2015 Air and Space Conference

Panel Air Force Energy with
Miranda Ballentine, Assistant Secretary Air Force for Installations, Environment and Energy
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HOST: It's one of the many professional development forums and workshops that we're hosting here, and we hope you can avail yourself of many of them.

Today's panel discussion will center on the ongoing technology investments, trainer and training improvements, behavioral adjustments, and operational improvements that are all aimed at getting the most fight from our energy resources. And our wonderful panelists will share some of their outstanding success to date.

Our panelists include Ms. Miranda Ballentine, Assistant Secretary of the Air Force Installations Environment and Energy; Colonel Rick Eccher, Acting Division Chief of the Fuel Efficiency Division at Air Mobility Command; Lieutenant Colonel Mark Lyons, Air Force Retired, Instructor Pilot in the T1-A, and I

have some issues with the T-1 that kept me from landing with blown tires a few weeks ago at my home airport, but we can talk about that later; Captain W. Austin Street, Executive Officer to the Commander 97th Air Mobility Wing, and Dr. Leslie Perkins, Director of the Air Force Research Laboratory Energy Office.

So with that, Ms. Ballentine, I cede control to you, and I will join you as you're finished.

MS. BALLENTINE: All right. Very good, thank you. Well, first I apologize. I normally don't like to stand behind these things, because they're not really designed for the vertically challenged. So hopefully, you can at least see my eyeballs from the audience. I'm going to take a couple of minutes to just take us through a little bit of an overview on Air Force energy. How we think about energy, why we care about it, what we're doing about it, and a little bit of the how.

But then I thought rather than just having me stand up and be yet another talking head from the Pentagon, which we'll be getting a lot of them, and no

offense to any of my colleagues, but I thought it'd be much more interesting for you to hear from the people that are actually doing the work on making aviation energy more efficient, more affordable, and getting more mission out of every gallon of jet fuel. So I'll take just a couple of minutes to take us through slides. I don't have a clicker. Does someone have a clicker? All right, there's someone. Take us to the first slide. Go on to the next one. All right, give me the first build.

I don't think I need to really expand too much on why we care about energy at the Air Force. It underpins everything we do. It fuels every sortie, it launches every satellite, and it powers every single mission control. Without energy, we don't have a mission. And it's relatively reliable for us, has been relatively reliable for us, but it's more and more vulnerable with time. Go ahead and build.

It really comes with four, at least four risks. First, is geopolitical risk. And you see this more and more that some of the challenges we're facing

around the world are exacerbated by relationships between energy-supply nations, and energy-buyer nations. And increasingly between energy-supply nations, and just one case in point our recent reduction in cost of oil, largely driven by the fracking industry here in the U.S., has cut the buying power in Russia by half, because the ruble is tied to the price of oil. So how does that exacerbate the challenges and the geopolitics that we're dealing with?

There's mission risk. If you're an installation and you lose your electrons, and you have three or four days of diesel genset backup for just mission critical facilities, and you're out for weeks or months, how does our mission get impacted by that?

Of course, financial risk. We spend about $9 billion on energy at the Air Force. And it's a growing share of our overall budget. Energy is about 9% of our budget now, and that's up from 3% just not too many years ago. So it's a growing share. About $8 billion of the $9 billion is jet fuel. So we spend

just about a billion or a little bit more than a billion on electricity and other energy for our installations.

And, of course, environmental and community risk with some fuels being dirtier, and more impactful to communities than others.

So what does that mean? Go ahead and build it out. We're really doing three things. First, we're assuring supply of both oil, fuel, electrons, thermal energy. Second, we're building resiliency. So looking for 21st Century solutions to energy resiliency. Looking beyond the diesel genset to smart, cyber-secure micro grids and the like. Third, we're reducing demand. Go ahead and build again.

We really have two primary ways that we do that. First is technology. It's really fun to talk about technology, and Dr. Perkins is going to talk to us a little bit about some interesting technological innovations today. But, second, it's a lot about innovation, the ingenuity of Airmen. And our other panelists will talk to us quite a bit about ingenuity

and innovation.

Now, in the Air Force we talk about energy really through two veins. There's installation and facility energy, which of course is critical to mission execution. But there's also aviation energy. So just to be clear, today's panel is primarily focused on the latter. We're primarily going to talk about aviation energy. But during the Q&A session, and we're going to definitely save some time for Q&A, if you have questions about installation or facility energy, feel free to ask and either I will try to answer them, or we'll call on one of our experts in the audience.

So you can go ahead and go to the next one. Oh, this is just a fun little slide. How do we get to innovation? We get to innovation really by combining the ingenuity of individual people with technological invention, and that's how you get to innovation. One or the other on its own doesn't get you all the way there. And go ahead and build to the next slide.

So, I'm actually not going to read the bios of each of our panelists. I'm going to actually start

our discussion today just by asking them each to introduce themselves, and take just about one minute each, we'll time them and see how they do, about one minute each to tell us a little bit about who they are, what they do for the Air Force, and why don't you guys also tell us what motivates you? What gets you really excited about working on Air Force energy each day? Dr. Perkins, why don't we start with you?

DR. PERKINS: Oh, goody, so I can go over. Hi, I'm Leslie Perkins. I'm very glad you didn't read the bio, because I sound like the preeminent nerd of life. I'm a quantum chemist who works with the Air Force Research Laboratory. I'm currently the Director of the Energy Office in the Air Force Research Laboratory. I've been in AFRL with assignments to OSD for about 18 years. And I can't believe I said that, since I'm only 29.

What makes me motivated or excited to work in energy? That's kind of easy for me, as a technologist, because technology makes me giddy. But the fact that I can look at technologies with my

cohorts in the research laboratory as well as across the federal landscape, and go, "What can I do for capability? Making technology that works within the energy resources that I have?" And that's a twist on a problem, because we when you ask a scientist or an engineer to build something, they always want the multibillion dollar, "I'm a big old hog." But adding that little bit of a challenge just, it makes me giddy. I don't think it makes them as giddy. But it makes us feel like we are putting something together that the Air Force can use.

MS. BALLENTINE: Great. Thank you. Colonel Eccher?

COLONEL ECCHER: Hi, good afternoon, Colonel Eccher. I'm with headquarters AMC. I'm the Acting Division Chief there. We like to consider ourselves kind of like the 800-pound gorilla, because we mentioned the numbers, but we've got about $4 billion worth of fuel of that we burn in the mobility air forces. That's active duty, Guard, and Reserve. Think of the big aircraft, the C-17 and C-5, KC-135s.

We were formed about 2008, when the price of aviation fuel went from $1.00 to about $4.00, so it quadruple spiked. That's when our office was created. We were given the task of coming up with different initiatives to reduce demand. So you saw the slide Ms Ballentine put up, so we want to reduce demand. And our other thing that we do is foster that energy-awareness culture. That's the critical mass that we're at.

We've had 75-plus different initiatives where we reduced demand, and we're saving approximately half a million dollars every single day. That's the easy part. So when you asked what excites me now, well, kind of like what Leslie's saying, the new technology. And nothing better than moving downstairs. It's just amazing to see those types of technology. So that's what's exciting. The more that we can take out the pilot's hands, and make it automated, that's a success story. We'll talk about some of those technologies later, but thank you.

MS. BALLENTINE: Mark?

LT. COLONEL LYONS: Good afternoon. I'm Mark Lyons, Lieutenant Colonel Retired. I'm currently a San Francisco Based, Triple 7 officer, first officer for United Airlines. Prior to retirement I was a T-1 instructor pilot at Vance Air Force Base for nearly 17 years. I conducted a fuel efficiency study at Vance on behalf of the Energy Analysis Taskforce and AETC last year. Instructing in the T-1 for over two decades, I knew there was a better way to do business at UPT. And my passion for finding a way to support the energy initiatives of the taskforce helped me conduct the study.

During the study we identified four areas where efficiency could be taught to our student pilots. They were identified by my team, where current flying styles could be altered to achieve fuel savings. This really allowed us to educate our students and plant the seed when it came to fostering an energy-aware culture at the beginning of their pilot training career. We concluded the study last year. We had great success with the study when it came to fostering

that energy-aware culture and introducing fuel efficiency techniques, specifically to the young student pilot with the T-1 aircraft.

MS. BALLENTINE: Austin?

CAPTAIN STREET: Good afternoon. My name's Captain Austin Street and I am an instructor pilot at the C-17 formal training unit, Altus Air Force Base, Oklahoma. We're home to the C-17, the KC-135, and soon to become the KC-46 formal training units. But from 2012 to 2014 I was the Operations Flight Commander for the C-17 formal training unit. And during that time, and with the help of other wing agencies, we were able to save $64 million out of our flying hour program in the form of 3,000 hours that we gave back to AETC to be either reallocated to other units, or to be realized as actual savings for the Air Force.

Watching our flight develop and implement these procedures, and also help, freedom, and flexibility from our AETC leadership is what motivates me to continue to save energy for the Air Force. Because

from that first innovation we created new ideas and new ideas until we looked up and we found ourselves leaner and operating more efficiently than ever before while still not sacrificing any capability to produce those combat mobility aircrew for the mobility air forces.

So it was rewarding to be around a group of people who were looking to make a difference, enabled by their leaders to do so. And it was rewarding to see how these small ideas turned into huge impacts for our Air Force.

MS. BALLENTINE: Great. Well, thank you, everybody. So in case you didn't notice, we have really a whole range of levels all throughout our organization starting from truly basic flight training, up through the wing level, through MAJCOM and then all the way up to AFRL which is really an enterprise-wide organization looking at the future of our Air Force. I'm going to take moderator's prerogative here and start with some questions. I'll ask a few questions, and then I'm going to turn it

over to you. So please start thinking of questions now. If you have none, I've got more, of course, in my back pocket. But start thinking of questions, because it'll be more interesting if we hear what you're interested in hearing.

But I'm going to actually start in that order and go back to that basic flight training. And, Mark, maybe you can tell us a little bit more. Why is it so important to start with the very, very beginning of pilot training? And I'll tell you, I actually got to go to Vance, and they took me in the simulator and they ran me for 40 minutes. Twenty minutes the right way to do it, and 20 minutes the old way to do it. It was really rather interesting how very slight changes can make such a big difference in that fuel efficiency. So, Mark, can you tell us a little bit more about why is that so important?

LT. COLONEL LYONS: Planting the seed of fuel efficiency, or fostering an energy-aware culture needs to start at the beginning stages of a pilot's career. And that is usually in pilot training. Specifically

in the T-1, it lends itself to the tanker transport category of flight, and there are ample opportunities while flying that plane, as a student, that you can practice fuel efficiency. The idea that we can operate flight missions in pilot training without regard to fuel is a thing of the past.

Our planes of a past UPT were for the most part fuel limited. They took off with just enough fuel to pretty much do their mission. That's not so in the T-1. So we felt it was a perfect place because AETC is literally the first command that these student pilots are associated with. And if we could plant that see it's going to pay huge dividends further down their flying career when they go out to the bigger Air Force that they've been exposed to fuel efficiency concepts.

MS. BALLENTINE: Thank you. So, Austin, as these pilots come to you for the next level of training, so to speak, tell us more about what you all discovered in terms of use of airspace and use of air refueling tracks, and the innovations that you've come up with in those types of things?

CAPTAIN STREET: Yes, ma'am. At Altus, we followed essentially the same mentality that Colonel Lyons just talked about. The first thing we did is we started tailoring our ramp fuel loads instead of carrying a standard ramp fuel load. Obviously the lighter a C-17 or a KC-135 is, the more efficient they're going to fly.

But then they come to us and we have to teach them basically what's on the master task list for the syllabus that they're involved in. But that's not how our hours are actually allocated to us. We have an average mission duration and based on that average mission duration it's broken down into how many flight hours we get per year. So we needed to find a way to be able to still be able to accomplish all tasks and be able to produce excellent pilots, but still try and reduce that average mission duration.

And what we did, is the first thing and the easiest thing, was for us to target specific spots in the flight profile that was not value-added to the training. The first one was our air refueling tracks

are pretty far away from Altus. We had four local AR tracks. And one of them was about 25 minutes away. The rest of them were between 40 and 55 minutes away. So they very first thing we did as a scheduling office, is exclusively schedule that closest air refueling track.

But, we tried to take ourselves outside of the paradigm, of, "Well this is our airspace and this is what we have to work with." And say, "Hey, can we rebuild this airspace?" And so the next thing that we did was redesigned our air refueling tracks and basically created points in space about 20 to 25 minutes away from Altus, which allows our students the time to get prepared for the air refueling run checklist, but still eliminates that drone time between takeoff and getting to our air refueling tracks.

So now we have three tracks that are much closer to Altus than before. Taking that idea, and looking at other aspects of flight, we have airdrop training there, as well. And usually we'll have eight passes

across our drop zone and they'll all be via a 28-minute low-level route. But we only needed to fly that low-level route one time. So the next seven times are just wasted time.

So we just redesigned a re-attack routing that we can fly both in the weather and in VFR conditions back to our drop zone. And that saved another $3 million per year. Moving those AR tracks closer saved $29 million per year.

So that dropped our average mission duration by about 5% compared to fiscal year '13. And that savings became realized as long-term savings that we'll never be spending that money again at Altus, by saving $26 million a year in our flying hour program. And we're still refining that and saving more and more.

MS. BALLENTINE: I have to tell you folks, I go to a lot of energy conferences. And I think probably a lot of folks in this room go to a lot of energy conferences. And what do we like to talk about at those conferences? We like to talk about technology,

finance, and policy. And people like to say if you can just align technology, finance, and policy, we'll solve all these energy problems. None of that is rocket science, right? That's just ingenuity of Airmen taking a focus and shifting the inertia of how we've always done business. And thinking, "How can we do business differently?"

We're going to talk about rocket science in just a minute when we get to Dr. Perkins, because that's pretty fun to talk about, too. But this kind of stuff really excites me. And we have stories like this all over our Air Force. And the question is what can we do to inspire more people to change the trajectory of our inertia. And, Rick, I sort of teed you up there for this question of the energy-aware culture that we talk about quite a lot. At the MAJCOM level, can you talk a little bit about energy-aware culture and how important is that to what you're doing? And I would also like to ask you to touch on mission a little bit. So we've talked a lot here about dollars saved, which in this budgetary environment matters. And I, as a

taxpayer, am excited to hear about these millions of dollars that we're saving. A half a million dollars a day, that's stunning. But tell us a little bit about mission. What does all this mean for mission and energy aware culture?

COLONEL ECCHER: Well, I want to back up just a little bit and we'll answer the question.

MS. BALLENTINE: I'll prod if you don't.

COLONEL ECCHER: We got a lot of that low-hanging fruit, we talk about. That's all done. So we decided to go, "How can we really, truly incentivize?" That's a big issue that we have. Because in the airlines it's easy. They profit share. We don't have that luxury to throw dollars at pilots. But we have leaned on the commercial world and looked to them to say, "What are you doing?" Because they're an industry leader because it affects their bottom line.

So we've gone to them, and as far as mission-related items, they've used something called cost indexing for years. The Air Force hasn't. And just to break it down, for those that don't fly.

Typically, those that do fly, understand that you fly at constant Mach, constant airspeed, constant altitude, we're getting away from that. Because it's inherently inefficient. So we've learned that from our commercial partners. And our new flight planning software that came out last year, takes that into account. No longer will a C-5, or a C-17 fly a 12-hour sortie at the same altitude and the same airspeed. It changes now. And it's flight-planned to do that.

And the reason that's so critically important for a mission standpoint is if the pilot doesn't fly that profile that's on that computer flight plan, they may run out of gas, and they may have to divert. So we've taken that out of the pilot, and said, "If you don't fly this profile, you very well won't reach your destination." So that's an important, and that in itself has saved between 1 ½ and 3%. And you might think that that's not a lot of money. That is a ton of money when you're talking about $4 billion a year.

We burn 60% of the Air Force's fuel just in the

mobility air forces. That's why our office is where it's at. So that's a huge impact we've had. And we've had great success. And that really is just coming on line. We've only had that about a year. So there's tremendous savings there. But the true savings will come when we can actually cut back flight hours. And no wing commander wants to hear that, or ops group commander wants to hear about cutting back flight hours. But that's real savings. Because if you're saving fuel, you're saving some flight hours, they can repurpose those hours. And that, that's not really what we want. We want to give that money back to the war fighter.

To answer your question about culture change, again, because we're headquarters at AMC we're the ideal point to try to influence and try to effect that culture change. Every new aircraft commander that comes through, every single one, Guard, Reserve, or active duty, comes through to something called GRACC, Global Reach Aircraft Commander Course. So we get every single person that comes through. We have that

chance to talk to them. And we can actually look up their flying by name through, there's a fuel tracker and a mobility air forces website. We can actually see how they're doing. Now, we don't publish that. We don't want to embarrass people. But we can actually track how these guys and gals are doing. So it's amazing.

So not only do we get the aircraft commander, but we get the squadron commanders twice a year. The operations group commander by video teleconference twice a year. And every new wing commander does an immersion and comes to Scott Air Force Base, and I get a chance to talk to them for about 10 to 15 minutes, so I can see if there're accurate fuel loads, there're accurate cargo loads. How much are you using your APUs and your GPUs? And if nothing else, it just affects it, "Hey, big brother's watching." That's one way to influence change, is to have Stan/Eval or the Inspector General, and we're a part of all those programs right now. We've influenced them that much to get in there.

But, make no mistake, culture change is by far the hardest thing we do. It's much more difficult than research and development. It's changing people's minds. And, especially old heads like me, that when we started flying they said, "Don't leave any fuel back in the fuel truck, because that can't do you any good." Those days are over. Those days we have to effect that change. That extra fuel we carry, it's an extra 3% that we burn. So it's an education process, but it's nothing that's gonna happen quickly. It's a five to ten year, at least, some people say a generation to effect culture change.

Sorry for the long answer.

MS. BALLENTINE: That was great. Thank you. So we've just talked a lot about culture, and behavior, and how we fly, Dr. Perkins, can you talk to us about the technology side? Tell us about the engine.

DR. PERKINS: If I said, no, would you kick me out of here?

MS. BALLENTINE: I would.

DR. PERKINS: Okay. Yes, I can. I don't know,

is there another slide in this deck?

MS. BALLENTINE: I think there is.

DR. PERKINS: Sweet. Okay. I'm a researcher, and I have to have a picture. So everybody indulge me. Air Force Research Laboratory, we are leading the discovery and development of technology across airspace and cyberspace. And as we've already heard, aviation fuel is the thing that eats most of the lunch. My lunch, everybody's lunch. So a good deal of the S&T portfolio that's looking at optimizing our use of energy while still providing the same capability, or what we prefer, additional capability is in propulsion.

So for those of you who are not familiar, and remember I said I'm a quantum chemist, so anything I do on this adaptive engine, just take it with a, "Hey, a chemist is telling me this." So we've been investing a great deal of money in the research laboratory at how do I make an engine that can on all levels of throttle still give me fuel efficiency. And that was in originally our advent program, which was

an S&T program looking at validating not only the aerodynamics but the mechanics of what does into a third-stream engine.

It moved over to AETD, which was a tech development program, looking at reliability and supportability of all the components that go into one of these lovely engines. It is now transitioned over to an effort with the Air Force Lifecycle Management Center to do a demonstration validation of a flight quality engine, again, this is third-stream adaptive engine, something that no one else in the world does, and that's by design. Our engine technology is one of those things that is extremely controlled. If any of you look at the news, if some of our -- how did Secretary James call it -- the folks who don't mean us well, got ahold of this, we would be in the hurt. So we're very careful about making sure that our developments are ours.

What this is going to do, again, all throttles, is 25% fuel efficiency, and I have my numbers here, that way I don't screw it up. That can translate into

35% greater range, or 10% thrust with a greater thermal capacity. As many of you know, we dump a lot of heat into the fuel, and that can cause some issues, especially if it's too hot going into the engine. How do I maintain that? Or how do I use that for new capabilities?

One of the big things going on is our idea of a megawatt aircraft. I haven't met an ISR person who doesn't want more, wants it more quickly, and wants comms on top of it. Oh, yeah, and secure. Well, that's not chump change. So this all ties into technology that we're developing, looking at megawatt aircraft. How do I know if the engine's working real well? That's another area that we're getting into.

But, again, the propulsion is our biggest investment in the S&T portfolio because when, not if, notice how I'm positive. When we get this into the aircraft, we will see a noticeable difference buying more sorties with the same amount of fuel. Buying greater range with the same amount of fuel. And that's something that motivates not only me, ma'am,

but it motivate my colleagues in the research laboratory.

MS. BALLENTINE: Very good. Who's keeping track of time? Do we have --

QUESTIONER: I've got [Inaudible]

MS. BALLENTINE: We're good? Can we take some questions from the audience? Awesome. Let's take some questions from the audience. I'm going to still your mic, unless you've got another mic. And then you guys can share that one.

DR. PERKINS: I'll share. It's a kinder, gentler Air Force. We can do this.

MS. BALLENTINE: Do you want to be our guy or Pasquale?

QUESTIONER: Good afternoon. I remember flying C-130s and MAC right after the oil embargo influence. And we had a pamphlet that was called, "Birds Fly Free, MAC Doesn't." And I see a couple people nodding their heads. So I'm wondering, after almost 40 years of trying to bring that into culture, I've hears all the pilots talk about a culture of change, sounds like

some very good things have happened. But I'm wondering now it must be an incremental change, because I'm assuming that a number of pilots have now understood this, see the benefits of it, and now are fit into the training programs where it's already set up for them. How do you make the next step in incremental changes after essentially, I would think, a number of pilots already have that in their culture?

COLONEL ECCHER: Thanks for the question. One thing I just want to say, "The Birds Fly Free," which I received that, too, when I started flying, you're not going to believe this, but it's sitting our 2-star's desk, the new version of that. It's going to be published this week. So we haven't forgotten about that.

You ask a good question. It's just such a tremendous challenge. But one thing you can do to influence is beat them over the head with it. So Chapter 14 of most of the regulations now is dedicated to fuel efficiency. If you're evaluating it, and training it, and evaluating it, people will take it

serious. You hate to influence behavior that way, but that certainly is one way we do it.

And the Inspector General, just this year, as part of their MICT checklist, for those that know what that is, has incorporated fuel inefficiency in aviation ops. But it's a tremendous challenge. I was going to speak about this later, but this might be a good time. Unless you get senior leader buy-in, I mean all the way up to the top, and all the way down, you're not going to effect that change. We'd never want to compromise safety. So especially when I talk to the new aircraft commanders, safety is always first. It takes priority over efficiencies. And then mission effectiveness is next. But we want to just get these folks thinking about efficiency and fuel isn't free. And if we're not using it, then our CAF brothers, or our combat air forces can use it. Or someone else can use it.

So it's a long road to doing it. And we're always looking for ways to incentivize. Whether it's at conventions like this, or the ATA convention, or on

video telecons, wherever we can do, we try to. But it's an ongoing struggle and we're always looking for ideas. Thanks for the question.

MS. BALLENTINE: Anyone else have thoughts on that?

CAPTAIN STREET: I'd just like to talk to what Colonel Eccher was saying. I used to be that aircraft commander that saw the beginnings of mission in ex flying, is one of the programs that he's talking about. And one way is that you make it easier on the pilots. When I first came on as aircraft commander, we didn't have MIF-P-PASS yet. But then that program came out and it was actually pretty hard to understand until you actually got somebody who knew how to use the program tell you that it was basically three simple steps. Now, this program does all kinds of things for you, but in order to effectively use it for fuel efficiency, you only needed to know three different steps. And once it was explained to me that way, I realized how much easier it could be for me to save fuel.

And then the second part was our flight plans were not built the way that they are now. So these types of things that make it easier on the pilots to be able to save fuel will also help with the culture change.

LT. COLONEL MARK LYONS: I'll just say really quick. At pilot training, students are sponges. They're going to soak up whatever an instructor has to teach them. And so if we're not teaching it, they're not learning it. And that's where I saw being at a pilot training base, the biggest possible influence that we could make on those young pilots, that will serve them better and pay more dividends throughout their career. Getting them early, introducing it, it may not be something that they can apply on every single mission. It may be something that maybe they think about a moment, because of the type of mission that they had to do on that particular training day, but as long as it's being introduced, and we're planting the seed, we've got that. We're planting that seed that will grow as they continue their

career.

DR. PERKINS: So a non-pilot is going to answer, brace yourself. Let me ask the question in a different way. How do I eliminate that flying altogether? In the Air Force Research Laboratory we've been investing quite a bit of time and energy in concert with a lot of folks looking at simulator training. So take it out of the cockpit, not altogether, because I'm sure all the pilots in here will jump me after this, and not in a nice, "Hey, we'd like to talk to you," sort of way.

How do I make that training realistic? How do I take it out of a fuel-based activity into an electricity-based activity? Moving the problem somewhat, but changing the form of the energy that's in usage, thereby allowing other entities to come in. How do I use renewable energy to provide electricity to the base? So it's that kind of culture change, not only how do I work within the box that I have prescribed, but how do I think about it?

What an old professor of mine would say, "Just

look at the problem, turning your ear." See it in a new way.

MS. BALLENTINE: Thank you.

MISS Versprille: Hi, my name's Allyson Versprille. I'm a reporter at *National Defense Magazine*. And I wanted to ask you if you could maybe elaborate on the importance of alternative sources of energy, and especially when it comes to UAVs and if that's a key point of research, as well.

DR. PERKINS: So alternative sources of fuels, we'll just go with that, because I don't have provenance over all alternative sources of energy, like solar, just to set expectations. And then that way you don't jump me in a not so friendly way outside.

When I look at alternative sources of fuels, they're a few different aspects of it. First is actually creating the fuels, either from a biomass, or a lignin, or whatnot. There is some effort within the Air Force to actually create those fuels. But we're actually working across the defense and the national

industry, especially with FAA, since this has very commercial applications of not only creating it, but figuring out how do we incorporate it into our fleets without the significant amount of, ergo cost of, ground testing and flight testing?

So we work with CAFE, which that just escaped my head, I can get with you afterward, looking at rules and tools for taking possible new fuel sources and making them certified for aircraft use. We currently have two that we can use in a 50-50 blend. So that was a lot of work within the laboratory.

You mentioned UAVs particularly, certifying UAVs on the same types of fuels that are available, that is just part of the Air Force process.

MS. BALLENTINE: I would just add to that, that quite a number of years ago the Air Force went through significant effort, and I think probably most folks in the room are well aware of this, to certify all of our aircraft to fly on a range of types of fuels, including synthetics and various types of bio blends. So that effort was ongoing a number of years ago.

But I think Dr. Perkins touched on something really interesting, which is thinking beyond alternative jet fuels. So I just visited a brand-new simulator facility in Hawaii. It was only finished about two months ago. This is a LEED Platinum building. So this is where you start to straddle the worlds between jet fuel and electrons. So we have a LEED Platinum, I think it's a F-22 simulator facility, in Hawaii that is a super-efficient building and partially run on solar power.

So suddenly you're replacing jet fuel with solar power, how did that happen? That happened, again, through ingenuity. And those pilots because of the advances in simulator technology, those pilots can train in virtually any condition anywhere in the world, from Hawaii. It's really phenomenal and they can be linked up and work with other simulators around the nation. So it's really fantastic.

I'm going to take one of these from my card, and then we'll go back to the audience. There was a little bit of allusion to this when we were talking

about, "Well, gosh, we've been talking about changing behavior for 40 years, and how come we're still talking about changing behavior?" Have we not been successful? And I my experience behavior changes and inertia ebbs and flows. And a lot of things can drive that. One of the drivers, of course, is fuel cost. And about a year ago we were paying a hundred bucks a barrel for oil. We, the world, not we the Air Force. And now we're paying about 45 bucks a barrel for oil. What might that do, if anything?

Now, if we had unlimited dollars you might have a simple economic equation there. But we all know we don't. We have very limited pot of money. But this is actually for Colonel Eccher, but I'm going to turn it over to all three of you. The question is what adjustments did AMC make to accommodate the enormous increase in fuel prices? Is AMC, or AETC, for that matter, modeling what would be done if they spike again? And I can help with this, too. But talk about --

COLONEL ECCHER: That's a tough one.

MS. BALLENTINE: -- talk about fuel prices and the impact of fuel prices on behavioral focus of energy.

COLONEL ECCHER: Well first, the DLA, Defense Logistics, sets our prices. And they're notoriously behind when they set the price. They do not hedge, like the commercial airlines can. They're not allowed to hedge fuel. So right now it's $3.26 a gallon for aviation fuel, which is extremely high. And they're due to reset next month or so, about every six months. So you're going to see another decrease there. They're notoriously behind. So even though we get the question, "Gosh. I think it's $46.00 a barrel right now. Why do I have to care so much? We should be able to burn." Well, the prices haven't adjusted yet. So that's one reason. The reality is we are still paying an extremely high price for fuel. Way more than United, or Delta, or Southwest, so that's the first part.

And I think we try to teach any crisis that occurs, whether it's an earthquake, or unrest in the

Middle East, they immediately spike. Maybe for no reason. Or fracking slows down, because they're not as profitable. So we try to teach a little bit of the political game that this might be just a short-term point where prices will probably invariably go up. It is a constrained resource. It is a commodity, so there is only so much fuel. So that's what we try to teach them.

MS. BALLENTINE: I'll add to that. The Aspen Institute has been running an energy policy forum for about 40 years. And I attended it this year, and it's really a bunch of energy industry specialists, both from the oil and gas industry, and the electricity industry. And they kicked off this year's forum essentially reviewing what they've been talking about for the last 40 years, and the general consensus was everything they predicted was wrong.

It is incredibly, incredibly difficult to predict energy prices and oil prices. Very few people truly predicted the dramatic impact that the U.S. fracking industry would have on global oil prices. I think a

lot of experts are looking at the economic growth in China, which drives a lot of these prices. And the economic growth in China is shifting from a highly energy intensive set of industries, steel manufacturing, things like that to a much more services based industries, how is that going to impact price of oil? Will it keep it low? Will somebody else, China, or Brazil surge in those other types of manufacturing? This is a very, very difficult thing for even the world's best energy experts to predict.

And the price of oil is one thing but our own budget is something else. And you heard Secretary James this morning talk about the difficulties with sequestration and the budget that we have. And I'm going to answer another one of the questions up here which is, what national policies do you believe that we need, that don't exist, that could improve Air Force energy?

And I'll tell you the one policy, and I'm sorry if this seems like a cheap, get-of-jail-free card, that really needs to be fixed is sequestration. That

would change a lot of things for Air Force energy, if we could just have a consistent budget.

Do we have time for one more question, or are you hauling me off? Because this is a fun one. Okay. Dr. Perkins, what is your holy grail, what development do you think could magically transform the energy capabilities for the Air Force? And after this, if we could just go down the line and if you could each share what's the thing you're most excited about, in 30 seconds or less, for the upcoming year, that'd be great.

DR. PERKINS: That is a hard question, what is my holy grail? Unfortunately Monty Python's immediately popping into my mind. For energy, if I'm going to do a holy grail, I actually think it is going to be aircraft themselves, redesigning aircraft. Because we can only make, what was the comment, incremental changes not only to culture, but we can only make incremental changes to the current slew of aircraft that we have.

I know in AFRL we've looked at new and novel

designs, still has the same amount of transport capability, but is much more fuel efficient. Given the political contentions on that, I don't know what it's going to be realized at, but I think that if we can get over that hump, and not have flying saucers, mind, but have something that doesn't looking like your normal aircraft of today, I think that would go a long way at optimizing our energy resources.

COLONEL ECCHER: All right, 30 seconds. Something that excited me, two or three weeks ago I had an aircraft commander e-mail our organization box, and said, "Hey, I wanted to know why I've got 10,000 pounds of extra gas on my aircraft?" I've never heard of that before. We never get that. It's usually the other way around, "I need more gas because of thunderstorms, or possible diplomatic clearance routing," or whatever. So I conversed with him a little bit and he was honestly to the point it's like I'm just wasting that gas, because I know it's about 3 to 4% of burn for that extra 10,000 pounds. So it just finally says, all this work, all these, you know

it's been about seven years of work, we're starting to get through to some people. So that was just one encouraging note that just happened literally two to three weeks ago.

LT. COLONEL LYONS: At Vance the study concluded, and it was a good study. We were actually able to measure that the student pilots, kind of their thought process had changed. But probably more importantly, even after the study is over and concluded, and the report has been written, what we instilled at Vance specifically is now starting to take root in AETC, and kind of be adopted formally into the syllabus. And so we expect that to continue. And like I said, this was just the start of where we can go in planting the seed of fostering an energy-aware culture.

CAPTAIN STREET: I've got two real quick things. The first thing is that we're getting ready to introduce the KC-46 formal training unit to Altus, and we still want to protect our airspace. We built it to be as efficient as possible. And the way that we're going to continue to do that is we've taken one our AR

tracks, and traditionally you start at an initial point and you end at an exit point, and then we turn around and come back up the same way. So we can only have a formation of aircraft on there once every two hours.

Instead, we came up with a new design, basically a horseshoe design, where we can now put each formation of aircraft 20 minute spacing across, and use that same swatch of airspace, but now we've maximized it four and a half times the capability as before.

And then the second thing is, I see a cultural shift at Altus and across the AETC to look at training, not in terms of hours flown, but in terms of value-added, which is obviously a change in the culture.

MS. BALLENTINE: Well, thank you. I'll tell you what I'm most excited about for the upcoming year is Airmen like these four, out all across our Air Force, coming up with these ideas, implementing these ideas, selling them up, selling them down, selling them

across, and really driving change for our organization. So thank you all for coming such a long way to spend this 45 minutes with us. And thank you to the audience.

[Applause]

HOST: Ms. Ballentine, Dr. Perkins, Colonel Eccher, Colonel Lyons, and Captain Street, thank you very much. I could have sat here for hours and hours, because truly I've learned a great deal as I'm sure the 65 of the rest of us have as well. So thank you very much. We hope that as you travel far, you travelled energy efficiently to get here and join us.

We will adjourn now until 3:10, when the next session starts. I invite you to go down to the exhibit hall where we have absolutely unhealthy dessert waiting on you, and some coffee. And then I'd ask you to visit three booths while you're there. The Air Force Association, the host of this great conference, invite you to come by our master booth, where you can get an AFA membership and help foster these kinds of dialogues, at half-price, while you're

here at the conference. And then there are two other AFA booths, I'd invite you to. One is the Air Force Memorial, which of course, AFA's the executive agent for. And then my selfishly proud program, Cyber Patriot, if you're not familiar with it, please visit that booth, because we're reaching America's youth. Thank you very much, and please, again, a round of applause for our wonderful panel.

[Applause]

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