



Army Research and Development Contributions to Readiness

■ By Maj. Gen. Cedric T. Wins



Brent Geary and Jeff Gareri perform maintenance on a multi-mission launcher at the Aviation and Missile Research, Development and Engineering Center's high bay at Redstone Arsenal, Alabama. (Photo by Tom Faulkner)

FEATURES

Through expertise and collaboration, Army research and development organizations get Soldiers the equipment they need as quickly as possible.

Recognizing the contributions that Army research and development (R&D) organizations make to Army readiness can be tricky because the primary R&D products that Soldiers receive—new capabilities in the field—are usually the result of long, complex processes designed to deliver thousands of identical pieces of equipment to everyone at the same time.

If the Army etched each contributing organization's name onto the components of each machine, then it would be easy to see how many organizations contribute to developing the equipment and how vital those contributions are. Prominent among these names would be the Research, Development and Engineering Command (RDECOM), which executes about 75 percent of the Army's science and technology budget.

RDECOM has the mission to research, develop, and engineer capabilities that provide decisive overmatch for the Army against the complexities of the current and future operational environments in support of joint warfighters and the nation.

It's Complicated

Each piece of Army equipment is actually a system of systems. Each component of each system has its own history of discovery, development, and integration from multiple streams of technologies and sources over many months or sometimes years. Each component must take this complex path in order to deliver capabilities that improve Army readiness.

For example, RDECOM's Aviation and Missile Research, Development and Engineering Center delivered the first multi-mission launcher prototype to the Program Executive Office Missiles and Space in late 2015. It was the first major acquisition program developed by the government in more than 30 years.

The center brought together a team of more than 150 subject matter experts from more than 20 func-

tional areas to design, build, and test the system. The team also engaged more than 85 industry partners to assist in designing and manufacturing the launcher. All of this effort was for a system that is made from some existing components and fires existing rockets.

Army R&D personnel contributed to Soldier readiness by having the scientific and technological expertise, the collaborative reach, the position within the greater science and technology community, and the organizational scale necessary to harness the R&D process and meet the Army's needs. Using these tools, The Army's R&D contributions flow along two intertwined paths: scientific and technological expertise and organizational collaboration and support.

Expertise

Scientific and technological expertise contributions are easy to understand because most people have an idea of what scientists and engineers do: they study, work on difficult problems, collaborate, experiment, study some more, collaborate some more, and experiment again.

More specifically, Army scientists discover things about how the world works and use that knowledge to develop technologies. When a technology is sufficiently advanced, the engineers take over to develop it into something even more useful and ideally design a system that works for Soldiers.

Because of how science and technology work, advances may immediately benefit the Army or they may not be useful for decades—if they are useful at all. In science, as in battle, it is important to know when something will not work.

Not every aspect of how technological expertise contributes to readiness is immediately apparent. Scientists and engineers must first understand the unique circumstances and requirements of Soldiers and the Army. This is not something the average scientist or engineer typ-

ically knows, and it is not easy for someone who has not served in the armed forces.

Collaboration and Support

Technology has advanced to the point that an algorithm can be as valuable as a new material. An improved testing method or manufacturing procedure can save millions of dollars or make it possible to field a piece of equipment when the scale or cost would otherwise make the equipment impossible to manufacture. These advancements and their use are made possible through RDECOM's organizational collaboration and support.

Internal collaboration. RDECOM is an organization of almost 14,000 people, including more than 10,000 scientists or engineers working on thousands of projects. The command is composed of six research, development and engineering centers and the Army Research Laboratory that work to synchronize and integrate technologies into Army systems. Internal collaboration is very important.

Requirement partnerships. The most important thing Army scientists and engineers bring to their collaboration and support activities is knowledge. This begins with capabilities development. When RDECOM scientists and engineers are allowed to evaluate technology requirements and provide feedback, the Training and Doctrine Command has a better understanding of whether or not that technology will have some utility in meeting the requirements.

Armed with the knowledge provided by scientists, capabilities developers can fully understand the possibilities and not narrow requirements unnecessarily. They will also have enough flexibility to define key performance parameters and key system attributes to ensure the technology that the Army is pursuing and the requirements are synchronized.

Development partnerships. After determining the requirements,

Army R&D organizations partner with industry and share knowledge through established exchange vehicles, such as cooperative research and development agreements and memorandums of understanding. These exchange vehicles enable Army R&D organizations to develop technology faster because they provide access to research from industry.

Working with industry, the Army can field technology more quickly to Soldiers. The Army R&D community also works closely and shares information with academia. These partnerships help move technology more quickly from the development stage to the final acquisition stage.

Close alignments with industry and academia are key to getting the most advanced technology to Soldiers. The directors of research, development and engineering centers work in concert with industry and academia so that they understand the technological advancements in their fields.

It does not make sense for both the Army and its partners to invest money in the same area. That is why the Army shares intellectual property with its industry and academic partners, who then reciprocate. This kind of arrangement is necessary and will continue to yield positive results down the road.

Support to the field. RDECOM also engages Soldiers on the ground. The Field Assistance in Science and Technology (FAST) teams and RDECOM forward elements work with combatant commanders and major Army staffs who report how Soldiers are using technology in the field and if they have any problems that need to be addressed.

One of the primary ways research, development and engineering centers and FAST teams close capability gaps is by developing prototypes. Prototypes eliminate the long lead times that often occur as a capability moves through the acquisition process. FAST advisers continually look for prototypes that can be delivered

to Soldiers in the field.

R&D for the Future

While RDECOM works to develop capabilities that can be fielded to Soldiers now, it also has to manage innovation and technology long term. Some engineering projects will take several years to bear fruit, and some technology development projects will take significantly longer than that. Recent scientific breakthroughs may not result in a fielded capability for 20 to 30 years.

For example, Army scientists and engineers are exploring exciting technology in quantum effects, human performance enhancement, and synthetic biology. Soldiers in the future will need these technologies to fight and win, so the technologies will remain a priority.

It is also clear that if the Army does not continue to invest in R&D then a growing number of nations and nonstate actors will surpass its capabilities. In some areas, there is no such thing as quickly catching up, an axiom the Army has relied on for several decades.

Technology is moving at a fast pace. RDECOM scientists and engineers are working hard not only to provide today's Soldiers with the latest technologies but also to anticipate what Soldiers in the future will need in a world where battles will be fought very differently. At RDECOM, we are committed to exploring and developing new technology so that Soldiers are ready and capable to fight and win.

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