Lt. Gen. David Deptula, USAF (Ret.):

Okay, well, let's get started. And good afternoon, ladies and gentlemen. Welcome to this Mitchell Institute panel on the future of collaborative combat aircraft. Very nice. Yeah, it's obviously a topic of interest. For those of you who haven't had a good fortune of meeting yet, my name's Dave Deptula. I'm the Dean of the Mitchell Institute for Aerospace Studies. And to kick this thing off, I think everyone in here is aware that it's no secret that the Air Force today is the oldest and smallest in its history. And this capacity and capability challenge is complicated by China. You heard the secretary this morning, who's created a force tailor made to deny US freedom of action in the Western Pacific. Now, overcoming these challenges, it's going to require new approaches to fielding air and space power. Secretary Kendall has rightly identified the development of collaborative combat aircraft as one of the most important ways that we can solve this problem.

So to discuss this approach, we're really fortunate to be joined by four incredible Air Force and industry leaders. Let me briefly introduce them and then we'll jump right into questions and discussion. First, we've got Mr. Tom Lawhead. Mr. Lawhead is the acting Deputy Chief of Staff Air Force Futures. Next, we're glad to be joined by Mr. Dave Alexander. Dave's the President of General Atomics Aeronautical Systems. We're also pleased to welcome Mr. Robert Otis Winkler from Kratos Defense. Otis heads efforts to align Kratos' development efforts with DOD and Air Force priorities. Finally, we're happy to have someone many of you know very well, Mike Paco Benitez of Shield AI. Paco's expertise when it comes to the ins and outs of autonomy makes him an invaluable resource and exploring the operational value and limitations of autonomy. So given how much we've got to dig into, I'm going to jump right into questions and answers. And Paco, let's kick this off with you. So could you define for us just how you define autonomy and how autonomy is different than automation?

Mike Benitez:

Yeah. First of all, thanks for having me. The qualifying statement in that was my definition and the reason I say that: there is still no Department of Defense definition of autonomy. We've been talking about CCAs and autonomy for two years, still no definition. The 3000.09 series, the autonomous weapon systems policy, does not define autonomy. It defines what an autonomous weapon system is. So I put that aside, NATO has a definition. It basically says I have programmed a thing to do a mission within its constraints and it can evolve and adapt in the environment without further intervention of a human, but that really doesn't mean a whole lot. So what I like to use to describe it, and I'm really glad the Mitchell Institute started picking this apart about a year and a half ago, there's a white paper called Beyond the Pixie Dust and about halfway through that white paper they start talking about the Society of Automotive Engineers.

So autonomy is not new. It's just new to how we're trying to use it, so it's a huge distinction there. This is not news stuff. So the SAE defines autonomy in five levels. You have level one, level two, level three, four, five. Level one is your automated stuff, so think cruise control, autopilot if you're in a jet. Level two is your basic foundations of autonomy. So I can do some things within some very interesting constraints. Very, very constrained. When we talk about a Tesla and full automated driving, that is level two autonomy. When we're talking about CCAs, we're talking about getting to level three autonomy, which is now I have partial automation, so I have a specific use case. I have bound constraints and I'm going to execute these little sub elements of autonomy on top of maybe some man in the loop stuff. Then you get to level four, you get partial and you get up to level five, which is full.

So level four and level three are the two things that we really started to talk about when we talk about CCAs and autonomy. And so for all of the discussions, that's really what we should be start talking about. It's not what is automated, what is autonomy. It's what is the level of autonomy that we need to solve

this problem for the war fighter, for this mission use case. And I would argue level three should be the minimum requirement and level four is really what we should be shooting for, which is a mission-based, here's your goals, here's your objectives, here's your risk within those constraints, execute.

Lt. Gen. David Deptula, USAF (Ret.):

Okay. Thanks for that. And sticking on this topic for the group, autonomy is obviously critical to CCA capabilities, but it still remains pretty opaque to the pilots out there. So how can autonomy be made more transparent and trustworthy to human teammates? And what's industry doing to ensure that operator's concerns are being addressed early in the design process? So let's start with you, Dave.

David R. Alexander:

Thanks, General. So we're on the receiving end, I would say, of autonomy and our goal has been really focused on how to keep the aircraft air worthy when you're bringing in algorithms left and right so they can learn and so they can be updated quickly. So I would say since 2020 we've developed a system that we would call open, just for lack of a better word, would be open autopilot. But basically what that is is that you can have your autonomy algorithms that go through a validator and go into your autopilot. So if the autonomy is not working right, it says fly upside down and we don't want to fly upside down, it doesn't take the message. So we've implemented that on our MQ-20 Avenger platform and been bringing in probably half a dozen third party autonomy algorithms and have shown that we can stay safe.

You can bring them in. You don't have to go through months long failure modes and effects testing and all that. And I think that's going to be key to moving forward, is to be able to trust this validator, that you're not going to have the airplane do something you don't want it to do. You don't want it to fly downtown. You want it to stay in a geographical area. These are all things that this validator can do and allow us to move quick. And I think that's really key to speed to ramp, is to be able to bring these algorithms in and as needed change them. On the fly even, right there, real time. And once we get to that point and we can stay safe, I think it'll accelerate CCAs going forward.

Lt. Gen. David Deptula, USAF (Ret.):

Otis?

Robert Winkler:

Thanks. So I think the important thing is to integrate the operator from the very beginning. The two words that people should be thinking about is repeatable and reliable. It's the same thing that our pilots demand out of their wingmen when they're flying. At level three or higher autonomy, that's what we're essentially really saying. So if you have something with the commands that the flight lead, if you will, or the operator on the ground or the operator in a command and control aircraft are giving to the CCA aircraft, if they operate, if they're reliable, the way that the CCA operates is reliable every single time and repeatable every single time, you're going to build that trust up with the operators. And that's happening right now down at Eglin, flying the government architecture of ACO. It's happening out at the test center in Tucson and it's going to be happening when the Air Force stands up its new experimental units.

So you're going to get this operator involvement every single day. And it's going to, if we do it right, if industry works well with government to do it right, you're going to see essentially these things working just like you would expect a wingman to work every single day.

Lt. Gen. David Deptula, USAF (Ret.):

Paco?

Mike Benitez:

Trust. So when you think about TRLs, technology readiness levels, some of you guys probably heard me talked about this before, you have TRL one through nine. Well, to use that equipment, that technology, you have to have trust. So you can almost think about there's another TRL, a trust readiness level, one through nine. And there's a couple of terms, explainable AI, calibrated trust. Those are not buzzwords that the Department of Defense made up. Those are industry focused areas in cognitive systems engineering. It's been going on for 30 years. This is not new. And so I tell you this to tell you that we have applied scientific based principles using cognitive systems engineering with human factors embedded with fighter pilots, with our AI developers developing the algorithms. They can see the process and the output of that is a whole study called calibrated trust.

And at the end of the day, what you want to do is you want to field something that you want to know what the capability is and then you want to be able to calibrate that over on the other side, but where my trust is. And if you get it wrong, on the upside you have an over-reliance on this autonomy and it's probably going to lead to some safety or mission failure. And if you are under reliance on it, you're going to misuse or just not use it. And so you're not going to actually be able to use the autonomy to the way that it was developed or intended to be used. It's just like a radar. And if a fighter pilot had never heard of the word radar, had never had any academics and you gave them a screen and you go, "Hey, you're going to fly around. And when these symbols show up on your screen, just trust us. There's something there that's probably going to kill you. It may not, but you should probably do something about it."

He goes, "Well, how do I trust what's on the screen is real?" Well, you know because over years you've been indoctrinated with training, you understand radar theory, you get some academics and most importantly you understand the capabilities, the limitations and the attributes of that algorithm or that hardware and software. And so that's what we're talking about with calibrated trust. The DOD has launched a thing last week for a pilot program. I'll tell you that we've been doing that in our company for five years, three years with active duty Air Force fighter pilots in F-16s flying AI. So it's not new. It's happening. And if you're talking to people who are not talking about the cognitive systems engineering and calibrated trust, you need to start asking some questions.

Lt. Gen. David Deptula, USAF (Ret.):

And, Tom, I hadn't forgotten you. I just thought I'd let our industry partners go first. And now let's hear what the department of the Air Force has to say.

Thomas Lawhead:

I'll give you a one word answer and that's use. So as pilots, for those in the audience, I turn on my autopilot and it works. And eventually I monitor it and I trust it. I turn on my ECM pod, lo and behold, it works and certainly low levels of autonomy. One thing that we are doing in the Air Force is the experimental ops unit. One CONUS, one OCONUS. So we also bring in our allies and partners. Otis talked about Project Venom at Eglin, working on autonomy and AI. And the one piece of trust that we don't talk often about trust within the Air Force, trust within our fighter force and our bomber force, but what about trust with the FAA? So one of the issues, as Dave mentioned, was getting back and forth in the national airspace. How do we develop trust with the FAA that this CCA isn't going to go rogue and go off someplace?

So that's also one of the things that we want to do. And to explain Project Venom, it's F-16s with a pilot in it and running some autonomy algorithms so that we can take over it, if necessary, but that builds trust within the pilot core. It builds trust within the FAA that, okay, these things aren't going to go crazy. The experimental ops units that will come online starting next year I think will be critical to take a look at how we operate, how we sustain and maintain, how we integrate both with the joint force and with our allies and partners and critical going forward on how we'll actually end up operating these aircraft.

Lt. Gen. David Deptula, USAF (Ret.):

Well, thanks very much. And Tom, we'll stick with you for this next question. CCAs could take on a variety of roles and missions that I think everyone in here are familiar with, from loyal wingmen to sensor carriers and communications relays to munitions mules. What are the near term roles that you see CCAs most immediately being able to fill? And do these differ at all from the longer term mission sets that CCAs could support?

Thomas Lawhead:

Thanks. Yes, is being my answer. So last year we put out a strategic requirements document that defined the autonomous collaborative platform umbrella of capabilities and one of those capabilities would be collaborative combat aircraft. And you could expand that out to collaborative strike aircraft, reconnaissance, mobility, et cetera. So there's multiple pieces under that collective umbrella of ACP. What we intend to do is focus on an air-to-air mission set initially, again, so that we're not trying to boil the ocean at one point. Let's figure out early on in an air to air capability. How do we employ, sustain, and maintain these autonomous aircraft? How do we envision using them? What's the CONEMP? What's the CONOPS?

And then going forward, you could start to see that we would expand that mission set both within CCAs and then potentially within collaborative mobility aircraft, collaborative refueling aircraft, sensors, effectors, non-kinetic effectors out in the battle space. So we will run initially at a relatively low level of autonomy and then as we get smarter, as we exercise it, we'll start to ramp up both a level of autonomy and the breadth of missions that those aircraft will perform.

Lt. Gen. David Deptula, USAF (Ret.):

Thank you. For our industry partners, again, rapid fielding of CCAs is obviously a priority. However, the ability of industry to do so is going to require a clear demand signal from the Air Force and the Department of Defense. Are you all getting a clear enough signal or sense from DOD and the Air Force leadership regarding the requirements for future CCA development? Let's go with the Dave, Otis and Paco.

David R. Alexander:

Yeah, I would say it's crystal clear with the requirements that we're getting and right down to excellent detail and excellent, actually, kind of analysis of alternatives that led into the contracting method, led into proposals. But crystal clear, there's no doubt about it. I would say that's helpful, especially for companies that want to invest and lean forward and see how we can get speed to ramp. So yeah, I really appreciate the clarity on that. I would think the only thing that's fuzzy right now is really getting the budgets approved so we really can move forward.

Lt. Gen. David Deptula, USAF (Ret.):

Otis?

Robert Winkler:

Yeah, 100%. We've got a clear demand signal that's coming out from not only the Air Force, but DOD at large. You've got OSD, you've got the replicator program that's coming out now, you've got CCA. Just the number of people that are sitting in this room is a clear demand signal that this is an important portion of force design for the United States Air Force and for the DOD. I think what's interesting is we've been doing collaborative combat aircraft, ACPs. We've been doing this type of thing for a good little bit. And so the one comment I would have is we know, I think, the Air Force has done a fantastic job setting the requirements and moving out now with good budgets, realistic budgets.

But one thing that I think we could move faster on is time. And time will include making sure that you get a budget on time with continual persistent funding for these programs, but the fact that we've had a little bit of vacillations between mission sets between what we want to do is just time we don't have as a nation. And so I think that it's going to be important for us to either stay on the current timelines that that DOD has or even to pull them farther to the left to get things out there to deter our adversaries.

Lt. Gen. David Deptula, USAF (Ret.):

Okay, Paco, you want to jump on the bandwagon or object?

Mike Benitez:

Everything they said, but with one addition.

Lt. Gen. David Deptula, USAF (Ret.):

Caveat.

Mike Benitez:

I can't recall a government managed program that happened on time, cost or schedule. So how do we fight that? We have requirements creep. There's different ways that we're working with several organizations right now within the Department of Defense and the Air Force to address that, but one of the things that's clear is we can be unencumbered by the government if we just do it ourself. And so one of the things you'll see is Shield AI and Kratos are working together. There's going to be some really exciting news and I think by this time next year you're going to be sick of hearing about all of the things that we've been able to do in 12 months. So I'll just leave it at that.

Lt. Gen. David Deptula, USAF (Ret.):

Very good. One more for our industry. Go ahead, Tom.

Thomas Lawhead:

Yes, if I could just pile on from the government perspective on that one. So I think thank you, first off, for saying that we've defined our requirements. I think we have. I think Brigadier General Dale White and Air Combat Commander did a great job of defining the attributes of our first increment of CCAs. That second increment I think doesn't have any concern, but it's where some work needs to be done. And that is what exactly as we start to expand the universe of what CCAs are going to do from a mission standpoint. How do we avoid requirements creep? So how do we scope that down to what is in the art of the doable?

And again, as we iterate on budgets, so, again, would really like an on-time budget and no sequestration like effects. How do we push forward from there, continue to make sure that we follow this at least

early good example of well-defined requirements without getting too far out in front of ourselves? So that we define the mission sets we want to get after, specify the attributes we need, get the right documentation for requirements and the right budgetary funding to go forward. So thanks.

Lt. Gen. David Deptula, USAF (Ret.):

No, thanks for that. And one more for our industry reps. Secretary Kendall's described a nominal first tranche of 1,000 CCAs to support integration with the F-35s and NGAD. Assuming this acquisition effort's approved and funded, how is industry preparing for not only a rapid design and development process, but also for manufacturing? Dave?

David R. Alexander:

Well, I would say it's really nice to know that there is speed to ramp, but speed to mass as well. And it does affect how you go forward on the program. When I look back on the early days of the first 12 MQ-1s, I wasn't sure we were going to build more than 18 of those. And so we put enough design detail in it for 18. Well, at the end of the day, we built more than that and MQ-9 started out almost the same way. And somebody said we were in full rate production, so we were, but we've lived through that. But knowing that you have a design that needs to be low cost and upfront, but also mass produced changes how you look at the design problem, especially for an airframe and it's avionics. So what do we do to do that? I mean, there's things you have to do in parallel.

You have to look at automation and the manufacturing upfront and that means that needs to be included in your design upfront. So this is a whole do loop that is really important to know on the front end of the program. That's why I say we have clarity on this program of what they're looking for. Not just six of something they're looking forward to mass produced down the road. And not only mass produce, but make sure they're low cost at the same time. Other than that, it's all easy. So what are we doing? We're bringing partners in, but there's things that we have to do with being able to bring partners in and live in the same digital environment so we can all design together at the same time.

And manufacturing, it's the same way with partners, so we can run things in parallel. And I think in the end, making sure we have enough test assets so that you can build your skills and everything else in parallel. You could do something quick and then if you don't have enough test platforms, you can drag that whole program out. So anyway, it's good to know that there's speed to ramp, but there's also speed to mass. And it does change how you move forward on bringing the design to completion.

Lt. Gen. David Deptula, USAF (Ret.):

Anyone else would like to comment?

Robert Winkler:

Yeah, I'll just add that the Davidson window hasn't changed. And so we have a line in the sand that industry has to be able to meet to be able to put mass in the field for the war fighters. AFRL and LCMC did a fantastic job early on of spending some time and effort to get affordability along with scalability together. And I think that that's going to pay big dividends as we move forward because scaling is easy if you're willing to pay for it. But in order to make this relevant, we can't increase the cost of the article just because we want to build more of them. And so what we got to do is figure out, and we are, the technology is there with automation, with digital tools to be able to bring down the cost as you increase the numbers. But I will be adamant that the Davidson window is a line in the sand that we got to meet, so industries are well aware of that.

Lt. Gen. David Deptula, USAF (Ret.):

Okay, follow up to that one. What role do you all see advanced design and manufacturing processes like digital engineering or additive manufacturing playing to help speed up this effort?

David R. Alexander:

So both of those are very important, really, to go forward. And like I was saying earlier, to bring partners together and design real time, you can't do it without digital engineering. You have to live in the same design environment. You have to work off the same tools and not the same configuration that you're designing to. As far as additive manufacturing, just to give you an example, on MQ-9 Bravo, which is the next generation MQ-9, we went through that whole ... Typically what we do, which we like to do everything out of composites, but anyway, we came back and re-looked at how many parts could be built through additive manufacturing. And we saved $600,000 per tail on 300 parts and it adds up. So these new processes do make a difference.

Robert Winkler:

Yeah. I mean, I'll just add that for digital engineering, it's the new buzzword. It's paying off big dividends. I think the B-21 program in it of itself showed how important digital tools are and in a successful program that's on time and on budget, but you have to do it with an eye towards the affordability because industry can spend an awful lot of money on these digital tools. And you have to balance the return on investment with those tools to be able to ... It's not a panacea, so you have to be smart as you're utilizing those tools.

Lt. Gen. David Deptula, USAF (Ret.):

Paco, you got anything yet?

Mike Benitez:

Well, I'm in the bits business, not the atoms business, but what I will say is it's physics, so eventually you have to build something. And so having the resources and the supply chains in place to scale. And that's one of the things that's compelling with Kratos here on stage is they have a line that builds 150 drones a year with the ability to two, three, four, 5X that. And so that is critical when you look at the Davidson window, time and speed to mass, not just speed to ramp.

Lt. Gen. David Deptula, USAF (Ret.):

All right, Tom, effective human CCA teaming is going to be essential for CCAs to fulfill their potential. What are your thoughts on what can be learned from actual pilot operations that can shape CCA teaming concepts? And then conversely, where do you see reliance on past operational paradigms limiting the development of CCAs?

Thomas Lawhead:

So first I'll talk one thing about development and industry and then I'll jump into that question, if you don't mind, Dave. I worry about a lot of things. One of the things I worry less about now than I ever have is our in the air force ability to collaborate and integrate with industry. So in my mind, the conversations that we have now with industry are stronger and more fulsome than I have seen them in decades, so that's I think a great positive to me. In terms of what we can and can't learn from, you could go back to the F-22 and as we developed and brought the F-22 into service. We started flying it like an F-15C and

quickly realized that this is a whole different step. So we've already done some studies and analysis to show it will look similar to fifth gen fighting, but the addition of CCAs with fifth gen incredibly improves your survivability, incredibly improves your kill ratios.

This is at least in our analysis going to be successful. So that's kind of the mark on the wall that we need to hit and we'll continue to work that. I think the piece that we can't fall back into is, well, we've always done it this way. And that's both on the operational side as well as the industry side. So if we want collaborative aircraft that are sense making and/or acting in the battle space, we have to be very clear about what we want, what we need and then how we're going to operate it as we go forward. The paradigm may need to shift. This may not be an 8,000 hour aircraft. This may be something that we use operationally and maybe it goes to test for a while and then we get rid of it.

So we are still mulling through the potentials here, but do you need a depot to refurbish CCAs when you're not going to keep it for that long? Do we need an engine that has a life cycle of 2,000 plus hours on the wing if we're not going to use it that long? So maybe you go with a cheaper engine, maybe you don't build a depot, you concentrate on the sustainment in place. And there's probably going to need to be a different mindset there. And I think, again, bringing our Air Force material command brothers and sisters into this conversation early as we develop it and start to operate them as early as next year will be critical to figuring out what is different and what is the same and taking the best of both of those worlds with us.

Lt. Gen. David Deptula, USAF (Ret.):

Very good. This is another one for the entire group. People talk about CCAs as a way for the Air Force to get affordable mass. And I think one thing everyone's curious about is what's the definition of affordable in this context? If a CCA cost a quarter, or half, or a third, or you pick your number, as much as an F-35, what unique advantages can it provide that might offset simple cost comparisons?

David R. Alexander:

I'll start off. I'll just say the first thing is you're not going to have loss of life when one of these goes down. So whatever cost you put on that, I think, is pretty high. But we really struggled with this because you really have to size the platform to do the mission, and once you size the platform to do the mission, then it is what it is. And then you have to figure out how to make it affordable. So there's a sweet spot in there, but it's not going to do any good to try and get the cost down so low that you can't really do the mission effectively. So I think it's to make sure that when we say attritable or attrition tolerant, we really understand what we're talking about. If it takes a very large CCA to do the mission and it's a dollar per pound that we're all working against right now, then it kind of is what it is.

And so we got to be careful with the words attrition and attrition tolerant I think because what we've struggled with all along on this program. In the beginning, it was just going to be something you would throw away after a few flights. Well, to build a CCA that can actually do the mission, you're probably want to going to keep it for a while and not throw it away. So anyways, it is a tight balance and actually I think the requirements that are set out really help us get to the right point.

Lt. Gen. David Deptula, USAF (Ret.):

Anyone else?

Robert Winkler:

Sure. So I think Congress has actually done a pretty decent job this year in defining what affordability is in the NDA its got, which is pre-conference, but right now it's got $3 million for the cost for an

expendable aircraft, $10 million for an attritable aircraft and $25 million for an exquisite aircraft. So that bar is set and, as Dave said, we buy aircraft by the pound. Somewhere you're going to have to have that price point less than $1,000 per pound, potentially even half that in order to make something that is going to be survivable to be able to get to the point that you're going to complete the mission and then actually have some usefulness on the battlefield. So I think what that drives to is disaggregation of sensors and heterogeneity when it comes to the overall battle force mix. And so if your plan is to make a 10% cheaper F-35 that can go out there, then that's not going to get you affordable mass.

It just isn't. The complexity that we get with autonomy, we would be better off just continuing down the road, but we know that we can't. That the amount that we're divesting of aircraft right now versus the amount that we're buying is unsustainable, we're going to have to change the script a little bit. And so that affordability has got to be part and parcel of the whole entire program moving forward. The way that you get that is you don't make little mini me F-35s, that you disaggregate the sensors and you optimize the outer mold lines of all the aircraft for the mission sets that you're doing.

Thomas Lawhead:

So I think I agree. I'll push back a little bit on the utility of the kind of bucketed NDA numbers. They're interesting I think and maybe right. I don't know, but I'm not sure that we are ready to bucketize based on cost. I would much prefer to look at the mission success or failure and actually develop and procure what we need to win. Having said that, I'm happy to go with that. But I think for us, the ability to bring fires at volume at a time and place of our choosing is what we need to go after. I 100% agree that I don't need an F-35 minus $5 million because, again, that doesn't bring volume of fires. And what I need is capability in the battle space. So that's what we'll be striving for at the lowest cost possible. So we're not shooting for a cost, but probably the easiest way to make sure that CCAs are never a thing is to over require into that space and drive a cost that we can't get mass out of.

Mike Benitez:

Just one thing to add, we talk about affordable mass. I used to say there's a missing word, affordable, capable mass, but when you actually look up the definition in doctrine of what mass is, it's about amassing effects, not amassing forces. And so when you go how do I mass effects, going back and into it at an affordable way, you get into disaggregation. And maybe you have these formations of CCAs where I have CCA one, two, three and four. And they have completely different configurations and they're all autonomously figuring out who has what sensor to look at what and how can I build that track in a disaggregated way. And I think that's how you start breaking the price point, putting a $5 million radar and a quarter million dollar data link another and another and another and another. And it just gets more and more affordable or unaffordable.

And so breaking that cost curve, those supporting subsystems are just as important and a part of the equation besides the platform and the autonomy. And I think that's where industry is a little bit behind right now, is how do we build less exquisite, cheaper sensors to enable some of these things we want to do with CCAs.

Lt. Gen. David Deptula, USAF (Ret.):

No, thanks for that. Tom, back to you. As CCA employment concepts grow, battle management is probably going to become an increasingly central role for pilots and the Airmen at the leading edge. So what are your thoughts on how should tactics and doctrine change to optimize human CCA teaming?

Thomas Lawhead:

Well, first, I think they have to and I think they have to evolve. So battle management in the cockpit is not a new thing. Mission Commanders have been doing it for decades. Battle management in C2 aircraft, not a new thing. We will develop through an advanced battle management system a different way of piecing this together. And the degree of difficulty I think is what has stepped up. When you think about an air domain fight, as tough as that is from the cockpit side of the house, it's relatively simple. When you think about an all domain fight in a coalition, this starts to become pretty difficult. When you think about long range kill chains and that your sensor may be in space, it may provide a targeting update to a shooter who doesn't have organic target coordinates. He shoots a long range munition that gets updated from a collaborative sensor forward for an in-flight target update.

If you look at outside of just CCA specifically, this problem set becomes difficult. And we're working essentially on this whole puzzle that all needs to come together at the right time. So the ability to do that, again, at scale and in time is what is going to take practice. It's what we're working on, so we're building the plane as we start to figure out how to fly it. Always a recipe for success, but the teams, and there are literally thousands of people working this, are out there trying to figure out what that all looks like and how do we integrate it. So I think in the future, our integration issue and problems are the real tough ones that we'll have to solve. I am completely confident that industry will solve the technical and developmental issues.

I am completely confident that our experimental ops unit will figure out how to employ and sustain and maintain collaborative combat aircraft. The thing we need to continue to evolve on is how does the whole battle picture work? And how do we bring together this very diverse force that are disaggregated to a culminating point in time and space of where they need to be, when they need to be there to bring that effect to the battle space.

Lt. Gen. David Deptula, USAF (Ret.):

Okay. We've come to the end of our time, but please don't jump up and leave your seats because we have a special presentation for you. And before we get started on that presentation, I'd ask you all to join me in thanking our panelists today with a round of applause. Okay. Would the members of the Second Special Operations Squadron please come to the stage. Kind of put the award right in the middle of y'all. That's good. That's good. The Mitchell Institute for Aerospace Studies is pleased to announce that the recipient of the General Atomics RPA trophy for 2022 is the Scorpions of the Second Special Operations Squadron. The unit is based at Hurlburt Field, Florida. And to join me in presenting the award, I'd like to ask Lieutenant General Jim Slife, Deputy Chief of Staff for operations to please come forward, as well as Mr. Dave Alexander.

General Slife is particularly qualified to present this award as in 2022 he was the commander of AFSOC down at Hurlburt, overseeing all Air Force operations during a particularly challenging three and a half years. So with that, General Slife, over to you for a couple of remarks.

Lt. Gen. Jim Slife:

Hey, thanks. I appreciate everybody being here to help us celebrate the men and women of the Second Special Operation Squadron. I will just tell you that about three years ago the chief of staff challenged us all to accelerate change or lose. I think many kind of took that as a motto. There were fewer among us that took that as an order. And the men and women of the Second Special Operation Squadron took it as an order. And so when the chief said accelerate change, this is a squadron that did it. They pioneered satellite launch and recovery operations, frankly, years ahead of what we thought was possible.

I literally recall just several months ago sitting in a conference room asking, "When are we going to be doing satellite launch and recovery for our MQ-9 fleet broadly across the Air Force?" And the answer I

got was, "Sir, that's about two years away." And I had literally just read an operations report that this squadron was actually doing it in combat with prototype software. And so they were accelerating change out in front of the rest of the RPA enterprise. They recently used an MQ-9 to develop Reaper ACE procedures. They're literally landing MQ-9s out on unimproved landing strips to generate an ACE type concept of employment for RPAs. And so I think, folks, if you could one more time give a round of applause to the men and women of the Second Special Operation Squadron.

David R. Alexander:

So General Atomics is really proud and honored to be part of the Squadron of the Year award. And every year I look forward to getting with everybody and actually having a party on it. At General Atomics, we've been pushing automatic takeoff and landing forever. I won't go down that rabbit hole right now, but when I started hearing about all these events that were going on and all this agile combat employment, and I was thinking what happened to our Air Force? Who are these people? Well, here they are right here. You guys have really made a difference. And if you think about what we need to do to expand into the Pacific, what you're doing with automatic takeoff and landing over SATCOM really is going to make agile combat employment happen ahead of time because of you guys leaning forward and get it done. And it's really dear to my heart that it's happening. Someday, imagine this, we could do the whole mission with a keyboard and a mouse.

And that's what automatic takeoff and landing will do for us. So anyway, congratulations to the Second Special Operations Squadron. Job well done. Thank you.

Lt. Gen. David Deptula, USAF (Ret.):

Would you go down to the other end? We'll squeeze in for a picture. Okay, if I could get you all to squeeze in. Hey, not off the stage yet. Come on back. Let's squeeze in for group photo.

You bet. Thanks. Okay, thanks, General Slife and Dave Alexander. And once again, Mitchell Institute's proud to present the General Atomics RPA trophy for 2022 to the Second Special Operations Squadron. Thank you all and have a great aerospace power kind of day.