

**General Ellen Pawlikowski
Commander, Air Force Materiel Command**

Defense Writers Group

May 15, 2018

DWG: Is now the right time to split up the F-35 Joint Program Office, and what is AFMC's role in setting up a new System Program Office for the F-35A?

General Pawlikowski: -- to get the aircraft fielded. But as we go forward, I think that as you look at how these platforms will interact with the different services and just the challenge of trying to keep this large group of aircraft moving forward together with all the different players, the speed and agility that you hear us talk about nowadays in terms of being able to meet the National Defense Strategy is going to make, that type of organizational structure is just going to be too cumbersome.

So I think that it is the right thing to do. That said, I think we need to make sure that we do this in a measured way. We have a contracting relationship with Lockheed that goes through this single program office. That, we need to make sure we maintain the benefits we get from that, and we don't break that relationship prematurely. And we need time for each of the services to build up their organic capability.

That said, we in AFMC have been actively involved in looking at what we needed to do to strengthen the role of the Air Force as a group within the F-35 enterprise.

The first thing we did was we stood up the Integration Office back in 2014. In fact I was involved in that discussion with then General Welch. As part of that discussion, he and I discussed the fact that we would eventually need to go beyond just an integration office which is a small group of folks that live in the Pentagon, to what we call a Fleet Management Office. We have been in the early stages of looking at what will that look like. And the focus initially of that group is to look at the sustainment issues and what it's going to take. But also to look at what are the capabilities that the Air Force is going to need. And that, our Fleet Management Office, our strategy now that we have a position from Ms. [Lure] that we will look towards this transition to the services, that Fleet Management Office is our first step to doing that. So we'll work with that

Pawlikowski - 5/15/18

office, with Matt Winters and the F-35 team to make sure we do this seamlessly, with the objective of strengthening the effectiveness of the management structure to be responsive to what the Air Force needs from the F-35.

DWG: The one thing that we've been hearing for the past 20 years is that a strength of the F-35 is going to be the commonality and the integration and the jointness. Are we headed now to three separate sets of requirements and three separate logistics chains? Essentially, are we throwing all that away?

General Pawlikowski: I don't believe that we're throwing all of that away. The basic design structure is already set so I think there will always be a benefit of the commonality that we have. But I think that as we evolve the weapon system to be responsive to the different missions that we will call upon, there will be more attention to mission systems, for example, and some of the weapons that we employ off of it could very much evolve into different roles, because of the different roles that the Air Force will use the platform for versus the Marines and the Navy. So there will be some more uniqueness, but I think the basic structure. The engines, for example, all of that. There's benefit in that economy of scale which we all are benefiting from now, which I think we will continue to want to leverage.

DWG: Thank you.

Laura, then Valerie.

DWG: Hi, thanks for being here.

I wanted to ask you about the recent stream of aviation mishaps the Air Force and across the services have been experiencing. We've heard officials in the Air Force and OSD saying this is not a crisis. Would you agree with that characterization? It definitely seems like a crisis from the outside. Can you, I guess, defend that? And what is being done about that?

General Pawlikowski: First of all, I think the way the Air Force has approached this is not to panic. When you look at the data over the last couple of years, there has been, it's been the last six months, but if you look at last year, last years we actually had lower fatalities than in recent history, for example. But when you look at what's happened since January, it is a little bit, it is, it got our attention.

Pawlikowski - 5/15/18

As you know, General Goldstein sent out a message to all of the wing commanders, particularly for the flying units, to do a safety review and to take a look and make sure that we've got the right focus on safety.

Within Air Force Materiel Command, we are doing that in our units that fly. You know, the test center has a number of flying units. Big Safari, for example, has some units that do flying. And we've also asked our air base wings that support flying units like at Hill Air Force Base, the F-35, the air base wing there supports the F-35 wing. To also look and make sure that we do have the right focus on safety.

But in addition to that, I sent out a memo to all of the centers asking them to take a look at all of the data sources that we have, that we use on a regular basis to look at the health of our weapon systems, and to just take another look at that data from a different angle and see if there's anything that we are missing in there that would help us to predict what might be the next mishap.

For example, we have a program called the Air Force Structural Integrity Program, and that is an effort that we've been doing for probably 40 years, which uses predictive models and analysis to look at where we manage structural issues. That we want to look at and do inspections or do repairs on before we get into an accident. So I've asked that we, you know, just do what I call an out of cycle look to see what has happened there.

In another situation, another example is I've asked the Sustainment Center to take a look at what they have seen as airplanes have come in. For example, the KC-135 comes in to Tinker on a regular basis for preventive, for periodic maintenance, to see if we've seen any spike or things that have come up that we didn't, what we call unplanned work. You know, when we open up an airplane and we see corrosion somewhere, structural issues, we fix it even though it might -- obviously we'd do that -- even though it might not have been on the plan for that particular maintenance cycle.

So I asked them to go in and look at that data. Are there places where we've seen any spikes or any unusual behavior?

So we're doing that enterprise-wide, in addition to the safety reviews that the Chief is doing.

Pawlikowski - 5/15/18

So the difference, we don't consider it a crisis but we have elevated interest in making sure that we aren't missing anything and that we really do empower the airmen to make sure that they, that safety is always first.

DWG: Have any of the units done their one-day pause yet? And are there any trends that you can trace back? Sequestration is one theory. Lack of experienced maintainers is another theory.

General Pawlikowski: We have not -- I know that they are scheduled. I've not gotten feedback yet. On the additional work I asked for an enterprise look. I gave them until the middle of July because I wanted to make sure that they have the time to look at it.

By the way, I know that there has been some discussion about whether issues with sequestration could cause these.

What I will tell you is that our systems that I've described and the approach we took to allocating dollars are basically designed to fail safe. What do I mean by that? If, for example, under sequestration we had to reduce the number of airplanes that went through the depot, which would mean some planes that would be flying longer without their regular preventive maintenance, we would not fly those airplanes in an unsafe mode. We would basically make those, we would ground that particular airplane until we were able to do that maintenance.

So even though we did take reductions in areas with respect to sustainment during sequestration, I would be surprised to find a direct correlation because our whole approach to allocating resources in those decisions is what I consider a fail-safe. So in other words, if we don't spend the money, we wouldn't continue to fly that plane at high risk. We would not have that plane available.

So what you would likely see more from decisions that were made as part of sequestration would be a reduction in aircraft availability as opposed to flying in an unsafe mode.

DWG: But there were some I guess indirect results of that. Pilots flying less. Maintaining issues, maintainers leaving. So is that potentially correlated?

Pawlikowski - 5/15/18

General Pawlikowski: We do not know the root cause of all of the most recent accidents in particular. Most of them are still under investigation. And I would reserve an opinion on that until we see the results of that, of the recent accidents.

DWG: Valerie, then John.

DWG: I wanted to ask about a related issue, about physiological episodes, have been [inaudible] related provision, added some funding and reports. I know you can't comment directly on legislation that's working its way through, but in your mind, is the Air Force getting the resources it needs to fix the problem. What extra money? Or are there some other limiting factors here?

General Pawlikowski: Well, we have tackled each one of these as they've come up and aggressively worked it with as many resources as we can. And we're doing the same thing now with the recent instance with the P6.

As you know, General Cross stood up a safety investigation board, and we are supporting that. We are, in fact, today flying test missions out at Edwards Air Force Base to collect environmental within the cockpit, and to observe the performance of the air-breathing system.

We did the same thing with the F-22. We have been supporting the F-35. We have stood up a laboratory within Human Performance Wing to specifically look at the OBOGS, the On-Board Oxygen Generation System, which is one part of the air-breathing systems in these aircraft.

So I don't, at this point I believe we have the resources we're applying to it. Some of the things that are slowing us down with respect to the test is just the availability of some of the measurement equipment and test equipment, which just is a matter of getting the industry geared up to build those for us.

But the whole unexplained physiological event is a very complex challenge because of the fact that there's, an integral part of this is our human bodies, and there are always things for the last, well, since we first stood up aerospace medicine down at Brooks Army Air Field right after, in the beginnings of World War I through the inner war years, we have continued to learn about what the effect of flying has on the human body. And if there's any system in an aircraft that has that key interface

Pawlikowski - 5/15/18

between the human and the machine, it's that air-breathing system.

So any time we get into one of these we have that challenge of understanding the human performance versus what the Machine is producing.

DWG: You mentioned the problems that have happened over the last couple of months with that aircraft. Right now the report is [inaudible] a couple of light attack aircraft, and one of them is a version of that [inaudible]. Does the Air Force have concerns that if it were to procure that aircraft down the line, that it might start to see more of those episodes? If there can be a connection there?

General Pawlikowski: No. Because we have over two million hours of flying the P6 with that OBOGS system. And when you look at -- and by the way, that system that's in there has many similarities to other OBOGS systems. So the question, OBOG systems are proven to be able to perform and generate oxygen. And by the way, they're one of the most effective ways of doing that. You better be careful, I'll get my geek on and explain to you why they are. [Laughter].

I think what we have to continue to do is to understand how that OBOGS interfaces with the rest of the system and understand what changed. We have two million hours on the P6. So what has changed in there with that OBOGS? And that OBOGS has matured over that time.

And, by the way, we're about ready to put a new condenser on which is more efficient and more effective. That's starting this October. It will take us a couple of years to get that on there.

So we do not see the current system as a measure that says we have to abandon the OBOGS, the On-Board Oxygen Generator. This is just a matter of understanding what's going on with that air-breathing system that has changed, that is causing us to have this increase in events.

DWG: John, then Ashley.

DWG: It's good to see you. I'll beg your indulgence for asking another question about hypersonic.

Pawlikowski - 5/15/18

I'm hoping you can clarify something for me. I've been told three different things about the hypersonics research infrastructure. I've been told the structure we have is perfectly fine for what we need to do. I've heard we need to go on a campaign of building new tunnels, new facilities. And I've also been told that it doesn't matter, you can't test what you need to test on the ground, you have to do it in the air or in simulation.

Which one of those is actually closest to the truth? And if we do need to embark on a campaign of research facility building, whose portfolio is that in? Is that Air Force Materiel Command, AFRL, DARPA, NASA? Who?

General Pawlikowski: I think the short answer to your question is yes to all of them. First of all, I know you know hypersonics is always five years away, right? John always says that to me, that's why I have to do it back to him.

But hypersonics, when you use that broad term of hypersonics, you're talking about a wide range of, it's a speed regime, right? And there are different techniques for getting there. And so there are some capabilities which are a continuation of a traditional way of getting to that speed where what we have is probably good enough for now.

That said, though, it isn't good enough to do some of the, to be able to maximize the data collection on the ground that we believe is going to be important to really mature the hypersonics into the kind of weapons and the capabilities that we're looking at.

So we do have an investment going on at the Arnold Engineering and Development Center to bolster our hypersonics capability. And in fact, that's being done with not just the test center, but a team of AFRL down there as well. And NASA has been involved in these discussions too. So that's why I kind of tongue in cheek said yes to all of them, because it is a whole community involvement in this. The effort that we've got going on down at Arnold is one that's being orchestrated and helped by the TRMC, the Test Range Management Center. And I believe that those improvement efforts we're doing down there, some of it is revitalization of some facilities that we haven't used in a while, bringing them up to speed, will be critical to being able to reduce the demand on flight tests.

Pawlikowski - 5/15/18

As you know, flight tests of any kind are much more expensive and much harder to control the environment than in a ground test facility. So I think some of the effort, for example, that we've got going on down at Arnold will enable us to get to ground truth data that will be closer to the physics than you can get from a flight test. And by getting that ground truth data that's closer to the physics equations, because I can control the environment better, it will enable us to build better models which will enable us to be quicker and more effective at designing these.

DWG: And real quickly then, is Arnold the only place where these are going to be built? And do you see private industry building the tunnels that you might contract to use?

General Pawlikowski: I'm not, right now I'm not aware of what industry's doing. It's not to say they aren't. I'm just not aware of it. I don't know of any other activities within the Department of Defense with respect to the wind tunnels and that aspect for hypersonics. That's not to say it isn't. I'm just not aware, John. I just know about the activities down at Arnold.

DWG: Ashley, then Sasha.

DWG: Tensions in the Middle East are rising right now. The potential [inaudible] is increasing. Could you talk a little bit about Materiel Command and how they're preparing for [inaudible] operations over there, and the challenges you see getting the right weapons and equipment [inaudible]?

General Pawlikowski: Well, almost anything that goes on in the Air Force, an airman in Air Force Materiel Command is involved in. So when we look at readiness and our support to readiness, we actually have to take a holistic approach, global approach. So we have efforts going on every day that scope everything from the basic research to supply chain management.

For example, when you ask about what are we doing in anything from say support to things going on in the Middle East, or support to PACOM with respect to threats from the Pacific, or support to General Walters with respect to Europe, we are always constantly engaged on, for example, on the research side with Air Combat Command and others as to what technology do we have that's near term that can support, what things should we be

Pawlikowski - 5/15/18

looking at in the future? So we have that going on. And that's a focus on what can we bring forward.

The Life Cycle Management Center and the Nuke Weapons Center manage the life cycle of the weapon systems. So they are constantly looking at what kind of aircraft availability do we need to have? Do we need to be able to fly in a different environment? What do we need to do to make sure that the airplanes are ready? Can we, if there's a request that we be able to do something faster, then we engage with the contractors to figure out can we get that done faster.

For example, there's been an intense effort on the part of our Munitions Directorate down at Eglin Air Force Base to look at the industry capacity to produce precision weapons, which is in direct support of not just ourselves, but our allies. All the way to our Supply Chain Operations Wing, which is at Scott Air Force Base. And they are responsible for moving what we have to different locations around the globe in response to the demand signal.

So for example, if in preparation for the Olympics General Shaughnessy out in Pacific needed some extra shelters, for example, they will take those from where they currently are somewhere in the United States and send them out there. And they are constantly on watch and tracking what's going on in operations and making sure that the parts are available where the airmen need them.

So our approach is yes, to run to the sound of the guns like everybody else, but we have to take this holistic approach because we don't want to shift everything to one spot and then not be able to support elsewhere.

DWG: Right now are you looking at [inaudible]? And what is the status of [inaudible]?

General Pawlikowski: Well, we have already. We have increased the capacity and the number of our precision weapons over the last couple of years. The JDAM kits, for example, small diameter bomb, all of these we've looked at what is the capacity that we need, and we've already done that.

I can't really speak to the specifics of what we're shifting around, but what we are doing in Afghanistan and Iraq is direct response to the Secretary of Defense and the CENTCOM commander

Pawlikowski - 5/15/18

in terms of the shifting that they're doing, and that's about as far as I can go on that. But let's just say we're actively involved in making sure that we know what they need and we get it to them when they need it.

DWG: Sandra and then Tom.

DWG: Thank you, General. I wanted to ask you about one of the NDAA provisions in the House Armed Services bill. It's about the idea that the Air Force should have a separate acquisition work force. They've been pushing that for a while, and this legislation is still moving through the process, but there seems to be bipartisan support for that idea.

I'm curious what your thoughts are. They've been very critical in reference to you not being responsive, so they keep pushing the separate acquisition work force. Would you have any thoughts on whether that's a good idea?

General Pawlikowski: I actually am not familiar with that particular piece of the language. I do know I have some experience in this area, having spent frankly eight of ten years in the space business and now being back.

I think that there is a huge benefit in having a degree of cross-flow between SMC, the NRO, which are the two primary space acquirers that have Air Force people, and the rest of the acquisition community.

There are unique things about acquiring space systems that drive you to have an expertise in certain areas, more than in other areas. So they're having, if you think about it in terms of a college, having a minor in space acquisition I think is of value. But if you were to completely isolate that group from the rest of the acquisition community, I believe that you will lose the benefit of the cross-exchange of ideas and not have the broader view of acquisition within the space community.

Somebody like me, I spent my first 20 years not in the space business. Spent 10 years in the space business. And now I'm back. And in both times, I found that there were things I brought to the space community because of my experience that they didn't have; and then on the other end when I came back to the aircraft side, if you will, some of the things I brought from learning from the space community.

Pawlikowski - 5/15/18

So I think that to completely isolate them would not benefit the space community as much as they may think it is, just because I think you just don't know what you don't know if you're never exposed to anything but that particular specialty.

DWG: Given your extensive background in space, now with the thinking that there's nation state opposition in space, do you think that is why there's a fundamental change in the process, in the thinking, mentality of --

General Pawlikowski: I think the fundamental change you've seen happening now is a recognition on the part of first the Air Force and now the broader community that space is a warfighting domain. And what that means is that we, the expectations for our space systems has changed.

When I first got into the space business in 2005, we talked about space systems as what we called force enhancements. What did that mean? Satellite communications. It enhanced force operations on the ground. Missile warning. Navigation. GPS.

And our total focus was to provide the best capabilities in each of those areas. And it was assumed that when you put a satellite up there, it was not going to be contested. You might deal with some jamming, you know, but you assumed you were in a space environment. That's no longer the situation. So that's the first thing. So we have to look at the requirement signal for the space acquisition community to be, so a satellite communication system can't just provide great communication. It has to be able to withstand an attack, so to speak. That's the first thing.

The second one is, technology has changed. Technology has changed to the point where launches, the costs have been driven down, and so the idea that you have to put as much -- when I first came into the space business, we built big satellites because it was expensive to get a launch vehicle, so you wanted to put as much as you could on that satellite because you wanted to get the most out of that launch. Now launch is cheaper and we realize that these big huge satellites are not easy to defend. And having multiple things on them, made them very attractive as targets because you had so many different things that you could -- so that's the second thing. Technology has changed and we need to be able to leverage it.

Pawlikowski - 5/15/18

And I think those two things are driving a change in the way we architect our space and how we, the size of satellites will change. The mobility of satellites will change. But the basic process of designing and building these, which the acquisition community relies on, is not going to change.

Now, there are some things that the acquisition community has to be responsive to, and that's the fact that, the third big change. The first is where it's a warfighting domain; second, technology has changed. The third big change is there's a commercial market in space now. Every day you're hearing about somebody else that's getting into launching small satellites. And that commercial market means from a space acquisition perspective, that the opportunity for a broader industrial base for the space community, acquisition community to engage in, is there. And whether, and that will require the space acquisition community to modify and adjust the way they do business, and you're seeing some of that with what General Thompson's doing with the OTAs to go after things.

So I think those three things are huge impacts on the space world writ large, but also when it comes to space acquisition.

If you think about those things, some of those are not that much different than what we're experiencing elsewhere in defense acquisition writ large, right? So that's why I say the benefit of -- so somebody that came in working on the air side that has experience working with commercial industry could hugely benefit the space community.

DWG: Colin, then Sharon.

DWG: The ECCT. You started the [inaudible] electronic warfare. Can you bring us up to date a bit on that, and how is multi-domain command and control proceeding? We've heard nothing since the report came out from the Chief, really.

General Pawlikowski: The Electronic Warfare ECCT is moving along smartly. I do have some insight in it, but I'll be honest with you, Colin, I haven't parsed out in my head what's classified and what's not yet to be able to speak to that one. But what I can tell you in the broader sense is that the team has done their initial storming phase, shall we speak, the broad look at what the issues are, what's going out, and they have developed several lines of effort. Noe is, of course, is focused on leveraging what technology's out there. But another

Pawlikowski - 5/15/18

one is also focused on educating the airmen and then understanding. Those are two that I think it's fairly safe to say we'll have some focus on them. I think we've got an update to the four-stars coming up in the next month or so.

Now in the multi-domain, General Saltzman has been. Remained in place and is responsible for executing the recommendations that came out of his report. So he's actively involved, for example, with Air Combat Command, in helping to establish the Shadow Ops Center, the Shadow OC which is an approach to continuing this evolving, as you've seen in the press, of the Air Force efforts to be better at agile software development and to particularly leverage those types of tools to make our operation centers more effective and to bring in the multiple domains that are out there. He's working with the training community in terms of building ourselves into more professional competency in that theater, strategic level command and control expertise.

There's also effort ongoing with the other services as we look at multi-domain with respect to understanding concept of operations and strategy. General Holmes, in particular, has been working with the Army, for example, in understanding their multi-domain operations and blending together some of the concepts of operations that we're talking about.

DWG: How far away do you think we are from the RFI, RFP for multi-domain? Is it five years? Three years? Ten?

General Pawlikowski: I don't think you're going to see just one monolith RFI, RFP. I think you're going to see an evolution of things blending together. We have a couple of operation centers, so to speak, that are out there. The National Defense Space, National Space Defense Center, did I get that right? And as that, those capabilities will be added. There's a TACC which is the Air Control Center that Air Mobility Command uses for their assets worldwide. And then there's the AOCs. So I think what you're going to see, as opposed to one monolithing multi-domain is that those are going to start to get linked together in a way that most effectively leverages it.

DWG: Sharon, then Mark.

DWG: Can you talk a little bit about the way forward for the Light Attack Aircraft? And then what fundamentally, I think we're now almost into the tenth year of talking about

Pawlikowski - 5/15/18

[inaudible] aircraft, and it feels like the types of conflicts they were meant for, ISIS, Afghanistan, are either winding down or moving towards local [inaudible]. Is there a lesson learned on how to do this?

General Pawlikowski: I've only been involved in the Light Attack for the last two years, so I can't really tell you about the ten years. But I think where we are today with respect to Light Attack is that we have just started, down at Holloman, our second experiment with the two aircraft. And the focus on this one is to make sure we really understand what the opportunities and constraints are with respect to the logistics and the sustainment associated with being able to support these.

Part of what we will do is continue to explore and understand what kinds of weapons and what degree of systems that we will put on these to be effective. But also, the third thing that we are exploring as we go through this year, which gets to your question about hey, do we still need these, is to see these as an opportunity for building on our coalition parts.

We see the Light Attack Aircraft. We still see that we will continue to find ourselves in these less denied areas where a Light Attack Aircraft could come into play. But in particular where we are working with the coalition forces that the nature of this airplane being lower cost, being a little less complicated to operate, to fly, will give us more of an opportunity to have a broader group of nations be part of working with us and using this airplane.

We also see the aircraft as an opportunity to help us with our pilot shortage.

Now we're short pilots but one of the key things for us, our success, is that we have experienced pilots, and the Light Attack Aircraft gives us an opportunity to experience pilots and then transition them into maybe the 5th Gen aircraft.

So we see the aircraft as an opportunity, first of all, to be able to free up some of the higher-end aircraft from doing those missions, as you described; second as an opportunity for us to be able to build on our coalitions and to be able to fly with them and give them an opportunity to be flying in the same aircraft we have; and then third, is a place for us to be able to ensure some of our pilots, to get them the flying experience

Pawlikowski - 5/15/18

that will help them to become experienced pilots sooner than if they were just growing in one of the weapon systems.

So those are, that's what makes it attractive to us. It's those three things. And this next set of experiments is enabling us to kind of hone in on some of the details of how we might do that.

DWG: When you say working with coalition partners, I didn't really catch that. Because our coalition partners have bought different aircraft. Do their procurement choices affect ours?

General Pawlikowski: Not for this case, but what we hope to do with this is to get ourselves to a price point and a capability that it's attractive for them to fly the same airplane as us.

What we've seen, particularly with some of the countries that we work with that don't have an industry of their own to go to, that when we buy something it's more likely that they'll be interested in buying it. So that's the way we see it. And that will allow us also to get the economy of scale by having more of them purchased as well as more of a global support structure for the supply chain. Which will be attractive to them as much as it is to us.

DWG: Mark, then Courtney.

DWG: Hi, General. I hope this is in your lane. The B-52 re-engining. Can you give us an update on that? When you expect the RFC for that?

General Pawlikowski: I believe this year we are in the study mode to understand exactly what, you know, to understand the landscape and see where we are. I don't know when there is a, when an RFP is scheduled to go out. I just don't have the depth on the details of that. But this year I know that we are looking, getting into the details and understanding what the potential opportunities are.

DWG: Do you have any concerns about the re-engining or continuing to fly additional aircraft for another 30-plus years?

General Pawlikowski: General Randall made the comment that the B-52 has good bones. Everything we've seen continues to reinforce that.

Pawlikowski - 5/15/18

We recently took the airplanes through a set of inspections that were triggered by our Aircraft Structure Integrity Program which I talked about earlier, in which we were concerned about the potential based on our analysis that there might be some structural integrity issues. But we've been through almost all of those airplanes now and did not see any significant issues. We did have a couple where we had to make some repairs. That's why we do the inspections. But we continue to see that that -- it's a remarkable airplane when you look at the versatility and what we've done with it. But also keep in mind, that airplane, it may be older but when you look at the number of flying hours, for many, many years that airplane sat ground alert. So the number of flying hours on that airplane compared to some of the others isn't as high for its age. But it's got good bones. Structurally solid. And we thin that with the re-engining, we can really drive down the fuel cost and of course those engines that are on it are just getting harder and harder for us to sustain, just because of their age.

DWG: Courtney.

DWG: I wanted to ask about, I saw [inaudible]. Dr. Roper has talked a lot about [inaudible] the airplane in those areas, and I know that there's a lot of [inaudible] in your command as well. Have you had direction from leadership to kind of, I guess, continue to expand that more? And do you expect to see resources shift to support more experimentation?

General Pawlikowski: The leadership across the board has advocated for more prototyping experimentation, and Dr. Roper, since he's come in, he has really tried to incentivize and energize the Program Executive Officers to look at this.

Right now he has a number of efforts to get [candidates] out there for some areas that he thinks may have some high payoff. We'll be in discussions over the next several months as to which of those might we be able to do, and where the resources might come from that for doing that. That's one of the things that we still have to work our way through.

As you're probably aware, much of our budget's tied up into bid programs of record. And this prototyping experimentation provides an opportunity to go and build something and try it, without having that huge tail of okay, I know today I'm going to build 300 of these. Right? Before I even build the first one.

Pawlikowski - 5/15/18

So that part is still understanding, I think, the comfort level, to be honest with you, of the leadership as to how many dollars I want to apply to prototyping. One of the keys to prototyping is you may not buy it. Right? And that's a hard thing for us to decide to do. To go ahead and say we're going to spend money to go do this, and we may not do anything with it afterwards.

So I think the environment's in place to allow us to do this, and now we've got our big toe in the water with the Light Attack, which was nominally, you know, not too expensive, but as an experiment. The question now, this is Ellen Pawlikowski speaking as I see the environment, is when are we going to take that first big plunge and invest some real dollars into a prototype with the belief, with the understanding that we may not buy anything.

I think this will also involve not just our comfort level, making that huge cultural change. If you think about that, that's a pretty cultural change, but also the industry. Because I think that we will want to do this in collaboration with the industry and what will be their expectation that we'll build something and we may not, may or may not continue it. Because I think that's the key to this, is to be willing to go out and do something and not spend two years figuring out what the requirements are before you do it. Right?

DWG: Can you [inaudible] what kind of candidate areas are that you're [inaudible]? Also, do you think we'll see more small experimentation before we do that big [inaudible]?

General Pawlikowski: I think you will see more and more small experimentation because of the empowerment that the leadership has given to the community. And in fact the Strategic Development Planning and Experimentation Office has some experiments that they've been working on that will continue to go on.

It's hard to say. We'll see as the dialogue goes on over the next several months, as we start to look at what does our '20 budget look like? I know all of you are focused on the '19 budget, but we're spending a lot of time talking about what the '20 budget looks like now. I think that will be one of the key parts as we go through that, if we're going to make an investment in a prototype, then you're going to have to start to see it come out in the budget.

Pawlikowski - 5/15/18

DWG: [Inaudible]?

General Pawlikowski: I think it's open. I think Dr. Roper has basically said hey, if you've got something you think is a candidate, let's look at it and bring it forward, so I think we're pretty wide open in terms of the different things that can happen.

DWG: Marcus, then Matt.

DWG: Good morning, thank you.

I wanted to ask you about predictive maintenance. I've seen [inaudible] regularly, commercial [inaudible]. About a year ago General Everhart from Air Mobility Command [inaudible] technology on his cargo planes and tankers, but the largest hang-up was actually getting data from the companies that build these engines and aircraft.

So I wanted to know if you could talk just broadly about how predictive analytics can help with your maintenance problems? Are you using it? And [inaudible]?

General Pawlikowski: I absolutely love it, and I'm right there with General Everhart. I believe it is a must-do for us. We have had an effort that General Everhart has been leveraging within the Life Cycle Management Center for about three years. Started about the time I took command. To look at what we call condition-based maintenance plus. Which is a variation on the name of predictive maintenance. And we have been, we've benchmarked Delta because Delta has been, has demonstrated the effectiveness of predictive maintenance in dramatically reducing the number of delays to flights due to maintenance. And so we have started to work that in terms of getting the data and applying machine learning -- AI, as people like to say -- to looking at the data that we have. Because what predictive maintenance does is that it looks at data on the performance of the airplane that is recorded, and it predicts ahead of when a part may fail or break. And then you actually replace that part before it breaks, and you do that scheduled so you're not doing it during down time.

So the key to predictive maintenance is having the data off of the airplane, having the right what we call the algorithms, if you will, that looks at that data and is able to correlate okay, when the temperatures of this particular area of the airplane or

Pawlikowski - 5/15/18

the engine starts to go up, that means this is going to fail and go and replace it. So we need those algorithms.

And then the third thing you need is, you need to have a supply chain and a maintenance scheme that supports that. So in the case of Air Mobility Command, we're working on all three of those things. The first part where the machine learning comes in is we are trying to leverage what we already get off of airplanes, as opposed to trying to go in and put instruments in places. And it turns out there's quite a bit that's there. But it may not be a direct measurement. So in order to measure the temperature in this one particular spot I'm getting information somewhere else. This is where the artificial intelligence, machine learning comes in because we can look at a whole bunch of data and figure out where the patterns are that will tell us to do that.

So we have applied it in a subset of the C5. We've actually also done some work because of the instrumentation of the jet on the B1, which is not an air mobility platform, but the B1 is an airplane that we actually bought with a whole bunch of data that we weren't using. So we started to take that data in and started to analyze it, and it's allowing us to learn about it.

So we have, we're very excited about this because we see huge potential to improve aircraft availability and drive down the cost.

The key too, though, will be a cultural change to this. Because can you imagine when we start telling the maintainers, take that part off and replace it, and they're like well, why am I doing that? There's nothing wrong with it. Right? So we'll take those parts back and look at them in the depot and validate that they were really ready to fail.

But as you pointed out, you know, it's proven that it works. And we just -- what the key to this for us, when we talk about it, is it's tied to readiness. That's one of the major focuses of the Secretary of Defense and Secretary of the Air Force. And one of the big benefits is the reduction in the amount of time that airmen on the flight line spend troubleshooting a broken part, because the parts, we'll take them off before they break. And in the time the airplane is sitting on the ground, while they, or the second or third order effect of the part being broken.

Pawlikowski - 5/15/18

So we see this as a huge benefit and in fact we have been frankly funding this by, we in the Life Cycle Management Center, have been kind of funding it by, as I like to say, it's like finding the loose change in the seat cushions. We've been funding it at the low level in order to prove it, but as we have now shown some of these things, particularly to General Everhart, we're seeing more and more interest in it and we're going to start, we're looking at increasing the investment in that to bring it further.

It's not to say it's going to happen overnight, because the key part of understanding what the data shows us, and then correlating it specifically to maintenance actions, replacement actions, is going to take some time to work through, and we're going to have to work with industry because some of the data we need we may or may not have, particularly for those airplanes that we acquired that are say commercial derivatives or are ones that we bought under a total system performance contract. For example, we're in discussions with Lockheed Martin on the C-130J, which, as you know, is a commercial airplane which is largely supported through Lockheed. But they also have an interest in that because of the number of companies, others that they sell that to.

So in some cases we'll be working this collaboratively with our industry partners. In other cases, we'll be doing it completely organically.

DWG: Do you have any metrics on who [inaudible] whether or not it's actually helped?

General Pawlikowski: I don't have them off the top of my head, but I can tell you that I was impressed when I saw some of the data that they were showing me. On the C5, I'd have to parse it out in my head. We've got a number of things we're trying to do with the C5, with General Everhart, just because of the, it was a good target of opportunity. And we're doing 3D printing of parts on the C5, which has also shown some huge benefit.

We have, there's a handle on a door that we recently, that they started to fail after all these years. Right? And the part's not available anymore. The estimate from DLA was that it would take them at least a year to get us the part, and it was about \$1300. Well, in about six weeks we 3D printed it for about \$700. So that's the kind of thing that we're trying to do.

Pawlikowski - 5/15/18

What we're showing, by the way, with the efforts that we have across the board on the C5, is that if we focus our technology on improving sustainment, we actually can, we can actually have some true benefits in driving down sustainment costs. Particularly for these older airplanes where these parts aren't available anymore.

DWG: Matt.

DWG: Thank you, General. Are there concrete flight test plans for a hypersonic weapon or vehicle at this point?

General Pawlikowski: We have been working collaboratively and cooperatively with DARPA for quite a while now, and there are some flight test programs associated with those efforts with DARPA. And we have started to look at what it might take to transition some of those to being real weapons capability.

I don't have the schedule off the top of my head, but within the next couple of years there are at least two flight tests that are scheduled in support of the efforts that we've worked with Steve Walker and DARPA.

DWG: Along those lines, there was a report that came out a couple of months ago talking about [ceramic] research. Research in that. I wonder if you could help me to understand the scope of the hypersonic program right now within the Air Force, the goals going forward.

General Pawlikowski: So in the world of hypersonics, we are, a lot of the focus has been on understanding the environment and the flight test. There also is some focus in terms of understanding what, the materials part. Because as you know, high temperatures, high speed. So there is some work that's been going on in terms of understanding the materials. But the focus, so it's been in both those areas of both the understanding of the ability to get to that speed and then surviving that speed.

And then there's also, the other part of it as I like to say, to hypersonics. Okay, so you can go fast. So what does that mean? And the end game is important too, as I like to say, which means that the accuracy of getting on the target. So what is the precision technology that allows you, you know, after you get there fast, to make sure you're hitting the right thing? So there is also some investment we have in understanding the end

Pawlikowski - 5/15/18

game seeker technology, if you will, which also has to survive that environment.

DWG: Vivian, then Ariana.

DWG: Hi, General. Kind of going back to the Light Attack comments about the benefits to coalition partners. I was wondering if you can talk a little bit about when you're considering buying your equipment, to what degree are you considering interoperability? And in your conversations with industry, are you finding them to be enthusiastic about common systems and that interoperability? Or are there still challenges related to IPE and things like that?

General Pawlikowski: Well, we have, first of all, as we are transforming, as our Chief would say, we need to start looking at ourselves as a network of apps and apertures, as opposed to platforms.

Speaking in terms of open mission systems. You may have heard the term, this is something that was first developed as part of, frankly, the B-21 activity, looking at avionics. We've been expanding that into other areas. It's a big deal for us. As we look at the ability to operate as a network of sensors and those platforms now become part of that network. And the ability for us to be able to easily and seamlessly connect to the network and to provide information and to learn from the network has become more and more every day a major player in how we approach our acquisition. I think probably one of the centerpieces for this is this Advanced Battle Management System that you've heard us refer to, where we're looking at how do we leverage the capabilities that are out there.

There are some of us who like to say the F-35 is a sensor platform that happens to carry a few weapons. Right? So how do we leverage that sensor platform with other ones?

So key to us is this open architecture, the openness, the ability to be able to take a radar and replace it on a 5th Gen aircraft, and replace it with one that say was developed for the F-35 and put it on the F-22 or put it back on the F-15. This is really important to us.

So in terms of our dialogue with industry, the open mission systems concept, the avionics, that was done collaboratorily with industry. And so we are getting reasonable support from

Pawlikowski - 5/15/18

them, and more and more as we start to continue and beat the drum, being multi-domain becomes more and more important. That we're able to exchange information.

So I think you're going to see that continue to be pushed.

Industry, you know, they're listening. And as a general rule, industry is responsive on a more [consistent base]. So I think, you know, I think they're starting to see that we're serious about this and that there's a benefit to them as well because then they will have more opportunities to be able to sell what they have to multiple platforms and they will have a bigger base.

DWG: So are you saying the question of operability is more proactive when you're having discussions about it with them? Other than maybe --

General Pawlikowski: I think it's kind of like, when we talk about space and about survivability or the ability to -- it was always like sometimes not even on the sheet, right? And contrast now when we talk about mission systems on our platforms, the first word out of our mouth is the word open, because we're serious about not having to deal with proprietary interfaces and proprietary systems that only work with one platform.

DWG: Two left, so we're going to move into the speed round now. It's Ariana and David.

DWG: I have to ask about the Air Force's favorite plane, the A-10. We notice there's money in the budget for the A-10 to get some new [wings]. But are you concerned at all about the supply chain for those [wings]? Is industry expressing interest in the contract? Or are they worried that the Air Force may yet again try to retire the A-10s, and they're trying to wait and see [inaudible]?

General Pawlikowski: I don't know the specifics of the market survey that's been done, but I do know that there were at least two that were interested before, and the fact that we can continue to have some dollars out there. I understand there's a potential for some increase in the coming edition. So I think there's an interest in there.

Pawlikowski - 5/15/18

The jury will be out, though, in terms of the price I can get. Right? That will be a function of what folks think will be our long-term, our buy of those as we go forward.

But I think the industry sees that we're serious about that. There's been active participation in the industry discussion that we had as we prepare that RFP to go out.

DWG: Talk to us about the demand curve for unmanned aerial vehicles. In recent years, Air Force officials have often talked about an insatiable. Growth in terms of demand, particularly in the intelligence/reconnaissance area. What do you see happening in the next few years in that regard?

General Pawlikowski: Well, as you, as we look forward to what the Air Force will look like in 2030 on remotely piloted aircraft, as we like to call them, play a big part in it. You hear the term family of systems. And I think you will see that RPAs will be an integral part of all of our strategies.

In the area of ISR, the insatiable appetite for that, that will continue to be a demand signal on us, and we have, right now, focused more on looking at the manpower intensity associated with that. And here's where we're looking for opportunities to apply artificial intelligence and machine learning and automation to reduce the manpower intensity of the processing of that, as well as looking at opportunities to reduce the number of pilots needed by looking at having multiple platforms being operated by one pilot.

If you actually are able to apply some enhancements of the capability using artificial intelligence and better, for lack of a better term, graphical user interface between the pilot and the system, we think that we can drive down the manpower part of unmanned aerals. And if we do that, then they will continue to provide even more and more of an opportunity for us as a force enabler.

But right now we've got to get after the manpower intensity of our unmanned air vehicles. But we clearly see opportunities to be able to do that.

DWG: General, we'd love to keep you all day, but I know that you have other things to get to.

Pawlikowski - 5/15/18

General Pawlikowski: Thanks again for doing this. I always enjoy talking to all of you and I look forward to seeing what you report.

#