



Interview with Dr. Marilyn Miller Freeman, Deputy Assistant Secretary of the Army for Research and Technology

The new vision for Army science and technology (S&T) is focused on identifying and promptly addressing the key areas where S&T can provide the Soldier with a decisive advantage, in partnership with other stakeholders. Here, a Soldier with Troop B, 1st Squadron, 113th Cavalry Regiment, Task Force Redhorse scans a nearby hilltop during a search of the Qual-e Jala village, Afghanistan, in February. (U.S. Army photo.)

Army AL&T: You spoke at the AUSA Winter Symposium about “turning things upside down” in Army S&T. In terms of execution, what are the first concrete steps needed to accomplish this at your level?

Freeman: The process of doing strategic planning and strategic change is well-known. The starting point is a good foundation, built on core values, mission, and fundamental business processes that we already have.

Next, we have to create a vision. It has to be clear and one that everyone can understand and get behind. A vision is a top-level thing. Our new S&T vision talks about empowering, unburdening, and protecting our Soldiers. It talks about technology-enabled capabilities being the key product we deliver. My point is: We are no longer just focused on delivering individual “widgets,” individual technology—partial solutions to things. We are focused on making the S&T product more robust and capability-relevant.

TRADOC [U.S. Army Training and Doctrine Command] does the warfighter capabilities. We are focused on providing technology-enabled

capabilities. Going forward, we will strengthen our partnership with TRADOC and work closely with their leadership to make sure that our technology deliverables enable the kinds of capabilities they envision.

The next thing leadership must do is set goals. I show a set of nine goals for Army S&T, which include things like, “world-class S&T.” The words sound great, a big aspiration and all. But what is behind the words? From my perspective, it means having the people, skills, and competencies you need in the right areas to do the job that you’re asking them to do. That doesn’t just mean we need a lot of Ph.D.s. We also need a lot of people throughout our S&T enterprise who understand what it is that the Army needs and how to apply their skills, their competencies, and their knowledge to solve those problems.

Timely transition of the right technologies is another extremely important goal. What do we transition? We transition ideas and concepts; we transition what works and what doesn’t. We transition information. There are a lot of things we transition other than just widgets. Of course, sometimes

we’re going to look at a set of things and say, let us show you how these several technologies work together to give you the capability that you want. Then it becomes a system or a subsystem that we transition. That’s a small part of what this goal is talking about. We’re talking to our PMs and PEOs to inform them about what technologies will work, and what won’t.

Every one of these nine goals is purposeful and meaningful. What I expect the community to do, starting with my office and my staff, is to understand what is behind them. They need to internalize these and figure out, in their responsibility realm, what they need to do to achieve the desired outcome.

Army AL&T: Is there a timetable attached to that?

Freeman: Yes. The timetable for my staff is the end of the fiscal year. I’ve asked them each to develop their roles and/or areas of responsibility—to tell me which of these nine goals they are primarily going to work on this year, and what their own goals, vision, and objectives are against these goals for their part of their technology or business portfolio. That’s the first step. At the end of this fiscal year, I’ll be expecting that our center and laboratory personnel will focus on understanding how they can contribute to achieving these goals. Of course, there’s nothing that precludes them from doing that ahead of time.

When you talk about goals, the logical next step is to talk about objectives. If you’re going to reinvent something, if you’re going to reinvigorate it, you have to look at scope, timeframe, and risk, which ultimately enables you to establish priorities. If you look at the set of my nine goals, there are three that are fundamental and are the underpinnings for everything else: timely transition of technologies, balanced S&T investment portfolio, and strong internal/external partnerships.



Strategy for Change Value Proposition for Army S&T



Vision
Provide technology enabling capabilities that Empower, Unburden and Protect our Soldiers and Warfighters in an environment of Persistent Conflict

Strategic Perspective for Success
Timely delivery of capabilities fostered by effective partnerships in synchronization with Army Force Generation and fiscal processes in accordance with the priorities of the Chief of Staff and Secretary

Respond Rapidly to Technological Evolution

New Metrics for Value of Army S&T:

- The technical capabilities we provide to Warfighters
- The data and information we provide to decision makers
- The quality of the research, development, and engineering conducted in our laboratories and centers
- The contributions of our subject matter experts who participate in decision making activities
- The number of times we are called upon to provide innovative solutions to big Army/ DoD problems
- Our ability to effect positive change



Dr. Freeman (center left) views the latest S&T at the 2010 Army Science Conference with Dr. Malcolm Ross O'Neill (center right), Assistant Secretary of the Army for Acquisition, Logistics, and Technology. (U.S. Army photo courtesy of RDECOM.)

The transition goal represents the essence of what we are here to do in S&T, so its priority becomes clear and it becomes one you have to work on first. To address the transition goal, you must have clear programmatic objectives and resources in place to enable you to achieve them. Those resources comprise the balanced portfolio. And transition implies there are people ready to take the hand-off; thus the importance of partnerships—within my office, among all the people who work the different parts of the program, with the other parts of the Army and the people who execute the programs, including the lab directors; the different commands; the end user represented by the PEO and PM community; and the requirements community represented by TRADOC.

Army AL&T: What is the process for carrying out these priorities?

Freeman: Those are my priorities, which therefore become my staff's priorities, which I hope become the priorities for the whole S&T workforce. This really represents a top-down approach, which is a significant change from how we did business before when programs and priorities were established from the bottom up. Bottom-up is not a bad thing; but in this environment, especially when you're financially constrained, what you're lacking is the

ability to have impact. That has to be driven from the top, and that's what we're looking to do.

You have to have processes and tools to establish Armywide priorities. We had an approval process for the major programs in Army S&T, called the ASTAG and ASTWG process. That was the Army S&T Advisory Group, a senior leader four-star group, and the Army S&T Working Group at the two-star level. This process has been around for a long time. Army ATOs [Army Technology Objective programs] were the way we executed. This also was a bottom-up process that did not have

the full benefit of senior leadership influence until the end of the ATO selection process.

The outcome was that this process had gotten so out of sync with the fiscal decision-making processes, and we were planning programs in the June-July timeframe and getting approval for those programs in the September timeframe at the two-star level, and in a January timeframe, at the four-star level for the fiscal year we were in. By the time we got to Army leadership, they asked, "Why am I even looking at this? We've already put a budget for the next fiscal year on the street, and we're working on the one two years out."

So now we're not going to have ATOs. Not that management by objective is a bad thing. It is a good thing, but the process everybody associates with ATOs is not going to happen anymore, because it was so out of sync with everything else. An ATO was a piece of a puzzle. The objective was a component, a subsystem, a system—6.1, 6.2, or 6.3. It was not a concept that would enable a capability. At the end of the day, you have just a bunch of piece-parts and a very hard puzzle that may or may not fit



New Strategic Goals for Army S&T



Overarching Goal: To be the Army Senior Leadership's "Go-To" place for all Science & Technology and Engineering issues

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together. Instead, we will now focus on technology-enabled capabilities, and that substantially changes the structure of how we put together programs.

Let's start with looking at the puzzle that we're trying to put together. What is the capability we're looking at? Technology Enabled Capabilities [TEC] programs will still be objective-oriented, have milestones, and constraints; but they're going to be focused on delivering capabilities by a predetermined timeframe, and we are going to bring those ideas and programs to the Army leadership in a timely fashion.

To generate the ideas around which the TEC programs will be formed, we're going to have a "Big Ideas" workshop. We're going to have top-down leadership, from TRADOC, PMs and PEOs, G-8, and the Army S&T community participating in that workshop. Our objective is to generate five to 20 big ideas. The question will be, "What are the big problems the Army can't solve today, that technology can help us solve?"

The focus will be on closing gaps—not just addressing them. I use the example of lightening the load as one potential big problem. We know this is a problem. We've got Soldiers carrying 130 pounds. So, in this Big Ideas workshop, we might come out with something that says, I want you to give me a program that lightens the load for a Soldier or a small combat team through offloading or load redistribution, achieving a reduction of, for example, 25 to 30 percent for certain team positions and/or specific scenarios where loads may be extreme. We might set a goal of three years to demonstrate decreased load for equal or

better capability than they have today, against a preselected baseline. This sets a quantifiable goal or challenge around which a program can be constructed.

Army AL&T: Are you saying that improved capability is to be fielded in three years?

Freeman: No. This is to have things at Technology Readiness Level 6; however, we're going to get together a list of about 20 of these things, and we're going to say to the senior leadership, "Here's our list. Do you agree that these are the Army's top priorities, the big issues that you'd really like to have solved? If so, we ask that you prioritize them 1 to *n*." We have never created a prioritized list of big S&T issues before, nor focused on delivering new capabilities in a specified timeframe. I believe we have to do this to be relevant in this environment. It will give the S&T community what we need to focus our efforts for the near- and mid-term.

Army AL&T: The community being all the labs, all of your experts, your staff, everybody in Army S&T?

Freeman: Yes. My director for strategic plans and program planning is going to help the community come together to come up with viable solutions. For the example I just gave you, you're going to have to have people who know how to work Soldier weapons, communications, power and energy, armor, and other pieces of Soldier gear whose origin could be any number of facilities across the Army S&T enterprise. I expect them to work together to bring four or five pieces of this puzzle together in a synchronous manner to achieve the

goal. If they cannot meet the desired end state (because of technological challenges or funding shortfalls), they plan a program to get as close as possible in the timeframe set, and the remaining challenges become those we must work in other parts of the portfolio.

That starts setting up the next set of things, the enabling technologies, which are typically our applied research (6.2-type efforts) that we need to be working on. It also gives them a prioritization. In this case, we may need a breakthrough in science, and it helps us establish a guide and direction for future investment.

If funding shortfalls are the problem, then because we have leadership buy in on the priorities, we now have an opportunity to go into the POM [Program Objective Memorandum] process and more effectively compete for dollars. We have never had this capability before. We'll be better prepared, ahead of the game, because we won't just be looking one year out, and we will have Army leadership awareness and support. So when I say turning S&T upside down, this is what I mean. You have activities that are generating ideas and getting ahead of the "bow wave." Now we really can have a strategic view and a road map of where we need to go.

Army AL&T: Is there a single factor, or multiple factors, in modern warfare that drive the concern about closing gaps? What's the picture of warfare that you're working against?

Freeman: What we're really working against is persistent conflict and full-spectrum operations. You don't want to fight the last war all the time. But you have to be able to fight the last war and be able to figure out where you're going in the future war. That, frankly, is our partners' job to figure out, which is why we have to be working with them.

Whether we're out of Iraq, in or out of Afghanistan, or engaged in any other place in the world, this cornucopia of missions and mission skills and the burden it places on our Soldiers will continue.

Counterinsurgency-type operations are not going to go away. We have not done that very well, in terms of what we have given our Soldiers. We've got good equipment out there, but in the process, we have increased both the cognitive and physical loads on our Soldiers significantly.

Stability operations are going to continue. So our challenge is to look at this and understand other types of warfare where the biggest gaps are and will continue to be, the kinds of environments where Soldiers and small combat teams have to perform operations that change very rapidly. These are the missions where one minute a Soldier is in a vehicle getting all kinds of information—maybe engaging with the enemy or looking for IEDs—then the next minute is on foot engaging with the local population, having to adapt to multiple roles that may include being a friend, teacher, negotiator, diplomat, or a warfighter engaging the enemy.

Part of what our scientists in the “softer sciences” understand is that when you train a warfighter to be a warfighter, you're developing a certain set of skills. The softer sciences include cognition and cognitive training, part of which includes how we process information. Information is coming so fast and from so many directions, and many decisions have to be close to instantaneous. Soldiers will have to deal with this, and S&T can help ameliorate this burden, which by the way is another example of turning things upside down. The skills, knowledge, and attributes you need to do other noncombat parts of the mission are what the human dimension is all about. We are working very closely with TRADOC to achieve a better understanding of the human dimension.

We were very materiel-focused in the past. We had the Corps of Engineers, the medics, Army Research Institute, and training folks doing great research, but it was not integrated into a unified effort. The new approach is to focus on these big challenges and problems and not just the materiel things, encouraging the bigger community to work together to make a real capability impact.

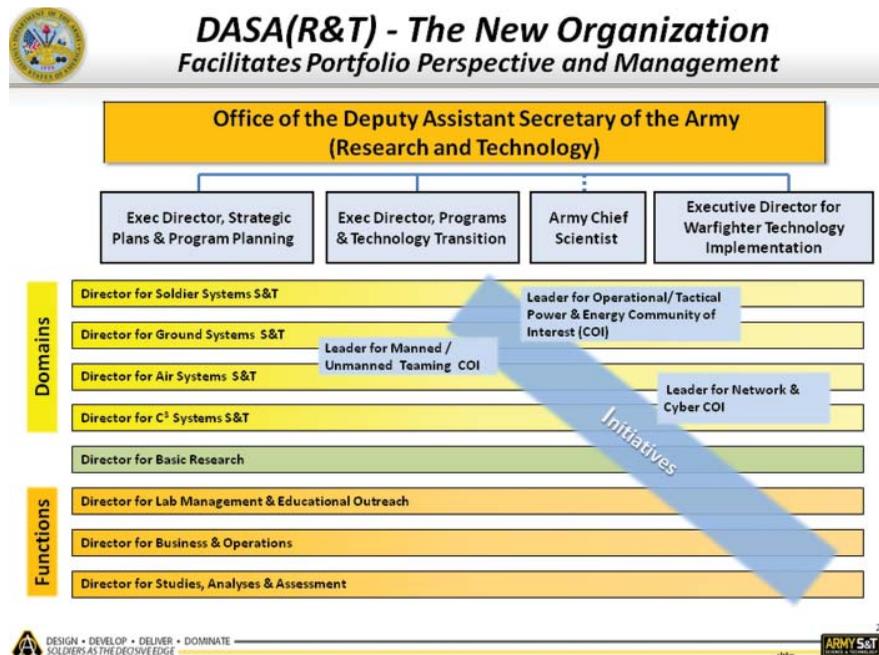
This brings me to the war-gaming aspect. You have to understand what Soldiers are doing. We send a lot of scientists and engineers to both training installations and to theater, but we can't send everyone. So one of the things we have had to do was create opportunities and venues for people to get together, focus around a problem or a mission, and, with Soldiers in the same venue, understand what they're thinking, how they're operating, and what their concerns are in a mission environment. That's what the war-gaming activities do. That's what a well-designed experimental venue will do.

For example, let's look at the battle at Wanat. What went wrong? The military has analyzed it, and the S&T community needs to understand the problem. In this scenario, we have

a small combat team that needs to establish a remote Forward Operating Base. We needed to understand the things they had to do, what they were thinking: What did they need, what did they take with them, and what can we give them to make them successful?

If we play this war game with Soldiers, scientists, and technologists in the room along with people from TRADOC who have to write new requirements and folks from industry who know how to transform ideas into materiel, we can start understanding what Soldiers think and how they equip to do their job. We get a baseline for what they're already doing and how their training and experiences influence their actions.

Then we say, OK, let's give you a new capability, for example, maybe an Exoskeleton or an equipment-carrying robot to improve your ability to carry or offload equipment. Or maybe I give you a lot more information that you didn't have before and then ask you, how would you execute your mission now? If we observe and interact with this process, we begin to understand the possibilities and potential impacts of technology on the warfighter and their mission. Context is important and is



another key aspect of reinvention, providing a virtual hands-on experience to understand the world of the warfighter.

Another part of this paradigm shift is focused on developing the platform. You put the stuff in and make it run, you make it mobile, you make it survivable—which means you put armor on it, maybe you put active protection systems on it, and all that’s good. You design it. You build it. You test it, and then you put a Soldier in it. Then you have HRED [Army Research Laboratory’s Human Research and Engineering Directorate] and the human factors people saying you’ve got to change it because they can’t push that reset button there.

The sequence of events was linear. You’ve got to turn all that upside down and start with a Soldier operating as part of a team and the requirements associated with keeping that team intact. Now, when I design this vehicle, I’m trying to build it from the perspective that I want to have that squad operate all together, and their survivability and mission effectiveness take priority.

The bottom line is we have to understand all of those relationships. That’s what S&T does as well—it helps you to understand the risks you’re taking against the tradeoffs you inevitably have to make, and you’re going to get a very different vehicle if you start developing from the Soldier, the squad perspective, versus that of the platform.

Army AL&T: Do you have any specific war-gaming events planned?

Freeman: Yes, we have several that started as a pilot effort when I was up at Natick. We used to do this same type of activity during the Army After Next initiative with TRADOC, but it was at a very high level: brigade and force-on-force. This experimentation is at the Soldier/small combat team level. Natick



developed a repeatable methodology to do this and worked with TRADOC to get multiple scenarios.

The latest experiment is still in the planning phase. We’re going to be running a war-game, tabletop-type event. It will be focused on individual mobility platforms to examine several contractor-developed concept alternatives.

Army AL&T: Are there any detractors to this reinvention, besides inertia and tradition?

Freeman: One of the biggest detractors is that it is not natural for people to work together. It really isn’t. Not just scientists—all people. Collaboration and cooperation are really not natural tendencies, especially when you’re threatened by declining resources.

I liken it to playing cards. You never want to show your hand, because you’re afraid if the other guy knows what you’re doing, you’ll lose the game. The higher the stakes in the game, the more closely you hold your cards. Right? The fact of the matter is, that is exactly the wrong thing to do in the world that we live in.

This is not a card game. This is not all about individuals or organizations themselves winning. It is about a bigger goal; it is about bigger survival. Therefore, the way you win this game is by laying your cards on the table and exposing it all, and being willing to share what you’ve got and the talents and capabilities that you bring to the table to solve the problem. So it is a difference between being in a card game and being an individual or an organization trying to win, and being in a problem-solving mentality. You’ve got to be in a problem-solving mode to win this game. Either everybody wins or everybody loses in this game, as I see it.

Army AL&T: So how do you overcome the tendency to not collaborate?

Freeman: You force it. You ask for results. I’m focused on results, not on activity. Activity is good; activity is the venue. But the demand for accountability, transparency, and responsibility has to be demonstrated through results, and people have to be held accountable for those results.

Army AL&T: Speaking of resources, what level of funding, short- and longer-term, will you need to

successfully reinvent Army S&T? Do you expect to obtain the funding?

Freeman: The interesting thing is, we have a \$2.3 billion budget. Every year Congress, up to this point, has been increasing that by giving an average of \$1.3 billion per year. They've been increasing the budget by 60-70 percent over the last six years with congressional adds. We've been working very hard to make those adds meaningful to the Army mission. Some organizations have been able to do it better than others. The fact of the matter is, in effect, our budget is actually going to dwindle, as opposed to grow.

I can't give a number for what the level of funding is until I've gone through the process to see what the big ideas are, build the programs to deliver the capabilities, cost them out, and so forth. Part of the strategy is that as you're doing this, you're also working on a growth strategy. But before you can do that, you've got to figure out what's important and establish priorities.

Army AL&T: Who are the customers?

Freeman: I prefer the word "partners." Partners are in the game with you, not shopping around for products like customers. Our partners are other DOD organizations like the PMs and PEOs, the Defense Advanced Research Projects Agency, and the Defense Threat Reduction Agency, for whom our scientists and engineers are matrix support and/or performing reimbursable work.

In this current environment, there is a real threat that if PEOs or PMs get budget cuts, and as Other Procurement, Army, funding goes away, and supplementals go away, these organizations will likely reduce their matrix support before they get rid of their in-house capabilities. That's why partnerships and value added are extremely important.

What do we add in terms of our skills, capabilities, and knowledge? What should they rely on us for? Again, it's not just widgets. It's people, it's knowledge, it's programs. We've got to look at the balance. We're facing some pretty tough things here, not the least of which is being held to the FY10 funding levels or less.

I believe we need more money. I believe \$2.3 billion, if we are going to have the impact that the Army S&T community should have, is not sufficient. I can't tell you we need to double it. I can't tell you what the magnitude is. I believe we need more. The way to get more is to plan the process of the POM and take these things that are priorities, and identify if we don't have enough money. Here's where a trust factor comes into play that says, "Can you deliver?" It is going to be very important to me that whatever this first set of programs are, these technology-enabled capabilities demonstrations, we deliver on them. If we don't deliver on those, this will all fall apart.

Army AL&T: You'll have lost your relevancy battle.

Freeman: That's exactly right. If you lose that relevancy battle, then I believe that it is going to be very hard to defend keeping the laboratories and the scientists and engineers in the Army. In addition, we have to look at the demographics in the workforce and ask ourselves if we have the right skills. Until we have a strategy, we can't make that determination.

To make things worse, we also have an aging and crumbling infrastructure, and we do not play well in the world of Military Construction. Part of this is, how do we fund the kinds of improvements that we need where we need them? The BRAC [Base Realignment and Closure] process gave us a lot of nice facilities up at Aberdeen [Proving Ground, MD] and other

places where we've had BRAC. That is not a long-term solution.

One of my nine strategic goals for Army S&T is a highly skilled and motivated workforce. Well, if you don't have a reasonably good infrastructure, you don't have good laboratories to work in, and you don't give scientists and engineers the kinds of facilities and equipment they need, it is hard to attract them.

Army AL&T: If you had one message to get across to the Army AL&T Workforce, what would you want to say?

Freeman: I'd really like them to embrace these goals and understand from different perspectives, including their own, what this means—really understand what we're trying to do, to broaden their horizon and start thinking more about the overall results that we're trying to achieve.

I would really like them to internalize what it takes, at all levels, to achieve this vision and these goals. This is not a ship-sinking message of "get on board or get off." This is an "understand what we're trying to do" message. Once you understand what we're trying to do, be a piece of the puzzle and go figure out the other pieces of the puzzle you should work with to make this happen.

We have such wonderful scientists and engineers who are smart and capable—and not just the scientists and engineers. All of our people, all of our administrative staff, all of the people who make this whole enterprise run need to understand this.

Everybody is a leader. Everybody is somebody who can make a difference. Everybody has a part in this. We talk a lot about the scientists and engineers, but it is all the people who make the laboratory system run. They all need to get this. They all need to get involved and get fired up. That's what I want.