

PTN Panel Video Q&A transcript

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Q1. So let's talk about learning next, where else can we be using this? Your training and your education experience goes throughout the Air Force. Can we use this with maintainers? Can we use this in other places, such as with the RTU's and flying training units?

A1. (Kwast) So what we were trying to do is look holistically and systemically about this problem. Because we have a problem not just with production, we have a problem with absorption, meaning how quickly can you experience an aviator to be competent at the job they are asked to do. And then of course the retention, which is are they happy doing their job. Are you happy doing something great for your country? Doing something you love in pursuit of that. So these things apply to all of those elements and as we looked at it holistically, we discovered these paradigms, and I only mentioned one of them to you in the opening statement, and that is time is the constant. We are trying to flip that so it's not just time is the constant, it's competence is the constant without losing your eye on the acculturation and the thing that makes you different from an airline pilot in pilot training. But to get at the second and third paradigm really gets to your question.

The second paradigm is, in the industrial age and in time memorial, most military people know this, the tools we had when we had a massive society having to go into World War II required certain human capital, behaviors and paradigms. One of them was, you come into the military, I'm going to tell you what to learn, I'm going to tell you when to learn it, and I'm going to tell you how to learn it. And if I don't tell you to learn it, you aren't going to learn it. And if you ask why, it's because I'm your boss. And we want to flip that paradigm, you can learn whatever you want, whenever you want to learn it, however you want to learn it, and you have some artificial intelligence that helps map how you learn best and adopt and adapt the environment to your propensity for learning to see how quickly you can learn and learn the mastery of something. But that paradigm is without losing the eyeball to eyeball contact with another human being which is one of those things that research shows you do not want to lose. So how much eyeball to eyeball contact do you need? Is it one instructor to one student or could it be something else is the question to ask. So that second paradigm of giving control to the learner with the tools of our age to say how fast can you learn what you need to learn? And you can learn anything you want to learn, any time you want to learn it, and in any way you want to learn it.

The third paradigm is, we stop teaching a skill. For example, right now when you go to pilot training, we teach you to fly a T-6. That is not the right thing to teach. All you have to do is look at the F-35 pilots out there. The moment they are a wingman in an F-35, they are not just [break in answer]. An F-35 pilot gets to the fight and he or she does not do what a fighter pilot did 10 years ago. They are immediately 35 miles away from their lead and they are seeing the photonic and electronic spectrum in ways nobody else on the battlespace can see. They are making decisions on grand strategy and order of battle and

they are saying, this I'm going to hand off to the Navy. This I'm going to hand off to the patriot system. This I'm going to hand off to 4th gen. This I'm going to ignore. And that I'm going to go after. That kind of strategic thinking where they are thinking like the strategists is something we need to start early. And we can. It's like all of you who have kids. They are only limited by how much you limit them. The human brain, the 18 year old to 24 year old brain, is capable of learning the holistic, systemic, strategic thinking. So everything we do, whether it is a cop, whether it is a battlefield Airman, whether it's a maintainer. We are going to teach contextually where we are teaching you the skill is secondary. You've got to be a master at it, but it's secondary. You are learning the skill in context of a mission and a goal against an adversary that is going to kill you and try to stop you. That adversary is as smart as you are, and they are as clever as you are, and you have to outthink them in the pursuit of your job.

That is a very different paradigm than the paradigm we did in the industrial age. So we are breaking all three of those paradigms simultaneously, and we are doing them not just for pilot training. This one just happens to be one of the latest crises, but actually, I would tell you our maintenance crisis is worse than our pilot training crisis. The foundation of logistics is more important to the tip of the spear of lethality and readiness. So, we have 4000 new maintainers, but they are all 3-levels sitting in the snack bar waiting for the one 5-level to show them how to do the job. Unacceptable. So the virtual reality and augmented reality where that 5-level can put on a set of glasses, and every 3-level can put on a set of glasses and go out and see the jet, and the artificial intelligence can say, that is the tire you want to change, there's the first bolt, here is what the tool looks like, here's the T.O. And if they do something wrong, it turns red and that 5-level can come over and say, here's how you do it, son. Or, they can look up the YouTube video of the master teacher of changing a tire, that they can see how to do it. Oh, by the way, here's the technique the T.O. doesn't say to make sure you don't strip the bolt.

You can see how learning next applies not just to these three paradigms as we are taking them through tech school without losing the acculturation and the cultural piece of this that makes them a war fighter, not just a maintainer. But also the execution of the job where these tools of our age can make a workforce more powerful at getting a job done. And maybe, instead of having one instructor pilot per two or three students, you can have one instructor pilot per 10 or 20 students because you have trust in the data and in the ability for the individual to teach themselves. So the real gold here is in the rest of the force. This is just the tip of the iceberg in pilot training. So I think that gets to your question.

Video timeline: 17:26

Q2. We've obviously been doing pilot training a similar way for quite so many years, how is innovation and culture key in this? And how do you change that, especially down at the squadron level?

A2. (Strohmeier) I think what we have seen, at least in the 560th is that, whereas the time horizon that a staff would normally operate on, when we talk about change, would be on order of months or years to inculcate a real change. Often that change is just evolutionary instead of being revolutionary or transformational. So what colonel Chandler and I have found, I think, is that giving your Airmen the opportunity to accept some risk, to explore and figure out what works to making, in this case, better instructors, and doing it at the squadron level, where you are directly at the mission, it really allows you to change your time horizon to on the order of hours and days where you can make that change happen and be able to continually innovate.

(Chandler) I think something we both experienced, and really the whole team, is that change is difficult. The cultural aspect is very important and can be as much a barrier as anything else when you try to do

something like this. We've been doing things a very similar way for decades and breaking that paradigm is difficult. What we have tried to do is really bring in that experience, rely on that expertise, and find a role they can be involved and a part of the process. Then they own it and they have that proud sense of doing something different and getting us to a point where we are better than we were before. That's something that is a daily challenge and something you can never lose sight of.

Video timeline: 19:44

Q3. How are the lessons learned from Pilot Training Next affecting the T-X acquisition program? Have you started looking at the T-X [inaudible] of this new program?

A3. (Kwast) This is the power of this model is that this applies to learning in anything. The fact the T-X will give us more agility and flexibility to learn in more and varied ways and reprogram that learning for new environments that will evolve in the future just accentuates all of this. The T-X will fit perfectly into this modality of learning because it really accentuates the human piece of taking a machine and using it to learn what you need to learn. And there's two points I want to make because I know there will be questions on these and these are really important points.

The first is the idea of risk. We are not taking any risk to mission. We are taking risks in places where we can afford to take risks because we have so many nice safe guards in place to make sure the human being is safe and effective. We talk about the fact there is no innovation unless you are willing to take risks, but when we talk about prudent risk, the organization's that are good at taking risk are the ones that know the difference between mission risk and risk that is affordable. So you can afford to fail. But you're really not failing. What you are discovering is what really doesn't work. That speed of discovery allows the adaptation.

The second piece of this is the innovation piece where...the leader of the organization, this is innovation 101, but the leader of the organization, whether it's a tech sergeant who is a front-line supervisor for the team, or whether it's the chief of staff of the Air Force. The only way you can avoid the bureaucracy for killing a new idea, because of the cultural realities of human beings and the organizational dynamics, the only way is for the boss to straddle the innovation piece with bureaucracy and be the adjudicator of what risk is reasonable and what risk is not. Otherwise, if the leader subjugates or delegates the authority for innovation down even one level, the bureaucracy will eat it for lunch. That's just the nature of organizations. It's not a bad thing, bureaucracies are required to perpetuate what works. But if you are trying to find a different economic curve, if you are looking for the game-changers, then you have to straddle this. Then when you see something innovative, then you pour it into the culture of bureaucracy, and you repeat, and rinse and repeat.

Those are the two principles I wanted to acknowledge upfront. The way you take risk is the key, sauce, the magic to make sure you are doing it right. Then the behavior of how you manage innovation requires the leader to actually take the risk or it will be consumed by the culture, which was the source of the question.

Video timeline: 23:10

Q4. How do you write a syllabus that's adaptive?

A4. (Strohmeier) When we started in the pilot instructor training aspect of this, and I know Slew has experienced a lot of this as well, we just kind of said, what are the capabilities we want in a pilot or instructor that can dominate in a peer-level conflict? We started, honestly, what would a conflict with China or Russia, look like? We said, it's going to look like an Airman that is often detached away from higher headquarters, often executed off of mission-type orders, with a significant numerical overmatch against them. They are having to be able to take, not only tactical risk decisions but they are having to make operational risk decisions. When we looked at our typical syllabus, we said, that syllabus isn't built to test whether or not somebody can do that. That syllabus is essentially spoon-fed from day one and is very directive and descriptive in what they should be doing. We started looking at that and as we continued to progress we hoped to get to a syllabus that is tailored to each student, that is really student-led almost, and it has a list of capabilities that get to that ability to operate inside of peer-level conflict that tests things like, what is that student's ability to seek solutions? Or to adapt inside a complex situation? Those are the kinds of things that we are working towards what this looks like in the future that we are looking at.

(Vickers) In many ways, it's competency based, not just task based. Right now the current pilot training syllabus we have C5102. It's a contact ride. You do a X number of contact events in it...take-offs, landings, emergency procedures, aerobatics...and most instructors in the room will know before you walk out the door the common student errors, and probably have the grade sheet half written. But you are going to go through that sortie because that's what was prescribed. To get away from that, to be more adaptive, what we did for iteration one was to pull out all of the knot holes that we yank people through in the syllabus. We took the tasks and the standards, those are constant, T-6, T-1, T-38 and IFF, we pulled those out. We took the tools, which is the T-6 and the immersive training environment that we put together, and the instructors and students, we put them together, and said, go. Just, see what you can do. Not a lot of structure. Feedback from, learning from, iteration one, it helps to have structure early on. The students desire structure. They want to have, instead of a having a wide menu of options to go do anything, they like to just have a couple things. What's going to help me to learn the most, first. The structure has provided some of that, so we are going to lean into that. I think to truly get an adaptive syllabus, you have optionality in it. So when you start out, instead of being directed what I have to do, I have a menu of options to choose from. Not just within category, contact, instruments, formation, but across category as well. I want to test myself. And you can begin that in the immersive environment. I can have optionality. I can learn more about individuals when they make decisions, and I am tracking the decisions. I understand what types of decisions they are making and start learning why they are making those decisions. I can learn more about those individuals and we can tailor the environment to them.

There are two things we are trying to do, two loops we are trying to close. An adaptive training experience. We closed that loop in V1, I can describe that to you if you want to stop by after. An adaptive training experience while in the execution of training, the environment adapts to how you are performing. The next thing we are going to try to get done in iteration two is to fully adapt the syllabus so the next event is tailored to your performance on your previous events, multiple events. It's prescribed for you, some options, a menu that you have, to pursue and what is available to you based on your previous performance. As you progress, you design your own path through the syllabus to the point where you get all the tasks mastered, and we have the data to prove it, and you graduate with a

certificate showing all the things you mastered. But your experience would not have been the same as the same person in the class next to you.

Video timeline: 27:20

Q5. What do you see in the challenges or headwinds of doing this? Is it overcoming the cultural changes? Is it finding the resources? Is it overcoming the acquisition program or finding enough instructors? What is your biggest challenge?

A5. (Kwast) Part of it is just reassuring people that we are not reducing the standard. In fact, this is the pursuit of excellence where we can actually map the assessments of a person. So when somebody in civil society comes in, it's not enough for them to say they want to be a pilot. They have to prove to us that they actually have the magic sauce to make them a good pilot, and then we give them a pathway to excellence. We don't accept anything else. So this fear is that we are really going to do damage. The fear that this world-class system that we designed in the 50's, that has produced the best pilots in the history of mankind, will be degraded because if it ain't broken, why fix it? All we do, is have too few pilots. Just build a couple more bases and we'll be fine. For me, that has been the hardest part. Reassuring the Air Force that we are not going to take risk that's reckless. We are not going to diminish the quality, we are going to increase the quality. But we are going to explore what the boundaries are. If you start with a clean sheet, and ask the questions of what assumptions have we built this upon, and you test those assumptions. If we can produce more pilots, that are better than we produce today, and if we can do it at cheaper price points and in less time, think of the implications of that for everything we do. If we can do that across every skillset, now the Air Force can learn faster than any other Air Force and we can adapt more aggressively than any other Air Force. And that, spells victory.

Video timeline: 29:31

Q6. Are you going to have to do additional screening or more rigorous screening? Is that going to be more helpful in any of this? Are you looking at medical qualifications? Are you looking at flight experience?

A6. (Vickers) For the first iteration of students, there is a current selection model for pilot training. They take the AFOQT, the TBAS testing for the pilots with previous flying experience. They combined that into a metric and that is your score. There is a minimum cut off and if you are above that, then you get to go to pilot training. So that is the current system. We leveraged some other talent selection. We are leveraging, it's a holistic psycho analysis, kind of, personality testing, cognitive testing to get a full sense of what a human being provides. Then we will tie that into the data and see how that correlates. The idea really is to find those key things that work together to create winners in the environment and produce an environment that tests those and allow them to start learning earlier. Allow them to compete earlier and prove they have what it takes at an earlier time. Selection is a very important part of this and our first one was, all right. I would say it's inconclusive. Right now I can talk offline if you're interested in what we did and what we learned from it. We have some high hopes for the second one. We have a different process we are going through as well.

(Kwast) So I know on this panel, we have the guys that are really working the pilot training piece of this but, I want to remind you that this is really a holistic look at the learning of the force, the development of the force. (The commander) of the Recruiting Service is here and that's really where this is all going, and here is what I mean by that. As they are capturing the data of what makes someone really good at

this, and we continue to capture the data of the master F-35 pilot, the master C-21 pilot, the master of any skillset, the master firefighter, the master mechanic, you can actually see the data of what is going on in the brain and the body for these world-class athletes both cognitively and physically in any job. You can see that data. We measure all kinds of things from your heartrate to your pupils. You may not know there are 3500 little muscles in your pupil and the windows are the eyes to the soul. As they are measuring this, if I have this little sensor in your goggles or in your helmet, I can see what is going on in your brain by what is going on with those 3500 little muscles in the iris. For example, if I put these on you and I say, lie to me. I can see the data of what happens of those 3500 muscles in your iris. That is what lying looks like for you. And now anytime you lie to me, even if you're trying to deceive me, I can tell your lying because we are such vicious creatures of habit, you can't control your iris muscles from lying to me. In addition to that becoming the new polygraph test, I can use it in Jeannie's world to weed out people who cut corners. Weed out people that deceive. Weed out people that will tell a lie if they think nobody's going to catch them. As I design these games to really see what people have in their attributes, their characteristics, their qualities of character, and their skills and knowledge, you really see now, that you can measure data. What we are doing is we are measuring the data of the magic sauce that makes somebody a master at a certain skill, and it can distill out how much experience or education you have. It goes to the habits of mind. Now you can start assessing, if there is a human being out in civil society, you can tell if they're somebody who will make a good intelligence officer, or a good pilot, or a good mechanic. Now you start marrying up talent and propensity and passion which requirements in the Air Force. You put them on a path to teach them something they are good at. When you talk about retention, there is nothing more motivating than somebody that loves to do something that's really good at doing that something and you are accentuating them being a master of what they love to be good at. Believe me, that is retention right there. And then the acceleration of experience, the absorption. Where these tools, where the individual now has the visibility into the data, kind of like CON academy, where I can see where I'm good and bad, and I can practice the things I'm bad at, and I can build on the things I'm strong at. Now you give the tool of that data to the individual, and this is a continual loop so we can scan civil society for anybody that wants to be in the Air Force. If they want to be in the Air Force, Jeannie Leavitt can see who is good at what. There may be 100,000 people that have gone in to take these assessments and these tests, and I only need 2000 pilots, I take the top 2000 of that 100,000 and I say, congratulations, you've got the right stuff.

So you see how powerful this can be at the development of the force from it's assessment in civil society through the development of that to being excellent. Not just mediocre, not just good enough, not just as good as any other air force, but truly designing excellence into the force development, and it's for every skillset. For me, that is the key here, that goes beyond...these guys just doing pilots, ok, but this is about Jeannie, and it's about recruiting, and it's about the data. That's the difference in this 21st century, in this information age, that we have never done in the industrial age. We have used proxies, to say, if you have done good on this test, you must be good. If you went to this school, you must be good. And we all know, there are people out there that are great at taking tests, and they are great at writing, but when you meant them, they are a social zoid and they shouldn't lead anybody. It's about performance. It's not about how good you do. It's not checking the square, it's about, are you good at your job. Thanks for letting me connect the dots across the horizon of the human development at being great Airmen and a great Air Force.

Video timeline: 36:26

Q7. What kind of tasks have you discovered are ill suited for augmented reality, artificial intelligence, etc.? I.e. which tasks are still best suited for the human-to-human interaction?

A7. (Frahm) What we look at is human-machine teaming. Computers are really good at rote, repetitive tasks; humans are not so great at that. That is when we start introducing errors and we get bored. What humans are fantastic at, are leveraging your intuition, the guess work, the hair on the back of your neck, the pattern recognition type things. When we use AI in pilot training next, what we have concentrated on so far, is building a tool a student can take home with them to get good at those rote tasks overnight. We can say, for example, here's this AI thing, go home, come back when you know how to do a loop. The AI can go through it and can teach them how to do it really well. When they come in to train the next day, the instructor says, ok, here is energy management, airspace management, communicating on the radios while you are upside down pulling G's, and all the other stuff we are trying to do. When you think about it, you really aren't doing many loops, it's not really a thing, but it's about how you think when you're upside down and you're under stress. That's that higher-level task that we want to free the instructor to really concentrate on. I think we've had a lot of success with that.

(Chandler) I think something these tools allow, is that deep repetition learning. If you're familiar with that system 1, system 2, type learning, if we can get a student pilot exposed to a certain task 50, 100, 150 times, whatever it takes for that to become, just, second nature to them, then the time in the jet is more effective. It's not that we are just cutting time in the aircraft, we are trying to be more effective with the use of that expensive aircraft that we're flying. Use that fuel smartly. It's really just another tool that allows us to get a student to a level of efficiency and expertise before they even get to the jet. That first flight is going to be more meaningful, they'll get more out of it and it is a more effective use of that time.

(Strohmeier) I think a tangible example of this, for myself, I'm an F-15 guy by trade, and the first time I ever flew an ACM – Air Combat Maneuvering engagement in an F-15 was the first time I ever saw ACM. I had never seen it before that and because of that, that first flight, I was pretty terrible at it. Think about, if instead, having to only get three reps of that in my initial B course in an F-15, if instead I could have seen it like 30, 40, 50 times using a cheap set of goggles, I could have heard the comm, I could have seen the line of sights, I could have seen the habit patterns that I was going to practice in the jet. That part task training happens on the ground so when we get in the aircraft, the instructor can then focus on the higher-level learning. He can get that student to a higher level of proficiency that we need to get them to, so we can compete on the level these guys need to compete on.

Video timeline: 39:50

Q8. How will the evaluations or check-ride requirements change?

A8. (Vickers) Recognizing what we are doing in Austin is about to be scrutinized, I wish this was my idea, our instructor pilots recognized the fact it was going to be scrutinized, so they kind of upped the ante. We had two check rides in pilot training next for this iteration. Check ride number 1 was not just a contact check ride. It was a basic instrument check ride with some basic formation, two ship out to the MOA, and then contact elements as well. Their final check ride, was an out and back, two ship, tactical formation to an out base, replanned, two ship, tactical low-level, for the RTB to multiple instrument approaches to include holding and a full penetration. Holy cow, what a (inaudible). That is a lot to ask of these young guys and they did it. In part, because they can hop in the sim and practice the night prior.

They get to hop in there and look at the bases. They get to go fly the low level and train to those specific tasks, so we want to introduce some uncertainty in it. They knew which low level they were going to fly, they get to go out and practice it, so that helps. But what does check rides look like in the future? When you have the data and you are sitting on top of it already, you can maintain a high level of proficiency with routine because there's no uncertainty any more. I can know when someone flies an ILS, what type of ILS it was, was it 15 knots of cross wind, turbulence and all sorts of challenges in the environment. And the guy did pretty well. I know this individual performed well and I can have a higher certainty of the overall quality of my force because it is all there already, and the information is there. What does it look like for check rides? I think there's opportunity to change the way we think about it, for sure. What will it manifest is up to leadership itself.

Video timeline: 41:56

Q9. How does industry play in to this, general? The Air Force's challenge with resources. How does industry help? Are you looking at using them more and possibly contract UPT?

A9. (Kwast) No, industry is our best friend. They do whatever we ask them to do. Our job is to be strategic about what we ask them to do. For example, as I talk to companies that do simulators, a cheap, off-the-shelf, we have 1.5 simulators per student. Yet, so, we ask for what we need here, industry will give us. They are innovative, they are creative, our job is to define the problem we are trying to solve and let them compete with one another to give us the most efficient use of the tax payer's money to achieve the outcomes we are trying to achieve. One of the insights for industry to recognize out of this is the transference, meaning what the brain learns in a virtual reality environment, or an augmented reality environment, and what they can actually do in the air, is pretty damn high. Meaning a simulator does not need hydraulics to have the brain learn what it needs to learn. It does not need high tactile, meaning that the rudder pedals are the exact same metal and the exact same feel as the actual jet. Your finger doesn't even have to hit the button, even though it is good for your muscle memory to actually move over and touch a virtual button, but it doesn't have to feel the button. Your brain does that transfer in genius ways, it's kind of the cave man in all of us that we are really good at the tactile. But your brain needs more reps cognitively. So, when you optimize this, you can have a very cheap simulation, especially with some of the AI coding that is happening now where it is really cheap to code the kind of environments where these kids learning to fly can fly an F-22 right now, then I can fly a C-21. Then I can fly a CV-22 and I can fly a KC-46. They're doing CREW, they're doing single seat, they're doing combat missions, they're doing complex wave forms... They are all over the place. They can learn anything they want. That's pretty cheap and easy. So, talk about disruptive to those companies that are building these massive anchors called simulators where you can only teach one student at a time, you know, a thing of the past. Industry is going to have to move as fast as we are, our job is tell them what problem we are trying to solve and let them go after it and give us the cheapest way to solve that problem and they are going to be competing with a lot of innovative companies out there that are disrupting the entire market of learning.

(Chandler) I would offer that something we benefited from is the commercial sector had this technology out there without us doing training using it. Everything you see down in the ballroom, if you have a chance to go by the booth or up here, is commercial off the shelf. That kept the cost low for us and allowed us to get a ratio that we haven't seen with our traditional simulators. At this point we have just been able to leverage the gaming market that has been driving the acceleration of virtual reality and gaming laptops and gaming PCs. That's allowed us to accelerate this process.

(Frahm) I think the other key piece to this, we found an opportunity in collapsing the cost of the simulator, but the opportunity was enabling learners to learn on-command and on-demand using these devices. We, in the first iteration, carried it probably about 70% as far as Air Force expertise and training pilots can carry it. It's increasingly becoming a technical task to carry the next steps. I think there are emerging opportunities for industry to come and contribute and what we are offering in Austin is a place where we can work collaboratively to do exactly that. Because this is a small program and we are trying to keep it lightweight, we have been really aggressive in ways we can use the existing far base rules and other vehicles that are available to us to bring industry in. We've been relying a lot on cooperative research and development agreements. We've been very aggressive about entering into those and giving access to the data set with a huge data stream coming off of these devices, and we haven't really quite touched on that yet, but these are data collection devices masquerading as simulators. We are capturing every piece of interaction between the student and the simulator. That creates a rich opportunity for people who are looking to develop those apps that are going to be debriefing tools or scheduling tools or all the other things that you need around pilot training to run an effective training center. We think, fundamentally, if you develop that product inside something like PTN, you have developed that product that can go towards the rest of the Air Force potentially, or certainly to outside opportunities, away from the Air Force, for how to train pilots better.

(Arrington) It's definitely been a credit to the culture that's been cultivated in allowing Air Force leaders at the squadron level, captains and majors, that are really getting after some of the toughest challenges to go out and talk with members of industry and allowing squadron commanders to fund those TDYs to go and talk to industry, big and small. Really cultivating that learning environment that's continuing to progress this knowledge forward.

Video timeline: 47:48

Q10. General, I would like to wrap it up with one last question. You had your first class of pilot training next start in February, graduated in August, well ahead of the traditional timelines for the classes. I was wondering if you had anything you didn't address today. Did you meet your intended goals and are there any other lessons learned that weren't addressed?

A10. (Kwast) There were a lot of lessons. So, this small panel just scratches the surface, so I'll share one with you that I think is really important to recognize and it's another paradigm shift, but it's on the instructor side. This also reveals a different way of teaching. Just like an instructor pilot might teach a little bit differently than a weapons school officer. It's true they have discovered they need to teach the students differently and that different way of teaching actually accelerates the learning of the student. We can get further into that, but any, I know when I became an instructor pilot in the F-15 and then I went off to weapons school, it was a totally different model for teaching. Much more sophisticated at identifying the human brain you are trying to connect with and communicate with, and finding adaptive ways of reaching that brain, and teaching it within the context of strategic thinking and critical thinking. The same is true here. The model we have tends to dumb down the potential of the human brain to learn in the traditional sense and we want to explore how aggressively someone can learn as we move forward. The other thing I'll tell you is this is like any other innovation 101 project where you discover new things by carving a small group of the right kind of personalities out of the bureaucracy, and you give them freedom and top cover and money, and you trust them, with certain boundaries so they don't risk the mission. They take risk with discovery. Then you get to a place where you can trust the data, trust what you have learned. And then you put it into the bureaucracy. If it is novel and useful, which are the two defining characteristics of innovation, and if it's novel, meaning it's different, and it's useful for

people to do their job, then the bureaucracy will generally adopt it. And eventually it will become part of the cultural paradigm and the bureaucracy will be repeated. And then you repeat.

What we are going to do is the second beta test because we are not at a place yet where we have confidence in the data to be able to go to the secretary of the Air Force and say, madam secretary, chief, here's the data and here is what we think it means for the business case of learning. But by next summer I think we will be there. Then, we will pull that into our model for learning and force development and it will probably drive talent management decisions. But this perpetual innovation machine will continue doing other things 'cause this is only one problem we've got in AETC. This problem of learning is only one problem we have. I've got problem of visualizing the financials of the organization so every dollar maps to mission accomplishment, strategy and the national defense strategy. I have problems of... and the accountability and auditability of that where I am managing my resources with precision. I have problems of data knowing what's going on in this continuum of learning for every individual. So you can see that this is not going away, this happens to just be one of the first projects, those projects are all over AETC. You go down to second Air Force at Keesler Air Force Base, take a look at what they are doing with cyber training down there, you'll see the same ear marks you see with this panel, here. Or you go to Shepherd Air Force Base and look at maintenance training, you'll see the same ear marks. You go to Vance, they're doing it at Vance. They're doing it at Goodfellow, with firefighters. So this is really a perpetual journey to tinker faster and learn more aggressively than... and get on a footing where we don't just learn something and pour it into our system and then say, we're good for another 70 years. It is a perpetual footing of adaptation where we are never happy with the effectiveness of today and we are always having a small group exploring every problem statement anybody has. Where when an individual Airman is frustrated at doing their job, there is somebody out there, outside of the bureaucracy, aggressively discovering what industry can bring us to be better.

That is different than the industrial age model of the Air Force, totally different. It's a different mindset. For every Airman coming in saying, I have to take responsibility for my own development, and if I'm not aggressive about learning what I need to learn, and being better than others, I'm going to be left in the dust heap of history. Life is a competition and if you want to be lethal and ready, and if you want to be a winner, you better be an aggressive learner and an aggressive adapter. I'm going to give you the tools to do that, and if you can't do that, bye-bye. Go find another job. Because you are not meant to wear a uniform of the defender of this civilization going into the 21st century. Because it's going to be aggressive. And this great power competition we talk about, the crisis has not hit yet, but it will probably hit in your lifetime. And if we don't get busy at learning faster, we are going to be out hustled by civilizations that can focus their money because they're a tyranny. And they have more geniuses than we have people. And we may be a creative culture, and we may be the natural leaders, but they are fast followers and that fast following could out accelerate us if we are not more aggressive at adapting.

So for me, this really gets to the heart and soul of where our nation is at, moving from the industrial age to the information age and to the digital age. And we are stuck in industrial age models of learning, of adaptation, and of innovation. And we need to fix the cultural piece of this. This is just one example. And I ask you, as you leave this little forum, don't just leave and say, hmmm, that was interesting. Take a look at yourself, and what you're doing, and the job you're trying to accomplish for our Air Force whether you are industry, or whether you are an Airman, civilian, Guard, active duty and Reserve. And ask yourself the same questions, what am I doing to take control of my own development? What am I doing to take control of my own innovation and my own adaptation? And how aggressively am I doing that? Because if you're not aggressive, you're going to get beat by other people that are more

aggressive and more motivated to win. So, let's get back to the basics of the art of war where if you're aggressive enough, nobody wants to fight you. And you win without firing a shot