

Fireside Chat: Connecting and Empowering Weapon Systems

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Heather Penney:

Ladies and gentlemen, good morning and welcome to this fireside chat on connecting and empowering weapons systems. I am Heather Penney, a senior resident fellow at the Mitchell Institute for Aerospace Studies. We all know that modern air warfare relies on rapidly gathering information, and pushing it out to the battle managers and the war fighters who are quarterbacking and executing the air campaign. This requires tightly integrating the sensors, the battle managers, the shooters, and the weapons through robust and survivable data links that are empowered by advanced decision aids.

To discuss how to best connect and empower our weapon systems to defeat adversary threats, we're lucky, no pun intended, to be joined by two remarkable Air Force leaders. To my far left, we're delighted to welcome Brigadier General Luke Cropsy. General Cropsy is the Department of the Air Force's program executive officer for command, control, communications and battle management. In this role, he oversees the delivery of the DAF Battle Network, an integrated system of systems delivering decision advantage to the joint and coalition force.

We're also very happy to have Brigadier General Daniel "Flak" Clayton. General Clayton leads the Air Force's advanced battle management system cross-functional team. And in this role he guides the modernization of command and control systems to improve decision-making advantage in competition, crisis and conflict.

Gentlemen, this is such a rich topic, let's dive in. But the first thing that I'd like to cover is terms of reference. Because I think too often we've conflated C3BM, the systems, the actual technologies and the networks that we use, computers, with the functions of command control and battle management. Because the operational architecture, how we wage war, and the functions, the decision and the information architecture, they rely on the technologies. Because they're so closely married, we've often conflated those. Can we get down to some terms of reference? Like I said, in the Venn diagram they often overlap, but we have to be careful to not muddle them. Can you please describe and differentiate command from control, battle management, and then describe the DAF Battle Network? This is really important because it gets into the work that you've done with modeling the network.

Brig. Gen. Daniel C. Clayton:

All right, Luke, I'll go ahead and start with this one. Thanks for the question, Ms. Penney. I think it's probably an appropriate time to take a little bit of a journey over the last 25 months to answer that question. I'm not specifically going to differentiate between command and control just yet. But in January of 2022, Secretary Kendall charged the advanced battle management system cross-functional team with giving him specific measurable improvements to command and control. And so, that was the charge that we were given, and that's the path that we've been on for the last two years or so.

As part of that, we did a literature review, market research. We scoured the interwebs to figure out when people say command and control, what does that really mean to them? There is a definition in the DOD dictionary for command, and there is one for control as well. That's the theory. But the practice for how the different service cultures employ that is vastly different. As this journey has gone along, I've also recently learned that in addition to religion and politics, you shouldn't talk about command and control outside the family. Because the second that you do, you'll get emotional, visceral responses from the other side, saying that's not how you do command and control.

Back to Secretary Kendall's guidance to us, what we did is we went out to industry, we went out to the private sector and said, how can we better define and have a common framework for the lexicon and the taxonomy for what you just described at the beginning? With that, we landed on a rules-based approach to performance delivery. A subset of that, as most of the engineers in the room will know, is a model-based systems engineering approach. We took joint and military operations, which are extremely complex, and we decided to try to functionally decompose those to the max extent possible. In doing that, we discovered, hey, we think that there are, as everyone knows, all models are wrong, some are useful. Our transformational model broke it down into eight different decision domains, and then the ninth was the operational environment, which is basically planet earth and everything on it.

But within that context, we said we want to differentiate discreet and orthogonal decision domains to include planning, command and battle management. That is how we have defined what your question was about, which is command and control. Within that, we've done some extensive work the last two years. Battle management was probably the most complicated, so we started with that one. We've done functional decomposition down to the tier three level. What that means is we have very specific knowledge and understanding of what are the information exchange requirements from this C2 node to this C2 node, which are platform agnostic.

Of note, the transformational model for planning. We've worked with the United States Navy on that one. That has 12 sub functions, the TMBM, the battle management one has 13 sub functions. We can get into a little bit more detail on that in the future. But what I will note is that on this journey of the last two years, and socializing this outside of the Department of the Air Force, we've talked to Haskin SaaS PSMs at some level, we've talked to SACD clerks, we briefed the OSD CAPE, their analytic working group last fall. We briefed the OSDA and S acquisition working group last fall as well. In addition, we've also released two RFIs to industry, the previous two September AFAs, so that they can understand that this is the direction that the Department of the Air Force is headed.

And then finally, I'll just note that from an allies and partners standpoint, we've shared this with all of our five NATO partners to include France and Japan as well. From our perspective, we think that we're plowing some new ground and trying to, again, have that common understanding of when we say command and control, this is specifically exactly what we mean. And it's all about decision advantage, and ensuring that the future war fighters have the skills, the knowledge, the applications, and the tech stack to make sure that they have that decision advantage going forward.

Brig. Gen. Luke C. G. Cropsey:

Heather, thanks to you and AFA for giving us the opportunity to do this. Flak and I are very comfortable in our role together in this endeavor that we're doing called advanced battle management. But one of the things that I think we need to unpack a little bit more are the labels that we're using, because I think there's a lot of confusion, to your point earlier, about, hey, what is this ABMS thing versus this C3BM thing, versus the ABMSCFT, and now this thing called the DAF Battle Network? There's a lot of jargon going around on that topic. What we're trying to do is provide, and to Flak's point, specific concrete definable and measurable definitions around what we're trying to do to make CT work better.

The key point here is that if it's not measurable, we don't know whether or not the things that we're doing are actually moving the needle in the right direction or not. A lot of the work that, quite frankly, the CFT has done on the modeling piece is absolutely essential to what I have to pull over on the acquisition side to know whether or not the kit that we're providing is actually given the war fighter anything that matters in the outcome.

In regards to the acronyms themselves, ABMS as a historical term started a ways back. It went from Air Battle Management System to Advanced Battle Management System. We did these things called on-

ramps back in the 2018 to 2020 timeframe. And then we graduated that conversation into a program of record that the DAF RCO was running, and we still called it ABMS. We had ABMS, the early on replacement to something that might look like J STARS, to hey, now it's this internet of things that we're doing on these on-ramps to, hey, now it's this thing that we're doing as a program of record.

Quite frankly, the maturity in that conversation, and the rigor being applied in that conversation just continued to go up, and we got better and better definition around what we meant when we said Advanced Battle Management System. When the secretary stood up C3BM a year and a half ago, it was to take that ABMS program out of the RCO and the architecture work out of the chief architect's office, and combine them into one place at one time. We still had this ABMS thing that now meant at least five different things, all under the same label. Part of what we did when we brought the terminology of the Department of the Air Force's Battle Network into play, was to acknowledge the fact that we were now talking about an entire system of systems, of which a part was the Advanced Battle Management System that I now had underneath of me directly. But it also, quite frankly, involved 50 additional programs across seven different PEOs around the rest of the Air Force. You can see where the scope of the problem has changed dramatically.

And we said, look, there needs to be a way for us to talk about the scope of that system of systems in a way that doesn't involve a 15 or 20 minute dialogue every time we do it. We've used the term now, DAF Battle Network, to describe this very now expansive and extensive system of systems that we are now providing back up into the joint force, as a way of connecting not only what we're doing across air and space, but quite frankly into the Navy, into the Army, into the Marines, and into our coalition partners.

That's also been part and parcel to the conversation that we've had with Congress. The one thing that we did do, is we kept ABMS as a label tied to the money. Because we didn't want to confuse anybody with regards to where the budget was at and what we were doing with the dollars, and we wanted to make sure we were transparent about how that thread flows through this whole conversation. Now, if you want to get technical, ABMS is actually a term that we use for the program element that we fund all of the work that we're doing on. But the terminology in terms of the operational capability that we're providing into the fight, is what we're calling the DAF Battle Network.

Heather Penney:

Thank you. The DAF Battle Network, I think, is crucially important. Because it helps us transition away from thinking we're going to have one battle management to rule them all, or one command and control system to rule them all. To your point, Flak, this is a lot like the religion and politics discussion with the different services. Because each service has their own command and control philosophy, and that's dictated by their domain and their operational concepts, the way they fight war, and the speed of their war and their scheme of maneuver.

We all know the Army, for example, loves being very, very organic. Well, the scope of the Air Force is vastly different. We should not try to impose the same command and control philosophies across to all the different services. But the DAF Battle Network, as the information and data exchange backbone, allows you to do so many different things, especially when you do the functional decomposition of what are the functions? What are the things we need to do, and what are the specific data requirements that we need to be able to execute war? Thank you. That's a very, very good discussion, gentlemen. I appreciate it.

But General Cropsey, you've already described how we've evolved from ABMS to the DAF Battle Network, and Flak, you have a phenomenal analogy to help make it clear for us to understand what this now means. Would you mind going into that?

Brig. Gen. Daniel C. Clayton:

Yeah, of course. I will say it also seems that fate is not without a sense of irony. Because when it was the Air Battle Management System, I was the human being in 2017 who would have to hit print on the slides, and then walk General Holmes around the building to Secretary of the Army, Chief of Staff of the Army and explain why, even though J STARS was being recapped, something was going to come in behind it. And so, I've seen this progression for the last seven years.

As I try to get my mind wrapped around it, I'm probably the least smart person on this stage, and so I have to go to analogies that work. As much as I would love to take everyone in this room out to Space Force Buckley and say, hey, let's go check out the DAF Battle Network, it's not a thing. For me, when I try to explain this to my neighbor or to my spouse, I say it's kind of like the Verizon 5G network, for instance. The average American doesn't really care about Wi-Fi routers, and cell towers, and fiber optic cables, and software algorithms that manage data flows through networking op centers, and I probably lost about half of you 10 seconds ago. The point is they just want to turn on their phone and see the content. Or when their family, in my case, my children when they want turn on Disney+ and watch a movie, they want it to work.

The analogy then comes back to the military use case, which is if I have a battle manager sitting in a TOC light staring at a CBC2, so cloud-based command and control application, they don't really care about the non-sexy stuff. They don't care about all of the infrastructure behind the scenes. They just want to make sure that they have the data that they need to say, "Okay, I need to launch a four ship here, I need to launch an eight ship here," and just go do it. That's where, with Luke and I, we're trying to think about it that way, so that we are actually focusing on all of the non-sexy stuff that will enable the war fighter in the future to deal with that.

If I may, right here, I will just note that in the transformational model... I would like to take all of you on a quick thought experiment, to imagine yourself in the INDOPACOM Theater in a couple of years from now at one of the 69 ACE locations that your Airmen or Guardians could be at. Just think about in the first 12 hours of that potential conflict, how many decisions are going to have to be made? We'll just narrow it down to just the planning decision, or the battle management decision. Is that hundreds? Is it thousands? Is it tens of thousands? From our perspective, even if it is tens of thousands of different decisions that have to be made, through our transformational model, all of those could fit neatly into one of those 25 sub-functions that I just described. 13 for battle management or 12 for planning.

And in that I will say, and this is again, for a lot of our industry partners that are with us today, each of those 25 bins or those sub-functions are an opportunity to provide a software application or a microservice to the war fighters. And so again, back to the analogy, that seems to work for me and it seems to resonate. But again, this is an extremely complex and complicated situation that we're trying to connect the folks that need to potentially fight tonight, as well as design and build the future architecture that we want in the future. This gets to some of the transition from a platform v. platform fight to a system v. system fight.

Brig. Gen. Luke C. G. Cropsey:

I'm going to build off of that a little bit, Flak. One of the things that I think is important for everybody to understand, is that we've left the deterministic war fight in the rear-view mirror. When I say deterministic, what I mean is I can put in a single input and know based on the input and how the system works, what I'm going to get for an output. One input equals one output, cause and effect. The complexity of the environment that we're talking about is so high, that I now have what in systems theory is known as emergent behaviors in the system. Where I'm going to put an input in, and I'm not sure what's going to come out because of the complexity that's involved.

Because of that, my ability to predict the future around what's going to happen, and whether or not if I do thing X, thing Y will happen, is going down rapidly. In order to actually build out a system that's capable of dealing with that level of complexity, you have to thin slice the problem. When I say thin slice it, what I mean is you have to be able to actually boil the problem down to something that's actually humanly solvable, in the context that Flak just talked about, know exactly what decisions have to be made by who and in what context. You have to get laser focused around what that particular human needs to have in order to make that decision. You're going to apply everything that you have in a kit, to figuring out how to help pull the complexity out of that person's brain and put it onto the system, so that every single byte available to that brain is being focused on the one decision that actually matters in that fight.

What that means is, the work that we have to do on our end of it because of the system complexity, you're not going to be held to a bunch of complex rules in your brain simultaneously with all the things that you actually have to manage. Which means that the rules have to be that much more simple. To manage all of that, we have to actually abstract that complexity out. To go back to your cell phone analogy, your cell phone is really simple to use. You push a button, and you hit an app and things work. But if you look at the underlying product architecture in your phone, it's wickedly complex to make all that happen.

What we're trying to do is build that system in a way that takes that complexity, puts it on the system, and then gives the war fighter that bandwidth back to manage all of that operational dynamic decision making that has to happen. For that to work, we have to take the simple system today, get that to work, and then layer it successively one after the other, in rapid iterative fashion, so that we get to the outcome that we need.

Brig. Gen. Daniel C. Clayton:

I'll just pick up on that as well. Everyone here has a cell phone, right. Right now, without you even thinking about it, your cell phone is pinging the closest cell tower, the closest Wi-Fi router to determine which has the best signal to give you the data that you want. Or in this case, because Luke and I are friends, if I go to his house, it might say his Wi-Fi router is the strongest signal, so I'm going to go to that one. It does all of that automatically, so you don't have to think about it.

One thing that I'll bring up from an experimentation standpoint, when we built a model, we said, this is kind of the first step. The next step is we need to experiment with it. Out of the Shaw Capstone, and this is I think again, perhaps plowing new ground, we're trying to apply a level of scientific rigor that maybe has never been done before. Oftentimes, you'll hear about the art of C2 or the art of command. We're trying to apply specific measurable scientific rigor to some of those microservices, and some of those applications that Luke was just describing.

Just recently back in December, we had a Shaw Capstone event. We ran a transformational model battle management for match effectors experiment. I can definitely say, we just released the report yesterday, but we can definitely say that we baselined last summer, and then back in December we brought in a new piece of software and said, if we apply this software to this human machine team, will it move the needle good, bad, or ugly compared to what the baseline was in December? I can say definitely, yes, it does actually move the needle. Back to my comment about the 13 sub-functions for battle management and the 12 for planning, now we just need to do that 24 more times to ensure that each of those sub-functions we can actually validate. This gets back to the connection that Luke and I have with respect to our teams and the model that we're using, that then informs the architecture that his team is designing and building.

Heather Penney:

Would it be fair to say that the work that you're doing across the Battle Net, which really comes down to transport, that's the information architecture, literally the data links, the processing infrastructure, the software and the apps, that you're doing that kind of complexity using processing automation and so forth, so that you can leverage what humans bring to the fight, which is our cognitive abilities? That, I think, is really going to be an asymmetric advantage against adversaries like the PLA, is that our war fighters are smart. What you're doing within ABMS, within the DAF Battle Net, is not taking away the art. It's understanding what we can automate so we can best leverage and optimize the advantage that humans bring to the fight.

Brig. Gen. Luke C. G. Cropsey:

Yeah. I think on that front, the piece to this that is often lost in this conversation, is that if you don't have something from a target perspective that you're trying to hit in an acquisition sense, well, whatever you got has got to be better than what I'm doing. Not necessarily. One of the things that we've been doing a lot of dialogue and discussion around is really in the requirement space. If we're going to do a system of systems architecture, and we're going to build out what that needs to look like and how it needs to function, we're going to end up with a lot of derived kinds of things that have to exist in order for those mission threads to close, that today look a lot like a platform requirement. I'm going to say, hey, in order for you to get the transport that you need to connect into the Battle Network, you're going to need to connect this way. That's going to look like a requirement on individual platforms. But I don't actually need a requirement at the platform level, I have one up at the system of systems level.

We've had a lot of conversation about, hey Flak, from a requirement standpoint, I need a architecture level requirement that you need me to point the whole system of systems at. And then the conversation about, hey, what do individual platforms need to put on in order to make that architecture real? Turns into a much more straightforward discussion around how you actually make the architecture real, as opposed to it being an individual conversation on a platform by platform basis. I think that's a key difference in the way that we're looking at this problem right now. And one that I think from a GPC perspective, you heard the secretary talk about where we needed to go on the requirements front. Some of this is actually driving that conversation around, hey, how do we get to the point where we've got these consolidated system of systems requirements that allow us to very rapidly now go after individual platform things?

Brig. Gen. Daniel C. Clayton:

On that note, I will say that I would challenge everyone in the room that you need to be empowered to think differently. I think everyone knows that the pacing challenge is putting us in a position that what we've done in the past may not help us win in the future, per se. With that in mind, and back to the requirements point, I will say that in the 1950s and 1960s, there was, if you look at air-to-air missiles, there was a specific requirement for four to five humans had to be able to physically pick this missile up and connect it to the lugs on the side of a plane. Well, the size and the length, and all of the things that went into that requirement are essentially driving some of the next gen air missiles that we're talking about today.

In our mind, this is kind of like legacy thinking, we're unnaturally constraining ourselves to something that occurred 50 or 60 years ago. In the command and control space, what Luke and I are trying to do, and our teams are working on, is how can we think differently about command and control in the future? Not being constrained to, well, if I just made the workflows faster, then I would've won yesterday's war better. We're not trying to do that. We're not trying to automate things that

fundamentally it was a broken process in the first place, but we'd never acknowledge that. We're trying to fix both the process, and then the architecture that will allow us to make quicker and better command and control decisions in the future, and we're not constrained by legacy thinking.

Heather Penney:

Thank you. General Cropsey, thank you for bringing up how important the new organizations, especially the Integrated Capabilities Command will be to supporting a new system of systems for the DAF Battle Net. That's not simply just Air Force or air breathers, but it really integrates both the air and the space domain in a way that I don't know that we could have really done without this kind of reorganization. I'd like to shift the conversation a little bit more to the command and control piece. Could you describe or discuss the relationship between command and control and battle management? And how does this relationship adapt the responsibilities and the authorities in a contested environment?

Brig. Gen. Daniel C. Clayton:

On this question, I will default back to the transformational model that I said previously. For our perspective, it is planning, command and battle management, period. Within that context though, we think that there are lots of growth opportunities for how to think about this differently. I will say that, for instance, we talked about the wars of the past, and perhaps I'll use the air tasking order as an example, in our understanding, that is just an output from the transformational model for planning.

If I could just, again, if everyone could bear with me for another analogy, I will say that in the past it was more perhaps like a symphony orchestra. Where you have one conductor, you have a hundred musicians that have trained and rehearsed, they're at the top of their game, they know exactly what they're going to do, and it's going to be amazing because rehearsed a thousand times. And then contrast that to maybe a jazz ensemble, where you have a handful of folks who generally know that, hey, we're going to be playing the blues today, or we're going to be maybe playing something a little bit happier tomorrow.

But the point is, as we go forward in the future, the ATO, again, it may be this legacy construct that comes out of planning. In the future, we may need more of a joint tasking order, or even perhaps a mission type orders or an MTO, where we know that even if we build one of the most resilient architectures possible, that we're going to lose the primary, alternate and contingency method of communication, and so our Airmen are going to have to be more trained and equipped to be put in those situations.

Again, back to my scenario on INDOPACOM, which is if we have 69 different ACE locations, how are those Airmen and Guardians going to be able to pick up and fight? My assessment, and our team's assessment, is that's probably going to be more like that jazz ensemble than it is that symphony orchestra. We think that there's going to be this maybe sliding scale of deliberate targeting, deliberate planning that most of us have experienced the last 20, 30 years of our career. And it'll be more in the dynamic side, of the dynamic targeting, the dynamic force employment of how do we still make those decisions, how do we get after the commander's intent, but do it in such a way that we're not tied to this single product ATO that comes out every 12 hours? We're going to have to iterate more rapidly.

Brig. Gen. Luke C. G. Cropsey:

Yeah. I guess what I would add to that is the distinction between strategic operational and tactical C2 is becoming increasingly less helpful. The reason I say that, is because at the end of the day, the decisions, the data flows and who has access to them, are becoming increasingly blurred with regards to the echelon of command. If at the strategic level, at the COCOM level, if you're looking for information and

insight to make decisions at that level that aren't congruent with the way that you're actually doing the operational and tactical side of the business, our ability to move things at the rate and at the speed that we need to move them is going to fundamentally be disconnected.

From a technical standpoint, as a guy that's running the nerd herd side of this, it's the same stack. At a technical architecture level, we're running all of those things on the same infrastructure. It's not different infrastructure, it's the same infrastructure. You might have separate specific applications that you're using for the type of decision that you're running, but it's all running on the same underlying infrastructure. I think what's going to continue to evolve in this conversation, especially as we continue to engage on the CJIC2 front, as we engage in the INDOPACOM Joint Fires Network conversations, as we continue to reach out to the CDAO and the CIO on the OSD side of it, those conversations are going to be important because. If the team doesn't realize as a whole that you can't just cut it off at echelon two and do separate things across those, we're going to end up potentially painting ourselves in a corner that fundamentally doesn't work at the war fighting level.

Again, another reason why we keep going back to this transformational model, is because it puts very discreet, specific decisions and information exchange requirements into the space no matter what decision you're making. That provides a level of continuity and integration across all of those that we haven't had in the past.

Heather Penney:

Just to clarify for the audience, when you say transformational model with respect to the DAF Battle Net, what you're really saying is we are looking at all of the different functions, the 26, 24 functions that need to be executed, that they've derived through that functional decomposition analysis. So of all of the broader functions, their sub-functions and so forth, how they're related. It's really the transformational model is referring to this architecture that you've developed through a very systematic engineering, so that you're approaching this entire project with that kind of data-driven rigor and architecture.

Brig. Gen. Luke C. G. Cropsey:

Yeah. Maybe to just try to simplify this a little bit, I'll do it this way: in life, there are nouns and there are verbs. You need both... and you have an engineer now talking about English. You need both to make a full sentence. But if you don't want to get trapped with the nouns that you've been using for the last 50 years, you've got to figure out how to understand what verbs those nouns are enabling. I have an F-15, I have an F-16, they have a particular mission that they're capable of doing. The noun is the platform, the verb is the mission.

What we've done with the transformational model is we've pulled the verbs out and away from the nouns, so that we're no longer in the C2 construct, trapped by the way that we have done them for the last 50 years. But we now understand the function that those things have to do with a much higher degree of precision. So that Flak can now hand those functions back to me and he can say, "Okay, Genius Boy, what do you have for me today? And then how do we keep iterating on those things rapidly? Because in this space, the nouns are changing every 18 to 24 months. This is not like a 25-year airplane program. This is a 25-month software and infrastructure program, that if we aren't rapidly iterating on this, and I don't have an exquisitely clear sense for what verbs, what missions I have to be able to do with those things, we're not going to get there fast enough.

Brig. Gen. Daniel C. Clayton:

Just as a quick example, planning, command and battle management is what we have defined command and control as, but there are six other decision domains to include: intelligence, connect and data, sensing, et cetera. We have not done the functional decomposition of those yet. In some cases we will say that those are kind of C2 adjacent, so those are things that enable the command and control that we're talking about.

One epiphany that I personally had within the last six months or so, is that if a battle manager in the sky is trying to make a decision and they say, "Hey, I have this weapon and this shooter, and I have this target," the decision to pair those two together. And then if I have a collection manager on the intelligence side, and I have a sensor and I have that same target, the decision that those two humans is making is essentially the same decision. As Luke is describing this, our transformational model is allowing us to talk apples to apples. It's across different tribes in the Air Force and the Space Force. That's the other bit of complexity that we're trying to contend with, is our service has been phenomenal at doing vertical integration for the last 75 plus years, but the horizontal integration maybe has been a little bit lacking.

Back to the nouns conversation and how we potentially trapped ourselves, is this platform is amazing at this and this platform is amazing at this, but at some point in the future they need to talk to each other. But we never figured out how to talk to each other until we built those two platforms. What we're trying to say is here's the digital infrastructure, here's the foundation at the beginning, that any future platform could tie into if it wanted to.

Heather Penney:

We talked a little bit backstage about the information requirements, and this gets a little bit to what you were saying about we can tie these together, in that targets have their own unique and organic information requirements. If I'm sensing and targeting a tank that's moving at 10 miles an hour, I can have much larger error probability of their location when I'm doing the initial part of the kill chain. That drives certain sensor requirements, data requirements, and network requirements. But if I have an airborne target that's moving at mach and highly maneuverable, I need to have a much tighter, more precise error location with a much faster update rate. And so that's what you're really talking about when you're saying, hey look, we're not being so platform centric. We're really drilling down into the attributes of the data and the network to enable more integration across the entire force.

Brig. Gen. Daniel C. Clayton:

I will just say that on this front, Luke usually does a pretty good job of talking about not the abstract, but the specific. One of the things that we've also tried to provide from our team to his team, is joint mission threads. As specifically as possible based on the pacing challenge, these are six missions that we're trying to close, so that he can be as specific as possible and go as deep as necessary, to understand the architecture requirements at that level.

Heather Penney:

Thank you. Much more specific or concise than I said, so I appreciate that. I do need to give my air battle managers a little bit of love here, so I need to send this question out for the battle management professionals: "With J STARS gone, in the future of our experience battle management, what is the future for these folks? In the Air Force, our manpower billets are tied to our platforms, and there's a serious gap before we field these seven, which may leave key bands of battle managers with no option except for out." What do you see as the future for this crucial career field? I look at our electronic

warfare experts, and we just decimated them when we retired the F-11. Can we give those guys a little bit of love here, give them some hope?

Brig. Gen. Daniel C. Clayton:

Absolutely. Back to the INDOPACOM scenario of 69 ACE locations, I think there will be an even higher demand signal for battle managers. Not necessarily air battle managers, but just battle managers in general. And so that skillset and that transition, I think will be hugely important going forward. Just as an example, I know that at a couple bases that have those platforms that you mentioned, as well as at the US Air Force Weapons School, the transformational model that I described earlier, those 13 sub-functions of battle management are already being taught as part of the syllabus to ensure that going forward, the next generation of air battle managers will be able to have those skill sets. More broadly, I think that the more that we start to experiment and test out ACE across the world, we're going to have an even higher demand signal for humans who have the critical thinking skills to make those battle management decisions in the future. And we're going to have to continue that across the DAF.

Heather Penney:

Absolutely. We're getting close on our time, so I'd like to do this, not quite a speed round, but I do want to focus on what initial operational capabilities are. You're taking an iterative approach, and this is on everyone's mind, how long do we have to wait for the DAF Battle Net? Is this a 2035 capability, or are we starting to field these things a little bit sooner?

Brig. Gen. Daniel C. Clayton:

Heather, I'll say what I said at the last AFA, which is the Department of the Air Force is modernizing command and control for decision advantage today. I think Luke has more specifics than that.

Brig. Gen. Luke C. G. Cropsey:

Yeah. I think, again, I alluded to it at the last AFA, but DAF Battle Network is here now. Between the conversation in September and the one that we're having now, we have operationally deployed cloud-based command and control to the eastern air defense sector and to the Canadian air defense sector with more on the way. That's now in the rear-view mirror. They're actually up and operating. The other thing that we've done in the last four months is we've put 16 TOC-L experimentation kits out in the field. Because at the rate that things are moving, we actually need the nouns and the verbs to rhyme so we get the full sentence. Because they're moving so quickly, we've got to get some of those kits out to the operational field before we go in and do a bigger buy, so that we understand exactly what we need to get into that scaled capability. They're out there.

Brig. Gen. Daniel C. Clayton:

On that note, I'll just add, so the Tactical Operations Center Light is going to be part of Project Convergence Capstone 4, which is happening later this spring. And on that, it already has the cloud-based command and control. Again, because of my interesting history with this current topic, seven years ago was a lot of lightning bolts on charts. Those days are behind us. We have actual stuff in the field that is allowing war fighters to test and experiment with it and have that decision advantage today.

Heather Penney:

Thank you. I think that's what we all want to hear, is that this is not some PowerPoint strings on charts, that this is actually things that you are delivering today. That's important for everybody to know, as you

deliver this iterative capability and you build that out, you're going fast and you're going through cycles. That's crucial to make sure that you're getting it right. We've got just a few more minutes, and gentlemen, you have the center stage. What do you want to say to this audience before they go? What is the one piece that you want them to walk out of here having learned from attending today's session?

Brig. Gen. Luke C. G. Cropsey:

I'm just going to double down on the secretary and the chief's comment from earlier in the week. When my team walks in the door, I tell them, "We're winning tomorrow's war today." Whatever mindset you walked in with, it better be game on kind of a mindset. We push that mindset to the entire team. Whether you're working for me directly, whether you're part of that broader DAF Battle Network on the government side or on the industry side, we're getting after it right now. Our time of consequence is here and it's happening. If you're not all in on what we got to do to make that real, you need to find somewhere else to go work, because you're not going to last very long with the two of us. We have an extreme sense of urgency about what we're doing. We're actually delivering capability now, and it's fundamentally upending this game. If you thought you understood what this looked like and how it was going to work, I got news for you: you don't. If you're not literally in the cutting edge of this conversation, you're already three weeks too late.

Brig. Gen. Daniel C. Clayton:

Thank you to AFA and to you, Heather, for this opportunity. I think that from our perspective on the requirements on the operations side, I would say, again, what I said previously: everyone in this room needs to be empowered to think differently about the problems we're trying to solve in the future. I'll also note, I won't go so far as to say that the transformational model, again, to give true credit to the genius behind this, it's Colonel Jon Zall, a lifelong ABM-er. It's not going to probably supplant the OODA Loop, because that's been around for decades. But I have a feeling that at an AFA in the next 10 or 20 years, people will be talking about this with the same importance that the OODA Loop has presented over the last few decades. Again, the partnership that Luke and I and our teams have is phenomenal. The opportunity that we have to blend the operator and acquire together is amazing. Again, I'll just double down on what I said previously, which is the Department of the Air Force is modernizing command and control for decision advantage today.

Heather Penney:

Thank you, gentlemen. We very much appreciate your insights here today. It's clear that you are laser focused on ensuring that our Airmen have the capabilities, and the network, and the decision advantage that they need to go into bad guy land, do their mission successfully, and come home safely. That is a moral obligation, imperative that we have to our Airmen. Again, thank you so much and thank you for being here for today's session. Have a great aerospace power kind of day.

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