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General McConville: [starting at 0:06:46 after the introductions]

Thanks, Bill. What I’d like to do is just set the stage, as we talk about the future of vertical lift. I think there are a couple of ways of doing it. As we look to the future, there are a couple of ways to get to the future. One is to start where we’re at right now and move from where we are. The other way is to go into the future, look at 20 or 30 years, get an idea of what we think we need to have, and then move back from that position. That’s the strategy that we’re taking in the Army right now.

We would argue, and if the Chief [of Staff of the US Army] was here, he would tell you that we have the world’s greatest aviation force with the world’s greatest helicopters today. The Apache helicopter is the
biggest killer on the battlefield. What our CH-47s and Black Hawks are doing, along with our Gray Eagles, are supporting the ground force throughout the world in a way that we are very happy with.

However, we shouldn’t be satisfied with where we sit. We’re using helicopters to do primarily three things in the Army. We’re using them to find things. We’re using them to kill things. And we’re using them to move things. As we go into the future and we look out 20 or 30 years from now, what we see is we still think that we’re going to be finding things, we still think that we’re going to need vertical lift to kill things, and we still think that we’re going to need to be moving both troops and cargo throughout the battlefield.

The difference is in how we’ll do that. The difference is the conditions that we’re going to operate under. We have a strategy and we’re doing it right now. We’re incrementally improving the great helicopters we have. They all start off as Alpha models. Pretty soon you work your way through, some are Echo, some are Foxtrot, some are Blocks. We’ve incrementally improved the aircraft that we have.

When we talk about Future Vertical Lift, what we’re talking about is where is the leap ahead technology, where is the technology that is going to give us overmatch on the battlefield, where is the technology that 10, 20, 30 years from now is going to make us the most lethal force on the battlefield where we have tremendous overmatch over our adversaries, we can operate in contested domain warfare as we go forward.

That’s what we’re trying to work right now. That’s what we’re going to discuss as we go forward. I’ve seen some incredible things happen. I’ve been very impressed with some of the PowerPoint briefs that I’ve seen. But, our soldiers can’t fly PowerPoint. Our soldiers can’t fight with PowerPoint. So, we’re going to challenge all of industry to work closely with us and develop the Future Vertical Lift that we need for our soldiers in the future. Wally will kind of lay that out as we go forward. Thank you.

BG Walter Rugen:

Thanks, Sir. General Ham, AUSA, thanks for a great venue to discuss our passion in vertical lift. We really appreciate it.

The CFT started last November. Again, just like every other CFT, I have folks from across the enterprise to have a laser focus on S&T — laser focused on requirements, contracting, testing, costing, and all of those things that go into making large programs like ACAT-1Ds successful. We’re looking at forming this team to do things in parallel, where in the past we’ve done things sequentially. We’re looking at being innovative and agile. We’re also looking at the mundane things that we have to do in every program and making sure that we boil the efficiency into that as hard we can. Having a team that is laser focused across those specialties has been powerful to watch.

So, what are we going to do? The Vice already alluded to it, but we really want to build an aviation force that is optimized and lethal for large scale combat operations. It’s going to be dominant in that lethality and overmatch that we enjoy today, but that we need for tomorrow. Reach, protection, and then also the ability to be adaptable. We have to be able to rapidly upgrade these machines and these aircraft.

Aviation has been an asymmetric advantage for our Army and the Joint Force since Vietnam and LZ X-Ray. We’re not giving that up just because the air domain is tough. We’re going to compete in the air domain and we’re not yielding it to anyone. Truly, the ground force and the fires team, they need us in
the air to bring that air-ground integration that is a powerful asymmetric advantage for our Army and the Joint Force.

As we look to the future, we see a number of challenges for Army Aviation that we have to contest with. We have to be able to operate in contested air space. We have to be able to be lethal at extended ranges and maintain our vertical lift overmatch and dominance. We have to improve the human-machine interface and offload the cockpit loading with holistic situational awareness where we can see a lot of autonomous things done for the crew so that they can focus on dominating the area or corridor for the Joint Force. We want to demonstrate mature autonomous decision making.

Lastly, but probably one of the most important things, is we want to support ultra-reliable designs that give us maintenance-free operating periods, but also address our lifecycle costs. Cost is one of the kings in what we’re looking at doing.

Task and purpose: Our task is to accelerate the selected disruptive technologies that are going to address those challenges. The challenges are going to keep us viable in the air domain.

We have four lines of effort associated with the task and purpose:

First, **advanced UAS**. We view UAS as a purpose-built area, not a multipurpose one-size-fits all. We think we’re going to have multiple form factors, but predominantly we’re looking for key attributes that can allow us to dominate in contested airspace and IADS. So low observable, survivable, or if they’re inexpensive throw-away, swarming, runway independent, and the ability to deliver targeting for long range precision fires at operational and tactical distances. Also, nonlethal effects, so think electronic attack. We want to be able to stimulate, allow the enemy in a contested airspace to turn on their radars. We want to be able to spoof those radars, jam those radars, hunt those radars, and kill those radars.

The next line of effort is **Future Attack Reconnaissance Aircraft**. Again, we want it sized to hide in radar clutter. Also, sized to operate in the urban canyons of mega-cities. It needs to be a clean sheet design, optionally manned, so a lot of autonomy baked into this future aircraft, with improved reach and survivability.

These two will form our advanced team. This advanced team needs to deepen the inner operability between our ground force and fires team to be able to detect and deliver lethal effects, assess those effects, and reattack if need be.

The next line of effort would be our **Future Long-Range Assault** helicopter. This helicopter is going to have the speed and reach. The reach is the speed, range and endurance, once we do dominate an area or corridor, that this will be agile and have the speed to flow through that window of opportunity. It needs to have significant increased protection, operate from sanctuary, and just be something that exploits our windows of opportunity.

The last is an **Open System** approach amongst all of these clean sheet designs. When we think open system architecture, we want an architecture that is both open and resilient, government-designed and defined specs that you, as industry teammates, plug into so we can shorten our typical five to seven years upgrade into something much shorter.

Lastly, when it comes to aviation and our portfolio, we take pride in paying our own way, so affordability and being good stewards of every taxpayer dollar is forefront on our minds.
With that, I’ll stop. 30 seconds, I yield.

**BG Thomas Todd:**

All right. For those of you that don’t know me, I’ve certainly been in the PEO a long time. I’m looking forward to being part of what is, I think, groundbreaking goals by the Army that senior Army leadership has set forth for us in the third priority within the CFTs.

Specifically, PEO Aviation has largely been involved, as the Vice mentioned earlier, in largely upgrade program over the past 10 years. Those programs have been necessary. I would say that we have a workforce that is attuned to that. Where we will seek to grow our workforce and where we’ll seek to become really key partners in the process is how do we transition technologies out of science and technology, out of demonstrations and experimentations, once the CFT deems it necessary and the Army makes a decision to move forward.

The workforce is obviously ready to do so. We have done it on small scales. I’ll give you a few examples rather quickly.

We’ve done that certainly on the Improved Turbine Engine Program, which came out of the AATE, Advanced Affordable Turbine Engine, science project. So, we have that, as well as the composite rotor blade transitions and a few other things that we’ve done. But as you largely know, there is great difficulty in transitioning programs from science and technology. I think that’s the beauty of the Army Futures Command. It will give the horsepower to decisions that need to be made, resourcing that needs to be provided. Leadership from Wally and the CFT on integrating all of that across all domains in the process that’s required. Then we’ll actually have, I think, a really high chance of success at bridging that gap, which has become so difficult in our business.

I will say this. As we pursue new technologies, we have talked significantly about — and the Vice mentioned the PowerPoint briefs, soldiers can’t fight them, neither can we develop them if they’re not worth the weight that they’re printed on. What I would say to this in industry is we are looking for your candor, we are looking for your feedback, we are looking for your participation. We also need to know what you actually can accomplish. We don’t necessarily need to hear what you may want to bake a little bit longer in S&T, because — and Wally mentioned this earlier — we’re after getting technologies really transitioned into tests where we can finalize affordability, producibility, reliability, and survivability, which is what you would hand me at the end of the day, so that we can deliver to the soldier in a relatively short order. That has been difficult. That is tremendously difficult.

Commercial aviation, the fixed wing business is largely driven by the commercial sector, fixed wing technology. Helicopter technology, however, is driven by us, the military sector, in large part. There are some civilian applications and civil applications that we do take advantage of. But, advancing technology in vertical lift is dependent on us, those of us in this room today. I would ask for your continued commitment and realism in whatever we decide to make decisions on going forward.

There are a few principles that we should apply, that I would say are characteristics of successful development programs that we’ve seen, whether it be the Fox trot model, the Mike model, clean sheet purchases off of the commercial marketplace in the way of Lakotas, fixed wing, or even independently invested-in development efforts like Gray Eagle. That is as follows:
Integrity is paramount in all that we present and discuss. There is no way that we can do this if there’s not integrity in each of the goals set forth and decisions we make.

Humans, keep the human and the soldier at the centerpiece of everything that you propose. It certainly paramount as we achieve the objectives that Wally laid out, that we understand that is always, and always will be, about the soldier in our business.

Never lose sight of the objective. In other words, don’t get distracted by a lot of stray voltage or shiny objects. Stay focused. Keep the team on track.

Only those people who can say yes have the authority to say no. In our business we have a lot of opinions, we have a lot of people that write articles, we have a lot of people that, quite frankly, feel like they have decision authority. But, the decision authority resides here and it resides within the Army leadership. While we are interested, we’re going to try to keep our team focused and only deal with those that actually have authority.

Ownership — everybody on the team. Ultimately, what we need is when you do say something, do you want to put your name on the line? We need a commitment. This gets a little bit into integrity, but more ownership. Take ownership of what kind of claims you’re making, because we are going to rely on them. We may call you on them.

Make sure that you produce and field when good enough, not when it’s as good as it possibly could be. We absolutely have to make sure that we get this capability to the soldier and that we do not spend double the amount of time achieving the last 10% of the capability when 90% was good enough.

You’ve heard this echoed; buy what you fly. I think you’re going to see that in some of the strategies laid forth and we already have that in some of our strategies as we pursue JMR.

Know when to quit, if necessary. We will be making decisions. We won’t always necessarily transition everything that you propose, but we look forward to hearing from you. We encourage you to engage the CFT, specifically, as Wally integrates. We look forward to making sure that whatever we decide to put in the hands of the soldier is a success every time that he has to pull that trigger.

Thank you.

Jeffrey Drezner:

Thank you. Good morning. It’s an honor to be here as part of this panel. RAND was asked two years ago by the J8 to look at management constructs for Future Vertical Lift. By management constructs I mean the organizational structure, roles and responsibilities within that structure, internal and external reporting lines, that kind of thing. The emphasis, if I could turn our objective a little on its side, the objective was, “Does a joint program structure make sense for FVL?”

We looked at the history of joint programs, which is decidedly mixed, in terms of cost, schedule, performance outcomes. Then we looked at various structures. So a couple of key findings:

One thing that I thought was interesting is that joint and commonality are not the same kind of thing. Usually we think about the benefits of joint as a reduction in duplication across the services, or some form of cost savings by the reduced duplication. Actually, a lot of the savings comes from the commonality itself. The commonality is more organic and there are sort of natural incentives for certain
kinds of things to be common across the services. Part of that, from historical experience, is you’re not actually forcing services to do something jointly, which doesn’t usually succeed. It should be voluntary.

The joint management structure itself adds a lot of complexity to what’s already a very complex management challenge. That’s a high cost. In fact, from our data, there is a pretty significant joint cost growth premium. In general, joint programs tend to have higher cost growth than single service programs.

There are a lot of challenges in managing a joint program. Again, these are on top of the challenges managing the complex weapons system to begin with. In particular, aligning the requirements, schedule, budget, and keeping that alignment over time. FVL isn’t going to be done in five years, this is a multi-decade initiative. That’s a lot of time to maintain that level of alignment.

The single most important aspect, I think, of this comes down to requirements. I think the lessons from history is that if your requirement isn’t the same — and I said the same, not similar — a purely joint structure probably doesn’t make sense. The model for that would be the F-35.

There isn’t a single best management construct that is applicable to FVL. There are a lot of different Capability Sets that are being talked about that have different characteristics. Those programs, as they unfold, may need slightly different management constructs that are tailored to the needs of each particular program.

I think I hinted at this, we couldn’t find any evidence of actual savings from the joint programs. It’s partly because the data isn’t collected that way and partly because most of the time those savings don’t actually materialize. Unfortunately, we also could not find evidence of savings from commonality. Those savings probably do exist, but again the data isn’t collected and put in one place where we can actually see that. I think that is something that FVL community has an opportunity early in the planning stages — as part of AOA, for instance — to look at historical savings from commonality in programs, like V-22 and UH-60 for instance.

In the end, we recommended a lead service management structure for FVL for each program. If you really do want to take advantage of the potential for commonality across the services, and also across the different FVL programs, you probably need some kind of umbrella higher-level organization, both within the Army and within the DOD enterprise, to coordinate those kinds of common elements.

That’s our basic findings. There is a published report that is available on the RAND website, or you can let me know and I can send it to you. With that, I’m giving you extra time.

Mike Hirschberg:

Great. Thanks. Let me also say it’s a real honor and pleasure to be here today with this distinguished panel of speakers. My name is Mike Hirschberg, I’m the director of AHS — The Vertical Flight Society.

We were actually formed 75 years ago in 1943, just as the Army was ordering its first lot of production helicopters, the Sikorsky XR-4. Sikorsky and the Army got together with other industry members from Piasecki and Bell, the scientific community, the other services, academia, and said, “This is a new technology. We need to come together and help advance vertical flight.” That’s what we’ve been doing for 75 years. Our first honorees were Igor Sikorsky and Colonel Frank Gregory from the Army, one of the early Army leaders in developing the helicopter. We bring together industry, academia, and government
to try to tackle the toughest challenges in vertical flight. It’s a pleasure for me to represent the scientific community, the developers, across industry, academia, and government today.

There have been probably two decades of study and analysis going into what is now FVL. I think that combined the scientific community says, “We can do this. We can provide this extended operational reach. We can provide incredible capabilities, ‘Action at X’ in support of the soldier.” As mentioned before, there is a technology flowing from military into civil, and there is also the other way. You look at things like the Black Hawk going into the S-92 Superhawk, now being fielded decades later as the VH-92 Presidential. The U.S. military has the best vertical flight aircraft in the world, bar none. No one else in the world can develop the technologies that we have in things like the Apache and the Black Hawk, and the Chinook that are fielded today.

Industry, academia, government, the scientific community, we’re leaning forward for Future Vertical Lift. The government expenditure for JMR is a couple hundred million dollars in total. It’s been publicized that there’s about a hundred million dollars going to each of the two main competitors, main S&T developers, Bell and the Sikorsky-Boeing team, as well as some funding to Karem Aircraft and AVX Aircraft. Industry is putting in hundreds of millions of dollars more to get it proved that this can be done. You look at $300M that Sikorsky is investing in the Raider, probably more than that each for Bell and the Sikorsky-Boeing teams for Valor and Defiant, and you’re looking across industry probably close to a billion and a half of dollars that are going into the current demonstrations to try to convert those PowerPoint slides into something that can be seen, not taken to the fight, but demonstrating what the state of the art is, what industry can do today, and provide capabilities for the soldier for the future.

We talked about cost and affordability. One of the big things is, yes, we can go these really super long ranges. A lot is being talked about speed, the speed of Future Vertical Lift. I think, probably more important than speed is probably that range. But those things also drive size. In order to keep affordability, there does need to be an appetite suppressant, as stated, in order to keep the sizes down and make them affordable. Once those requirements are set, to lock them in over the decades, so that industry can produce those products without chasing shiny objects or other things to make them better but maybe unaffordable and not converge. It’s really consistency of purpose and achieving those transitions that have been so elusive in the past from the S&T community or the acquisition community to actually get into the field.

Comanche was an incredible program that was an incredible aircraft, but not delivered. Those technologies are being used in things like Future Vertical Lift, but we need to work together in order to be able to deliver these capabilities. That is one thing that I really want to state is that industry and government can work together. It’s really that collaboration that will do the best to bring these products together. Venues, such as this, bringing the warfighter and industry together are key. Events like we have at AHS — we have an annual technical Forum. To be able to get the scientific community, the folks from RDECOM, to come to attend the world’s largest technology event for vertical flight and see what the rest of the world is doing, see what is out there, is really important. It’s something that I’d really encourage the Army and leadership to encourage, that interaction with industry and government.

Working with our brethren as part of the Vertical Lift Consortium, that’s one of the key takeaways is industry and government working together can really achieve tremendous results.

**Gerry Graves:**
Good morning. My message for you today is that collaboration is crucial, but it’s not easy. It is going to be crucial for success in the Future Vertical Lift initiative. That was recognized in the memorandum from Undersecretary [of Defense for Acquisition, Technology and Logistics (ATL) Dr. Aston] Carter when he launched the Future Vertical Lift initiative. He recognized the importance of the role that industry would play in the success of the Future Vertical Lift initiative.

Responding to that, industry got together and formed the Vertical Lift Consortium in 2010. The mission of the VLC is to work with the government collaboratively to develop and transition technologies for vertical lift rapidly and affordably to get them to the warfighter. That’s a mission that is constant for us and it gives us an objective that lines up with the FVL CFT and with the Army.

We’re organized, as a company, with over 110 member organizations, arranged in categories based on the sector they’re in. We have the OEMs as members, the large defense contractors, the engine companies, the small vertical takeoff and landing companies, the suppliers, and other niche companies. We’re organized that way to give each of those sectors a voice. They all have representation on our board of directors. That’s essential, too. We can’t just be run by the larger companies. One of the important things that we do is to bring in these innovative companies that will bring new technology and help them in doing business and bringing their value to the Future Vertical Lift initiative.

The Army is looking for a better way of doing business. So is industry. One of the tools that has been provided to us is called the Other Transaction Agreement. I’m sure many of you are familiar with OTAs. It’s something that was developed to give flexibility and to decrease cycle time in providing new capabilities to the warfighter. It does give us some opportunities to collaborate in ways that have not been so easy to do in the past.

For example, the VLC has collaborated with the government in information sharing. We’ve had workshops with the FVL requirements IPT, Colonel Bentley came and met with us a number of times. Honestly, it was one of the most exciting things I’ve seen in my career to see industry coming together with the government, hearing what the capabilities they’re considering are and providing feedback. They’re being informed, but they’re also letting the government know what the art of the possible is and suggesting some new things that are out there. We can do that under the authority of the Other Transaction Agreement.

We’ve also collaborated with the government, with the Joint Council of Colonels, looking at such areas. We worked with Jeff on commonality. We gathered an opinion from industry on what it is, when it might work, what are some of the issues. Not only did we give a majority view, but we also presented the view of those that didn’t necessarily agree. We provided that back to the government as valuable information, another way we collaborated.

We’ve collaborated with the Future Vertical Lift S&T IPT. They presented to the VLC over 10 of their technology roadmaps and then, collectively, the VLC prepared a report with a variety of views on those roadmaps — recommendations back to the government. This type of collaboration, I think, is essential to being successful with the Future Vertical Lift initiative.

As Mike mentioned, we collaborate with AHS in education and promotion of the Future Vertical Lift as an initiative.
The Other Transaction authority also provides us with some other ways to collaborate. For example, we can, with some support from the government, bring together subject matter experts to meet with the Army in talking about and developing specifications for things such as a Joint Common Architecture that General Rugen referred to. We have a project going on now that is looking at attempting to define that interface between the platform and the mission system. It’s a real challenge, but we’re doing it as an industry group — it’s not an individual company. Universities play a key role in these as well.

Lastly, we are able to execute research and development projects that are focused on prototypes. This is a key piece of doing business in a new way. It enables the government to more quickly get projects underway. Nominally, we see three to six months from presentation of the requirement to VLC to owned contract and underway. We’re able to do things more quickly because of some of the latitude that we get from working under an Other Transaction Agreement and having our members sign up to a base agreement in advance. It does reduce the cycle time and that’s very important.

It’s not easy. If you think about the VLC, we have companies that are fierce competitors, we have companies that have the prime/supplier relationship. We have to be sensitive to those things, but we can undertake work together as an industry, providing back to the government and executing these projects in a new and different way that allows us to achieve the rapidity and affordability that we need to see with the VLC.

I see that my time has run over, but I think that our members are all in with Future Vertical Lift and we look forward to working with the CFT as it moves forward. Thank you.

**Phillips:**

I’d like to thank all of the panel members for your comments. They did a great job. We have quite a few minutes left for questions. I’ll get to the first question. The first one really centers on cost. Sir, you mentioned it and many of our panel members addressed cost as well.

In your role as a Vice Chief, you spend considerable time, I know, trying to make sure that our Army and our soldiers are equipped with the best equipment, trained, ready to go, fight, and win on the field of battle. When it comes to Future Vertical Lift, and given the priority of that program, what are some of the challenges that you see today, and future challenges associated with keeping FVL on track and funded going forward?

**McConville:** [0:44:21]

I think you’ve had a chance to see that we have six priorities. We want to modernize within all of these priorities as we go forward. Cost is key. Not only the cost for development, but the cost for procurement and the cost to actually maintain the aircraft as we go forward.

We’re into mass, as far as the amount of aircraft that we have, so we are not looking at, quite frankly, procuring expensive aircraft. As we have this discussion, we want the aircraft priced at the same range that they are right now. We want them to be able to operate at the same price per hour that they’re operating right now. The philosophy we have, we used to pay maybe $1,000 for a black and white TV, but technology has increased and now we get a color TV with a lot more capability. That’s kind of how we’re approaching the cost equation.
All these programs are competing against each other. We have a top line, we have so much for modernization and procurement. People ask, “What are the big decisions,” talking about decisions that can be made. Decisions that are going to be made on Future Vertical Lift and some of the other programs, when do we shift, when do we get to the point where the technology is such that we’ve developed the program and it provides such overmatch that we’re going to switch from what we would call the legacy program and move into the new program and go forward.

What we’re not going to be able to do is afford everything. What we’re not going to be able to do is spend large amounts of money developing things that are not going to get into the hands of the soldiers. That’s the challenge that we face. We look forward to working with you on this challenge.

**Phillips:**

I’d ask any of the other panel members, if you want to discuss anything on cost or challenges that you see ahead.

**Hirschberg:**

I’d like to say that I think with manufacturing technology improvements that industry can definitely improve on cost per pound, as in the past, for looking at aircraft that are cheaper than today. Certainly, with improvements in engine technology, with ITEP and FATE, and just designing with maintainability and sustainability in the aircraft, they can be more supportable. I think the real challenge is what you’re comparing. If you’re comparing a 20,000-pound Black Hawk to a 30,000 or 35,000-pound replacement, then it’s probably not the right thing. If you’re comparing it to an aircraft of similar size, I think that those cost targets for affordability could also be met.

**Phillips:**

Thank you. Next question. Is the intent of FVL to replace current platforms or add to them? General Todd, this was to you, but we’d also open it up to others.

**Todd:**

I’ll start by saying yes to both. In 1978 we procured an aircraft called a Black Hawk. It was there to replace the Huey. We kept Hueys an awfully long time. I would say that what we envision is a set of new leap ahead capabilities, in this regard, with these technologies that are going to provide us — some have said 10X, but it’s really about that overreach and that overmatch that we require.

Will we still maintain some of the current platforms into the future and beyond? Absolutely. There will a mix, undoubtedly. Wally, I don’t know if you want to add.

**Rugen:**

Yes, just to highlight. I think General Gayler and his team are working hard. Everything is on the table, as far as the organizational structure. We’re taking a hard look at modularity. It’s certainly in Fort Rucker’s wheelhouse. We have our laser focus on that as well, and that is through General Gayler’s team.

**McConville:**

I was just smiling because when I drive past the 101st Combat Aviation Brigade headquarters there are pedestals, and there’s an OH-58 sitting on a pedestal, there’s a UH-1 sitting on a pedestal, there’s a
Cobra sitting on a pedestal, and now there’s an OH-58 Delta sitting on that pedestal. Those are all of the aircraft that many of us grew up with. As we go forward — and, really, when does that happen? Those are the type of decisions that are going to be made. It’s really going to be based on when the technology is ready. As we look at the threat and we look at the environment, what is going to give us that overmatch that we’re going to put in the hands of our soldiers? As soon as we can get it, and as soon as we can afford it, that’s what we’re going to do. Is it going to happen tomorrow? No. Hopefully, we’re not sitting around and someone else is sitting up here as the Vice, maybe a lieutenant, and it’s 2050. Hopefully, some of these aircraft are sitting on the pedestals of his headquarters as we go forward in the future.

**Phillips:**

Thank you, panel. Next question. Sir, I would ask you to maybe address this first, but I open up it up to all of the panel, because this is something that many of us have lived through. There are several questions that relate directly to this. Looking at DOD 5000 and a list of the multitude of studies and documents designed to keep programs on track, the requirements are significant going forward. It’s probably safe to say programs such as Comanche, Crusader, FCS, JCA, ARH, etc, did a wonderful job submitting all required documents, yet they all failed to get to the soldier. How does the Army and industry meet statutory requirements to keep FVL on track and yet deliver on time to the performance that our soldiers desire or need?

**McConville:** [0:50:52]

I think one of the reasons that we’ve stepped across special teams, one of the reasons we’re standing up Futures Command, one of the reasons that the Secretary, and specifically the Chief, General Milley, have been so adamant about trying to align the organizations so that we’re ready for combat or ready for development is precisely because of that. When you trace the requirement process and you look at how many people get a vote on requirements, and how long that takes to develop, and then as it gets into the acquisition world and the ability to refine those requirements and continue to develop as we go forward, it just takes way too long and things change. We do not have the agility in the system to allow senior leaders to come in and work with industry and collaborate with industry as things have changed to get it to what we need.

As we move forward, we’re hoping and we believe that the structure that we’re getting in place is going to allow us to overcome some of the obstacles that we’ve seen in the past.

**Rugen:**

Sure, let me take a shot, too. I’ll just point to the JMR-TD. That’s a tech demonstrator. That’s kind of where it starts. We’re going to work with maturing technologies in S&T, where our authorities are a bit more agile and a bit more innovative, and we can move with more speed. I think, also, that the requirements process is, for the six priorities laid out by the Secretary and the Chief, the bureaucracy has really flattened when we talk about those requirements. The requirements process is just not going to take the years that the Comanche or FCS requirements process took.

The senior leaders are committed to giving us time. I will tell you, I met seven times with the Vice last week — and that’s a good thing. What I’ll tell you is this: we are getting access to senior leaders for decisions on these priorities, because the focus is laser focus.
Competitive prototyping, we’ve got to do more of that. I think the success of JMR-TD and the wisdom of our leaders back when that kicked off is what we want to leverage. It is different. Is it still hard? Certainly. But, we have a different focus and certainly a few different methods, a few different tools in the tool kit.

**Todd:** [0:53:40]

I’ll just echo what Wally was saying. It gets back to a point I made about successful acquisition programs. If you can’t say yes, then you can’t tell me no. If you’re not a decision authority, you’re just an advisor. While we’ve had rightly intended initiatives that have achieved, ultimately through what was intended to be really good system engineering, they’ve achieved unintended consequences and slowed programs, created drag, and not allowed things to get into the hands of the soldiers in the past. I think what is ultimately a revolutionary approach by the Army to stand up a very coordinated unity of command effort, obviously with a lot of supporting organizations, is going to push through a lot of issues that we’ve had in the past. I’ll leave it at that. I’ll just say ‘watch and see how we do.’

**Drezner:**

I guess, from an analyst point of view, I don’t want to be too skeptical or cynical, but I would caution about overreach, especially in terms of the requirements and all of the different things that we would like to hang on the first program or programs that come out of the FVL initiative. It’s not that you can’t have all of that eventually, you just can’t have it all at once.

**Rugen:** [0:55:15]

No. We are very informed on that. We want the Alpha model. We don’t want the Mike model. That’s great wisdom.

**Drezner:**

You figure out what’s important, you do that first. Then do sort of a parallel development of all of the things that you want next. Then figure out how to feed them into the program. I think that gets what you want, eventually. It also accelerates getting capabilities into the field.

**Rugen:**

I couldn’t agree more.

**Hirschberg:**

If I could also add to that. I think probably Comanche was that overreach of technologies in a lightweight [platform and trying to get everything] in there, and then death by a thousand cuts. Other things, like ARH — those failed acquisition programs aren’t unique to the Army. Certainly, the Air Force and Navy have had quite a number of helicopter procurements that have been tied up in shifting requirement and a lack of understanding between the government and the industry, as far as what actually really needs to be developed.

It really is focus, collaboration. One service that actually has a pretty good record, as far as procurement, is the Marine Corps. You look at the V-22, the F-35B, the -53K. They’ve some of the most advanced
aircraft in the world and that’s by focusing and collaborating and seeing it through the decades and decades to deliver a product for the warfighter.

Rugen:

Those are quite expensive, though.

Hirschberg:

Yes.

Rugen:

We want to be a little different.

Hirschberg:

They don’t have a lot of funding, but they’re able to get [advanced aircraft through perseverance].

Rugen:

They have a lot of funding, because they bought real expensive stuff. But, anyway, that’s my opinion.

Phillips:

Dr. Graves, anything?

Graves:

Yes. I would add that the importance of time to market cannot be underestimated. The risk goes up dramatically the longer it takes to get the program out there. The risk of losing support with Congress, or changes in Army leadership, and losing part of your industrial base if they’re not getting a reasonable level of work to undertake. I think there needs to be a lot of attention paid to the time to market.

Rugen:

That’s a good point.

Phillips:

That’s a great point to make. Also, the industrial base and the importance of that.

Mr. Drezner, you talked a little bit about jointness and commonality. Under what conditions does joint program management make sense?

Drezner:

I think the basic condition is that the requirements are the same. The F-35 would be the model of how not to do joint, because it turned out that there are three different airplanes there, for different missions they have different requirements. That’s the fundamental success factor, if you will.

The second one, I think, is that participation should be voluntary. Meaning that the services that want to participate in a joint program are doing it because they see a benefit to participating, so they’re self-motivating, self-organizing, and they’re willing to commit to the program. Historically, one of the
problems with joint programs is that there isn’t any penalty for pulling out, and that’s a problem. With voluntary participation, at least you know that they want to be there as part of that.

I mentioned the technology overreach and incremental development or parallel development, I think that helps a lot as well. I think the most successful version of a joint program, historically, has been a lead service structure where you have participation in the program office and even in the approval chains from the other services, say in deputy positions, so they’re still in senior positions and they’re participating.

I think those are the basic elements. When you say it that way it’s not too complex, but when you think about it, it turns out we really haven’t done that before in any of the services. There are some successes. JLTV and JDAM, for instance, come to mind. Those are both somewhat less complex systems than a future rotorcraft.

Phillips:

Thank you. Mr. Hirschberg, is industry really leaning forward on FVL or would they rather just build Black Hawks and Apaches forever? What do you think?

Hirschberg:

Industry is absolutely leaning forward and recognizes the tremendous leap ahead in capability for the next generation. I guess I’ll say that one reason for that is industry sells products on the international market. There are advances, around the world, of other rotorcraft. Even though we currently have the best aircraft in the world — military aircraft, certainly in the commercial sector that is not necessarily the same. Industry is absolutely investing in the next generation technology for the warfighter and also for commercial and international sales. I think everybody sees the long range benefit of next generation technology.

Phillips:

Dr. Graves, one question for you. We talked a lot about this. The importance of industry and collaboration. Every panel member has addressed in some kind of way. Given the consortium that you support, how best should members seek engagements with the government, or how can we, as a team, better collaborate?

Graves:

We have some pretty good mechanisms in place to support and enable that collaboration. We’ve collaborated with General Todd’s group in PEO Aviation, and in looking at the education that was necessary about Other Transaction Agreements and supporting their educational efforts. Also, we have others from government come to the VLC, maybe they call me directly, and they have a message they would like to get out to industry or they are interested in industry knowing about a program that they’re offering. It does serve as a focal point for that kind of communication.

Then the VLC is supported by a Consortium Administrative Organization. That makes it a lot easier to work on some of these projects, because the CAO manages the administrative and financial aspects of the consortium in a way that is acceptable to the government. That makes it a lot easier, particularly for small companies, non-traditional companies, to collaborate and work with the government, because
they’re getting assistance in how to do that and help in preparing their responses, at least the form of their responses, if it’s a competitive program — and our prototyping projects are competitive.

Phillips: [1:03:07]

Thanks. I would just add, for General Ham and AUSA, the Army leadership, forums like this, I think, are incredibly important for us to be able to come together and better collaborate. Not just in where we are now, but on the floor, visiting industry, etcetera. Very positive.

Hirschberg:

If I could add to that. I absolutely concur with that and urge the Army and the services to do more outreach. We’re an international organization, so we have international members from around the world. We have international attendees at our events. As mentioned, we’re the vertical flight technical meeting, the Annual Forum. Especially in this upcoming event, having such a small limit on the vertical flight researchers and developers and R&D, I think is detrimental to the workforce and the warfighter. In past events, with some of the travel and attendance limitations, we’ve had more attendees from Turkey than the U.S. Army, we’ve had more attendees from Germany. It’s a very competitive world out there, so I would really encourage the Army and the services to look at opportunities like this for industry and the services to work together and collaborate, and talk.

Phillips:

Thanks, Mike. Next question. I think this is important, because many of us have lived this. Are other services, including SOCOM, interested in your light attack aircraft efforts? How are they participating within the CFT? Maybe General Rugen first.

Rugen:

I think it’s larger than that, but yes, certainly SOCOM is participating in the requirements integrated team, that is headed up by Colonel Ramsey Bentley, on a routine basis. But all of the services are participating. We even have international participation with the UK, Canada and Australia as a few notable participants.

This all predates the CFT. Again, I think the Future Vertical Lift effort has been ongoing for quite a long time. Fort Rucker and the TRADOC Capabilities Manager [TCM] have been working these integrated teams for quite some time, so the communication is pretty strong across all of the services and internationally. That’s important.

McConville: [1:05:52]

I would like to touch on the Special Ops perspective. There’s a reason why we selected General Rugen to be the CFT director, because he’s got a Special Operations background. Those that know what the 160th [Special Operations Aviation Regiment (Airborne)] has done, both operationally and also in developing systems for the nation, there’s a reason why we’re doing that. There’s a reason why General Donahue was selected to be the Cross Functional Team leader for the Soldier Lethality, because of his background. Our Special Operations Forces have a different system that is much quicker than ours. We are certainly looking at what they’re doing and then collaborating with them as we go forward. They have many of the same needs. They need to find things, they need to kill things, and they need to move
things. So, we share the same interests in what we want vertical lift to do. As we move in the future, we certainly want to move with them. I personally met with the senior leadership of the Marine Corps to make sure that we share a vision in what we’re doing and what they’re doing as we go forward on this endeavor.

**Phillips:**

Another key and critical question, first to General Todd and then to others on the panel. Is successfully transitioning programs from science and technology to prototyping and then production just a matter of drill, or where do you see the challenges? Second part of that question: who should decide when 90% of something is good enough, is that the PM, the PEO, or who within the Army leadership should actually make that decision?

**Todd:**

First, one of the reasons they call it the Valley of Death is because nobody and nothing is in it. There is largely an absence of resources or focus when we come to the point of transition of things from experimentation and demonstration to actually productionizing and building. I think one of the benefits of the Futures Command is it will put people intentionally right in the middle of that who are decision makers for the Army and it will put the appropriate resources in there. It is not just a matter of the process; it’s a matter of leadership and leading through it and making key decisions and the right folks in the Army making those decisions, which gets straight to the second point:

PMs and PEOs don’t make decisions regarding whether or not something is acceptable to the Army or not. We execute programs on behalf of Army leadership. PMs and PEOs, largely, are there to execute that disciplined skill set that is required. However, leaders in the Army, well above me, well above my PMs, ultimately — and I’m sure Wally will tee a lot of those decisions up for those senior leaders who will make those decisions.

**Rugen:** [1:09:07]

I think the other thing that I would just add, too, is that we want to do more experimental prototyping, competitive prototyping, and tech demonstrations to get the science and technology efforts far more mature before we hand them off. We feel like that’s going to be a way to really shave off significant time on what any typical aircraft, or the average, is a 15-year process. Well, that’s a non-starter. We cannot take 15 years for these future aircraft. We’re looking, very much, at a far more agile process in S&T. Again, we have to put the resources so that the hand off is clean, and decisions.

**McConville:** [1:09:51]

We had this discussion and, certainly from the leadership side, we know that there are always going to be things that we want to improve on any type of system that we bring on. People say, “Is 80% good enough?” What we would say is “maybe.” It just depends on what the 80% is. 99% may not be good enough, if it’s a life, health, or safety type issue.

As we move forward, we want to get the system into the hands of our soldiers or our pilots as soon as we can do it safely, understanding that’s going to be the A model and there’s going to be room. As we build these systems, what we really want to do is look into the future and say, “This is what we need. We know it may not be there yet, but we can see a path to there,” whether it’s a version, it’s a block, it’s
a different model. But get into the hands of the troops as soon as we can and then incrementally improve from that known point, which is much further than we are right now. That’s kind of the path that we want to take as we go forward. That’s why it’s really important for the leadership to be involved, because we can make those type of decisions at our level.

Hirschberg:

I think that would be great. Industry has shown, as I mentioned, with advanced manufacturing capabilities, the ability to do rapid prototyping, to deliver things, even very large systems. You saw that with Valor and you see that with Raider, and you see that a lot now with the electric VTOL community where private capital is going into developing [them]. There are 50 different electric VTOL companies out there developing innovative technologies. I think one of the issues with aviation procurement in the past hasn’t been “is 90% good enough or is 80% good enough.” It’s when the requirements become 105% or 110% of what was originally spec’d. So it’s requirements creep that’s, in my opinion, one of the biggest roadblocks in developing and delivering capability to the warfighter.

McConville:

Good point.

Graves:

I think this is one of those areas that obviously needs a new way of doing business. I certainly hope that the CFT can help to implement some of those tools that are out there. The Valley of Death has been around for several decades and we’re still struggling with it. One tool that has been suggested, I haven’t see it used it yet, but Congress extended the Other Transaction Authority this past year to allow the transition from prototyping into production without another competition. Now, it’s easy to say that. It hasn’t been done yet. Certainly, there are going to be some in industry that will have to change the way they do business as well.

Rugen: [1:13:01]

Yes. We’re looking at more agile contract avenues as well, the OTAs and the TIAs. We’re looking at them very hard.

McConville:

We often talk about prototyping systems. What we’re doing right now is trying to “prototype a process,” if you think about it. We don’t have it perfectly right yet. Just like anytime you design something new, we don’t have it perfectly right. We’re going into this knowing that we don’t have this exactly right and we’re spending a lot of time at the senior leadership, meeting with senior members of industry, we’re meeting with Congress, and they’re all helping us work our way through this, because we know what we have is not working the way we want it to work. We know that we have to do something different. We have some ideas. We can certainly look at the process and go, “The way we’re lined up right now is a linear process that is not designed to get things quickly and timely and costly. It doesn’t work for anyone.” That’s what we’re trying to do right now. That’s what really Futures Command is going to bring to the table. We don’t have that exactly right yet, so we have to kind of work our way through that. We’re open to constructive feedback. Thank you.
Phillips:
Great dialogue. Jeff, question: I’ll open this up for the panel, but, Jeff, if you could respond first based upon your background. Vertical lift is not purely a U.S. only domain. Does exploration and dialogue with non-U.S. military allies and partners, to include non-U.S. defense industry, figure into FVL planned approaches, based upon what you know and what you’ve done with RAND?

Drezner:
I have to admit that I’m at least a year out of date with what FVL is doing, so I’m going to put that part of the question aside.

There is nothing inherently wrong with international participation or non-defense industry participation. In fact, there are innovative ideas. Those are both sources of innovative ideas that could be useful for the Army. The same kinds of lessons, though, apply. I mean, you don’t want your international partners to have different requirements than you do. The non-defense industry isn’t really used to dealing with the military or government, in general. That actually is a significant issue sometimes. But, there are also mechanisms to address that. OTA is one of those mechanisms that can be successful in bringing in non-defense.

So, yes, I think it’s possible. There’s no reason not to encourage it. It’s when you get to that first formal program, how are you structuring management and the participation there. One of the lessons from history is for any joint program, or even elite service kind of program, you need to codify what the rules and the processes are so that all of the participants actually know this is how we’re going to do it, if there are disputes this is how we’re going to resolve those [through] an MOA.

Phillips:
Any other comments?

Hirschberg:
Yes. I worked in the JSF program office from 1993 to 2001. We did some different reports and analysis, and histories of the procurement process. One of the things that struck me was when the Admiral who was in charge of the program said that because they had so many international partners that helped the program go, that helped it keep going, because they had international agreements and that helped keep the U.S. in the program, even through the dark years when not only was the acquisition process but the technology wasn’t quite there as well.

Rugen:
[Inaudible] support.

Hirschberg:
Exactly. FVL is like the difference between an old flip phone and a smartphone. It’s a whole new generation of technology. It’s not just the medium class, it’s replacing all of the DOD’s current aircraft, from small, medium, large. It’s going to be revolutionary in nature. Absolutely, industry wants to compete for sales. Just like industry got their aircraft worldwide, we think that the revolutionary capabilities of Future Vertical Lift will really help the American industry. I think encouragement of
international participation, and even international industry, is going to be very beneficial for the defense industry and for the warfighter, ultimately, and the taxpayer.

**Phillips:**

Great comments. I would just add that Foreign Military Sales and what we do, what General Todd does, to sell many of those many of those aircraft to our dozens of allies and partners becomes key and critical.

Next question. General Rugen, I think this would be to you. In your assertion that the U.S. Army leads tech and VTOL, have you looked at racing drones? For example, the $1M prize offered by Dubai, won by a 15-year-old. Augmented and mixed reality, HUD, NVIDIA Research. That’s from Dr. Tom Hughes.

**Rugen:**

We have looked at that. I met with DIUX and they have an eVTOL program there. We signed a letter of interest just to watch it. We’ve looked hard at companies that are doing augmented reality. Again, we want that cognitive offloading for our cockpit. When we talk about optionally manned, optimally manned, or fully manned cockpits, we’re certainly in that space as well.

The one thing that I want to challenge — . Again, on our UAS, we’re all-in there, too, for the key attributes I already listed, the swarming and such. Batteries today are problematic. I’ve gone to school on this. The best tes car out there has a battery that has 170 watts per hour per kilogram. That’s the best one. A gallon of JP8 is 12,000 watts per hour per kilogram. We really have to close that gap if battery technology is going to be something that fuels our vertical lift of the future. We’re certainly watching it. It’s compelling to watch and we’re learning from it, but there are certainly some big challenges out there.

The last thing I would say — again, I’ve gone to school on this stuff — specific energy. Think cruise control, it can keep you going. But, we need specific power when we jerk the guts out of a helicopter to be agile on an objective. Batteries aren’t good at delivering that collective thrust that we might need in a high-power setting. We have to close that gap with batteries as well.

**Hirschberg:**

If I may add to that. As mentioned, there is about a billion dollars going into electric VTOL technology. There are aircraft flying today, four-passenger electric tilt rotors that can transport. One of the great things about it is the reduction of noise. But, yes, they have about one-twentieth of the specific energy as fuel. By converting to a wing and flying as an aircraft [it makes up for this deficiency]. It’s not there today, but five years or 10 years, certainly for smaller aircraft, so maybe having a silent eVTOL infiltrator could be a tremendous asset for Special Ops. Unfortunately, it may also be an asset for our adversaries to be able to take an urban air taxi aircraft and fly it where we don’t hear it and infiltrate or insert people. It’s definitely an incredible capability potential for electric VTOL. It’s certainly not there today, but I think in the next five or 10 years, as they become operated commercially, that there is tremendous opportunity and challenges we need to consider.

**Phillips:**
General Todd, it’s comforting to hear lifecycle costs mentioned first in presentation on new programs. How are you changing the culture to keep the top metrics of cheapest and fastest delivery from once again forcing very high sustainment cost as warfighter and sustainment community? How do you grade your progress and the results? How does the rest of the panel grade the same measures?

**Todd:**

Quickly, all of our programs undergo a lifecycle cost estimate. We certainly have to address that. I’ve talked before about well-intentioned initiatives that have unintended consequences. One of the benefits of assessing lifecycle costs at all key gates in any program lifecycle is that we make an affordability assessment across the Army. That is not taken lightly. As the Vice said, we cannot afford, given that we go at scale, where no other service goes in the way of quantities that we procure. We cannot afford premium solution that might only need a fleet of 100 to 200. We’re going to buy significant amounts of vertical lift assets on the battlefield, both manned and unmanned, both optionally piloted and autonomous, as well as manned in the future.

Arguably, lifecycle cost is most important to the Army, of any of the services, when it comes to vertical lift. We will continue to assess and advise accordingly. I would encourage you, as you work through some of the S&T transitions, as you work through some of the prototyping that you’re working through, take that into account.

Remember, I mentioned four things that when Wally hands me a prototype and says, “I need you to really make this thing doable,” ultimately what my team will get after is reliability, affordability, producibility, and survivability. Those four things are paramount in our mind and we’ll continue to keep them there.

**Rugen:** [1:24:05]

That’s on the forefront of what we’re doing in the CFT as well. The parametrics are kind of dated that DASA-CE [Deputy Assistant Secretary of the Army for Cost and Economics] and CAPE [Director of OSD Cost Assessment and Program Evaluation] use. With what we’ve seen coming out of the automotive industry and spiraling into what is now the defense industry and what you guys are doing out there to make your production go from 19 days to 19 minutes, we need to understand that and bake that into our parametrics.

One of the first things we did was get a bunch of ORSAs [operations research and systems analysts?] from Johns Hopkins to really look at that, what you guys are really doing in your spaces, how you’re innovating, and then how that can feed back into our parametrics so that they’re accurate and so the affordability analysis that we’re doing is far more precise.

**Phillips:**

Next also important question. General McConville, I’ll refer this to you first, and then maybe General Rugen. Do you believe the Army can afford the advanced FCL CS-1 and CD-3 in parallel while modernizing the existing legacy fleet?

**McConville:** [1:25:17]
That’s the big question. Depends on what it costs. I’m serious. That’s the trades that we’re making at the senior level as we go forward. We’re looking across the portfolio. We’re watching what industry is doing and we applaud industry for really going after [this].

I have an engineering degree, I don’t consider myself an engineer, but I do remember when you looked at helicopters you could only go so far and so fast with the configurations we have. Now industry is actually trying to break that paradigm by going to different configurations that are going to allow us to have greater reach and greater speed. We have to bring that together and take a look at how that technology is going to develop, how much we’re going to have to invest in science and technology, and research and development, to bring that along. At the same time, we’re going to be looking at the threat and looking at how we’re modernizing the platforms we have, which are the best in the world right now and we want to continue that progression. But there’s a time out there — and again, that’s the decision we’re going to have to make. We can’t afford everything. We’ve got to figure out when that is. That’s the decision that we’ll be making over the next couple years.

Rugen:

Yes, sir, it’s Conditions Based. It depends on how good our development is, how quick it is, and when it meets the mission and meets the capability goals that we set. There will be decisions, I would think. Again, we don’t see our top line growing through the [2020s], so what budget we have is what we have to live with. We’ll have to live within our means, so those will be important decisions.

It’s important that we develop our capabilities and get a solid product out that can compete with the current fleet. The current fleet is pretty good, so this better be a lot better.

Phillips:

I open this next question up to the entire panel, because I think it’s important for much of what we do today. Vulnerability of systems and networks to cyber attacks is increasing. Who is responsible for software and hardware assurance in current and future platforms, weapons, and networks?

Todd:[1:27:47]

I’ll tackle that up front. Information assurance, cyber security, obviously we have an ever-growing set of requirements on us. That’s one of the things that our programs have to be agile about to keep pace with the threat. Ultimately, when we take a system that you may develop through what is development testing, seeking fielding release at a minimum so that we can put it in the hands of the operational user for test, we owe it to that soldier to make sure that we’ve run the traps, developed the systems that are essentially segregated where necessary and have the necessary protections in them that are required to operate on the modern battlefield.

The difficulty becomes predicting the future. That’s why when we talked earlier about getting the initial platform out and then upgrade it over time. That will be one of the continuous upgrades that we have to perform, both on the current fleet and the future fleet.

McConville:

I just want to touch on that. As we look to the future and we talk about multi-domain battle, really what we’re looking for as we build our systems is we’re assuming that we’ll be contested in every domain. It’s
almost contested domain warfare. As we’re building a system, we’re going to lay requirements on that can operate in an environment where you’re contested in cyber, we’re going to put a requirement on that you’re going to have to be able to operate where we’re contested in space. We’re doing certain things to get after those challenges that we see. Again, you’re certainly going to be contested on land as we go forward. As we look to the future, that’s the leap ahead type technology that we need. That’s going to be evident in the requirements that we put out.

**Phillips:**

One final question for the panel and then we’ll go to closing comments. We have many more questions here. Thank you, audience, but we’re not going to be able to get to every one of them. For the entire panel, anybody who wants to respond:

Considering the aircraft modernization programs for the reserve components, most of those are in the out-years, if those programs are terminated in favor of FVL what is the plan for RC — reserve component — modernization? Will FVL be fielded in the reserve components near simultaneously with the regular Army?

**Rugen:** [1:30:18]

I’ll take it first. I think as we look at it, I don’t think we’re terminating any programs. The fleet is large, it’s a near 4,000 helicopter fleet. We will maintain the current fleet for quite some time. I think that modernization will continue, albeit at a slower pace.

We’re one force, so there is going to be a plan to modernize the RC with FVL capabilities. We’re one force. That has been clear from the Chief.

**McConville:**

I just want to make sure that there will be no decisions made — and right now as we talk about the future and Future Vertical Lift, General Dan Hokanson, who is a senior Army National Guard aviator and reservist, is on the team. He’s providing insight to make sure that as we move forward we’re moving in unison. The Guard and Reserve for aviation play a critical part of that and they will have a voice, and we will make sure they are resourced as we go forward.

**Rugen:**

Sorry to jump in, too, but they’re on my team, so all compos are represented on the team.

**Phillips:**

For closing comments, about one minute or less for each panel member. I’ll turn to Dr. Graves.

**Graves:**

Again, I would emphasize the importance of collaboration. I would say that industry fully supports the Future Vertical Lift and believes that it is going to bring that leap ahead in capability that our warfighters need and that industry is excited to be a part of it.
Secondly, I would say that collaboration needs to include all of those that can say yes, as General Todd says. That means the government side and the industry side as well. Collaboration has got to be pervasive.

My third comment is that the VLC is on the ground and up and running and ready to help out. We look forward to working with the CFT in whatever way makes sense.

Hirschberg:

Just to echo some of those things. Industry is absolutely leaning forward. This is a long game, so FVL is looking at transition plans over the next 50 years. In fact, this is something that the S&T community has been working on for 20 years already. We held a Joint Future Rotorcraft [Program] conference in 1998. My predecessor testified to Congress in 2003 and 2005, expressing the need for a next generation rotorcraft program. That led to the Congressional direction in 2008, ten years ago, to start the FVL program.

Working with the VLC and our industry partners, we’ve been able to keep the attention on the Hill: we’ve been briefing about 50 Congressional offices every year. Over the last four years, that has brought an additional $50,000,000 to the S&T line to support FVL.

Industry, academia and government: all leaning forward on FVL. We’re very happy that the Army made it its number three priority. We all want to work together to deliver next generation capabilities to the warfighter.

Drezner:

I think I would just again say that when you’re making decisions about how to structure the programs, about how to structure the initiatives, what the requirements for the first step should be, what technologies to use: use the information that you have available and remember the lessons from history about over complicating both the decision processes as well as the system and the management structure that you’re given, so that you actually set yourself up for success, which is not something that a lot of major programs have done.

My understanding of FVL, which predates the Cross Functional Teams, so I don’t know exactly how that fits in. The FVL initiative was already doing a lot of things that we ended up seeing as a best practice: early engagement with industry, some early prototyping, trying to get the Joint Council of Colonels and their IPTs worked on collaborating across the community. I think if you want some commonality and the benefits of commonality, those kinds of activities need to also continue.

Todd:

I’ll say, first and foremost, PEO Aviation is committed to this teaming effort and certainly making sure that we do our part with whatever we’re asked to do by the Army. I will say to industry, industry partners, as General Rugen alluded to the fact that we’re going to do things further in S&T than we’ve done before. I will tell you that requires a commitment on both our parts, not just decisions but commitments.

Where we need to be is we need to have more than 200-hour demonstrators in our hands to be able to make decisions and go fast. As you think towards the future, as you think towards things that Wally talks
to you about and my PM, Colonel Steve Clark, as well as my UAS PM Colonel Courtney Cote talk to you about, really think about taking it just to the next level, help us to get it to a point where we can actually take it in to test, so if we do decide that it’s something that we want to pursue that we can go forward with it. It really is difficult on us when we look at items that are shelved after a demonstration and it’s really not an attainable asset.

It’s a change in the model. I would encourage you to invest appropriately. We look forward to seeing what we can do together.

**Rugen:**

The Aviation Enterprise — the Six-Pack as you’ve heard it called — really feel like we’re at an inflection point. Similar to 2003, where we terminated Comanche and redirected all that funding into the current fleet that is getting us through the current conflict, we feel currently we’re again at an inflection point for these peer/near-peer competitors we see on the horizon. The time is now. Develop these disruptive technologies for critical capability to fight and win in the future.

**Phillips:**

I would just add one comment from being your panel moderator. One of the takeaways that I have from this is how tight the aviation community really is. It’s so important that they remain tight moving forward as we execute FVL.

It has been an honor to be the panel moderator. Thanks to General Ham, General Swan, AUSA, [and] the Army leadership for allowing me and this great panel to be here.

Sir, closing comments?

**McConville:** [1:37:33]

One thing that I was thinking about which we didn’t talk about. As we look into the future, if you look across the spectrum of how we operate aircraft — aircraft, historically, have been manned and that’s been where our focuses are. We’ve had pilots wearing white scarfs and doing all of those great things that that pilots do. Now we’ve started moving to where we have pilots remotely operating aerial vehicles. In some places, they’re sitting in a container somewhere trying to fly that unmanned aircraft, so they still have the scarfs on (I don’t know why they need them). But anyway, then we go to the future and we start talking about autonomous systems, with artificial intelligence and machine learning. From where we sit, a lot of things are going that way. We see that happening in industry, we see autonomous cars coming on board. There’s a lot of technology out there. We’re certainly going to be looking at that, but that’s not a panacea for everything.

If you look behind us, you see a screen of me, but if you were just watching that screen you would get a sense of me talking. You can’t see the person in the seventh row sleeping. No, I’m just kidding. You don’t get that sense — you don’t get that feel as we go forward. We’re going to be a balanced approach. On the spectrum, we’re going to be moving that way. We’re going to see things coming out where we want optionally manned or optimally unmanned type systems. We’re going to be looking at unmanned systems. We talked about manned / unmanned teaming. There will be some unmanned / unmanned teaming as we go forward. We’re going to change, because if we’re going to put someone into a breach,
if we’re going to put someone into an integrated air defense situation and we have to kind of open that up, we’re certainly going to be looking at situations where we’re not going to put pilots in that.

There will always be a person in the loop, they just may not be in the lead aircraft. They may not be in the formation. As we go forward, we certainly want to think that way. As we go forward, we applaud industry for trying to break the paradigm we have for helicopters today, because the future may not be helicopters. We may need to go further and faster. We’re going to see, just as we extend our long-range precision fires, we expect our adversaries to do the same thing. That puts our Forward Arming And Refueling Points at risk. We’ll need to go further and faster, as we look to the future.

I’ll just close with I’ve seen some very impressive briefings over the last day on Future Vertical Lift. We just look forward to flying those PowerPoint slides that we all saw. Thank you.

Phillips:

Please join me in a round of applause.

* END*