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DWG: Good morning, everybody. Let me begin by saying thank you first and foremost to our guest this morning. Dr. Will Roper is the Assistant Secretary of the Air Force for Acquisition and Technology and Logistics. Sir, thank you very much for making the time to come and meet with us today. On behalf of everybody in the crowd here, we appreciate your time and we appreciate your thoughts in advance.

Dr. Roper, let me begin with a question about the investment repriorities that General Goldfein's been speaking about as recently as last week. A $30 billion reshuffling, essentially.

A question I have about this process is if we are going to retire Air Force systems early to reinvest that money in capabilities that are needed in the 2030 to 2038 timeframe, are you by necessity entering into a period where you're accepting additional risk essentially by getting rid of capabilities in the short term to pay for capabilities that will come on-line later? Is there danger in that?

Dr. Roper: Any time you retire a system you are accepting some risk. You've taken an asset and now you don't have the asset in the future. So of course there will be some change in our risk posture.

But I think General Goldfein is exactly right. That if we are going to compete long term against peers we have got to step back from our Air Force and ask ourselves which systems have future value five to ten years down the road, and which ones are increasingly going to be applicable only to counterterrorist or low threat environments?

So the Air Force took a hard look this year at which systems will help us in the future to free up funding so that we can do the modernization we desperately need to do.

I'm pleased that a lot of what we're proposing for our next budget focuses on digital transformation, getting enterprise cloud across the Air Force, connecting the development environment that many of you have reported on in places like Kessel Run, Kobayashi Maru. This is our development platform. We now have to connect that to a combat cloud so that we can write code and deploy it at the pace our warfighters need. But it's more than just cloud. It's getting software defined radios and networks at the edge so that we can adapt at the edge as quickly as the threat compels us to. And if we can do that and create internet type effects within the Air Force, then that's a completely different model than we have today. Building dominant platforms that enemies can't shoot down.

So we still want to build really awesome platforms, but in the future we want them to be able to work together like a family or a team and be a dominant family, a dominant system of systems, and not have to rely on one or two technologies to win against the world of threats that we face.

So it's going to be an uphill climb to defend this budget. I'm very proud that the Air Force has taken this bold move . And I think the toughest battle is going to be defending the funds for the digital transformation because you can take pictures of airplanes, you can take pictures of ships and ground vehicles, you can't take pictures of electrons. But in the world we live in, electrons and photons are the most important thing that moves. And technology data is more valuable than oil, the most valuable thing on earth. And we need to start valuing that in our budget.

So we put our money where our mouth is in this budget and we'll see what OSD and what Congress have today.

DWG: Software networks have traditionally been very difficult to develop on time, on budget, et cetera.

Dr. Roper: Understatement. Yeah, we have not been a good software company, but we're starting to be. You've seen that in the Air Force over the last year and a half.

DWG: When you compare your plans for the future with pre-existing plans which were more heavily centered on bending metal, how much confidence do you have that you'll be able to get what you need when you need it?

Dr. Roper: I'm very confident in the Air Force's ability to do it. I am less confident in our ability to defend the budget for it.

Coming in, I felt software transformation would be exceptionally difficult. I had so many questions in confirmation prep related to software, and I had this moment of clarity. I remember thinking this is going to be very hard. I was wrong. It's been much easier than I thought. So coming in, creating organizations like Kessel Run and Kobayashi Maru which are software factories. They generate code in weeks, not months or years. And from those early examples of excellence, software factories have now spread across the Air Force. Many of them you haven't heard of because their names tend not to get the limelight that Kessel Run has. But we have 30 or so locations that are doing wicked fast coding.

So now that it's clear to me that we can code, and we have a lot more coding talent in the Air Force than I thought. And it's not all airmen. We have mixes of airmen and contractors. But it's the model of the software factory that's working. Getting coders, working with operators, where the expectation is to deploy in weeks.

Now that we've proved we can do that, now we should follow the same path that software companies went over a decade ago.

I had a great trip with Secretary Mattis out to Google before I joined the Air Force, and they explained their software progression and their movement into cloud-based development and deployment as driven by the need to write code faster. So it's not the things that we typically tout for cloud, that it's more cost-effective and allows us to do things in a more distributed fashion. Google told me they had to move to cloud because they couldn't update their search engines fast enough to be competitive. It was a better software development and deployment architecture. And you know he rest. They moved all of their development into cloud, that got their data in a common environment that could be accessed by users, and now it's turned Google from a search company into an AI company.

We want to do the same thing in the Air Force, but we'd be foolish to follow a different path. So we're writing code well across the Air Force. Step two, we're doing now with our Cloud One program. We're moving all of our developers into one development cloud. So that contract's been awarded. It's under protest so we'll hopefully get through that. But our hope is within months, like no more than three months once we're through protests, that we will have our Kessel Runs, our Kobayashi Maru, F-16s, F-22s, maybe F-35, certainly B-21 and GBSD coding in a common cloud. And then my hope is as more developers share that infrastructure, data will be available, and that data will start turning into machine learning opportunities for us in the future.

The other side is obviously not just doing the enterprise cloud, it's having that capability at the edge.

So all of that is what I reference in digital transformation. It's just trying to create in a military department what we all enjoy in our personal lives every day.

DWG: Good. Thank you.

We'll begin across with Erin and then Lee.

DWG: Thanks for doing this.

One follow-up to what Adam was talking about, and what he mentioned in the question, he talked about defending the budget. What is the strategy for going to the Hill and explaining to people hey, it's not about bending metal right now, it's about this. And even if it's any metal in your district, this is what we need.

Dr. Roper: Like anything this complicated, we have to have a multi-faceted approach. The first is just being extremely transparent. The tech talk in digital transformation ramps up very quickly, so we're fighting hard to put everything in plain English.

The first thing we've done is adopt a naming convention that we hope will help, and it was inspired by the Cloud One program. We give every aspect of this digital transformation the One moniker at the end. So even if you're not a tech person or a software person. If you're a budgeter in the Pentagon or a warfighter, and you hear One, whether it's Network One, Platform One, Data One, all those things tell you it's part of this internet movement in the Air Force. So that's thing one. Get it where we can actually kind of talk about the family of capabilities we have to develop in a way that's coherent.

Thing two. We've got to put the effects for the warfighter not something that are in the out-years, because that's not how commercial tech works. So we've committed in the Advanced Battle Management System program, that's the warfighting side of the enterprise transformation. Enterprise IT is a service. Cloud One, all of that is the development side. So those two things are coherent and integrated.

We've got to be able to do that in a way that's radically different. If we do a waterfall deployment and say you're going

to get the Advanced Battle Management System in five years, I already know it's failed. That's not how a commercial software company deploys.

So the way we structured the acquisition plan is quite novel. It is to do what we call "connectathons" every four months. We will not slip them. And it's to invite our combatant commanders, our fellow services and industry to bring systems that they want to connect in a way that will give warfighters advantage, that they are also willing to put into a potential deployment production line after the fact.

So the first one we're going to do in December is going to connect F-22 and F-35. We've been talking about that ever since I joined the department. We're finally going to do it with a Babble Fish like translator drone, what we call, I can't remember now. It's something one. That's why we do the one. I can't remember what it's called -- Gateway One.

So Gateway One is going to be the universal translator for the F-22 and the F-35. First we'll deploy it just on a pole out at a range; and then four months after that we'll put it on our Valkyrie drone and actually fly it along with the F-22 and the F-35.

But as all "connectathons" should be in the future, it's not just limited to those systems. We're going to bring in Starlink Satellites from SpaceX and show we can bring commercial com, and then push our picture down to a handheld tablet to represent a ground operator.

So we have space, air and ground in one "connectathon". In the future that's how we want the program to evolve. Whoever's ready gets to demonstrate first, gets into the pipeline first, and they get to access the funding that we're requesting in the budget.

So what I would turn around to members of Congress and

companies, and anyone who's interested in this program. I would say if your system is ready to go and you're willing to connect it, get it into one of our "connectathons". Compete for this money outside of the normal POM cycle. And by doing that and only focusing on things that are shovel ready, the Advanced Battle Management internet of things, affects, should emerge, vice delivered. Just like the internet of things has connected increasingly, more broadly, as opposed to having a monolithic deployment.

The good news about that is that you don't really have to believe us for very long. Just let us get through a few "Connectathon" cycles, and if we're failing miserably, then that should tell you something about the future of the program.

But one of the things that's cool is we've got a design team that's unlike any you've seen before in the department. We've got internet of things pioneers, we actually call these people pioneers for some of the programs, who are not advisors. They're designers. They're some of the original designers of Uber. CTOs from Google. Creators of the Oculus Rift. People that have made this transformation happen commercially, that are excited to help us do this in the Air Force.

So if we fail on this attempt, I don't think we'll likely succeed again. It's just great having a lot of people that you can point to revolutionary commercial the and say this is the person that created it. They had the vision. And they didn't let bureaucracy or nay-sayers get in the way. So they'll be good medicine for us.

DWG: Going back to actual metal for a second. The KC-46 update on the cargo issue. Is there an update on the cargo issue? What's the status?

Dr. Roper: Yeah, doing well. I think the issue with the locks was identified. We're working options currently with Boeing and their supplier. I'll get that for you for the record. I can't

remember their supplier's name. I wasn't familiar with them before then.

So I'm confident that we'll get that fixed. We're looking to our operators to tell us which one of the solutions that have been identified is the one that they'd prefer. But that goes in the bucket of why we do operational testing. You would not find something like that if you weren't actually flying cargo. So that goes in the kind of normal deficiency space.

Things like the Remote Visual System are the areas that I keep the most focus and concern.

DWG: There's a timeline on the cargo issue?

Dr. Roper: Months.

DWG: Lee, then Sandra.

DWG: Could you talk a little bit about the likelihood of [exporting] the B-21 and if there is [inaudible] there. There's been a lot of talk in open press about that.

Dr. Roper: Lee, I have so much on my mind just building the B-21, that if I can enable that debate because we've got a bomber that's continuing to deliver on time, on cost, then that's wonderful. I really have not plugged into the exportability issue. I've heard from our warfighters many times that when we go into an allied fight only the U.S. is bringing bombers. So I can understand why diversifying is something that an operator would want. But it's a nuclear bomber that's going to have a lot of our best military technology in it. So exportability and being able to secure those technologies is a difficult challenge, as it is for anything that we export.

So I'm going to keep my head focused on getting to Initial Operational Capability on time and then I'll let the debate go where it goes.

DWG: Okay. Thank you.

Can you talk a little bit about Light Attack? Do you think it's going to die anytime soon? [Laughter].

Dr. Roper: I have participated in this Light Attack saga like many of you have. What I've seen on it is just the experimentation has led to better questions. I think in hindsight we should approach experimentation more like a scientist, meaning that one round of experimentation is probably not going to be sufficient to answer all the questions that we would ask.

And what I've seen come back from the operators from the first round are two insights. One that we do need some kind of network that can allow us to work across coalitions. I truly appreciate this connectivity issue is just so debilitating.

I was talking before about making the Air Force an internet of thing type force. But that extends all the way to our allies and partners. And the way that we build networks today, where you build a bilateral one with every single mission partner is not going to work.

So I definitely have a strong demand from our operators to continue the aero net experimentation, and having real planes flying is a great way to do that.

The other thing that I've seen come back especially from our Special Operational Forces, is the need for an armed overwatch capability, which is not the same as a Light Attack. I think experimentation would be a great way to go out and explore ways to provide that. But my caution in the future would be to take a scientist's view which is that discovery tends to lead to better questions, and saying that you are done is something that is approached with more conservatism academically.

So we live, we learn. I think that's likely what you'll see from Light Attack are kind of two prongs. And whether we call the armed overwatch Light Attack -- probably not, because it's not Light Attack. But we've learned the operators need for it, based on this experimentation which is when you're still in academia you love when an experiment leads to questions in a completely different direction. That's the point. The point of discovery. The fun of discovery.

DWG: Is it fair to say then that it's morphing into this overwatch capability?

Dr. Roper: Is it formally that is the Air Force position as of today? No. But I see it going that way.

DWG: Thank you.

DWG: Saundra, then Pat.

DWG: Thank you, Dr. Roper.

I have a question about industry competition. You've said in the past that you think the industrial base may be too small, that you wanted to have more players, more commercial players. Now in terms of [space] and some of the very large programs in the Air Force, people see the Air Force restricting competition. Like they see the block buy for launch being two people, two companies; they see the LBIR being a [inaudible].

So how do you explain that maybe the Air Force wants to change that in the future? Or do you think that will [inaudible]?

Dr. Roper: That's a good question, and it's something that I think about every day. It's my biggest concern, is a business model for this century that grows the industry base I think there's no more important question in acquisition. The tension in the system is that I have warfighter demands that have to be met in a strict timeline. And so whenever you have a demand and

a strict timeline you have less ability to bring in new market entrants that need more time to develop. The worst time to buy something is when you need it.

So the practice we've got to get into is buying something ahead of needing it so that multiple companies can go through a tech maturation phase which gets them up to a similar bar of technology maturity so that the competition becomes about superior design and life cycle cost, not just the past pedigree of companies. So you'll see that tension where we've got to get off the RD-180 Russian engines. So we've got to move.

We've got to have missile warning at the time that we need it. And so that forces us to make more restrictive choices. But even within these programs, we're trying to create as much competition as we can. I think the launch program is a highly successful program. It's a very different kind of acquisition where we're trying to make a domestic industry base capable of meeting national security concerns. OSD recently gave it the Packard Award, which is the highest acquisition award, which is awesome.

So we're fighting for competition wherever we can -- let me say we're fighting for competition within the constraint of the timelines we have. What I would ask of our future warfighters is give me the requirement in budget ahead of having a strict timeline to deliver.

One of the reasons that I am such a big fan of the Section 804 Middle Tier Acquisition Authority, which is something that I don't think has been clearly articulated. It's just viewed as a fast path. But why is it fast? And why do I prefer it?

When we move into one of these large acquisition programs, if you follow all of the documentation burden of a traditional acquisition, it takes you at least a year if you're excellent, and more likely a year and a half to get industry on contract. So you've already ceded a year and a half. If you've got a

strict delivery timeline then you're probably short-changing your design phase and you're more likely to take a flawed design into production and every cautionary trail in acquisition you can trace back to a flawed design in production and now you've got to fix something while you're building it.

The reason I love the authority so much is it's like an extra year in design for every major program and they desperately need it. But I'd like to see them have even more. So giving me that extra year allows me to work the restricted set of competitors better. If you let me start the program a year before that, now I can work on bringing new market entrants in.

DWG: What do you make of like [Microthin] Space Development Agency, that they can build a [constellation] in two years? How do you make sense of that?

Dr. Roper: I've never been briefed on their plans or ideas. I'm tracking all of the industry companies that I'm aware of that are working on the large disaggregated constellations, and we're a fan. That's why we're working with DARPA on a disaggregated constellation.

But one thing I do know is true is that when industry puts up their disaggregated constellation, they're hoping to make money. And for me to put one up, we lose it.

So I'm a fan of trying to flight-follow industry as far as we can. Most of the companies I'm aware of are working communications. I think that makes a ton of sense for us. So I think that's likely to be the first distributed low earth orbit constellation that we see. I think we would have to stay very close if not identical to the commercial design. And one of the reasons that I'm a fan of communication satellites is you wouldn't have to worry as much about the threats to low earth orbit that you would expect to see for say an imager like the laser threat that we expect to face from the Chinese. It's not as if it's a threat that you can't overcome, but if you can't

overcome it cheaply, now you can't afford to disaggregate. A commercial company is not going to feel like they have to overcome a laser threat to make their business case. Right? They're working in the passive, benign environment. We're not.

So we've got to look very clear-eyed at the future, make sure that we crunch the numbers, which we do in the Air Force. Our space analysis, space survivability. Some of the best I've ever seen in government. Heroes to me. National treasures. And we've got to be, we have to be clear on how we invest and right now the Air Force's position is that there isn't a silver bullet in space. When has there ever been a silver bullet? Maybe stealth is as close as we've ever had and just something that we just a one-stop-shop way to win, but it's not anymore. We worry about the bases those stealth airplanes take off from. Everything is contested now. If everything is contested and conflict is everywhere, then you've got to diversify. And we think the same thing will be true in space, and there will be very different ways to work in low earth orbit than there will out at geostationary.

So expect to see from us a family of systems, an architecture. Where beating the family should be harder than beating the individual platform, which is exactly what we plan to do in air as well.

DWG: Pat, then Jillian.

DWG: Hi, sir. Were you at Hypersonic Pitch Day?

Dr. Roper: No, unfortunately, I had to do Space Pitch Day and then I went out to our F-16 Sonic [View] demonstration. But Duke Richards covered it for me.

DWG: Okay. Is it true the Air Force knows ahead of the Pitch Days who's going to get contracts or not?

Dr. Roper: No.

DWG: No? It's not? I was told to the contrary that the Air Force knows, because they have to submit technical proposals ahead of time, that these competitors, that you know who's going to get a contract ahead of time.

Dr. Roper: We don't.

DWG: That's not the case.

Dr. Roper: No.

DWG: Okay.

Dr. Roper: The first Pitch Day that we did there were maybe 80 percent of the companies, 80-90 got contracts. So we do, just to be fair to the companies, we do invite companies that we think have a good chance, but we don't know until they give their oral presentation, we can ask them questions. That's the biggest thing I've learned from working with venture capitalists and commercial investors. They think you're crazy to invest in an early stage company if you haven't talked with them.

So most of what we're getting in the live pitch is the ability to ask questions; the ability to ask about their commerciality, how are they going to commercialize; if they're working with the Defense Department. And increasingly, we're understanding the value of the team. If it's a very early stage company you're buying their talent, their experience, and in many cases just their energy and enthusiasm.

So we hope for a very high percentage. That's what doing the early review does. But there's a reason why all of our pitch books have our source selection cover sheets on them is it's a legit source selection.

DWG: Okay. So I guess real quick, do, you had nine teams at Hypersonic Pitch Day. Do you perhaps plan to expand that for

your future pitch days? And where did the extra $250,000 come from?

Dr. Roper: So the extra $250,000?

DWG: The Air Force said that contracts were going to be a max of $750 per its hypersonic press release announcements. And then I was told that you were giving out another $250,000 in option contracts.

Dr. Roper: Again, I'll look into the details of hypersonics since I wasn't there. I'm going to guess that it's similar to what the team did at Space Pitch Day where $750 was the max phase two award you could get from the SBIR, Small Business Innovative Research. And then the program office brought additional funds to either take that company to $1.5 million or $3. And by the way, that is a hugely positive evolution for pitch days. Because the SBIRS money is going to be there every year. It's fenced by Congress. It's for this.

Now that program offices are bringing their own money to pitch day, that's telling the customer, the company as well as their private venture investors that there's already customer buy-in.

The other thing that was really awesome about Space Pitch Day is we had the warfighters in the room, and in many cases their insights were the difference maker in the decisions that we made.

So we're finally bringing the whole C-suite team in the Air Force to the business table and it's going to help companies working with us.

The next big evolution for us has got to be getting to phase three awards. So phase one, phase two. I think we've made positive progress. But there is no money for phase three. There's no phase three account. That's program dollars.

So my hope is that doing the commercial matching that we've done as an experimental prototype with $50 million, trying to seek three to four times private matching, that that will be the carrot for our program offices. That if they bring their own money to the table for a phase three award they're likely to see that money tripled or quadrupled by private investors, and if they don't, then they're missing out on the opportunity.

So we're going to attempt that early next year. Hopefully announce the winners in March. And if that succeeds, then that closes off our investment ecosystem. Then if you don't make it past those phase three larger awards, then there's probably a reason why we shouldn't work with you. But up until now phase three has just been kind of an ad hoc non-systematic thing. And again, I always try to put myself in the PEO's role and say what would compel me to bring my own money to the table given I have near term issues? Opportunity would compel me to bring my money to the table. So we'll see.

DWG: Thanks.

DWG: Jillian and then Vivian.

DWG: I wanted to follow up on the Starlink satellite and the "connectathon". When might that happen? And can you give more detail on what you plan on connecting to them, and if you're working with any other startup company?

Dr. Roper: It will occur in December. We're being aggressive on that. So December will be the first "connectathon". It's to show we can get commercial communications into airplanes, and it's something that we need broadly. If we've got a commercial sat overhead and it's got bandwidth and we're a licenser of it. Then we want to show that we can spread out our ability to communicate across the world in different options. And areas that we're looking to actually deploy that capability right now ae on our tanker fleet, where we don't have enough bandwidth. So KC-135 has raised their hand and said we want to be the first

to go operational with it.

So ahead of that we're showing in a demonstration mode that we can do this across a much broader set of platforms.

We have a whole slew of companies that we're working with that provide commercial bandwidth.

I'm trying to remember what they call the name of the program. Global Lightning I believe is what Air Force Research Lab calls it, and it's completely focused on trying to bring commercial com into our platforms. So I'll have Cara work with you to get a list of all the companies that we're working with, and anyone else who would like it.

DWG: So you mean next month this is going to happen.

Dr. Roper: Uh-huh.

DWG: So that could work with their, they only have like 120 satellites up there now. That's enough for what you need?

Dr. Roper: Just to demonstrate that we can do it. That we can go from an idea to connecting things in four months. And there's nothing magical about four months. It just kind of divides the year evenly. But we wanted to just set an aggressive pace that's different than what we've done in acquisition in the past. We want more of a commercial pace of deployment. And it's going to force all aspects of the Air Force, not just the development to get in line. We've got to be able to test. We've got to be able to certify at that pace.

So as a total Air Force, we have to work at commercial speeds. And I have to give a shout-out to our colleagues at NORAD/NORTHCOM because they have driven this demonstration, which we call On-Ramp One. You've heard the Chief talk about his highway vice trucks. It's his big moniker. He wants to be the service investing in digital highway, not the trucks, the

airplanes, the satellites only. And so to on-ramp to that highway, this will be our first attempt. And failure is an option. And I hold that up for all of our aggressive experiments. I want us to embrace risk on this. And the second that we become risk averse in something that is supposed to move at commercial speeds, we won't be. We won't move that fast.

So we'll see if we succeed. If not we'll learn, and then four months later we'll get a chance to reattack and improve.

DWG: Thank you.

DWG: I wanted to ask you about adversary air training. I know the Air Force recently awarded a $6.4 billion [inaudible] company for adversary air. So do you see that as a trend moving forward, that you'd like to, you know, essentially rent adversary air training so that you're not using old aircraft like the T-38. And be part of a way to try and save money over the FYDP?

Dr. Roper: I'm a big fan of making as much of the military as a service as possible, because as we discussed earlier, we're trying to retire systems that we don't think can help us fight and win the contested environment, and once you own something it is nearly impossible to get rid of it in this business.

I have joked enough about their needs to be a milestone path to [E] that denotes the point in a program where you're paying a disproportional and detrimental cost to keep it sustained and upkept. And I'm finally past joking about it and have a team working on Milestone E for elderly. It will be the point where we think we're having to take on herculean efforts to keep systems operating; a point at which no normal common-sense business would see value.

And I hope that will start putting a moniker on programs where we think it would be better to divest and build something new. And if we don't have to own it, if it's a service that we can

have where we can scale up or down without owning that life cycle, then that's the way we need to go.

So I'm happy with the program plan that we have.

I think adversary air in the future is something we could even start exploring automation for. So trying to lower the cost again because we're bringing in platforms, not pilots. But in order to replicate all the complexity that a fighter pilot is able to bring to bear, the human element is still needed. But that doesn't mean we shouldn't aspire to that in the future.

DWG: When you say automation, can you elaborate on, is that like live virtual constructive training? Is that like using unmanned vehicles?

Dr. Roper: All. I think the live virtual construction is what you'd likely see first, so giving people a lot of runs before they actually get up in the air. But I don't think it's out of bounds to have maybe simpler training, or let's say more, you know, kind of like a set of baseline training or qualifying rounds that every pilot needs to go through, being able to automate that so that the off-script, the audibles are things that are being provided by the humans.

But we've got to find a way to start mixing people and automation in the air and in space because we're already seeing that commercially. Again, it's a place where failure is an option. We probably won't get it right the first time. And the more I engage with artificial intelligence researchers, the more clear-eyed I am about what the first iteration of automated intelligence machines are going to be, and they're going to be powerful but vulnerable. So I'm confident we're going to have to have a mix of these things. But right now I don't have AI at the warfighting edge. I don't have it on a tactical system so I can't learn anything about how to break it and then fix that break, and then hopefully break that fix and go back and forth, back and forth, just like we have on stealth and counter-

stealth.

So the cool thing about this AI revolution is if we could actually get it into our platforms and then start figuring out how to defeat it, it puts us on a path for what you might call digital stealth that's very similar to what we live, eat and breathe for physical stealth, electronic stealth. I think the Air Force muscle memory will just kick in and we'll know how to fight that fight. But we're got to get it to the edge first, which is why I'm so passionate about all this digital transformation. You can't just say I want AI. You've got to have a digital infrastructure to deploy it on, and no service has one. It takes money to do it. And now, like awesomely, the Air Force has put significant money in its budget to do it. So if we can do that then I think it opens up a broader world for us and one we need to open up.

DWG: Nicholas and then Scott.

DWG: Thanks very much. My colleagues here are much smarter than I am about some of the details on what you do, so forget me for asking that 30,000-foot question, or maybe 20,000 foot, about China.

You've talked a lot about competition with China recently, mentioned it this morning right before we started. My broad question is, what are you worried about China's doing better than us? You talk a lot about innovation on the battlefield. Where is their innovation better than the U.S.? And a little more specific question, how important is new technologies in the F-35 block 4? How important are those to maintaining an edge on Chinese [inaudible]?

Dr. Roper: That's a question, to talk about what I worry about and where I think the advantages and disadvantages are between us and China, that is a rich, rich discussion that the amount of time we have will not do justice to, but I'll give a couple of instances. I think about this problem a lot.

Broader than just China versus the West or China and Russia versus the West, I think you're seeing in this century a competition between open systems and closed systems. And technology is exacerbating both, right? It's making open more open and closed more closed.

So I think ultimately this idea that innovation is a battlefield and that whoever's driving the tech will have a greater say as to how the world will evolve and whether open systems or closed systems of government will have an advantage is absolutely true. So it's a battlefield being fought in every classroom, laboratory, company, every nation. Technology is so fast, so accelerated that you can't even predict the future . So if you can't predict it then you need to be continually making it or be agile in responding to it. We haven't had to be in many decades, so I believe that that's true and I'm doing my best to try to make the Air Force part of the equation.

I think the biggest detriment, but it could end up being a weakness on the whole, are closed governments anointing tech companies and giving them the full backing early on without the benefit of strong market competition all the way through their development and deployment?

So the advantage early on is that you get an influx of cash and that's something that companies here in the U.S. and the free world wouldn't have the benefit of. But in the long term I think the market dynamics really strengthen companies. It keeps urgency in competition in place.

So what I would like to see the U.S. do is try to level the playing field. But since the U.S. is bigger than my job, I'm trying to do it for the Air Force, which is to make the market that we represent not one that anoints companies, but one that is easy to work with companies that can help solve our problems.

Historically, over like the last decade, if you're a tech

company you don't want to work with the U.S. government. We're too slow. We're too debilitating=ng. We have too many strings attached to how we do things. So working with us would slow you down and would crush you under the competitive market dynamics that are true and present in this country and around the world.

But if you're a company that can solve military problems, it ought to be a strategic advantage to you for multiple reasons. One, we are a market. We're not just an investor. I use that word broadly. We're not owning equity, and that's a huge strength, by the way. But the fact that we put a company on contract allows them to develop technology. But then we're also a purchaser of it and we're a purchaser that pays a different price than the commercial world. We pay higher prices. We don't need things in the same large quantities that the world does.

So for a lot of tech companies, I think the Air Force could be the bridge that gets them cash flow for increased development, lower in cost, so they have a better chance of becoming commercially viable.

What's awesome, this hypothesis is bearing out as we work with more private investors.

I was just out at Space Pitch Day this last week, but spent a lot of time meeting with startups, with founders and with venture capitalists, and arms are wide open because any increased probability of finding an early customer is what an investor is looking for. And that early customer being the military has been out of bounds. Now we're putting it in bounds. And what we're seeing are companies that are working with us through pitch events aren't just getting money from us. They're getting three, four, five times the funding from private investors.

We just closed our Strategic SBIRS solicitation where we invited companies to propose to us phase three development work where

they're looking for U.S. dollars. And as a necessary condition of getting our funding, bringing additional private investment.

So if we put in a dollar they will bring three or four times the amount of private funds.

So the companies we closed on are requesting $300 million total from us. We likely won't award all of it. That's not huge within the portfolio of the Air Force. They're bringing over $1.1 billion of additional private investment opportunity. This is our first time trying this. That's huge. Four to one is awesome on our first attempt.

So now if that becomes the MO in the future, if you can work early on with the military, solve our problems, and we as a good partner do not pull you overly into an orbit that makes you a defense-only company, that not only do you get non-dilutive capital from us, you get private investment and have a better chance of developing and commercializing ahead of other companies. Then it's not the same model that China takes as anointing a company, but it does give companies an advantage if they can live in both markets. If they can be dual use.

And whereas the 20th century really ended up creating large defense primes, I think this century's challenge is creating large dual-use companies that are changing the world with their tech but that feel a connection to the military because we were a good partner when they needed us and we remained a good partner as they grew.

So hopefully the first round of companies that are working with us, we will be that good partner. That's the litmus test for me.

DWG: Just quickly, specifically, what has that closed system as you describe it in China, allowed for the Chinese Air Force specifically to succeed at and to accelerate that we're seeing within --

Dr. Roper: Just by having the ability to determine what companies do. They have access to their entire innovation base. But it's by compulsion. Whereas for us it's got to be through volunteerism. But that's been a strength for us.

So I fear right now the U.S. Air Force does not have access to the entire U.S. innovation base, and I want to try to make that as untrue as possible. But what I firmly believe is that our system of open ideas, markets and elections will win on the long term because those competitive dynamics create an urgency and a self-stabilizing force. But just because we think they're better in the long term should not lead us to believe there might not be short term advantages that we need to try to over come by changing the way we work with commercial innovators.

DWG: Scott and then Auriana.

DWG: The "connectathon", I was wondering if you can just kind of tell me a little bit about the format and operational way that will kind of work.

Dr. Roper: Like when it's the actual day of or --?

DWG: I guess the way I'm picturing it is like a pitch day. But is it just, what is happening every fourth month? Are you saying this is the next thing we're going to do? How are you getting to that moment?

Dr. Roper: It's a great question because we're making it up as we go. There's never been anything like this. So up front we have let our combatant commands volunteer to sponsor them and NORAD/NORTHCOM was the first volunteer, and they're very gung-ho about the Advanced Battle Management System as a way to improve homeland defense. So they jumped in and provided the operational context, helping work the assets that we need available to participate. The F-22s, the F-35s. And so we're very thankful for that.

At Corona two weeks ago, that's where all of the Air Force leadership get together, I volunteered, I guess, to work with STRATCOM and SPACECOM on the next. But your point is exactly right. We need a way for people to propose "connectathons" and get into the pipeline. So I wouldn't be surprised at all if it ends up being like a pitch day. I don't know if it we'll necessarily need people to pitch live to us, but having a proposal process where we review the maturity of the tech versus the benefit to the warfighter, we would do the former, our operators would do the latter.

What I love about this, it's kind of a competition within the joint force. So if you are able to connect -- but you've got to do some things on your own part, right? If we need to install software defined radios in your system, those systems are going to have to go into depot maintenance for a period of time and they're not going to be available to you. So you've got to take the risk of having systems have downtime to get the benefits of the funding that's in Advanced Battle Management System or digital transformation writ large.

But if you look at commercial tech, software defined systems have amazing advantages. I think every system will have to do this eventually. So we're going to be looking for the fast movers to volunteer, and then we'll look at the fast followers and after we get to that point I guess we'll just start tasking other people to come into the development pipeline. But I like working with people that are more inclined to do it.

And if you want a guess of one of the systems that I think will sign up wholesale will be F-16. It's a very innovative, agile program with very innovative, agile operators. Because they're looking to keep that system viable. They know it's going to be challenging to keep an F-16 viable in a contested environment.

I was with them on Thursday to watch the first Kubernetes deployment on a military system. So it's a hugely valuable new

military, sorry. It's a hugely valuable new software technology that solves many of our military challenges. It's more efficient. It's more secure. It abstracts the software from the running environment. It's almost like a quantum unit of code. So if you're in the Air Force and you're thinking how do I know the code running on my laptop will run on my jet the same way? Containers and Kubernetes which orchestrates Containers solve that challenge for us.

This team decided to do it and did it in 30 days. First time that's been done.

So I look at that and think oh my goodness, this is taking on the challenge that we see across the joint force of embedded code and the difference between the development and deployment environment being a limiting factor for operationalizing. They're using a commercial technology that solves both of those.

So I think that they will be likely to sign up, but what's great is, if you write about this other programs will read this and say F-16? Wait a second. No, we'll do this before they will. So I want to create a little intra-service and intra-joint force rivalry about who's going to digitize first.

DWG: And secondly, sort of different, but I think this kind of ties in. It feels like you're pushing, and I mean the military as a whole is doing this, is pushing risk farther down and decision-making farther down the chain.

What kind of advice do you have for managers who are just kind of taking the helm of this? You've got pioneers of being these risk managers. What's their kind of survival tool kit to deal with this kind of stuff?

Dr. Roper: I'm very mindful that telling people to take risk and convincing them that they have the protection and cover to take risk are very different things. In past jobs I've received those fail fast type memos and didn't believe them. So I worry

about this. Maybe it's my second biggest worry behind industrial base and just competing with China, how do we become a service that returns to its roots, where failure is viewed as part of the discovery in learning and where we don't believe we'll ever get something right the first time, and if we do, we didn't go far enough. A cutting-edge Air Force should not get it right the first time.

So the only answer I have, how do you get people to believe it, is you have to live it in yourself. So I try to take risk and just make choices that I think are necessary to compete, but sometimes are not the, I guess the easy choices or ones that give the best kind of, less criticism of what you're doing. So I try to do that.

But there's not a lot of execution at a high level so the execution is going to happen at those lower ranks.

I've tried to create ways to highlight good risk-taking that has not ended up leading to success, but led to valuable learning, so we have awards for that now called Spectacular Learning Event awards. And when we first started, they were all like the answer you give in an interview when you're asked what your greatest weakness is, and somehow you end up giving your greatest strength as the answer. You know, I work too hard. Or I'm overcommitted to excellence or whatever. [Laughter]. Perfection gets in my way.

Those were the first answers that we got. And now we're getting real failures. So I give, we had a weapons program that won recently and their program originally was conceived around a game-changing technology being brought in by an industry partner that we thought was very risky but interesting, and they didn't think was risky. We couldn't close the risk calculus for the amount of funding that we have available. So we proposed doing a cost-share on the program if the vendor was willing to do that. They said absolutely, we're going to prove you're right, you're going to love this weapon.

When we got down to awarding the contract, the vendor got cold feet. They weren't quite so sure about their risk assessment. I think they thought that we would capitulate, give in, because not awarding contract and, it's not really canceling a program because it didn't ever begin, but not putting something on contract and terminating the effort, well that's a negative thing in the Pentagon. That's what the team did. They said we have no basis to change our opinion of the risk of this system. We do not believe it is likely we will succeed without funding that we don't have and iterations that we don't have in the technology development cycle. So I was so proud of that team, and I've tried to celebrate them every opportunity I have because that's exactly the kind of behavior we want. We want people to stick to their guns, to toe the line, stand their ground, and if those examples start encouraging other people to take the fight stance in what would be perceived as an unpopular position, then watch out because that's the early Air Force in a nutshell.

So the first failures and how the organization responds to them are the most critical things we do. Because I don't think memos and telling people to take risk is going to speak nearly as loudly as seeing how the first risk-takers who don't succeed are celebrated. I own that I would probably not be talking with you had I not taken a risk in my last job that happened to work out. I had just enough money when I was founding the Strategic Capabilities Office to do one project. One. And we bet everything on anti-ship capabilities for Standard Missile 6 and it worked . That was all the funding I had. I doubt I would have been given more funding had that failed. But my goodness, being able to take something the Navy's going to buy in many hundreds that's doing a defensive role and giving it an offensive role for pennies on the dollar, just a software change, that's a no brainer. That's a great risk. Right? If you're doing like the investment calculus, if that was an investment you could make privately, you'd say that's a great investment. But the fact that it worked out is only, is likely

the reason that I was given additional resource.

So it's that rewarding the risk takers for whom it works out, and there's a falseness to that and a hypocrisy that we need to kill in government.

So I hope we have some more failures that don't work out so I can celebrate them, which is a strange thing to say as the acquisition exec, but if all we get are the safe failures or the ones that succeed, I don't think it will wholly change the culture.

DWG: Auriana and then Rachel, and then we'll finish with Tony.

DWG: My questions are actually clarifiers. Could you tell us about the Valkyrie program and having it host the gateway at one point for the F-22, F-35 connectivity? Is that just for a testing purpose of is it actually going to be a concept of operations for the program?

Dr. Roper: For the purpose of the "connectathon" it will be a testing platform. It's very amenable to adding the gateway on.

Our warfighters are very interested in having attritable systems so I would not be surprised if that comes soon to an Air Force budget near you. And if that's the case, then these kind of experimentation will help warfighters understand how do you use an attritable system? And attritable for me means something that you can re-use but you don't plan to re-use forever. And that's actually part of the calculus we're trying to figure out with systems like the Valkyrie. Is the knee in the curve something takes off only once? Well, that's kind of a weapon. Is it something that takes off thousands of times? That's really an airplane. Where is that spot in between? Right now industry seems to have concepts settling on 50 to 100 takeoff and landings.

So we're also interested in just getting more rep time to

determine where the knee in the curve on attritability is. But I thin it will be hugely powerful in the future because right now the Air Force, everything that takes off is meant to come back and land. And that seems pretty difficult facing all the threats that we have. So if we have to take risk or fly into the unknown, shame on us if it's something that has people in it.

DWG: My second clarifier is with Light Attack earlier. You said it would morph into armed overwatch and that's what Light Attack was supposed to kind of take over. But could you just give us a sense of what that actually means? When I think of armed overwatch I think of things that already exist like MQ-9, F-16. Why can't they do a job like that?

Dr. Roper: This was not, I don't think this was originally what was being looked at for Light Attack, and the program began right before my time in the Air Force. It was not an acquisition strategy that I put together. But it appears to me looking back it was about trying to do experimentation with currently available systems that you could also put networking in so that they could talk to each other across a coalition that could do the Light Attack role.

We were working that through experimentation, special operating command, AFSOC and SOCOM, and started having a stronger and stronger voice towards needing a better armed overwatch capability, and I think exactly what you said. There are systems right now that we don't really think of as being in the SOCOM portfolio like MQ9s that we'd like to explore and see can they do a better job for that?

So experimentation with systems we have now I think is a great way to try to go after that role, but it's a different role than light Attack. Again, I'm looking back on this. You're asking me to try to connect things I wasn't there to hear the conversation. But it appears like there was first a desire to go after one mission; and then as operators got more contact

with systems, other missions that might be more pressing came to the forefront because this experimental approach would be a really good way to solve them quickly.

DWG: Rachel.

DWG: Can you talk about any kind of behind-the-scenes work that you guys are doing for F-15EX right now? Or is all of that on hold with the CR. What can you do --

Dr. Roper: We can plan, but we can't award contracts. So we're trying to think about the digital Air Force transformation up front. We're talking about taking systems off the flight line and having to go back and digitize them. We would like to digitize while we're in production as much as we can. So we can plan, we can have interchanges with Boeing, we can talk with our warfighters, we just can't put money on contract to buy them. That's valuable work and in some ways I'm kind of glad we have a small pause, but if we stay under CR this entire year, what a debilitating thing for the Air Force. Especially for space where we're trying to build systems to be survivable in space. All of the new starts, nearly all of them classified, so they're hard to get the public to say yes, we must have that. It's just going to be a big setback for us. So I have fingers, toes crossed. I'm not carrying horseshoes and four leaf clovers, but I may start doing that, because we really need a budget this year.

DWG: A couple of months ago General Ray at Global Strike Command mentioned that senior leaders were getting ready to brief you on experimental reports of something about [arsenal plane]. Do you have something you can just give us an update on what you're looking at with that? What those experiments might be?

Dr. Roper: I'm not exactly sure what the specific brief was. If you look at our force going forward, a lot of the programs that we have are turning the bomber force into something else.

A B-52 with a lot of hypersonic weapons on it is, I'll call it a bomber but it's certainly not dropping things down. Quite the opposite. It's almost a missileer instead of a bomber.

So I've been doing a lot of reviews with General Ray and Global Strike Command. Since we're working very fast on putting hypersonic weapons on the B-52 and those programs are doing well, can we think more broadly about how an airplane carrying a lot of weapons can be looked at? There are a lot of other systems that are currently in development, even some outside of the Air Force that seem to make sense.

So I presume that was the reference, that we want to take a broad look at how does the standoff bomber work in the contested environment in a way that's complementary with the stand-in B-21.

DWG: Are you kind of abandoning the idea of having a separate arsenal plane and just sort of rejiggering [inaudible]?

Dr. Roper: I don't know, obviously the arsenal plane thing I've got some background with. I don't think that the Strategic Capabilities Office has publicly released what the platform that was originally looked at was, and so I just have to defer to them and not step back into the old job. But they are still our partner now on all of our hypersonics work. We would not be able to keep our HCSW Program, the Hypersonic Conventional Strike Weapon, we would not be able to accelerate it without the work that the SCO was able to do on the marriage of the heavy weapon to the airplane as well as the booster itself. So we're very, very thankful for that partnership. And also are looking at an expanded set of topics with them, which again I have to defer to them to discuss with you.

DWG: Tony?

DWG: Bomber question. Are you talking about linkages and improvements in them? You want to make the bomber do something

else. The B-2's defensive management system's having major issues. Why is it having these issues? Has Northrop under-performed? And what does it tell you about the difficulty of this linkage, this vision, [heavenly] vision that you want to incorporate in three or four years, when you can't get this bomber right and it's your major [inaudible]?

Dr. Roper: It's actually a really good case study of what new software techniques will give us over old. So let me kind of set the context.

I think that Northrop underestimated the complexity of doing the B-2 modernization, but I think we would have as well. And what the team is seeing is the conflict between the code being developed in its development environment, running in the operational environment which is the B-2. It's exactly the thing that this Kubernetes technology overcomes. That the software is fully extracted from any embedded code, run time, any of the things that are on the jet and not in the development environment. It's just a hugely powerful thing to know your code running on a laptop. It's exactly the same code, bit by bit, that will run on the airplane.

What the B-2's seeing is that the development environment does not perfectly mirror the production environment. So when the code goes out to the airplane, specific factors from the hardware or embedded code force whatever was written in the development environment not to work perfectly. So the team's having to do a lot of rework.

I think it's a great example of why our new systems we've got to get to software definition and move to this Kubernetes Container technology. Because if we're going to deploy like within like days, then we can't go to our testers and say well I'm pretty sure this will run but I can't properly model the hardware/software configurations on the jet. And what's awesome about the hardened containerization, I think of it as like a quantum unit of code. Everything that you need to run -- the

code, the run time, the libraries, any shared file system, is in that container, and that container running on the jet is exactly the same container that was running on yoru laptop. That is not the case for the B-2 right now.

So that program because of the deployment timeline that's needed, we can't go back and containerize it up, but for programs like the F-16 we can certainly show that this capability is very amenable to run on legacy systems and aside from the fact that it abstracts the hardware from the software, it has many other values. It's more efficient. Takes much smaller file sizes. It loads much faster. It's more secure. It self-heals when you have failings in it. So I just see a huge benefit, which is why commercial industry as moved to this technology so fast. I think it's been since Lenox that you have seen such a broad adoption of a technology across industry.

So what's pretty awesome about the f being better at code than I think anyone else is that we see this as the enabler. So programs like GBSD, B-21, F-16, F-22, anything that has hardware to run on sees this as a way to lower their risk. And what's going to be awesome about from scratch programs like GBSD is they're going to get to explore it from the ground up as opposed to having to retrofit it.

DWG: Are the concerns in Northrop's performance on B-2 DMS, are they raising issues about how they're doing on the B-21 in terms of systems integration issues?

Dr. Roper: No, no. The difference is, B-21 they're designing from the ground up; and B-2 they're having to go back to decades-old hardware. It's the ghost in the system that the engineers for the B-2 now don't know are there because they're not emulated in their development environment. Which is why you can go from thinking I've written this code, I've used agile development practices, it runs in my development environment. And then when they run it on the jet there's an issue because there's something in the underlying hardware that conflicts with

the code as written in their [[depth] platform.

So for B-21, since you're designing from the ground up you try to make your development environment mirror your production as closely as possible. So Northrop has done a great job of trying to get coding talent from the B-21 to take a look at what's happening in B-2. I'm watching that very closely though, because I don't want to pull the B-21 off of the great progress it's on. But I don't view this as a failing on the part of Northrop. I view it as just simply a cautionary tale for us about not moving to this containerization in our new systems.

DWG: Okay. Are you going to put out a new acquisition book, by the way? :Last years was really good, that acquisition summary.

Dr. Roper: Absolutely. Anyone that would like one. It's something our workforce likes so they can take it home and say here's what I do for a living. I even hate the term acquisition. I think of this as a cool tech company. If you notice like most -- [Laughter]. Come on. Fancy airplanes and satellites and cyber stuff. It's awesome. The Air Force is an awesome tech company.

When you come in and you engage like renewing procurement or acquisition, that's not how Apple or Google would talk about what they do. So most of the way I try to message what we do is to follow a playbook from commercial tech companies.

The acquisition side of this business, I have 51,000 people with tons of experience and expertise that do a great job of advising me on all of the legalese of acquisition. The onoly thing I do that is of value in my estimation is bringing that technology lens and saying here's the next big thing we've got to do.

So bringing that innovation side to the Air Force seems to dovetail really well and I'm seeing the change within our workforce of people starting to brand more as a tech company. Things like Kessel Run and Kobayashi Maru, all these things that

are more SciFi inspired, if we gave them a crappy government name, does that inspire you to think of yourself as a tech company? Certainly not.

Cloud One, before we renamed it, was called Consolidated Computing Environment, which has got to be the worst name I've ever heard, but it certainly does not sound like something I want on my own phone. Cloud One sounds great.

So it's an absolute wonderful first-rate cloud that by the way, we just got our development environment from Level Up that we're going to call Platform One. We just got it accredited for information level five and certified for continuous authority to operate out in our space development workshops. Space Camp and Kobayashi Maru. It's awesome.

I don't think that team would be hitting commercial speeds, commercial deployment timelines if they weren't wearing the kind of commercially inspired swag with commercially inspired branding. I think branding and marketing matter a lot because they tend to lead to a culture and culture beats process any day.

So when you go into Kessel Run or Space Camp, you know you're in a different culture than the Pentagon. You're in a culture where days count. Today counts.

So I'm going to continue that because I think this tech branding is a really good way to take acquisition in government. Quit calling it acquisition and think of it as the tech company of the service. And hopefully that will inspire more people to dream to commercial tech timelines.

DWG: Dr. Roper, we'd love to keep you all morning, but we are out of time.

Dr. Roper: I would prefer to stay here than go to the Pentagon. [Laughter].

DWG: Thank you very much.

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