Department of Defense Bloggers Roundtable Via Teleconference With Paul Eremenko, Program Manager, and Lieutenant Colonel Nathan Wiedenman, Deputy Program Manager, Adaptive Vehicle Make Portfolio of Programs at the Defense Advanced Research Projects Agency (DARPA), Subject: New Methods for the Design and Manufacturing of Defense Systems Time: 11:01 a.m. EST Date: Monday, December 5, 2011

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BRADLEY CANTOR (Office of the Secretary of Defense Public Affairs): Hello. I'd like to welcome all of you to the Department of Defense Bloggers Roundtable for Monday, December 5th. My name is Brad Cantor with the Office of the Secretary of Defense Public Affairs, and I will be moderating our call for today.

Today we are honored to have as our guests Mr. Paul Eremenko, program manager, and Lieutenant Colonel Nathan Weidenman -- Wiedenman -- sorry -- who holds a doctorate in mechanical engineering from the Massachusetts Institute of Technology and is deputy program manager of the Adaptive Vehicle Make portfolio of programs at the Defense Advanced Research Projects Agency, or DARPA. Today they will discuss how DARPA is pioneering new methods for the design and manufacturing of defense systems in order to compress the development timetable by a factor of at least 5. They will also discuss how the agency is seeking to expand the pool of innovation through crowdsourcing and collaboration.

A note to our bloggers on the line today: Please remember to clearly state your name and blog or organization in advance of your question. Respect our guests' time and keep the questions succinct and to the point, and please mute all your phones when not speaking.

And with that, I turn it over to our guests.

LIEUTENANT COLONEL NATHAN WIEDENMAN: OK. Hello, everyone. My name is Lieutenant Colonel Nathan Wiedenman. As he said, I am the deputy program manager for the Adaptive Vehicle Make portfolio program. Paul Eremenko is also on the line, program manager.

And I'm going to give a little bit of an overview, some of the philosophy behind why we think this is the right thing to do and what exactly we are doing, and then we'll be happy to take your questions.

So I think it is fairly safe to say that there isn't much argument that the direction we've been going in military acquisitions lately is not a sustainable path. We can't continue to spend more and get less for the money we spend.

For example, according to the final report of the 2010 Army Acquisition Review, chartered by the secretary of the Army, over the last 15 years or so the Army alone has spent $22 billion on programs that were eventually canceled. Now that's not to say that the Army didn't get anything for that -- for that money. There's a lot of good research, development and some very good spin-off technologies. But we certainly didn't get the helicopters, artillery pieces and ground vehicles that were originally intended.

Now this is of course not limited to the Army. In writing his book "Augustine's Laws, which some of you may be familiar with, Dr. Norm Augustine looked at military aerospace systems and saw that at the current rate of increase, we are less than 50 years from spending our entire defense budget to purchase one aircraft. That may sound crazy, but he wrote this book almost 20 years ago, and the trends have held since then.

So why are things like this? Well, we believe that a big part of the problem is that even though the systems we're building are much more complex than they have been in the past, the way we engineer defense systems hasn't fundamentally changed in a long time.

MORE So how do we currently design these big, complex systems? Well, as I say, the same way we've been doing it for over 50 years. We break down the systems we need, typically along engineering disciplinary lines: This is a power system; this is a thermal system; this is a drive system, for example. And we make sure that all the parts are the best possible for their individual tasks. And then we put it all together, and we build it. After we build it, we test it to see if it works the way we expected. And of course, invariably, it doesn't, so we have to go back and redesign, rebuild, retest and so on. That takes a lot of time and a lot of money to iterate like this. The problem is that right now there's no way to really know how a big, complex system works until you actually build it. We need new approaches to design and modeling that enable us to predict all of those interactions.

Now, in the Adaptive Vehicle Make's portfolio of programs, we are working on solving this problem: How do we find a way to capture all of those interactions, how those bits and pieces work together to understand how the system works before we build it. In other words, we are building a new set of tools to enable a designer to create what we call or what is commonly called a correct-by-construction system design, meaning that when the design is complete and we build it, that system works the way the design predicts, the first time. That is, the first one we build, it's not a prototype, it's a production model. We don't have to get stuck in this design-build-test-redesign cycle.

We've taken our inspiration from the integrated circuit industry, which went through this same sort of transformation about 30 years ago by building a set of design tools in the integrated circuit world called electronic design automation. Integrated circuit designers were able to create these kinds of correct-by-construction designs, helping to maintain a 24-to-36-month product cycle that has really helped to sustain the massive growth in that industry ever since. We've also learned from the semiconductor and software industries that when you do something like this, you open the aperture for innovation by increasing the number, diversity and speed of those who can design and contribute to the process.

Now, having design tools like this leads to some really interesting new capabilities. For one, we can actually build things differently. With this ability to create correct-by-construction designs, we don't need to iterate the design on the factory floor. So the factory itself is freed up to a level of flexibility that just was never before possible.

In the iFAB program, which is part of Adaptive Vehicle Make, we are working towards building that factory of the future. This is a collection of manufacturing capabilities -- we call it a foundry -- linked by a common software that allows a user to rapidly reprogram the foundry for a new product. Instead of building one factory, wrapping it around one product or even a family of similar products, the iFAB foundry is a manufacturing capability with no learning curve. It doesn't take millions or billions of dollars or months or years to retool and refit the facility to build something new. Creating this kind of capability, in combination with the design tools enabling correct-by-construction design, will allow the fielding of systems that would otherwise take a decade or more in as little as two years, fivefold reduction in development time.

That all starts with that correct-by-construction design representation. When that design gets transmitted to the foundry, the foundry itself digests it and then configures and programs itself to build the product. So in designing -- in processing that design, the foundry selects the necessary processes and equipment, determines the sequencing of product flow and production steps. It generates machine instruction sets, and it generates instructions for the human workers in the foundry.

But what that means is the foundry doesn't all need to exist under one roof. We actually would anticipate that the foundry will consist of an amalgamation of existing fabrication capabilities. We think of it more like a collection of nodes than a network, again, linked by a common software and the correct-by-construction design.

This allows a foundry operator to access high-capability expertise around the country rapidly and seamlessly, at a competitive cost.

If a new product is needed, all it takes is a new set of design information. The foundry figures out what nodes and pieces of equipment

are needed or are most efficient or cheapest, generates the process flow and equipment instructions.

Now of course interaction between the design environment and iFAB is still both -- is still two-way. We have to build in feedback of design constraints. What can we build? How much will it cost? How long will it take? And of course with respect to the designs themselves, how can we improve them, speed them up or simplify them, or even reduce the cost associated with those designs?

This new approach, if we're successful, will mean more value in return for the investments we make in defense technologies and a decrease in the time that it takes for us to field those products. Both of these will ultimately save lives.

In order to prove all this out -- because otherwise it's all just a bunch of theory -- we are going to use the design process in the iFAB foundry to build a military ground vehicle. Using the Marine Corps amphibious combat vehicle requirements set, we will run a series of design challenges, reach out to a broad crowd of people with design expertise. These challenges will increase in complexity until we design a full ACV, a full amphibious combat vehicle, and then we will build it in the iFAB foundry.

Now I just want to be clear. We are not part of the ACV program of record. This is a research and development effort running in parallel to the Marines' program. If we are successful, the ACV program will simply be the first beneficiary. We hope to see this methodology applied broadly across the Department of Defense and elsewhere.

So that's kind of an overview of what we're doing, why we're doing it. And we would be happy to take any questions you may have.

PAUL EREMENKO: And in fact -- thanks, Nathan. This is Paul Eremenko. I just wanted to chime in with a quick status update. So the design tools activity that Lieutenant Colonel Wiedenman described has been ongoing for a little bit over a year now -- and so that's an ongoing effort -- as well as a couple of -- well, a number of efforts, almost -- a bit over a half a dozen efforts for individual enabling technologies for this iFAB capability, this factory of the -- programmable factory of the future capability that the lieutenant colonel described.

We -- I am pleased to report that about an hour ago we posted the final solicitations for the iFAB foundry -- so to actually substantiate this capability, to aggregate those individual technology efforts and actually build a foundry to build infantry fighting vehicles and -- as well as the FANG effort, which is the -- sort of the common product thread that we're going to pull through the design tools and through this -- through this factory capability. So those solicitations were posted on FedBizOpps about an hour ago this morning.

MR. CANTOR: Great. Well, thank you, gentlemen.

I'd like to now open the floor to questions. Bloggers, please remember to state your name and blog or organization in advance of your questions.

Let's start with Chuck Simmins.

Q: Good morning, gentlemen. Chuck Simmins from America's North Shore Journal. I get what you're trying to accomplish here, but I'm looking at one particular program, the Joint Strike Fighter, the F-35, and the nearly 10-year development process that took place with that, marred by, in around year four or five, a complete revamp of the requirements for the aircraft. How does -- the programs that you are working with here and looking to test, how do they prevent someone just saying, oh, now we've got to go in a completely different direction, and in essence undoing years of work?

MR. EREMENKO: OK, this is -- this is Paul Eremenko. That's a -- that's actually a really good question, because I think it cuts straight to the heart of why -- or actually why we call this effort Adaptive Vehicle Make. I think one of the reasons -- well, actually, let me preface all of this by saying that there are undoubtedly a number of policy issues that are associated and would need to happen in order to facilitate sort of true transformation and acquisition. DARPA is not a technology organization, so our focus is on the technological solutions. But I think there are a number of examples sort of in the history of DARPA where technological solutions have driven -- disrupted policy reform, and so that may well be the case here.

Now, specifically to your point, one of the reasons that I think requirements creep occurs is precisely because the development timeline is so long. So by the time you are some number of years into the program, the geopolitical climate may have changed, a number of new technologies may have materialized and a number of technologies that you had originally baselined for the system may have become obsolete. And so that is a significant contributor to requirements creep.

So if you can -- if you can sort of cut -- and it's a vicious spiral, right, because then the requirements change and protract the -- require redesign and reverification, retest, and extend the program. So if you can -- if you can kind of nip the spiral at the bud and say we're going to design and build the vehicle in two years as the first decision that you make, controlling for time, then I think that obviates a lot of the drivers that ultimately lead to requirements creep.

Q: OK. Thank you.

ERIC MAZZACONE (public affairs officer, DARPA): If I may, this is Eric Mazzacone, the DARPA public affairs officer. What Paul meant to say was that DARPA is not a policy organization, that we are a technical organization.

MR. EREMENKO: Oh, I'm sorry if I misstated that; yeah.

Q: Thank you.

MR. CANTOR: All right, great. Up next we have John Doyle.

Q: Yes, good morning, gentlemen. Thanks for taking the time to talk to us.

One quick factual question: I'm sorry, what does the acronym iFAB stand for?

MR. CANTOR: Before we proceed, Mr. Doyle, can you say your organization that you're calling from?

Q: Oh, I'm sorry. John Doyle with the 4GWar blog, also a freelance writer.

MR. CANTOR: Thank you.

LT. COL. WIEDENMAN: So this is Lieutenant Colonel Nathan Wiedenman; iFAB is an acronym for Instant Foundry Adaptive through Bits. And it really speaks to what we're talking about, what I mentioned earlier, by being able to take a data stream, that system representation, that correct-by-construction system representation, and rapidly reprogram the foundry, that manufacturing capability, to be able to change directions with little or no learning curve and to build a new system, a new product.

So iFAB -- Instant Foundry Adaptive through Bits.

Q: OK, and if you could -- I'm a little confused at how this will -- this is working in conjunction or parallel to the current Marine Corps combat vehicle program. And I guess maybe you could say why you picked this one, that particular type of vehicle, to be your first project.

LT. COL. WIEDENMAN: So it was important to us to do a real project, to do a real product so that we could actually show the -- demonstrate the technical capability that we're able to build a system that is of appropriate complexity, that is -- and we're not building a toaster; we're building something that is, no kidding, one of those complex systems that has been giving us these issues in military acquisitions, but beyond just being appropriate complexity, that it is, you know, in the immediate sense, militarily relevant. The Marine ACV program is something the Marines have been working on for some time now with the predecessor, the EFV, the Expeditionary Fighting Vehicle. That was one of those programs that got cancelled for some of the very reasons that we've talked about: It was taking too long and costing too much money; we were ending up getting a lot fewer of the systems than we had wanted. And so it was, for many reasons, the most appropriate thing for us to build.

Now, the tool set that we're talking about and the foundry capability we're talking about is not specific to a ground vehicle, to the ACV. It's applicable across, you know, things like the Joint Strike Fighter or other complex military systems. The foundry that we are

building in this case will be for building an ACV, but the principles behind it and the design tools that we're putting together are really applicable across a much broader set of domains, things like other, you know, complex military systems like, you know, fighter jets and so forth.

Q: Thanks. I'd like to come back to that later after everybody else gets a chance.

MR. CANTOR: OK, Sean Gallagher.

Q: Yes, wanted to ask, first of all, if -- how --

MR. CANTOR: Can you -- can you state your name and your organization real quickly? Q: Yes -- yes, I'm sorry. Yes, Sean Gallagher from Ars Technica. And I wanted to ask both gentlemen about the MENTOR program that you're also setting up in conjunction with this program. I understand that you're looking to distribute 3-D printers to a number of high schools around the country in order to sort of bootstrap some of the interest in this sort of dynamic manufacturing capability and also to help sort of build the skill sets up for people who may work within that kind of an environment in the future. And I want to get some background on that.

MR. EREMENKO: Sure. So MENTOR is part of the Adaptive Vehicle Make program portfolio, and part of the objective is to try and instantiate this kind of capability, this distributed, highly programmable, rapidly responsive design and manufacturing capability in the next-generation -- in the next-generation workforce. So we think that the -- that the actual FANG vehicle, which is -- which is our moniker for the parallel to the ACV program, will probably enable -- the prize challenges that drive that or that's -- that that's orchestrated through will enable participation down to the college level, sort of meaningful participation in those prize challenges. And that's what DARPA has seen in previous prize-type efforts.

So MENTOR is explicitly geared at the -- sort of the tier below that in terms of age group, and specifically at the high school level. So it's intended to be an analogue, but geared at slightly less complex -- slightly less complex systems, at the high school level.

Nathan, did you want to add anything?

LT. COL. WIEDENMAN: No, not really, this -- just that, as Paul said, it's really focused on how do we get the right level of distributed digital manufacturing, distributed digital design tools out to the high school level and really motivate that next generation for coming on and being able to utilize tools like what we're trying to build under AVM in helping American manufacturing in the future.

Q: OK, thank you.

MR. CANTOR: Great. Up next we have Phyllis Zimbler Miller. Phyllis? (Pause.)

OK, we're opening it up to -- I think we had a couple of people sign on after the call started.

Anybody there that didn't sign in yet?

Q: This is Michael Hoffman from Defense News.

MR. CANTOR: OK. Do you have a question?

Q: Well, yeah -- I think I missed the first couple minutes of this, but I was just wondering if you guys could really -- just trying to follow this a little bit; it's a very complex issue right here. But in terms of the ACV, you guys might have already addressed this, and I apologize if you have but, again, I'm wondering why you guys picked the ACV; if there were different aspects of the -- you know, aspects of the program that really brought it home; what you guys are trying to develop here; and what type of relationship or what type of communications you've had with the -- you know, with the services on this.

MR. EREMENKO: Sure. So, this is Paul Eremenko. So, there are basically -- I guess I can distill it down to sort of three criteria that we were looking for and that led us to the ACV program. The first one is that we wanted a control, basically. So we have a new approach to the -- to the, I guess what I would call the "make" process, right -- the design, verify, build process. And in order to exercise it and show that it makes a difference, we wanted to apply it side-by-side with something that resembles sort of the conventional status quo acquisition and development approach. So we wanted a control.

The second criterion was that it had to be of representative complexity. Lieutenant Colonel Wiedenman sort of made the allusion to the toaster, and the point really is that -- is that complex systems are different in kind, in that they exhibit emergent behaviors and unanticipated interaction. And so the system had to be of representative complexity and have a variety of different physics domains, so a hydraulic system, a thermal system, electromagnetics, embedded software, et cetera. So we wanted all of those features to be there so that we could -- we could really prove sort of the hardest -- the hardest case and know that -- know that the approach would be generalizable to just about anything else.

And then the third criterion was that we wanted a willing partner. And the Marine Corps were a very, very willing partner. So to answer -- to answer your specific question on what is the relationship and how do we interface with the Marines, we do have a memorandum of agreement with the Marine Corps, signed at the leadership levels. And they are -- they're observers and -- of our activity, and so we're in fairly constant communications, but not on the critical path. So their program is not predicated on any outputs -- the success of their program is not predicated on any outputs of the AVM -- of the AVM effort. However, if we are successful, I think they would be a very -- a very willing and ready transition partner for us at the conclusion of the AVM effort.

Q: OK, thank you for that.

MR. CANTOR: Great. Any bloggers not get a chance to answer -- ask a question? (No audible response.) All right.

I believe that John Doyle had a follow-up. John? (No audible response.)

OK, well, thank you all --

Q: I've got one follow-up if -- because this is Sean Gallagher --

MR. CANTOR: Oh, Sean Gallagher.

Q: I had another one, too, if we do have --

MR. CANTOR: OK, so we do have follow-ups. OK. All right, so we'll start with Sean. And who is the -- who is the second person? Who is the second person that had a follow-up? OK --

Q: John Doyle.

MR. CANTOR: OK. John Doyle, all right. So we'll start with Sean, and then we'll go to John.

Q: OK. So wanted to ask about how the -- sort of the methodologies from open-source communities were being applied to the problem set that you're encountering here. It seems like you're -- some of the things I've read in background seem to indicate you're applying some of the same sorts of processes in terms of program development that the Army has tested and that DOD has tested in the software realm around SourceForge capability -- the Forge.mil and other software engineering efforts utilizing community development. And I wanted to ask what sort of lessons you'd learned out of that environment and how you were applying them to how the tools are developed here.

MR. EREMENKO: Sure. So, this is -- this is Paul Eremenko. Well, first of all, as Lieutenant Colonel Wiedenman noted, we think that sort of moving to this "correct by construction" design tools and then a separate, highly flexible, programmable manufacturing capability creates sort of a decoupling effect between design and manufacturing. And that in and of itself -- meaning that you don't have to have a captive fabrication facility to be a designer of complex defense systems. And so that in and of itself creates kind of an opening of the aperture to the -- to the innovation process, because you no longer have the capital requirements of having a factory in order to be a significant player in the -- in the defense industry; which is -- which is a very different paradigm.

And we did see that occur in the integrated circuit world. So we call that opening of the aperture democratizing innovation or democratizing the innovation process.

And we thought that we would do sort of a parallel experiment. It's not -- it's not a -- it's not absolutely essential to the utility of the -- of the design tools that we're developing or the factory of the future, the programmable foundry capability that we call iFAB.

But we did want to do an experiment. It's called vehicleforge.mil. It is part of the -- (inaudible) -- portfolio. And the goal there was actually to democratize innovation and open the aperture to innovation by several orders of magnitude beyond what we would expect to see anyway as a consequence of those capabilities. And so that -- hence your allusion, sir, to taking some of the lessons from the open-source community and trying to apply them here.

And so in the software world, one of the -- one of the enablers to open-source innovation through sites like SourceForge in the -- in the civilian domain, and forge.mil in the military domain, is the fact that anybody can go in and they can modify the software -- the design of the software. They can check out, say, a module of the software, augment its capability or alter its capability, check it back in. And then the user, as well as the community, can rapidly recompile it and see what difference that made, and if that actually enhanced its ability that, you know, might fix the vulnerability or perhaps introduce a new vulnerability that wasn't anticipated into the system -- into the software system. And so that's -- you know, that process has proven itself, over the years, both in the civilian and the military domain, I think with some -- with some success, and yielded very, very high quality software products.

Now the obstacle to doing that for hardware systems -- you know, it's something like a vehicle or, you know, whether it be a military or a commercial vehicle -- is that if you -- you can put the drawing tree for your vehicle on a forge site. That's not hard to do. But then if somebody alters, say, checks out a drawing for a wheel or a tread, and they make an alteration to that drawing and check it back in, you have no way of knowing what -- how that impacted performance or even if the resulting design is self-consistent.

And so our design tools, the meta design tools as we call them, essentially function as a compiler, as an analog to a software compiler in this scenario. And so that led us to think that we might be able to apply these kinds of forge-type open-source innovation methods to try and amplify the democratization effect and really open the aperture to participation in the innovation process down to the individual level.

MR. CANTOR: All right -- oh, sorry, continue.

Q: I was just going to ask if there was any -- if you could make a comment at all about any of the results on vehicleforge so far.

MR. EREMENKO: Well, vehicleforge is still under development. We haven't deployed the site.

Q: OK.

MR. EREMENKO: So it's still -- it's still being developed. And it is predicated on the existence of the meta tools.

Q: Right.

MR. EREMENKO: We have completed their first year of development, and we're just beginning the second year, which will be a -- an end user maturation effort, so that they are usable by a wide spectrum of designers.

Q: OK. Thank you.

MR. CANTOR: All right. John Doyle, do you have a question?

Q: Yes, Colonel or Doctor, just to kind of tie up a couple of loose ends in my mind of what we're talking about here, the Marine Corps' Combat Vehicle Program is going to continue on the track it's going on now while your program operates on a parallel track. Is there going to be communication back and forth? You talked about a memorandum of understanding or agreement, I think. How does that work?

And I guess my final question or part of this question is, when you get to the end stage, when you have the vehicle, what do you have? Do you actually have a physical combat vehicle, assault vehicle, or is it just a design? And if so, what do you do with it, especially since the Marines are working on their own vehicle? And you know, how does this avoid doubling the effort -- or redundancy; that's the word I'm groping for. Thank you.

LT. COL. WIEDENMAN: Sure, excellent question. This is -- this is Lieutenant Colonel Nathan Wiedenman again. With respect to our relationship with the Marines, as Paul mentioned earlier, we have pretty constant communications with them. They are observing our progress and providing us, you know, things like the requirement set, because obviously, we need to have the right requirements in order to be able to build the right vehicle to the right -- to the right specifications.

What happens when it's all done? Well, we are going to build a vehicle -- we're going to build a vehicle to the ACV requirement set. And part of our agreement with the Marine Corps is that they will consider it as part of their decision for moving forward in the program, as part of their -- what's called LRIP, low-rate initial production decision, as well as perhaps the long-term full-rate production decision for the ACV.

So while we are not on critical path and their program is not predicated upon success of AVM, if our program is successful and we build a vehicle that is better than anything else that they've got, then they have promised that they will consider our vehicle for fielding, for the -- to satisfy the ACV requirement.

Q: Would that then lead to whoever they have -- they're ever -- they're working with now, if they're working with a private company, a government contractor, to develop the ACV that they're working on -- would they then take your plan and hand it over to, just out of the air,

you know, General Dynamics or whoever and say, OK, here's what we want; you build it? Or does this complicate the process in any way, you know, given the way that contracts work?

MR. EREMENKO: This is -- this is Paul Eremenko. So the intent for the ACV program -- and I should let the Marines speak for themselves, so I'll just say that my understanding of the ACV program --

Q: Sure.

MR. EREMENKO: -- is that they utilize a competitive prototyping approach. And the intent is that the -- is that the AVM FANG vehicle will be one of the competitive -- essentially one of the -- one of the competitors in the competitive prototyping process.

And the intent then in is that iFAB is not just a prototyping facility; iFAB is intended to be a full-scale -- a full-scale fabrication facility, which is -- which is sort of uniquely enabled by the distributed approach that Lieutenant Colonel Wiedenman described, that it's a very, very easy-to-scale capability and -- just basically by adding additional nodes into the iFAB -- into the iFAB network. And so the intent would be then that iFAB could support both LRIP and full-rate production for the Marine Corps if the FANG vehicle is the one that's chosen in an operational test and evaluation -- (inaudible).

Q: So just to be clear on this, if your -- and I say "your"; I mean -- I mean DARPA's, but if DARPA's design is -- after we go through this entire process, if DARPA's design seems to be the superior one and the Marines like it and they pick it, who would then build it? Would you folks build it, or would you turn over the design to a contractor? There'd be a bidding process to say who could build it faster and cheaper? How would that work?

MR. EREMENKO: Well, I -- so I want to sort of tighten up the language a little bit and be a bit more precise, right? So DARPA is not building anything as in, you know, with -- as a government entity, right? We contract out all of -- all of our activities, and so we will have a performer who will be the iFAB foundry performer who will operate and maintain the iFAB foundry. And that's what the solicitation that just hit the street this morning is for is to select that performer.

Q: I see.

MR. EREMENKO: And so then that facility would be what would -- what would produce the ACV vehicle variant if the FANG vehicle does prove to be successful in an operational sense.

Q: I see. (Chuckles.) Do you anticipate a lot of duplication by contractors who are bidding for the Marine Corps project to hedge their bets and bid for yours as well?

MR. EREMENKO: Well, I think it's a different -- (audio break) --

MR. CANTOR: Looks like we got disconnected there.

LT. COL. WIEDENMAN: I -- this is -- we may have lost Paul there for a moment.

As he was going to say, it's a different way of doing things. It's a different methodology. But sure, they -- I think that those companies will want to participate. They're certainly paying close attention to what we are doing and are going to be interested in how these tools develop. And hopefully, they will see the value in this and utilize it to streamline their processes so that we as taxpayers get the increased value from our defense acquisitions that we want.

Q: I'm sorry. Just that last speaker there -- was that Lieutenant Colonel Wiedenman?

LT. COL. WIEDENMAN: It was, yes.

Q: OK. Thank you.

MR. CANTOR: OK. Do we have any more questions?

Q: I did here, over at Defense News. It's Michael Hoffman again. So again, I'm trying to understand this a little bit better too. I guess one of the questions I had was, what is your -- what is you guys' budget for this going forward and, I mean, how often are you guys going to be working with the Marine Corps on this? And I just -- if you could start with the budget question, I'm wondering, for the money going forward on this, I guess the question comes from the fact that the ACV -- there are lot of questions about if the military's going to have the -- enough money to pay for an ACV going forward. It's interesting to me that there's a whole separate effort going on with the ACV on your end. And I know it's a lot -- in a lot of ways much different, and you guys are looking for a lot of savings in that way. But I'm wondering if that could cause problems for the ACV going forward.

MR. : Go ahead.

LT. COL. WIEDENMAN: So with respect to -- and this is Lieutenant Colonel Wiedenman again -- with respect to, you know, the budget for the program, this is part of a larger effort across DARPA with respect to manufacturing that covers not just the ground vehicle domain that we're working here in building an ACV under AVM but covers many other aspects and many other programs that the director, in her congressional testimony -- I think it was this -- earlier this year -- said that we are putting as an agency approximately a billion dollars towards these manufacturing programs over the course of five years. And AVM is just an aspect of that. It's not a small aspect, but it's an aspect of that larger effort.

Q: OK. Thank you.

MR. CANTOR: OK. Well, if that's -- is that it? Anybody else have any questions?

STAFF (?): No. MR. CANTOR: Great. Well, I'd like thank you all. We've had some great questions and comments today.

As we need to wrap up today's call, I'd like to ask if our guests have any final comments.

(No audible response.) Nope? OK. Well, I'd like to thank our guests. And today's program will be available online at dodlive.mil, where you'll be able to access the story based on today's call, along with source documents such as the audio file and a print transcript.

Again, I'd like to thank Mr. Paul Eremenko, program manager, and Lieutenant Colonel Nathan Wiedenman, deputy program manager of the Adaptive Vehicle Make portfolio of programs at the Defense Advanced Research Projects Agency, or DARPA.

With that, that concludes today's event. Feel free to disconnect at this time. Goodbye.

MR. EREMENKO: Thank you.

LT. COL. WIEDENMAN: Thank you.

END.