress rather than go through the steps of creating a new workforce and forging new relationships with service, department, and Congressional stakeholders.

Programs standing up technology initiatives with no precedence or budgeting history and a new team of personnel are not so advantaged. Such projects invariably include challenges and opportunities that are not understood before development, testing, and integration manifest them and subsequent accurate analysis explains them. In turn, as issues surface, technology initiatives—to its detriment—can be used as a bill-payer by programmers, budgeters, or legislators.

Finding 11: Fast-track frameworks are not a panacea

In multiple cases, interviewees stipulated

there could be benefits to creating a PPBE fast-track framework equivalent to the rapid acquisition pathways for software and prototyping, suited to new technology adoption and integration. Still other interviewees identified that such a fast-track framework does exist in DoD’s Rapid Acquisition Authority (RAA) (q.v. NDAA for Fiscal Year 2002 (H.R.4546, P.L. 107-314), NDAA for Fiscal Year 2016 (S.1356, P.L. 114-92), and DoD 5000.78 Rapid Acquisition Authority). These latter interviews observed, however, that the RAA remains subject to the military services’ responsibilities vis-à-vis budgeting and acquisition. That is, because the services are accountable for achieving full operational capability and sustainment for existing programs such existing programs can be prioritized over new initiatives.

Any new technology must be interwoven with myriad other capabilities, tactics, techniques, procedures, doctrine, organization, training, logistics, and facilities. This integration of a new solution can easily be more complex and a greater burden than creating the solution. At the same time, all programs, including service priorities, in every budget cycle are effectively in competition with one another for funding. Even with a fast-track framework, new initiatives seeking to transition technology to operational capabilities can suffer in competition with established programs of record during annual PPBE funding justification, vetting, debate, and redistribution.

Finding 12: The end of OCO funding has impacted responsiveness to urgent needs

Without an independent line of funding, proposed technology transition solutions designated for emergent or urgent operational needs compete for sponsorship against established programs of record which are supported by a broad set of

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stakeholders. In earlier years, Overseas Contingency Operations (OCO) funding was used to respond to combatant command capability urgent needs. With the 2022 end of discretionary spending limits imposed by the Budget Control Act of 2011 (P.L. 112-25), RDT&E and Procurement funding amounts formerly allotted to OCO were shifted into the military services' base budgets. Interviewees observed that the military services are averse to adjusting their programming and budgeting to address the combatant commands' declaration of urgent or emergent needs because this requires the services to make tradeoffs affecting the service's established priorities to fulfill someone else's immediate requirement, which may or may not prove enduring. As one interviewee said, "the services look at this in terms of having a new bill."

RECOMMENDATIONS

The findings above lead to recommendations. Just as the findings were reported to the Commission on PPBE Reform, so too the recommendations developed from these findings mirror and reinforce the Commission's recommendations.

Recommendation 1: Consolidate PEs to increase program budgetary flexibility during execution

Program offices should organize budget structures in consolidated PEs. This consolidation will boost program adaption to changed circumstances with a more rapid reallocation of resources. (*q.v. PPBE Commission recommendation: Review and Consolidate Budget Line Items*)

Recommendation 2: Increase Reprogramming thresholds commensurate with the DoD budget and inflation

Congress in annual appropriations bills,

Section 8005, should increase the reprogramming threshold limit in proportion to the size of the defense budget and the effect of inflation. Allowing for greater amounts to be shifted during execution will boost program adaption to changed circumstances with a more rapid reallocation of resources. (*q.v. PPBE Commission recommendation: Update Values for Below Threshold Reprogramming*)

Recommendation 3: Amend the Defense Modernization Account

Congress, with an NDAA, should amend 10 U.S. Code §3136 governing the Defense Modernization Account to keep expiring funds within a Program Executive Office, if they are spent before the next year's funds are enacted. This approach will incentivize and support more efficient and effective program office use of funding at the close of each fiscal year per the intent of Congress. (*q.v. PPBE Commission recommendation: Encourage Use of the Defense Modernization Account*)

Recommendation 4: Allow money to be moved between Colors of Money within a program

Congress in annual appropriations bills, Section 8005, should allow for Program Executive Offices to move funds between colors of money. This will afford program offices in the year of budget execution greater agility to respond to challenges and opportunities. (*q.v. PPBE Commission recommendation: Address Challenges with Colors of Money*)

Recommendation 5: Amend the Continuing Resolution prohibition on new starts

The Congressional Continuing Resolution, Section 104, general prohibition on new starts should be altered to allow for new starts to begin in the case of DoD initiatives to answer urgent and emerging

needs. This will speed the initial development of solutions by five to seven months. (*q.v. PPBE Commission recommendation: Mitigate Problems Caused by Continuing Resolutions*)

Recommendation 6: End the practice of linear obligation benchmarks

DoD should replace the practice of linear financial execution benchmarks with a new s-curve distribution benchmark that allows for an uneven obligation rate. Moreover, the new benchmark should be tied to the department's receipt of funds from the treasury after annual appropriations have been enacted. That is, Continuing Resolutions as well as the period of time demanded for the flow of funds to DoD and onwards to the military services and their subordinate programs should be factored for the start of the s-curve. This will afford programs a greater emphasis on what the effectiveness of their purchases as opposed to the current emphasis on timing of obligation. (*q.v. PPBE Commission recommendation: Rebaseline OSD Obligation and Expenditure Benchmarks*)

Recommendation 7: Increase program office coordination and collaboration with Congress and external entities

Program offices should improve communication with Congressional staff. Likewise, as a means of communication, defense appropriator and authorizer committees should be granted appropriate DoD PPBE-related database access and training. This will assist with greater transparency and shared understanding between DoD and Congressional stakeholders. Similarly, the structure of the DoD Justification Books (J-books) should be improved to provide Congress with comprehensive information in a uniform, more easily digestible format. The J-Books description of the interde-

pendent relationship between PEs and programs as well as their importance to the service acquisition strategy should be better delineated for transparency to Congress. Program offices should also increase coordination with adjacent programs, programmers, budgeters, requirements offices, and legislative affairs offices within their service, as well as with other military services and other government agencies. Likewise, a critical means of program success in PPBE is leveraging support from department or service senior leadership. (*q.v. PPBE Commission recommendation: Strengthen Relationships*)

Recommendation 8: Promote the use of existing rapid acquisition authorities and contracting strategies

Programs and organizations should make use of existing, innovative budgetary and developmental authorities. Approaches such as the MTA, OTA contract vehicle, MOSA, and purchasing commercial technology solutions can bypass delays in the requirements process and the acquisition system. The military services can implement this practice with education and training across program offices, resource sponsors, programmers, and budget offices. (*q.v. PPBE Commission recommendation: Improve Awareness of Technology Resourcing Authorities*)

Recommendation 9: Institutionalize PPBE workforce training

Across all levels of experience and types of roles, professionals involved directly or indirectly with PPBE should benefit from formal, documented annual education and training concerning the larger interwoven processes and systems they serve as well as the directives and procedures germane to their specific duties. Participants should be rewarded for completing annual education and training—beyond

the incentives seen for completing DoD annual requirements related to personal behavior. The education and training should be explicitly aimed at arming participants with a robust comprehension of the steps, timing, stakeholders, authorities, and rules involved in PPBE. Also, some education and training should be given to augment participants' analytical skills. This is not to imagine that the myriad stakeholders and participants in PPBE will work harmoniously and mechanically together. Everyone will continue to do what they want to do, thinking they know best. But, with education and training perhaps they can do so better informed. (*q.v. PPBE Commission recommendation: Improve Training for Personnel Involved in Defense Resourcing*)

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