Actively Managing the Technology Transition to Acquisition Process

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Technology transition requires collaboration, commitment and perseverance. Success is the responsibility of everyone in the development and life-cycle management of a system from concept to fielding, and fundamentally requires sustained leadership commitment to the acquisition program. The science and technology (S&T) community focuses on rapidly maturing technology with the relevant performance to satisfy user-defined needs and the receiving acquisition program's requirements. This mandates close and continuous dialogue across the acquisition and combat development communities.

Congress has directed that "the technology in the program has been demonstrated in a relevant environment." Thus, Milestone B decisions involving technology transitions must demonstrate at a TRL 6 or higher level. To this end, Army S&Es provide expert technical advice and engineering support to quickly develop and test interim solutions to urgent needs to achieve required TRL standards. (*Army AL&T* Magazine file photo image.)

Many factors determine whether or not a technology transitions from the laboratory to the ultimate customer — the Soldier. These factors include technology maturity, performance, affordability (of the technology and/or the system), manufacturability, available funding, schedule, continued need and/or support from program managers (PMs) and, perhaps most importantly, sustained priority for the technology/system in the Army's eyes.

Changing priorities and budget process instability have profoundly affected technology transition throughout this decade. We are a Nation at war. With the Army's focus on support to current operations, the Army S&T strategy has expanded to include the pursuit of opportunities that provide enhanced capabilities for the Current Force while continuing to develop and mature enabling transformational capabilities for the Future Force.

This strategy's dual objectives require flexibility and cooperation throughout the acquisition domain, including the processes by which we transition technologies from the laboratories and engineering centers into the acquisition programs providing products and/or services to the warfighter. In addition, we are also striking a balance between efforts that include:

- Capability pull — addressing an identified materiel shortfall within an acquisition program.
- Technology push — the discovery of new capabilities that can change the way the Army operates.

Given the Army's challenge to modernize the force while at war, the S&T community has been challenged to address technology affordability and manufacturability earlier in the development cycle.

Capability Pull Process

For long-term development and fielding of future capabilities, the Integrated Defense Acquisition, Technology and Logistics Life Cycle Management Framework (LCMF) establishes a deliberate *capability pull* process. This framework's normal timeline allows planning for development and transition of technologies to meet known performance requirements and production schedule needs. Technologies are matured and applications are refined in synchronization with operational and system concepts development. In this framework, technology development strategies are crafted to mature technologies for a specific application, reduce the technology risk and transition that mature technology to PMs in time for that acquisition program's System Development and Demonstration (SDD) phase. The Army Technical Objective (ATO) process fits well in this framework.

Demonstration ATOs (ATO-Ds) are often designed to meet a known specific need for a planned acquisition program in a specific time frame or a planned capability improvement to an existing system. Given the Army's challenge to modernize the force while at war, the S&T community has been challenged to address technology affordability and manufacturability earlier in the development cycle. When developing ATO-Ds, we look for opportunities to pair a developing technology effort with a supporting manufacturing technology initiative. These two efforts, done concurrently, seek to produce more affordable systems/subsystems to reduce technology risk for transition into an acquisition program.

The Technology Transition Agreement (TTA) is a management tool used to improve our success in transitioning ATO-D technology solutions to the warfighter. TTAs ensure that users, technology developers and acquisition PMs fully understand what is being developed and the final "product(s)" that will be provided from the S&T program. This agreement formalizes and documents the acquisition

Technology is transferred from the laboratory to the Soldier as quickly as practical. Limiting factors that impact tech transfer often include the maturity level of the technology, the technology's affordability or the affordability of the system it's designed to support, and manufacturability, just to name a few. Here, CPL Pavlo Colon drives his High-Mobility Multipurpose Wheeled Vehicle onto an Afghan National Police compound in Laghman Province, Afghanistan, July 26, 2007. (U.S. Navy photo by MC2 Joshua Karsten.)

program's needs for the key technologies being developed and validated against the receiving program's schedule and resources. Key TTA elements are:

- An accurate description of the technology product(s) to be transferred, including the Technology Readiness Level (TRL).
- The performance metrics that the technology product(s) must demonstrate at delivery and the relevant conditions of that demonstration.
- The required delivery schedule for the technology product(s).

The current requirement for ATO-Ds is to have a TTA in place as soon as feasible, but not later than 1 year prior to ATO completion. Meeting this requirement is necessary to retain ATO status and maintain funding through ATO completion. The TTA must:

- Define the technology transition path.
- Provide cost, schedule and performance parameters for the technology developer.
- Enable more defined requirements development and acquisition program planning.

Having a clear transition path also helps acquisition domain leaders to evaluate their own strategic performance in meeting warfighter-identified gaps, to establish priorities of effort and to use limited resources efficiently.

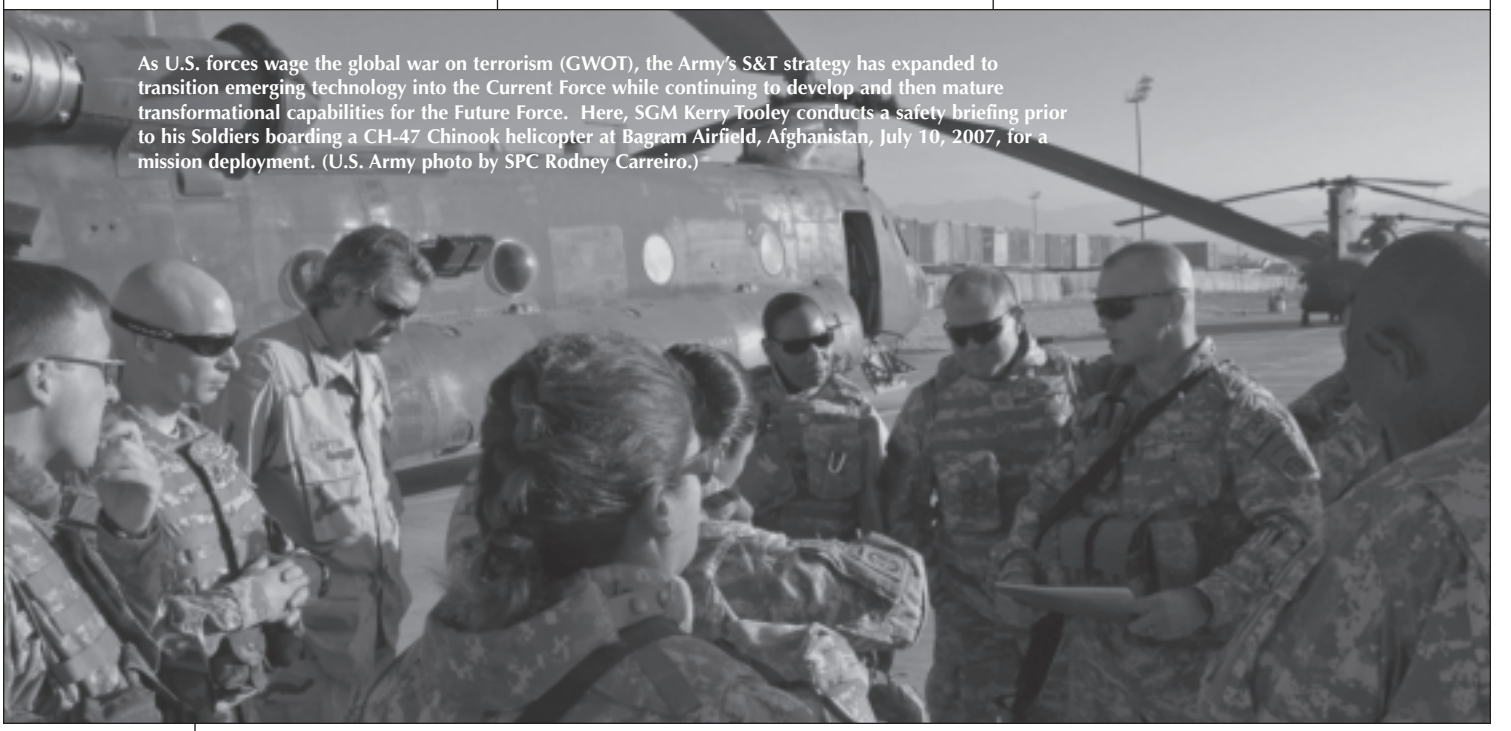
Technology Push Process

The process for *technology push* efforts is very similar but it requires an even closer working relationship with the requirements development community. "Tech push" is intuitively more difficult as it is seeking to apply an unfamiliar solution to an existing capability shortfall. These efforts tend to require much more robust testing and demonstration efforts to convince the acquisition and requirements communities of their added benefit to our Soldiers.

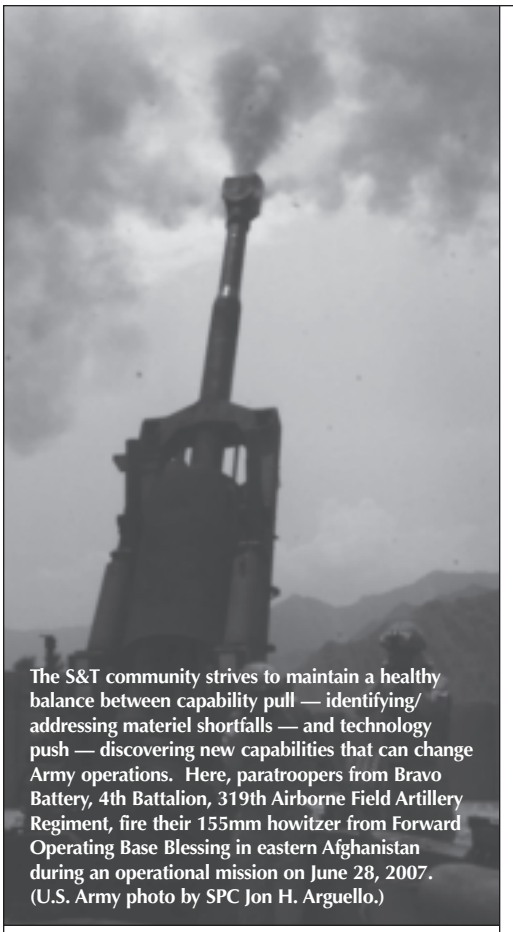
There are many checks and balances on the technology transition from S&T. One that is integrated into the LCMF is the Technology Readiness Assessment (TRA). TRAs are required for all acquisition programs undergoing a Milestone B or Milestone C decision review. The TRA's purpose is to assess whether or not the technologies to be used in an acquisition program are sufficiently mature for the milestone being considered. This assessment validates that the technology can be transitioned from the laboratory to the acquisition program with low risk. TRL is the metric used to assess technology maturity. The TRL approach was originally established by NASA and adopted by DOD to measure technology maturity against its intended application.

DOD policy requires that all technologies in a program must have been demonstrated in a relevant environment and achieved a TRL 6 prior to Milestone B. Exceptions, however, were frequent if the PM had an acceptable technology maturation plan and the resources to execute it. Since 1999, the Government Accountability Office (GAO) has published several reports criticizing DOD for allowing programs to begin acquisition with "immature" technologies. The GAO views the use of immature technologies as a major factor in causing cost and schedule overruns in major acquisition programs.

Congress, likewise, is concerned about cost overruns in DOD programs.



As U.S. forces wage the global war on terrorism (GWOT), the Army's S&T strategy has expanded to transition emerging technology into the Current Force while continuing to develop and then mature transformational capabilities for the Future Force. Here, SGM Kerry Tooley conducts a safety briefing prior to his Soldiers boarding a CH-47 Chinook helicopter at Bagram Airfield, Afghanistan, July 10, 2007, for a mission deployment. (U.S. Army photo by SPC Rodney Carreiro.)



The S&T community strives to maintain a healthy balance between capability pull — identifying/addressing materiel shortfalls — and technology push — discovering new capabilities that can change Army operations. Here, paratroopers from Bravo Battery, 4th Battalion, 319th Airborne Field Artillery Regiment, fire their 155mm howitzer from Forward Operating Base Blessing in eastern Afghanistan during an operational mission on June 28, 2007. (U.S. Army photo by SPC Jon H. Arguello.)

Section 2366a of *Title 10, United States Code*, as enacted by Section 801 of the *National Defense Authorization Act for FY06 (Public Law No. 109-163)*, requires the Milestone Decision Authority for Major Defense Acquisition Programs (MDAPs) to certify to Congress that "the technology in the program has been demonstrated in a relevant environment." This means that the TRA prepared to support a Milestone B decision must conclude that the transitioning technologies have been demonstrated at a TRL 6 or higher level. While Section 2366a still allows a waiver, it must be reported to Congress before Milestone B approval and the basis can be only to achieve critical national defense objectives. As a result, TRAs for MDAPs are receiving increased scrutiny by the Director of Defense Research and Engineering before he recommends that the Defense Acquisition Executive "certify" the technology maturity to Congress.

The second S&T strategy element is to seek opportunities to mature, provide and facilitate transfer of enhanced capabilities for the Current Force in the GWOT. In implementing this strategy, the S&T community fully leverages knowledge gained from past investments. Working closely with warfighters and acquisition PMs, Army scientists and engineers (S&Es) provide technical advice and engineering support gained from years of experience to quickly develop and test interim solutions to satisfy urgent needs in response to adaptive, ever-changing threats.

The S&T community encourages the use of initiatives such as the Quick Reaction Fund, Technology Transition Initiatives, Agile Integration, Development and Experimentation effort at the U.S. Army Research, Development and Engineering Command, and Joint Capability Technology Demonstrations that are designed to accelerate the transition from S&T to useful military products. Working with organizations such as the Rapid Equipping Force and the Joint Improvised Explosive Device (IED) Defeat Organization, the S&T community has contributed to shrinking of the development, experiment and assess cycle that quickly adapts commercial-off-the-shelf items or maturing technology products in development to solve an urgent warfighting requirement.

The Army Field Assistance in S&T Program provides a liaison for the component commander staff to transmit their near-term requirements to the Army laboratories and research, development and engineering centers, where efforts are focused on providing near-term warfighter solutions. Responding to urgent need requests from actively engaged warfighters, Army S&Es have been instrumental in rapidly fielding capability for IED detection and defeat, counter-mortar systems, individual Soldier and tactical vehicle protection, precision airdrop, robotic sensors and improved surveillance.

The teamwork that is being exercised in this rapid response environment is increasing awareness throughout the acquisition community that all of the parts are needed for successful technology transfer. While we continue to work on reducing the impact of factors such as the budget process, the relationships that are being engendered in the current warfighter support efforts are fostering the teamwork that will contribute to improved overall long-term success of Army technology transition processes and programs.

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