

Lieutenant General Steven L. Kwast

Commander, AETC

Media Roundtable

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**Lt. Gen. Kwast:** Let's go ahead and get this started. I want to jump right into your questions so that we get the most bang for the buck and I'm talking about what you want to talk about, not what I want to talk about. I know that's a break from normal tradition where they hear the question and they answer the question they wanted to hear, but I'd like to flip on that.

So go ahead.

**Media:** TX. When can we expect to hear more? And what are you doing to, how will you be changing what you're doing once the decision is made, whatever it is, whichever aircraft it is.

**Lt. Gen. Kwast:** The decision is imminent and I think imminent is in the next few months, we should be able to hear something.

Again, this is about the Air Force making sure that we really dotted all the I's and crossed the T's and have done due diligence and a thoughtful process to make sure that the future of training is maximized.

With regard to how things will change once we have the TX, it will depend on which one is chosen because there are minor differences in their modalities of how we can teach. But regardless of which one is selected, we will be able to have more agility and flexibility and training with this new generation trainer because it will be really built for the 21<sup>st</sup> century and the information age we're in. So we can essentially modify the training environment to accommodate many different attributes that we want to teach in the aviator and it's not stuck to the old steam dials we talk about in the past, where it's just one airspeed indicator and altimeter and there's not much else. So that kind of answers those questions.

**Media:** Courtney [inaudible].

[Inaudible] made yesterday regarding [inaudible] areas. How, what analysis is going on right now to look at what training infrastructure there will be for the operational [inaudible].

**Lt. Gen. Kwast:** The question, if you didn't hear, is how are we doing analysis to accommodate the growth required to move in the direction the Secretary and the Chief have articulated. The answer is that research is ongoing and always continuing. If we grow there is a logistics tail to that so we require more people

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and more money. As the Secretary's analogy, as the [first] gets more powerful it requires a little bit bigger muscle behind it to move it, and we are that muscle.

So there will be incremental increases in Air Education and Training Command to accommodate the larger production requirement for the force.

**Media:** And is that [inaudible]?

**Lt. Gen. Kwast:** Oh, it is. Absolutely. We are always doing excursions to explore if we need to get bigger, how do we do that? A few years ago, for example, we went through an exercise to say what if we were asked by the country to double our production? How would we do it?

So we go through those excursions all the time. This will be nothing more than once we get congressional approval to actually move in the direction the Chief and Secretary have articulated, then we will have the analysis that we can say okay, if we are going to increase this much this next FYDP, here's what we'll need to be [inaudible], and that lay-down is later, across the entire enterprise. So it's not a simple conversation. It's fairly complex. But the analysis is there and we've been thinking about it for a long time.

**Media:** [Inaudible].

Can you talk about how the [inaudible]? And how does that [inaudible]?

**Lt. Gen. Kwast:** Artificial intelligence, and I'll add to it, virtual reality, and augmented reality as well as supercomputing. These are all tools that have evolved dramatically over the last three or four years. All we're really doing is taking a look at some experiments to see whether these new tools can accentuate the speed and effectiveness of the human adult mind to learn a skill, a task, or anything.

So that's really what we're doing, is we are exploring. And we're looking at the data. We're actually allowing our students to explore with these tools of learning, and measuring what's going on in their brain, what's going on in their body, what's going on with the effectiveness of them doing the job we're trying to teach them to do.

And once we're done with these exploratory beta tests, then we

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will have some recommendations based on the data for our Secretary on what it might mean for second and third order effects. You know, what can we do with it?

So we aren't at the place where we can say what we can do with it yet. We're at a stage where we're exploring and [inaudible] new technology.

**Media:** [Inaudible]?

**Lt. Gen. Kwast:** Yeah. So the data is very promising that we can accentuate the adult human brain to learn faster, better, and I'll say more sticky, meaning that when you learn something you remember it longer and better. So the data is clearly showing that there's some potential here.

I think by next summer we will be done with some of our beta tests here, but this is, I would call this Learning Next. Okay? This is about every skill set in the Air Force. Whether you're a maintainer, whether you're a cyber expert, whether you're a defender, whether you're a pilot. It doesn't matter. It's about a human being learning a job, and the question is whether you can use the technologies of our age in new and novel, useful ways to accentuate that learning. And that requires really understanding how the human brain learns, and having the data to see the relationship between the learning environment and the effectiveness of doing the job.

**Media:** Can you give us some examples of something that makes [inaudible]?

**Lt. Gen. Kwast:** Sure. Here's an example. Right now as we are using augmented reality and virtual reality and artificial intelligence coach to allow pilots to go through the mental habits required to be good at flying the aircraft and we let them do that many, many times before they fly it for the very first time. We're finding that that very first flight is much more effective than doing it the old-fashioned way where we had only maybe one simulator and the simulator was not very good to simulate all the things they were going to need to do in the air.

So the digital age we live in, it's getting less and less expensive to be able to create an environment, a three-dimensional environment, to really make a human being feel like they are in the real moment. We're finding that that makes the brain learn better and faster so when they actually do the real event they are learning more deeply. So there's an example.

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**Media:** What is the actual data on the relevance of that? Or is that not just a matter of creating [inaudible] a more realistic --

**Lt. Gen. Kwast:** The artificial intelligence is, consider it like a coach. So I'm watching you do the job. And as you're doing the job, let's take a loop. Okay? The pilot has to do a loop. The artificial intelligence is watching you do that loop, and as you pull back on the stick it can tell what you're doing and say hey, you're pulling back too much. Okay? Stop pulling so hard. Hey, your nose is starting to drift to the right a little bit. Keep your eye on the horizon.

So the artificial intelligence is watching you. It's learning from you. And it's learning how you're learning. And it's giving you advice that's helping you real time adjust your learning so that you aren't making mistakes and not even knowing you're making the mistake, and it's not the blind leading the blind. It's an artificial intelligence that is actually adapting to the environment, to the way you learn. And it's coaching you along the way so that you are reminded of what you're doing right, what you're doing wrong, and how you might, it will even suggest you're more of a visual learner or you're more of a text learner. It's better for you to read it first and then do it. For you, it's better for you to see it first and then do it. These are the things the artificial intelligence is helping us with.

**Media:** Lee [Husband] with Aviation Week.

Last week the Air Force announced that they're instituting corrective measures for T-6, and I was hoping you could talk about some of those that fall with AETC's lane.

**Lt. Gen. Kwast:** With what regarding the T-6?

**Media:** They were saying that there's going to be more maintenance done on the aircraft. They also said that AETC was working with industry to --

**Lt. Gen. Kwast:** You're talking about the OBOGS issue.

**Media:** Yes.

**Lt. Gen. Kwast:** Okay. The Safety Investigation Board, which is

actually, what we do is we [privilege] that information so that we incentivize people to come forward and speak truth about it.

It is not fully out yet. So some of those are initial indications. The reality, though, is that we have found things we can do to help the system operate like it was designed to operate. So the deep work that we've done out at Edwards Air Force Base to really find out what is the root cause of why we're having some issues with the oxygen delivery system for the T-6 revealed a whole host of recommendations. And many of them are maintenance related, to just optimize the engineering design of that system to deliver oxygen the way it was designed to deliver. And those will come out real soon, but not quite yet. We still have to take that to our Secretary.

**Media:** Okay. Just because [inaudible] said that you were looking at adjusting the software algorithm in the OBOB system, like that.

**Lt. Gen. Kwast:** Right. And that's what we're talking about. You'll get all those details once it's fully out. But yes, that's one of the things, is to optimize the software so that the system is delivering oxygen at a more consistent rate.

**Media:** Tom [Papamoronis], [Inaudible] Magazine.

How are your efforts being focused on emerging threats such as quantum computing, and there are positive implications that can come out of that and [inaudible] the negative side [inaudible] foundational educational sample. I'm curious how [inaudible].

**Lt. Gen. Kwast:** The way we're tackling that is to first recognize that we live in a very different world today than we did even 10 or 20 years ago. And we are flipping the paradigm of how we teach people to think, so that they are thinking more contextually. And what I mean by that is they are thinking in the context of a mission they need to be doing. It's not just enough to teach someone to be a firefighter. It needs you to teach them to be a firefighter in pursuit of a mission, knowing full well that there will be another human being that is as smart as they are and as clever as they are, using artificial intelligence and some computing capability that we've never had in the environment before to try to stop them from doing that mission.

So it teaches them to think in a competitive advantage way that is a slightly different model than we've done in the past. In

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the past we taught them to be a firefighter and then we put the pieces together and the mission got done. Now we need every Airman to think more strategically about how they stay resilient at doing a job in pursuit of a mission, in the context of an adversary [inaudible]. So we changed the teaching paradigm.

**Media:** Are you starting to plan for a [light attack] training platform? Can you talk about how that will fit into current structures?

**Lt. Gen. Kwast:** We are, and the good news about the art of teaching is that when you have the fundamentals down, in other words, how the adult human brain learns, and how to write curriculum and syllabus and processes that each somebody to do a skill, the ability to take whatever we decide to do with the light attack and then design a program to teach somebody to be good at doing that will be easy to do. So a lot of the foundational work is done. We're just waiting to see what the decision is, and then we will move forward.

**Media:** Can you talk about how much more resources, what personnel effect will that have on --

**Lt. Gen. Kwast:** It will be the same as like with the TX where we take a look at one, how many we're going to buy; then two, how many we need to produce both from our country or other countries. And then that will fold into the calculus of how many more maintainers do we need? How much more ramp space do we need? How many more instructors do we need? So all of those are known cause and effect relationships. So we kind of have to be patient and wait to see what it is we buy, how many we buy, and how many people we want to produce.

Sid, do you have any questions on the phone?

**Media:** Yes, sir. I'll try to make this kind of a two-part question at least.

One thing we've asked before is we've asked about the severity of the physiological episodes. The Navy ranks them from low to moderate severe. We've also asked for a breakout of where these PE's have occurred. What bases. That's part of the question.

The other half of it is that you have said that what you've learned is that pilots have been exposed to what you said were significantly changing levels of oxygen concentration. That

raises the question, what oxygen levels are, what levels are there or what's the mix of gases here? Carbon dioxide? I've heard that you have a pilot who was found to have carbon monoxide in his blood. Is any of that going on? What's happening with the mix of gases that are in the cockpit that you've observed in your testing or research?

**Lt. Gen. Kwast:** The good news is it has nothing to do with the mix of gases. That's all safe and effective. And again, when you see the full report, this report will give you more information than a normal Safety Investigation Board will because there's really nobody that crashed an aircraft that did something wrong that we have to protect. You know. It's a little bit different. So you'll get a lot of the answers to your questions there.

But I will tell you, it has nothing to do with the mix of gases. That's physiology that we know pretty well.

What's new here is the fact that when you fluctuate that oxygen delivery., So the delivery of oxygen and the mix of gases is good. But when there's a fluctuation that's persistent over time. Where it's at, you know, 50 percent oxygen, then it's at 70 percent, then it's at 50 percent, then it's at 80 percent, then it's at 40 percent, then it's 100 percent. It's that fluctuation that we're finding is, the human body, on some days it does just fine with that because the normal mechanisms in your body adjust. But sometimes if you're, and we're not sure exactly why. If you're tired, if you're dehydrated or whatever it might be. On some days a human being will start, that dynamic can create what feels like physiological instances or hypoxia, for example.

So that's kind of what you're going to see when you see the full report and you'll get many more answers. But there's no issue with the molecule mixture or any of those other things you talked about. That's all good to go.

**Media:** And secondly, the severity of the episodes. The Navy I think had a total of maybe [inaudible] levels. And they were all ranked low. There was one ranked moderate because it involved a student. Can you tell me what the severity of your episodes was? You've had dozens of them. And where, what bases did they occur at? Were they all at AETC bases for one thing?

**Lt. Gen. Kwast:** Again, this is, for the OBOGS it's on multiple aircraft. But I will tell you that the severity of ours is very,

very low. In fact when you see the report you'll find that these are extreme outliers with regard to the severity. So you'll see some of those numbers come out. But that's the bottom line take-away is they are outliers, they are minor, but again, our responsibility is to really know what's going on in the physics here, and making sure we are doing everything in our power to make sure we have safe and effective aircraft for our air crew to train in.

Again, the details will come out in that SIB report and you'll be able to publish them at that point.

**Media:** Who's going to win TX?

**Lt. Gen. Kwast:** Let me give you a definitive answer on that. [Laughter]. I don't know.

**Media:** Now that the first F-35 squadrons are getting their first pilots, what feedback are you getting from the operational squadrons that might impact the training pipeline?

**Lt. Gen. Kwast:** That's a great question. What we're finding and what we are folding into our training is similar to what you were saying, Tom, and that is that a pilot ten years ago in a normal air superiority fighter or air to ground fighter, as a new wingman really didn't have to think like a mission commander. They didn't have to think like the leader of the entire multi-domain order of battle.

But in the F-35 because of its power to be able to see the photonic spectrum and the electromagnetic spectrum, every pilot coming in from day one is acting like the mission commander conducting the entire strategy for the campaign. Because they will see things that others cannot see, and they will make decisions on who should take care of what. This should go and be taken care of by the Navy. This should be taken care of by the Army. This should be taken care of by 4<sup>th</sup> Generation fighters. I'll take care of this.

So it's a different way of thinking as a youngster. Normally we take years to grow somebody into that kind of cognitive complexity to be able to do those multi-domain order of battle decision-making strategies. We need that on day one. And the good news is young minds are capable of learning that pretty darn fast. And that goes back to artificial intelligence, supercomputing, virtual reality, and augmented reality where we want from day one to be teaching people to be thinking about the



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pursuit of that skill, being a pilot, but in the context of a mission where they're having to make strategic decisions from the very get-go, and we don't do the stair-step approach.

The stair-step approach is more an industrial age model when we didn't have the tools to accentuate the human brain to learn things in context right up front. So we started slow. Walk before you run. You know. Crawl before you walk.

What we're finding, though, is the brain is so much more capable. And anybody who has children knows this. You know, your children are only as limited as your imagination oftentimes. With some limits, of course. A two-year-old may not know ethics, but we still try to teach them.

**Media:** Some 50-year-olds -- [Laughter].

**Lt. Gen. Kwast:** I won't go there. But that's worthy of a book right there.

**Media:** [Inaudible] war game that's going to happen for the first time next month, is that [inaudible] for AETC?

**Lt. Gen. Kwast:** Which war game?

**Media:** The [Doolittle] war game and [multi-domain] operations.

**Lt. Gen. Kwast:** AETC has a Wargaming Institute down at Air University which is really part of an entire network of wargaming capability. So what you find is that every war game has many different participants because what we find is that diversity of thought and the diversity of tools that are used to really have people be able to think through --

[End section 1]

**Media:** -- understand the space for the electromagnetic spectrum or cyber or under sea or land. And what we're finding is in the 21<sup>st</sup> century with the complexity of the world the way it is, and the interconnection of all of the data and of the information, whether it's warfighting or our economy, teaching our young how to think holistically and systemically about all the interconnected parts is a really important part of the educational foundation. So that is how we're doing it, is we are starting younger.

It's called [chunking] the education, meaning we are breaking the education into small micro-learning bits. We are putting it into an ecosystem where the Airmen have access to their education on command, on demand, and they are learning something every day. And it is connected with a broader picture of how the world is put together, how, and it starts with how is air power put together, and how does my job fit into it? How does air power fight into the joint fight? How does the joint fight fit into the interagency fight for whole of government? And how does that fit into the coalition fight with our partners and allies in order to do things in this world that uplift the human condition and avoid conflict?

We are teaching that at the foundational level for every airman. A firefighter is going to learn that. Not maybe to a degree that the National Security Advisor to the President will, but at the level that's appropriate for their skill and their contribution. Because in this world everybody needs to be thinking holistically or their action might decouple something bigger. It's the tactical lieutenant that becomes the strategic lieutenant because they make a call that becomes a political problem for our President because they weren't thinking about the bigger picture. We're teaching them how to think about the bigger picture.

**Media:** Given what you're saying, sir, about the F-35 pilots, I'm wondering if the Air Force by the light attack, you're going to have maybe not, I'm wondering, are you going to have sort of a gradation of --

**Lt. Gen. Kwast:** No.

**Media:** -- training to?

**Lt. Gen. Kwast:** No. This is again, breaking the model. Okay? So what we're finding, and this is part of the data back to your question. What we're finding is that if you teach the fundamentals of being a strategic operator of information and technology. The plane is one of the pieces of technology but the sensors that are feeding you information.

So if you teach this foundation of being a decision-maker, a fuser of information to utilize a piece of machinery to do something useful for the country, that it's pretty easy for the human being to adapt to whichever platform they might be flying, and that you can use just about any platform to teach the other cognitive skills required.

The example I'll give you is a test pilot. A test pilot learns how to think about aviation so that that gal or guy can jump into any aircraft after just studying the pamphlet for a few hours. They can jump into any aircraft and they are generally a master at operating that aircraft because they learn to think a little bit differently about the holistic, universal principles of the mind to operate a machine that has certain common habits required to make it work right. That's really where we're going with this fundamental paradigm shift.

So we teach a person to be a great aviator. They can fly a light attack, a TX, an F-35, and you start getting a common operator that can fly anything.

In the past, we optimized, where if you're an F-15 pilot, that is all you're going to ever be able to do because it takes so much dwell time to be good at it. We're moving to a different paradigm.

**Media:** I guess the sort of ancillary question to that is, do you need majors and colonels then flying? Or are they actually sort of got too much baggage from their earlier experience? It all sounds as if you're saying you can sort of create these younger pilots as more effective warfighters with the technology than older folks might be.

**Lt. Gen. Kwast:** I would phrase it this way, because I'm one of those older pilots. But I will say that over time you gain those sophisticated skills. Over time.

So I can lead an armada of aircraft with the Army and the Navy and space into a fight in Afghanistan where we're triangulating many different pieces of information and/or, you know, if it's a war game or Red Flag, for example. That's over years of building block approach of how to do it.

**Media:** So you still do need that for the larger --

**Lt. Gen. Kwast:** Absolutely. Absolutely. This is just actually finding that the human brain, given the right tools. And many of those tools didn't exist 20 years ago, but the human brain, given the right tools at the early ages, can actually get up on the step of being good at that higher order of cognitive place faster, and that's going to be one of the keys. It's basically, the team that learns faster wins. That's what we're getting after.

**Media:** The Air Force is getting ready to buy a couple of helicopters that will be replacing the combat rescue helicopter. Can you talk about what you're doing to prepare to train people for that?

**Lt. Gen. Kwast:** It's essentially the same answer. What we're doing is we're looking at the data of what makes somebody good at doing, being a master of a certain job. Let's take a helicopter pilot. What is unique about that data and the mind, and how do we accentuate that in the mind of the youngster coming in, in order to be a master at doing that job?

And so it applies to anything, from helicopter pilot, fighter pilot, mobility pilot, firefighter, security forces professional, cyber professional. This is about the data where I can see the master person doing the job and I see what's going on in the brain and the body, and I can map[ that to the talent I want to bring into the Air Force. So [PB] Levitt back there, General Levitt, is our recruiting commander, and she is part of this ecosystem where when we can see what's going on in the human mind of a master at doing the job, we can map that back to see that common core in the brain of a youngster and we can say you're going to make a great fighter pilot. You're going to make a great intelligence officer. You're going to make, so on and so forth.

So it's the same methodology that can be applied to any job we need the Air Force to do. And the reason we're moving to this is for the agility so that when there is a job we can't even envision right now, in five years from now there will be a job the Air Force is going to need to do and we don't even know it exists yet. Because of the speed of change.

I want a methodology of learning where the moment I see I'm going to need somebody good at that, I can teach them to be good at it. And this gives us kind of that universal Rosetta Stone for how the adult human brain learns, and I can apply that knowledge to the learning of any skill.

**Media:** Over the summer there was a little bit of chatter about spinoff experiments that we're going to have out of Training Next. And I was told that they were going to start sometime in the next couple of months. Have you started those yet?

**Lt. Gen. Kwast:** We have, and I'm going to let some of the folks that are here talk about that. But basically, what we learned in the first beta test, we are applying now at the Air Force

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Academy, for example. Simulators that are actually taking a look at the data of people that are not yet pilots, to see which ones would really be good at it based on the data we got from the first beta test, and that will fold into the second beta test starting in January.

The other spinoffs are some of the technology in these tools of learning, we've been giving to our place where we teach instructors how to be instructors, and we're giving it to our pilot training bases.

So a new pilot going to Vance Air Force Base in Oklahoma is actually getting to tinker with these tools. So those are some of the spinoffs.

What I have is, I have General Sears here, General Spangenthal, General Levitt and a number of others who, and in fact I'll point out [Gay Gerrington] and Justin Chandler. These are people that are deeply knowledgeable about these issues and they can help talk to you about them since I have to run.

But I don't want to stop this session because these questions really get at the core of these three paradigms that we're breaking, if you haven't already noticed.

The first paradigm that we're breaking, that we're, these are paradigms that were in the industrial age that we're breaking for the 21<sup>st</sup> century.

The first is a paradigm that time is a constant. You know, forever and a day, it's taken a year to teach a pilot to be a pilot. Whether you're good at it, bad at it, or average at it, it takes a year.

I want to flip that and say time is no longer the constant. Competence is the constant.

So when you have learned to master the skill, you can go to your squadron and start being a part of the fight. You don't have to wait a year if you can do it in four months.

Second paradigm, in the past in the industrial age when you come into the service, we tell you what to learn, when to learn it, how to learn it. I'm flipping that so we give you tools now. You get to learn what you want to learn, when you want to learn it, how you want to learn it, and you have an artificial intelligence coach that helps you, and then you have a human

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coach that validates that you can actually do the job. And we measure performance of the job not whether you do the assessments well. So that's the second paradigm we're flipping.

The third paradigm goes to Tom's question. The third paradigm is we aren't just going to teach you to fly a T6. We're going to teach you how to think like a mission commander in pursuit of an objective, a goal. You happen to be using a tool. Called the T6 to do that. And that's a very different paradigm than in the past where we just were teaching you to be good at flying the T6. If you were good at flying the T6, you graduated. We want you to be good as a strategic thinker in the context of the mission. That's the third paradigm we're breaking.

**Media:** Do you think you're moving towards a standard bank of avionics and [inaudible]?

**Lt. Gen. Kwast:** We'll see. So this is one of the things where we're going to explore that as we go forward, but we first want to have some confidence in this data and then when that confidence and hopefully by next summer we've got, we can go to our Secretary and say this common allows us to redesign the learning paradigm, and here's what we think we're going to do. So that will happen,

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