# Virtual Pathways: Application of the Adaptive Acquisition Framework for Synthetic Training Environments

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## ABSTRACT

Never before in the history of DoD acquisitions have Program Managers been provided the speed or flexibility to expedite innovation than that afforded by the recently implemented Adaptive Acquisition Framework (AAF). This groundbreaking policy restructures defense acquisition guidance to improve process effectiveness to increase the speed of innovation for critical defense technologies and services. Coupled with other powerful acquisition tools such as Other Transaction Authorities (OTAs), the AAF provides PMs with multiple pathways allowing for not only increased flexibility in determining the most suitable acquisition type, but also the ability to only tailor in policy requirements that are deemed relevant. This flexibility contrasts with conventional acquisition and enables successful prototyping and delivery of these critical technologies to Soldiers and Sailors in the field. The introduction of the AAF has proved opportune for the U.S. Army who have fully embraced this policy through the emergence of the Synthetic Training Environment (STE) family of programs. This has enabled the U.S. Army to be the premier adopter of two principal pathways associated with the AAF – Middle Tier of Acquisition (MTA) and the Software Acquisition pathways. Through these unique acquisition methodologies, the U.S. Army has been able to accelerate capabilities to the field through a series of informative Soldier Touch Points and Operational Assessments. As an early adopter of these pathways, the U.S. Army is setting a standard for successful implementation on these policies. This paper seeks to expand upon the progress to date by the U.S. Army STE programs on the implementation of these two AAF pathways, as well as provide valuable lessons learned and recommendations for those programs and DoD agencies looking to apply these powerful acquisition tools to current and emerging defense programs.

## ABOUT THE AUTHORS

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## Adaptive Acquisition Framework

The Department of Defense's Adaptive Acquisition Framework (AAF) is a comprehensive acquisition reform, aimed at transforming and improving DoD procurement processes. The framework is designed to enhance the flexibility, speed, and efficiency of defense acquisition programs while ensuring the delivery of cutting-edge capabilities to meet evolving mission requirements, representing a shift from traditional, linear acquisition practices to a more iterative, agile, and adaptable approach.

The AAF is built upon three key pillars: Capability Delivery, Acquisition Enablers, and Talent Management.
Under the Capability Delivery pillar, the AAF focuses on delivering capabilities to the warfighter more rapidly through the use of prototyping, experimentation, and early user feedback to inform the acquisition process. The Acquisition Enablers pillar aims to streamline the acquisition process and reduce bureaucracy through the use of innovative business practices, such as other transaction authorities (OTAs) and commercial solutions openings (CSOs), to leverage non-traditional defense contractors and accelerate the delivery of cutting-edge technologies. Finally, a focus on Talent Management which promotes a need to reconstitute decades of risk-aversion by moving to a culture of innovation, where experimentation and calculated risk-taking are encouraged to drive continuous improvement.

Overall, the DoD's Adaptive Acquisition Framework provides a roadmap for more efficient and effective defense acquisition. By embracing flexibility, promoting innovation, and nurturing a skilled workforce, the AAF aims to enhance the DoD's ability to rapidly adapt to changing threats and deliver advanced capabilities to the warfighter in a timely manner. Since its official unveiling in January 2020, the AAF has undergone continuous refinement and implementation within the DoD. The framework aims to evolve with changing acquisition needs and emerging technologies but must maintain a focus on realizing lessons from recent AAF programs to remain responsive, efficient, and effective in delivering capabilities to the warfighter.

## Synthetic Training Environment

The Synthetic Training Environment (STE) is the premier program for U.S. Army simulation and training modernization. The STE is designed to provide a collective, multi-echelon training and mission rehearsal capability for the operational, institutional and self-development training domains. It brings together live, virtual, and constructive training environments into a single STE for Army Active and Reserve Components as well as civilians. It will provide training services to ground, dismounted and aerial platforms and command post (CP) at the points of need (PoN) (USAASC, 2023). The STE is currently comprised of the Synthetic Training Environment Information System (STE-IS) which is a suite of integrating and infrastructure software applications, including the Training Simulation Software (TSS), the Training Management Tool (TMT), and the One World Terrain (OWT). This software content is then served to a set of STE hardware capabilities (consumers) such as the Reconfigurable Virtual Collective Trainer (RVCT), the Solider Virtual Trainer (SVT), and the Squad Immersive Virtual Trainer (SiVT). This paper will primarily focus on the STE-IS and RVCT acquisition programs of record.
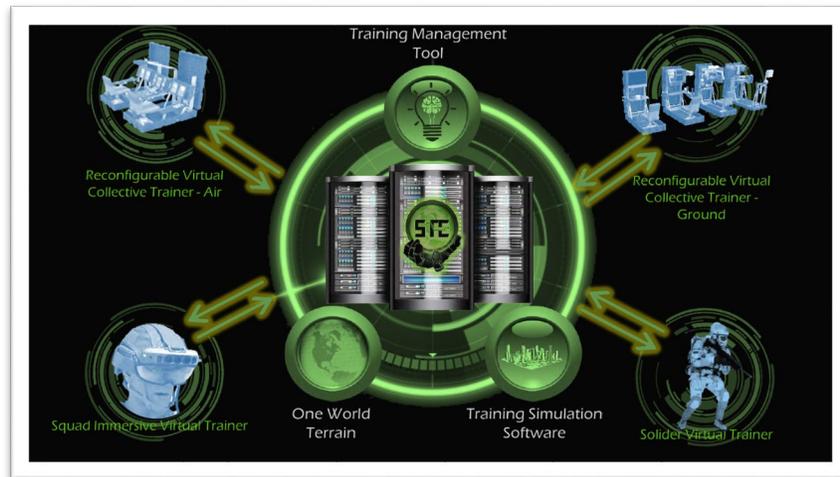
**Figure 1. Synthetic Training Environment (STE) Operational View (OV) depicting TSS, TMT, OWT, RVCT, SVT, and SiVT**

The STE-IS programs of record are executing under the Software Acquisition pathway approach which has been approved by the Army Acquisition Executive. The STE-IS consists of the Training Simulation Software/Training Management Tool (TSS/TMT) and STE One World Terrain (OWT). TMT is a set of intuitive tools that offer Soldiers the ability to directly Plan, Prepare, Execute, and Assess (PPEA) multi-echelon collective training. TSS is the foundational software framework that enables the instantiation of a common synthetic environment for the attainment of training objectives. OWT delivers 3D global terrain capability and associated information services that support a fully accessible virtual representation of the physical Earth accessible through the Army network.

The STE RVCT program of record is executing under the Middle Tier of Acquisition pathway which has been approved by the Army Acquisition Executive. The RVCT is a mobile, transportable, modular, and scalable training capability that includes aviation platforms (RVCT-A) and Ground platforms (RVCT-G) to enable dismounted infantry and maneuver collective training, collective gunnery training, and mission rehearsal at the Point of Need (PoN).

**APPLICATION OF THE AAF FOR STE**
The AAF Guidebook (Defense Acquisition University (DAU), n.d.) and DOD Instruction does not provide a single course of action or strategy for selecting which pathway or acquisition strategy that programs should choose, but instead encourages programs to "tailor, combine, and transition between acquisition pathways to deliver capabilities (Office of the Under Secretary of Defense for Acquisition and Sustainment , 2022)." Under this policy, Program Managers (PMs), with the approval of a decision authority, may leverage a combination of acquisition pathways to provide value not otherwise available through use of a single pathway. It should be noted that the use of multiple pathways does not affect the application of statutory thresholds unless a statute permits. PMs employing multiple pathways will: Define the transition points from one pathway to another pathway. PMs and program offices are encouraged to Plan Ahead, Collaborate, Reuse Artifacts, Tailor Processes, Get Creative, and Appropriately Scope Requirements and Acquisition Efforts when considering the use of the AAF (Defense Acquisition University (DAU), n.d.).

**STE Acquisition Strategy**
As described in the sections above, the STE is not a single program, but rather a suite of interconnected programs with a varying level of lightly to tightly coupled interdependencies. Because of these dependencies, many of these programs are running in parallel as independent programs but are linked together by shared Soldier Touch Points and software releases. For example, the TSS provides critical simulation software required for operation of RVCT vehicles, therefore once an MVP or MVCR is released, it is integrated into the RVCT hardware and these two programs conduct an STP in order to garner joint hardware and software feedback and inform future capability improvements.
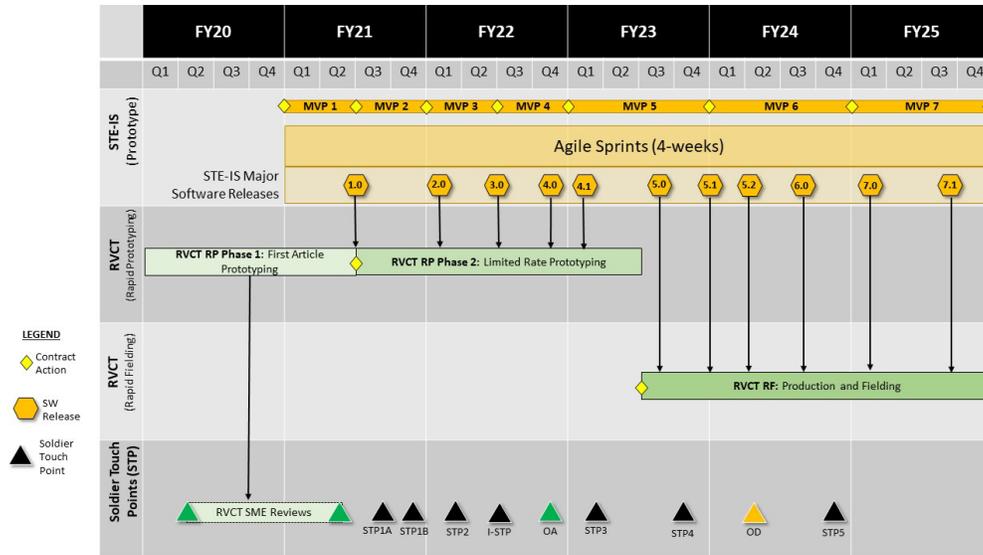
**Figure 2. Integrated Synthetic Training Environment (STE) Prototyping Schedule**

**Soldier Touch Points**

Soldier Touch Points (STPs) are a method employed by the U.S. Army to enable rapid and aggressive decision making to quickly discern viable military solutions and modify designs early, before sinking additional costs into a program or prototype (U.S. Army Futures Command, 2019). These Soldier-led events help ensure capabilities conform to a Soldier Centric Design approach and are designed for the specific needs of Soldiers on the battlefield. STPs provide feedback from Soldiers early in the prototype research and development process, which is an innovative process of modernization and part of the Army's Soldier Centric Design concept. Previous R&D initiatives did not include soldier input at the development stage. Instead, solutions were built and deployed, and soldiers in the field had to adapt it to make it work. Today the STP process streamlines the effort so that ideally, the new platform or solution arrives on the front lines ready for work (Lee, 2019).

STPs provide helpful input to industry representatives, testers, researchers, and acquisition experts on the capabilities soldiers will need to fight and win. The engagements can assist in pinpointing issues that may otherwise be overlooked, and in confirming or dispelling the need for development teams to address real or perceived technological challenges. Touch points have also proven essential in evaluating what might be a promising idea in a laboratory but a less feasible one in the field. These touch points play a significant role in shaping what the force of the future will look like and how new military acquisitions programs might proceed. STPs play an integral part of the Persistent Army Capability Environment (PACE) to enable continuous capability modernization (United States Army Acquisition Support Center (USAASC), 2022).

STPs can be highly formal and organized feedback events involving months of planning and soldier coordination, or they can be simple informal review events in which platform SMEs and stakeholders come together for a few hours to provide their feedback on early concepts or documentation regarding a prototype solution. For example, in the early prototyping phases of the RVCT program, there were approximately 15 formal STP events where soldiers were able to provide hands-on feedback of early RVCT prototypes, however there were more than 50 STPs conducted since the same stakeholders and SMEs were also participants in early concepting and requirements development reviews and technical interchange meetings for each RVCT variants and platforms. Alternatively, the STE-IS program has undergone four major STPs to date, each requiring many months of coordination and CONOPS planning and lasting for up-to three weeks at a U.S. Army training location.

**Table 1. Major STE Soldier Touch Points (STPs) to Date**

| Prototype Program | Event Name | Date | Location | Capabilities Evaluated | Outcomes |
|---|---|---|---|---|---|
| **RVCT** | SME Review(s) | AUG 2020 – FEB 2021 | Orlando, FL | First generation RVCT-Ground and Air prototypes | Engineering design and utilization feedback to inform iterative design updates of RVCT prototypes. |
| **STE-IS / RVCT** | STP1A | AUG 2021 | Orlando, FL | **RVCT**: Initial RVCT-Soldier prototype hardware<br>**STE-IS**: Squad-level capability | Initial feedback of squad-level hardware and software capability for STE. |
| **STE-IS / RVCT** | STP1B | NOV 2021 | Fort Cavazos, TX (Formerly Fort Hood) | **RVCT**: Enhanced RVCT-Soldier prototype hardware<br>**STE-IS**: Squad-level capability | User feedback on initial squad-level STE capability within an operational environment. |
| **STE-IS / RVCT** | STP2 | MAR 2022 | Fort Cavazos, TX (Formerly Fort Hood) | **RVCT:** Initial RVCT-Ground TADSS<br>**STE-IS:** Platoon-level capability | Initial validation of RVCT deployment Concept of Operations (CONOPS) at training sites. |
| **STE-IS / RVCT** | Integration-STP | JUL 2022 | Port Orange, FL | **RVCT:** Enhanced RVCT-Ground TADSS<br>**STE-IS:** Platoon-level capability.<br><br>Fully integrated training system to prepare for an Operational Assessment | Verification and Validation of STE-IS and RVCT interoperability at the Platoon-level prior to system deployment for Operational Assessment. |
| **STE-IS / RVCT** | STP3 | FEB 2023 | Fort Cavazos, TX (Formerly Fort Hood) | **RVCT**: All RVCT-Air TADDS<br>**STE-IS**: Platoon-level capability.<br><br>Air platforms integrated with ground and exercise planning management tool. | RVCT: RVCT-Air received approval to move into Rapid Fielding. |
| **RVCT** | HMD Rodeo | MAY 2023 | Orlando, FL | **RVCT**: All RVCT-Air TADDS<br>**STE-IS:** Platoon-level training capability.<br><br>Multiple COTS Augmented-Reality (AR) Head-Mounted Displays (HMD) fully integrated to support SME evaluation. | New AR HMD selected for integration into RVCT Production baseline. |
| **STE-IS / RVCT** | STP4 | JUL 2023 | Fort Cavazos, TX (Formerly Fort Hood) | STE-IS: Battalion Command Post Exercise (BN CPX) | TBD |

STPs also do not have to be holistic events focused on all available capabilities. In practice, we have found STPs can be extremely beneficial for focusing on specific capabilities of a particular system or program to maximize availability of soldiers. One recent example of this practice is on the RVCT program where an STP was conducted to evaluate various Mixed-Reality Head-Mounted Display (HMD) solutions for the latest generation of RVCT-Air cockpit trainers. This event, known as the "HMD Rodeo," provided the opportunity for soldiers to evaluate and assess various integrated HMD visual solutions, but also provided Government stakeholders, Contractors, and vendors the ability to capture real-time feedback about various solutions and document potential future product improvements needed. Similarly, the RVCT program conducted a series of vehicle-specific STPs known as "SME Reviews" to gather specific hardware feedback on early-prototype RVCT-Ground and RVCT-Air simulators ahead of any major STE-IS software release. This was paramount to influencing updated hardware designs and to ensure future hardware prototypes would be available for future integrated STPs due to long-lead hardware procurement and production timelines.

**Software Acquisition Pathway**
The purpose of the Software Acquisition pathway is to facilitate rapid and iterative delivery of software capability to the user. This pathway is designed for software-intensive systems. This pathway integrates modern software development practice such as Agile Software Development, DevSecOps (Development, Security, Operations), and Lean Practices.

**Minimum Viable Products (MVPs) and Minimum Viable Capability Release (MVCR)**
Flexibility is the name of the game when it comes to software. Acquisition programs must be responsive to change when developing software. This change can come from emerging technology, constant user feedback, or perhaps just simply being responsive to an ever-evolving software baseline. When it comes to software one must be, in a word, agile. The Software Acquisition pathway arms program managers with considerably more agility and flexibility; providing them an acquisition path more suitable for software intensive programs. This made it a natural fit for STE-IS given that it constitutes the central software infrastructure for Program Executive Office Simulation, Training, and Instrumentation (PEO STRI)'s modernization program. Additionally, the pathway allows for two ways to implement the acquisition: application or embedded. The former being for a software-only acquisition while the latter more suited for software embedded in a hardware platform. Given that STE-IS would be embedded within the RVCT, this made STE-IS an obvious candidate for the embedded Software Acquisition pathway, further cementing the new pathway as the right acquisition methodology for STE-IS. However, this new pathway deliberately left much of the details on how precisely to execute a program within the pathway, allowing program managers flexibility to determine how to incrementally build capabilities over time – tailoring in program documentation, vice tailoring out.

Under the Software Acquisition pathway, the building blocks of capability development come in the form of MVPs. These constitute a set of capabilities demonstrated in the intended operational environment that can elicit meaningful user feedback. The bar one needs to reach for an MVP is a deliberately low standard to motivate program managers to get the capability to the field sooner rather than later. Whereas conventional acquisition would have considerable rigor in the form of milestone decisions surrounded by entrance and exit criteria, the Software Acquisition pathway encourages agility. The capability should get in the hands of users much sooner than it is "finished." This deliberate acceleration in capability delivery helps to elicit appropriate user feedback that can then redirect the program manager as appropriate. Why wait until some culminating event to determine a failure to meet user intended requirements if that determination can be made much earlier in the development lifecycle, thereby saving precious time and resources?

MVPs facilitate this user feedback and for STE-IS, PEO STRI aggressively pursued capability development. The current contract for the TSS/TMT capability within STE-IS was awarded in June 2021. PEO STRI conducted the first soldier touch point a mere two months later, a highly aggressive timeline probably even in Software Acquisition pathway terms, let alone in major capability acquisition – the conventional one-size-fits-all acquisition pathway that predates software pathway. However, it should be noted that the TSS/TMT contract launched with a base set of commercial capabilities. The software already included mature first-person shooter gaming capabilities that had already been deployed for Army training. Additionally, the TMT portion included a software capability which already had a relatively mature set of exercise planning capabilities. Nonetheless, these already available commercial products did not natively interface with one another, and significant integration work would need to be completed before the program office could realistically conduct a soldier touch point. However, that is precisely what the team did and with that, the STE-IS had its first MVP—and MVCR as well.
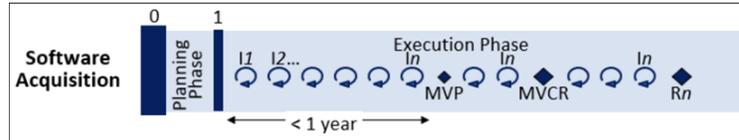
**Figure 3. Software Acquisition Pathway as defined in DoDI 5000.02, Section 3.3.e**

The software pathway policy allows for designating the first MVP as MVCR. In fact, the central tenet of this new pathway is to not only provide PMs with a more flexible, suitable pathway for software-intensive systems, but to also accelerate capability delivery via its policy requirement of delivering MVCR no more than one year following the initial funding. The commercial base set of capabilities contained within the initial solution of TSS/TMT allowed for declaring MVCR given that the software successfully demonstrated squad level capabilities embedded within its target hardware platform, i.e., the gaming laptop designated for first-person shooter gaming. Subsequent MVPs focused on the remaining target hardware platforms, the RVCT-Ground and RVCT-Air. After the second MVP, the STE-IS had reached sufficient maturity to facilitate the successful demonstration of the form, fit, and function of the various ground platforms at the platoon level. Then after the third MVP, the STE-IS had similarly reached sufficient maturity to demonstrate form, fit, and function of the air platforms as well as integration with one of the ground platforms and the TMT. The program is currently targeting the fifth MVP having sufficient software maturity to successfully demonstrate company-level collective training across air, ground, and dismounted soldier platforms with plan, prepare, execute, and assess functions executed within the TMT. The STE-IS established MVPs as six months' worth of capability development that initiated from a squad-level dismounted soldier capability to then incrementally adding the integration of ground and air platforms, all being managed with an increasingly capable TMT.

The STE-IS team executed the development of capabilities via DevSecOps principles within an agile framework. The team employed month-long sprints that began with sprint planning sessions and concluded with sprint reviews. The team formed scrums, i.e., small teams of developers focused on logically grouped capabilities. Currently, the STE-IS team also conducts a scrum of scrums, a weekly session with scrum leads where accomplishments, dependencies, and challenges are briefed. All of these constitute hallmarks of an agile implementation. The team employed a DevSecOps environment that leveraged automation where practical to introduce efficiencies not otherwise found in conventional software environments. For example, the automation of software builds has allowed the test team to efficiently assess the integrated capability versus executing a more laborious method of testing component by component; a meaningful benefit given the many variants of air platforms (e.g., Apache, Blackhawk) and ground platforms (e.g., Bradley, Abrams). The team has also made strides relative to operations with the development of an enterprise monitoring solution that enables users to monitor the health state of the simulation with sufficient granularity that pinpoints software issues to specific components executed within a given exercise anywhere in the world. This provides a meaningful first step in transitioning from regional or at times even localized simulation operations with current systems to an enterprise level, centrally managed simulation system.

While the TSS/TMT DevSecOps environment currently exists primarily for TSS/TMT development, the vision is to instantiate a singular environment at the PEO STRI enterprise level. In fact, PEO STRI has recently instantiated a team devoted to providing such enterprise level services. Dubbed UNified Integration and Transformation Enterprise (UnITE), this effort looks to transform how PEO STRI currently conducts software development, providing a path to transition away from stovepipe, vendor-proprietary software development environments to a government-managed environment accessible to developers across industry (Figaroa, 2023). Given the central role TSS/TMT plays in driving the modeling and simulation needs across the STE enterprise set of capabilities, it makes it a logical candidate for realizing the vision of UnITE. As such the TSS/TMT team is currently conducting a pilot to deploy TMT in a government-managed environment, aiming to prove an initial conceptual design that can be built upon for broader DevSecOps in TSS/TMT and ultimately the larger STE.

The preceding work accomplished by the STE-IS team in executing five MVPs worth of development within the framework of the Software Acquisition pathway and the upcoming digital transformation to a singular DevSecOps environment places PEO STRI at an inflection point in its vision of transforming military training. This vantage point affords an opportunity to reflect on achievements thus far, areas to improve, and the way ahead. The adoption of the software pathway has provided a more flexible, suitable methodology for capability development that more closely aligns with the dynamic nature of software development. Acquisition should not be a "one size fits all" approach as the federal government acquires goods and services as diverse as the mission requirements it seeks to fulfill. Software

in and of itself represents a unique challenge given the interdependencies that exist not only within a given piece of software but inevitably with the additional software and target hardware platforms it must establish an interface. The ubiquity of software demonstrates that this challenge will not just persist but grow in complexity.

Accordingly, agility reigns supreme as the guiding principle in software development at large, but particularly under the Software Acquisition pathway. However, this agility must extend to all stakeholders who have a vested interest in the development of the software-intensive system. While the focus tends to center on the PM developing the capability, the PM does not act alone. The PM must collaborate with the requirements organization, testers, subject matter experts, and users to name a few. They too must adopt the culture of agility and either minimize conventional practices of software development or even abandon them altogether. The rigor typically contained with conventional acquisition which emphasizes milestone decisions with strict criteria is largely incompatible with the dynamics of software development. It forces a level of scrutiny on capability development and the establishment of hard goals to advance to the next stage of acquisition. This delays capability development as it constrains PMs from delivering anything short of that stated goal. Yet typically the team has developed sufficient capabilities that provide appreciable value to the mission. The utilization of MVPs and MVCR provide PMs – and their stakeholders – with the policy tools to deliver those sets of capabilities early to the users. However, clinging to inflexible goals centered on higher than necessary levels of capability invariably delays instead of accelerating development. Clearly, the Army has agreed as well as it otherwise would not have embraced this new acquisition pathway. However, without the full endorsement of all various stakeholder organizations, from leadership down to action officers, the new acquisition pathway cannot rapidly deliver capability in a manner commensurate with how commercial industry delivers capabilities.

**Middle-Tier of Acquisition**
The Middle Tier of Acquisition (MTA) pathway is designed to rapidly develop fieldable prototypes within an acquisition program to demonstrate new capabilities and rapidly field production quantities of systems with proven technologies that require minimal development.

**Rapid Prototyping**
In 2020, the Assistant Secretary of the Army for Acquisition, Logistics, and Technology (ASA(ALT)) approved the RVCT program to utilize MTA as its acquisition pathway. This allowed for the RVCT program acquisition and prototyping strategy to be completely tailored for only those areas that maximize available development schedules and opportunities for STPs. The MTA Rapid Prototyping pathway shifted focus from the processes to the capability resulting in a better, more operationally relevant product being developed. This tailoring enabled the RVCT Government and contractor team to devise a streamlined repeatable process for the Rapid Prototyping phase which resulted in over 50 STP opportunities and led to the successful development of Generation 1 and Generation 2 RVCT prototypes. This tailored approach to RVCT prototyping is illustrated in Figure 4 as compared to more traditional MCA processes.
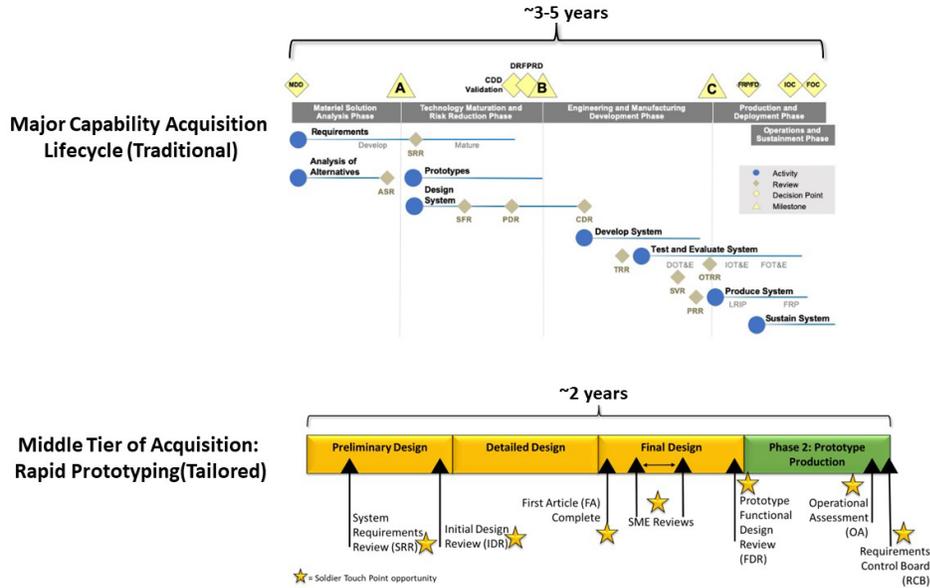
**Figure 4. RVCT Tailored MTA Rapid Prototyping Process**

**Table 2. Comparison of MCA Lifecycle activities with tailored MTA Rapid Prototyping**

| Traditional Major Capability Acquisition (MCA) Process | Tailored RVCT Process Under MTA Rapid Fielding | Process Description |
|---|---|---|
| System Requirements Review | System Requirements Review | Review of systems specification and requirements of each RVCT prototype. |
| System Functional Review (SFR) | Initial Design Review (IDR) | Review and approval of physical / virtual RVCT mock-ups concepts against the System/Subsystem Specification (SSS) and requirements. Identification of long-lead items. |
| Preliminary Design Review (PDR) | First Article (FA) Complete | First physical RVCT prototype completed for a given platform. |
| Developmental Test & Evaluation (DT&E) | SME Review | Multi-day review event with platform SMEs and stakeholders to validate design and fidelity of RVCT capability. Feedback will translate to retrofits and design changes. |
| Critical Design Review (CDR) | Functional Design Review (FDR) | Final prototype hardware baseline review and approval for each RVCT platform. Serves as the CDR-like function for each platform. Review of final SSS and System/Subsystem Design Description (SSDD). |
| Operational Test & Evaluation (OT&E) | Operational Assessment (OA) | Test and evaluation of prototype systems in an operational environment with operationally significant users. |

| Traditional Major Capability Acquisition (MCA) Process | Tailored RVCT Process Under MTA Rapid Fielding | Process Description |
|---|---|---|
| Production Readiness Review (PRR) | Requirements Control Board (RCB) | Stakeholder review and approval of prototype system feedback prior to production and manufacturing. |

Within five years of initiating the MTA Rapid Prototyping path, programs have the option to either a) conclude prototyping with no further action, b) transition to MCA, or c) transition to rapid fielding. Through the tailored RVCT prototype process, the RVCT program demonstrated sufficient capability maturity to conclude Rapid Prototyping and transition into Rapid Fielding; therefore, expediting capabilities to the field, ahead of schedule as compared with conventional MCA.

More than just acquisition process can be tailored under the AAF and the MTA as well. Outside of proposing new streamlined prototyping lifecycle process, the Government and contractor teams worked to tailor RVCT data deliverables and documentation artifacts. The original RVCT rapid prototyping Performance Work Statement (PWS) called for more than 30 program deliverable documents, each with regular and recurring delivery schedules throughout the prototyping phase. These documents included several logistics documents such as, the Level of Repair Analysis (LORA) Report, Technical Manuals, and Logistics Product Data, as well as traditional engineering deliverables such as the System/Subsystem Design Description (SSDD), Interface Control Document (ICD), and Hardware Baseline Document (HBD). Due to the incremental and highly evolving nature of the RVCT program in such an early phase, it was agreed that much of the data collected in these documents would quickly become obsolete as incremental prototyping variants are released and it was agreed to tailor these data artifacts to only provide the relevant information needed to inform acquisition lifecycle decisions. This allowed the Government to prioritize funding on prototyping capabilities versus more time consuming and less-valuable documentation especially in light of aggressive prototyping schedules and delivery timelines. Through this mutual tailoring process, the RVCT program went from 33 to 21 data deliverables in the Rapid prototyping phase. Through this reduction of deliverables, cost savings were recognized by the Government. Each of the resulting data deliverables were successfully completed and were crucial to inform program lifecycle and maintenance decisions for transition into the RVCT Rapid Fielding phase of MTA.

**Operational Assessment (OA) / Operational Demo (OD)**
Under MTA Rapid Prototyping, an Operational Assessment (OA) or Operations Demonstration (Ops Demo) serves as a Developmental Test (DT) activity and is conducted in a manner and at a venue that provides an environment relevant to the future decision that the prototyping project is intended to inform. The OA/Ops Demo should be conducted with representative units, missions, and environments. The key is to ensure the environment is relevant to the decision being informed. However, if the ultimate plan is to transition the prototype to deployable production assets, the relevant environment must include putting the prototype in the hands of a warfighter in an operationally representative environment. This ensures that the ensuing production assets can be successfully used by a warfighter in an operational context to meet their capability need.

An OA or Ops Demo should consider all aspects of system performance, including survivability and lethality if deemed critical to mission effectiveness or force protection. During the demo, operational personnel will operate the system, with the minimum necessary level of contractor support. Mission demonstrations should be designed as end-to-end missions to the maximum extent possible, to include planning, mission task execution, and post-mission activities, based on user-provided employment concepts and tactics.

The U.S. Army PEO STRI, Army Test and Evaluation Command (ATEC), and Synthetic Training Environment Cross Functional Team (STE CFT) have together conducted a combination of Ops Demos and OAs as milestone events for both RVCT and STE-IS to transition into respective production OTAs. The specific U.S. Army ASA(ALT) MTA policy recommends that an independent assessment from the U.S. ATEC is recommended, therefore these events have been managed and facilitated by ATEC representatives. These OA events are similar in scope to Soldier Touch Points, to include participation from active-duty soldiers and real-world training scenarios. Table 3 describes the implementation and outcomes of these OA events for RVCT and STE-IS.

**Table 3. Ops Demo / OA Implementations for STE prototypes**

| Event Name | Prototype Program | Date | Location | Supporting Units and Organizations | Capability Evaluated | Outcomes |
|---|---|---|---|---|---|---|
| **Operational Assessment (OA)** | RVCT | AUG 2022 | Fort Cavazos, TX (Formerly Fort Hood) | **Lead**: U.S. Army Test and Evaluation Command (ATEC) **Support**: PEO STRI, Army Maneuver Center of Excellence (MCOE), Army Futures Command (AFC) **Representative Units**: 2-13 CAV, 4-6 IN, 4-1 FA, 2-23 IN | •RVCT-Ground Training Aids, Devices, Simulators, and Simulations (TADSS) •RVCT fielding and deployment concept at the Point of Need (PoN) | •Approval for phased RVCT production OTA •RVCT-Ground received approval to move into Rapid Fielding |
| **Operational Demonstration (Ops Demo)** | STE-IS | FEB 2024 | Fort Cavazos, TX (Formerly Fort Hood) | TBD | TBD – Currently in planning phases. | TBD |

**Rapid Fielding**

Under the MTA pathway, the Rapid Fielding (RF) path enables proven technologies to field production quantities of new or upgraded systems with minimal development required. A program under this path will begin production within six months and complete fielding within five years of the RF program start date. The RF pathway supports the primary objective of the MTA which is to rapidly get systems into the hands of warfighters to provide empirical evidence as to baseline requirements, sustainment, and lifecycle costs. The RVCT acquisition program was approved to transition from the Rapid Prototyping phase of MTA to Rapid Fielding in January 2023 based on successful results from STPs and the OA in the Rapid Prototyping phase.

As part of the Rapid Fielding award, the RVCT program initiated a series of actions to ensure program production risks were mitigated to ensure successful and timely fielding of systems. Under the Rapid Fielding phase of RVCT, quantities of RVCT system manufacturing would scale by roughly 20-fold; therefore, the first activity undertaken by the RVCT acquisition program was to conduct an engineering design analysis against the RVCT prototype hardware baseline to understand any production challenges associated with supply chain and manufacturing. This process, known as Design for Manufacturing (DFM), was critical to ensuring RVCT manufacturing could be consistently streamlined and scaled commensurate with expedited fielding timelines and high-volume production throughput.

**Table 4. RVCT Design for Manufacturing (DFM) Analysis Items**

| Category | Description |
|---|---|
| **Design Improvement** | During the prototype design/manufacturing build and subsequent internal Physical Configuration Audit (PCA), a number of design improvements were captured for assessment as hardware design transitions to production. |
| **Obsolescence** | Reanalyze the bill of material, particularly the Commercial Off the Shelf (COTS) items for hardware that have been or are planned to be discontinued by the Original Equipment Manufacturer (OEM). |
| **Supply Chain Availability** | Survey Sub-contractors/Supplier/Vendor for assessments on bill of material items to identify constraints and develop mitigations. |
| **DFM / Producibility** | Assessing the prototype hardware configuration from a design for manufacturability, linked to Design Improvements and PCA, to recommend design and process changes to improve producibility, reduce cost of execution. |
| **Vendor Change** | Actions to de-risk production phase by establishing formal second sources for key commodities and/or assemblies. If many of the prototype system suppliers are small business that may have difficulty scaling. |
| **Fidelity Change** | Incorporating changes (approved) recommended by Subject Matter Experts (SME) to enhance hardware fidelity |

| Durability / Reliability | Assess ruggedization of the hardware design, particularly with respect to COTS hardware input/output interconnect ports, hubs, connectors. |
|---|---|
| Maintainability | Assessing prototype hardware configuration to improve maintenance of system, incorporating continuous improvement assessment from Reliability, Availability and Maintainability (RAM) data. |
| Usability | Identify/recommend Improvements in the prototype design to improve useability and user experience (assembly, disassembly, transport) |
| Cosmetic | Assess and recommend changes to prototype hardware design to improve appearance and functionality of the RVCT systems. Examples include color of nuts/bolts, cable sleeving color, etc. |

Any findings or engineering design updates from this DFM phase were then aggregated with the backlog of user feedback items from the RVCT OA event and the total list was prioritized with system stakeholders during a process known as the Requirements Capability Board (RCB), which is jointly chaired by leadership from the requirements, acquisitions, and technology stakeholders. A final, user-approved, list of engineering design updates and capabilities was then formalized as the RVCT hardware production baseline for the Rapid Fielding phase. Once this production baseline was finalized, procurement and manufacturing processes were quickly initiated so that production, testing, and fielding schedules could be finalized and managed. Under the MTA RF pathway, thousands of RVCTs will be fielded to over 20 U.S. Army and Army National Guard sites in less than three years. This is truly rapid fielding and could have not been as successful or efficient under a more traditional acquisition process.

**Contracting Considerations**

AAF pathways are naturally and intrinsically linked with Other Transactions (OT) authorities and procedures. OTs are non-standard contractual instruments that can include flexible business arrangements to acquire research and development or prototyping activities to advance new technologies. OTs provide opportunities to creatively structure agreements that may leverage commercial business practices and remove barriers to entry such as complex compliance and intellectual property rights requirements, to encourage non-traditional defense contractors to do business with the government. Teams should consider the concept of "stacking" their contracting efforts along the AAF timelines to expedite the market research, development, and ultimately fielding of capabilities. Through the use of different statutory authorities – starting early with prize challenges, moving to experimentation, and then to advanced prototyping –which each allow OTs to be awarded for different purposes at the unique state of the program lifecycle.

One of the most attractive features of OTs is the ability for the Government to award non-competitive follow-on Production OT contracts after a successful, competitively awarded, prototype completion. This powerful feature enables the central objective of AAF pathways to rapidly field advanced capabilities to the warfighter. While this feature provides huge benefit to expediting capabilities for the Government and users it has been scrutinized at times by policy makers (Rogers & Smith, 2023) and the Defense Industrial Base (DIB), especially for those not selected for an initial prototype award. If the acquisition strategy for a program identifies the use of this follow-on production award feature, it is imperative that members from the acquisition and contracting teams maximize transparency and ensure proper procedures are followed when awarding and administering the initial prototype OT.

Depending on the stage of the program, there are many unique considerations that should be considered and understood. Each area has unique tradeoffs for the future state of the cost, schedule, and performance of the program that have certain risks that must be managed to achieve success.

- Transition timelines between prototyping efforts and production efforts, specifically with managing development teams and production lines to maximize efficiencies.
- Phasing of funding on future decision points.
- Balancing user feedback with future cost/schedule/performance tradeoffs.
- Contract types to incentivize tech discovery and exploration (e.g. fixed price, requirement heavy prototype efforts do not always marry up during early development).
- Sufficient walkaway/termination language to protect both parties during prototyping.
- Incentivizing groups of contractors to work together without direct contractual relationships (e.g. removing dependencies).
- Balancing non-capability delivery requirements (e.g. extensive engineering or logistics documentation) with timelines to

make proper decisions for movement between pathways.

- Balancing and understanding of data rights and IP impacts to licensing at the appropriate

phase of the pathway – and future impacts to lifecycle cost management.

## LESSONS LEARNED / RECCOMENDATIONS

Continuous improvement is a critical necessity as part of any advanced prototyping process. As such, our combined Government and Contractor teams have made deliberate attempts to address implementation shortcomings and develop lessons learned so that we can continuously refine our acquisition prototype and production processes in order to better streamline manpower and fiscal resources, as well as to more effectively deliver capabilities to the warfighter. Through our experiences in implementing the AAF pathways over the last few years, we have laid out a series of recommendations, below in Table 5, that we believe would benefit any future practitioners of the AAF.

**Table 5. AAF Implementation Recommendations from STE Prototyping**

| Ref # | Related Topic | Recommendation |
|---|---|---|
| 1 | Deliverables / CDRLS | Carefully consider requirements for Engineering and Logistics data deliverables and documentation for early-phased prototyping. Prototyping is inherently incremental and evolutionary in nature which may cause early documentation to be rapidly out of synch of technical capability development. Every dollar spent on documentation is one dollar that could be spent on advancing technical capabilities. As proven through RVCT and STE-IS, documentation requirements for prototyping programs can be tailored to achieve the specific program lifecycle necessary to inform acquisition decisions. More detailed data deliverables and documentation can be reserved for production phases of the program once prototypes are more mature and more resources are available. |
| 2 | Contracting | When deciding upon an AAF pathway, speed of contracting and acquisition should not be the primary objective. Speed is a by-product of these pathways when creativity and flexibility are applied. If tailoring is not applied when adopting an AAF pathway, then any program may realize longer development timelines reminiscent of more traditional acquisition processes with costly requirements baked into contracts. |
| 3 | Acquisition Process | When laying out prototyping processes under an AAF pathway, it is important to remember that much like the prototypes being developed under the processes, the process itself can be prototyped as well. A perfect strategy does not have to be put in place on Day 1 of implementation, the processes should be evolved over time based on program dependencies and acquisition stakeholder feedback. We have found that regularly reviewing program processes and activities across Government and Contractor teams identifies redundant reporting or events. |
| 4 | Acquisition Process | If your long-term acquisition strategy relies on leveraging the follow-on, non-competitive, production capability of Other Transactions, it is important to maximize transparency in the early stages of program execution, especially related to communication to Industry, related to solution selection, acquisition strategy, and solution evaluation. Failure to provide proper up-front details may expose the Government to increased policy scrutiny and may cause avoidable program delays. |
| 5 | Acquisition Process | Until AAF pathways become more heavily adopted across DoD organizations, we have found it good practice to emphasize training to educate stakeholders on terminology introduced via the new acquisition pathways; identifying opportunities for increased efficiency particularly as contrasted with conventional MCA. This helps to institute a culture whereby stakeholders more-readily embrace AAF by relating to more well-known practices and how AAF can offer improved flexibility. This practice helps enable organizational acceptance across the acquisition community alongside the existing MCA. |

| Ref # | Related Topic | Recommendation |
|-------|---------------|----------------|
| 6 | Test & Evaluation | Due to the agile nature of prototyping programs, it is often difficult to pinpoint when specific capabilities will be available at exact points in time. Because each agile sprint determines which capabilities in the backlog will be developed, it may be difficult to plan major test events around specific capabilities. Therefore, it is recommended to level-set expectations on available system capabilities with system stakeholders and users when scheduling test events and soldier touch points. Promising too specific of capabilities up-front may result in negative perceptions and feedback at these events if unexpected blockers or dependencies are discovered during prototype development and design. |
| 7 | Test & Evaluation | When leveraging external test and evaluation (T&E) agencies, ensure upfront agreements are established related to post-test reporting and documentation delivery. Events such as STPs, OA, and Ops Demos are often tied to key senior leader engagements and program decisions. If test reports are not provided in a timely manner, then these decision points may slip resulting in negative program or resource impacts. Through upfront agreements with T&E organizations, we have established a process to receive draft assessment reports which are provided for senior leader engagements while formal reports are in development. |

The Government Accountability Office (GAO) has also assessed the AFF across several criteria in the three years since its release. In these evaluations, the GAO has made several recommendations to the DOD in the implementation off the AAF. Most of these recommendations recommend implementing leading practices for managing reform efforts, such as by developing an implementation plan to track acquisition program progress under these pathways (Oakley, 2022) (Rogers & Smith, 2023).

**SUMMARY AND CONCLUSIONS**

When considering the use of the Adaptive Acquisition Framework, it is important to remember that there is no gold-standard or cookie-cutter approach to implementation; however, identifying lessons learned or implementations from other applications is highly encouraged. Like the technology prototypes that they produce, these acquisition pathways are meant to tailor in *only what is needed* for a program based on a host of considerations, dependencies, or operational environments. This paper presented two example case studies of how the AAF was used to successfully streamline major prototype development for the Army simulation and training community. Between 2019 and 2022, the number of programs implementing either the Middle Tier of Acquisition or Software Acquisition pathways more than doubled across the DoD (Rogers & Smith, 2023). As the AAF and the pathways that it provides continue gaining traction throughout the DoD, it is important to understand not only the benefits they provide, but also the risks and challenges that may arise during implementation. These innovative acquisition pathways are force-multipliers for the defense acquisition community and proper application and management of the AAF is critical to ensuring their enduring use for years to come. The AAF aims to expedite innovation to the warfighter through technology prototyping, therefore AAF practitioners should also embrace innovation in their implementation of these non-standard acquisition models and should seek to prototype new and novel strategies when tailoring the most advantageous path-forward for their acquisition programs.

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