Interview

AL SHAFFER

Acting US Assistant Secretary Of Defense for Research And Engineering

Al Shaffer, the Pentagon's acting research and development (R&D) chief, is trying to focus funds to make sure that the fundamental engineering and development skills built over years of strong spending aren't lost in the present trough and that the US can keep its military technology edge. He voiced concern about the direction of R&D spending and said he thinks companies that invest now will be in a position to reap the benefits when defense spending ramps back up.

Q. Wes Bush, Northrop Grumman CEO, made a point in a speech several weeks ago that the R&D spend has not kept up with overall government spending in the last several decades. Do you think there needs to be more emphasis on the R&D budget on the government side?

A. The short answer to your question, yeah, I think Wes Bush has a point. The flavor of federal R&D spending has changed over the past 20 years, a tremendous increase in spending in medical and health sciences, but spending in a lot of the hard engineering has come down. Not so much in the DoD but in places like the National Science Foundation and other places.

Q. What are you doing to encourage industry to spend more on independent research and development (IRAD)?

A. I do recognize that there are a number of industrial partners who are drawing back on their IRAD. About five years ago, when the economy tanked, the government looked at doing a bailout of the automotive industry. So we looked at it. Two companies needed the bailout, GM and Daimler Chrysler. Two did not, Toyota and Ford. When we went back and looked at the R&D investment of those companies, Toyota and Ford had not pulled out of R&D in the previous 10 years. GM and Daimler had. I draw the inference that by drawing out of the IRAD at that point in time, those companies made themselves less relevant.

There was a recent article about spending on IRAD and there was one defense contractor who had increased their spending on R&D. And that company is posturing itself for when the budget starts to go up to have innovative products that we're going to want. I think they're setting themselves up for tremendous success for the future, especially if others in industry start to contract.

Q. What are your priorities for R&D?

A. We do research and engineering for three purposes. The first is to mitigate current or emerging threats from potential adversaries. The second reason is for affordability, to make current and future systems more affordable. Typically that means either using less-expensive components, enhancing interoperability or enhancing openness so that you can make easier modifications.

The third reason that you do research and engineering is to create technology-based surprise for any potential adversary out there.

In that space we're really looking at autonomy, and autonomy is much more than robots. Autonomy is getting unmanned platforms to operate together, go out and do reconnaissance.

Another area of technology surprise is in the area of human systems. We have two vectors there. The first vector would be in things like man-machine interface. If you take a look at [the F-35 joint strike fighter], although it was a difficult technology, integration of the helmet into the person and that interface allows them to do a lot more things.

The second area that we're looking at in human systems is in the whole area of cognition — how people take in information and react. That has applications for training. If everybody learns differently, if I can understand how you learn, I can tailor training systems and create a combat-ready person much more rapidly. The other part of cognition that

comes into play is if we can reduce the amount of time it takes for a person to recognize a situation and react.

The third area that is a very big priority for us, is providing space capabilities without a space layer. What I mean by that is that it's becoming easier and easier with modern electronics to do things like jam GPS signals. Our military is reliant on GPS both for precision navigation and for time, and most of our weapons systems need very precise time. If I can give the force of the future time in a pocket, so that they can take precise time in their pocket, if I can give them an IMU [inertial measurement unit] that gives them a precise location without GPS, then I've taken away the need or the value for an adversary to jam our GPS.

Obviously the fourth area as it's come out recently is that we still have to get much much better at being able to detect and monitor weapons of mass destruction, chemical weapons, at range. We've gone through this whole Syria business, we would like to be able to understand where all the tools are better at range and then be able to deal with it.

Q. In difficult budget times the priority seems to shift toward fielding products and away from basic research whose application is uncertain. How are you balancing those competing resource demands?

A. What we do is we allocate a certain percentage of our budget to basic research, that's the fundamental science that does the blue sky stuff. And typically we like to be somewhere between 15 and 20 percent of our entire spend on basic science. Then I try to balance out that 15 to 20 percent with roughly 40 to 45 percent of applied research, which is where we're maturing components, and the remaining 45 percent in demonstrations and prototypes.

Q. How do you keep those teams busy without greater acquisition dollars driving procurement?

A. Interestingly enough, although we have to protect the basic research, in times like we are faced with now where the overall procurement budget comes down, I have another responsibility and that's to be able to prototype systems sufficiently to keep our design teams in action. One of the most important things is the government and industrial design teams. We're going to be asked to create more prototypes but then not field them, to put them on a shelf.

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OFFICE PROFILE

Research, development, test and evaluation (RDT&E) budget

- **2013 (with sequester):** $63.4 billion
- **2012:** $71.4 billion
- **2011:** $76.1 billion

Biggest program: Joint strike fighter

Source: Defense News research

Q. There are low numbers of students graduating with degrees in science, technology, engineering and math (STEM). Does the US need to find a way to bend the curve or should the focus more be on how to make use of the smaller talent pool?

A. A little bit of both. President Obama has tried to reorganize the federal investment in STEM. I think that we do have to focus on creating more scientists and engineers. It has to be more glamorous. But scientists and engineers are strange people. Most of them don't come to work for the money. They want to be paid a fair wage, but most of them come to work because they want an interesting problem that is really challenging. I don't like to use the word crisis, it's hyperbole, but I do think there's a very grave issue for concern.

Q. Companies are concerned about maintaining data rights, saying that if they can't keep their data rights, there isn't sufficient incentive to invest some of their own money in R&D, even if government is contributing as well. Do you think there's been too much of a drive for data rights?

A. Let me ask you a question. Are you a taxpayer? How would it make you feel as a taxpayer to know that you're paying for the same product twice and only getting it once? I believe that if we pay for the research that we should get data rights. The licensing agreement should be such so that we, the government, must protect the data rights, must protect the proprietary information and must pay a fair price for what we're getting. That means that we should pay for some of the data that we're getting, for the data rights.

Q. Because defense acquisition can be complicated, it's been difficult at times to get commercial companies to offer some of that technology to DoD. How are you working to gain access to some of that technology?

A. Most of these innovative companies are small businesses. We're trying to streamline the process for Small Business Innovative Research (SBIR). SBIRs have three phases, we don't make good enough use of phase three. Phase one is an exploratory study, a couple of hundred thousand dollars. Phase two is up to $2.5 to $3 million to create a product. Phase three allows anybody, any government entity or for that matter another industrial partner to go out and use the SBIR product noncompetitively. That's a huge deal. If I can go out and have a small business develop something, under a small contract, $2.5 million for phase two, and this works, then it can float into, noncompetitively, a government procurement.

Q. Companies sometimes complain about the "technology valley of death" with the SBIR process, where products are researched and created but don't jump to acquisition. What can you do to help some of those innovations move along?

A. I'm not a fan of the phrase valley of death.

Q. What should we call it?

A. Darwinian evolution. Some things are supposed to die. It has been my experience that if you have a good product, and it's not priced exorbitantly, we find ways to keep those products alive.

I think a lot of people who complain about the so-called valley of death complain because the coupling of government and industry did not define the market realities early. America is littered with companies that did not succeed because people were building the wrong product. We're also peppered with companies that understood what the customer needed and created it. □

By **Zachary Fryer-Biggs** in Washington.