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"Adapting Under Fire: Ukraine's Race to Reinvent Modern Defense"

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FEATURING

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CSIS EXPERTS

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Kateryna Bondar: Welcome, everyone, and thank you for joining us today. I'm Kateryna Bondar, and I'm a fellow at Wadhwani AI Center here at CSIS.

So what we see today in Ukraine is not just the use of drones; it's a rapid evolution of modern warfare where low-cost systems, software integration, AI, everything rapidly reshaping modern warfare and how militaries operate today. And Ukraine is at the epicenter of this transformation. And it's not only theoretical. Ukraine is changing its tactics, its doctrine, adapting its technology and everything else almost in real time.

So I'm very pleased today to be joined by exceptional group of practitioners who are changing Ukrainian military today. So let me introduce Viktoriia Honcharuk, director of defense tech at the Snake Island Institute and a representative of the Third Army Corps; Captain Max Maslii, deputy chief of staff, 96th Anti-Aircraft Missile Brigade of the Ukrainian Air Force; and Senior Lieutenant Oleksandr Vorobiov, codename Zhan, deputy chief of air defense, Third Army Corps. Thank you for being here with us today.

Viktoriia Honcharuk:
Thanks for having us.
Ms. Bondar: Yeah. And I'd like to start our conversation with just giving us a broader context of where we are today. So if you were to describe us a typical week of operations and describing as a situation how it compares to 2022, how has it changed in terms of threats, in terms of volume of threats, and tactics, and everything? Just give us a broad overview.

Ms. Honcharuk: Yeah. I think I'll start. So Zhan and I come from an assault and infantry brigade, which is the people that are on the very front of operations that are doing storm assaults and defending our positions in the worst of places on the Ukrainian frontline. And I started as a combat medic, somebody who, you know, worked for the infantry, somebody who evacuated wounded soldiers from the battlefield. And I think my job is one of the ones that changed completely since the beginning of full-scale invasion, because back in 2022, beginning of 2023 we did have almost – you know, sometimes we did have a golden hour. It's one hour between being wounded and getting to a stabilization point. Oftentimes, we were able to do so. We had proper case evacuations and med evacuations, and we were able to locate soldiers much faster and much easier.

But with introduction of drones into the battlefield, that changed. First, it was difficult to do case evacuations, to get to positions to pick up the wounded, because of drones. We had to adapt by putting jammers on our cars, on our ambulances, on our armored vehicles, you know, finding drones locators to at least localize and kind of plan the missions around it. But then with introduction of fiber-optic drones, that became also very difficult because there currently isn't a reliable way to localize them, to be able to plan missions around them.

So they took medics out of casevacs. They pushed medevacs two kilometers back, then four, then six, then eight, then 10. Now it's sometimes up to 15. And you know, the last time that I was in positions we didn't have any evacuations, not because there were no wounded soldiers but because we just couldn't get to them. We couldn't plan missions around it. And

like, the last time I went to our positions I had to listen to people die on a radio channel because we couldn't do anything.

Ms. Bondar: So, basically, this is the kill zone that everyone is talking about, right?

Ms. Honcharuk: Yes.

Ms. Bondar: OK.

Ms. Honcharuk: And that kill zone killed medics, essentially, and the role of evacuation medics.

Ms. Bondar: Yeah. Well, we'll talk a little bit later – thank you, Viktoriia – about the kill zone and the airspace saturated with drones. And we have colleagues from air defense, and that's very relevant and interesting topic to our audience right now because of the situation in the Middle East and constant Shaheds – Shahed attacks. So could you please share a little bit how the tactics evolved using Shahed drones? And then we will switch to air defense.

Captain Max Maslii: Yeah, I guess I will take that. So if you take a look on the Snake Island Institute report published on their website, there is a very good picture showing how a number of Shaheds progressing with time. So talking about 2022, we had zero Shaheds first half of the year, and since September we started getting some. And now we are seeing five-plus-thousand Shaheds per month on the territory of Ukraine.

So talking about specifically Shaheds, which is better to call Iranian drone to be clear about what it is, it evolved a lot also in quantity and also in quality. It became some kind of platform which is changing with time. First, they started to try to make it less visible and detectable by our systems changing the surface, changing materials, color, et cetera. They have a lot of models. We have – we talk about Geran 5 already, which is a jet Shahed, much faster than a regular one. Shaheds have been equipped with more antennas to overcome our EW. They are capable to carry air-to-air missiles. They are capable to try to destroy our aviation and our helicopters. They are talking all together. They are transmitting video to Russia. They build enmeshed networks in the air and transmit data. They are capable of being managed by operator in the depths of the territory.

So there is, like, from zero Shaheds to very advanced in large quantities threat. It took them, like, a few years to take all the steps very fast. And it's evolved – evolving.

Ms. Bondar: So we basically see that the enemy adapts also really fast and iterates in terms of technology, and I assume tactics as well because first they were flying low –

Captain Maslii: Yeah.

Ms. Bondar: – now they're flying high, and then dive, right? So could you please tell us a little bit more how Ukraine is defending against this threat? And we hear a lot about layered defense, so could you please explain us what it is and how it's being built?

Senior Lieutenant Oleksandr "Zhan" Vorobiov: Let me start from the tactical – the frontline level, because in general Ukraine now have more or less three static layers of air defense.

The first one is an army corps layer which is the closest to the frontline, about first 50 miles or something. It's land forces who the main responsible of us is to protect our guys on the frontline, but still we have family there, everybody in Ukraine, and we need to protect them. And as we can, we are trying to do this. So the first echelon is us.

The second one is unmanned forces of Ukraine. It's a new type of – new type of unit, and they are covering the next 100 miles or something with interceptors, with radars. They are intercepting them.

And as – on the last part of Ukraine, air forces, they are covering it with big systems – NASAMS, Patriots, et cetera, et cetera, big radars.

So more or less generally it looks like this, but in my zone of responsibility, in the corps zone, we also have layers and it's also three of them. So it's, you know, like "Inception" film with Leonardo DiCaprio, dream in a dream. It's layer in a layer.

So the first layer of first layer is the infantry guys, so we need to cover them. And there are small drones like basketball. It's nothing about Shahed; it's really like this. And –

Ms. Bondar: Type one? OK.

Sr. Lt. Vorobiov: Type one, OK. Class one. And yes, we need to close the sky for this drone. And for me, for our guys, it's the hardest target because it's the smallest one. And we have no detection there; it's only eye to eye, bullet to bullet thing. So this is the first echelon.

The next one is to fight against almost the same, but there are some fixed-wing drone, Lancets. So the drone – and the ISR intelligent drone, they're higher in the air. They are trying to understand where is our logistics, where is our big cars, armored vehicles, our medical evacuation posts, et cetera. We need to cover all of this to maintain the fight.

And the last echelon of first echelon is to cover the city, the ground logistics, roads between, for example, our zone of responsibilities between Balaklija and Slovyansk in Donetsk and Kharkiv regions. So it's pretty big roads between them. It's, you know, like, wings over the battlefield now. And also at that stage we start destroying Shaheds.

And then how it works, it's just the sensors on the ground, in the air. It's a lot of them – video sensors, radars, acoustic sensors. So a lot of them. It's command and control who – everybody is speaking about interceptors itself, but somebody needs to control them. And interception itself is just the last part of all ground work that guys do in 24/7, and in general, more or less, it looks like this.

In numbers, for the corps, for the first echelon, for the last seven months we destroyed – now I think it's not the end of this month but it's already – only during this month it's 2,000 of targets, and during the seven months it's going up to 9,000 of them.

Ms. Bondar: So it's basically only on that part of the frontline?

Sr. Lt. Vorobiov: Yes, only on the first – so our zone of responsibility as a corps is 100 miles on the length of the front line and up to 50. So it depends on –

Ms. Bondar: On the depth.

Sr. Lt. Vorobiov: – on the – in the depths, and only on that part it's about. And to be honest, only about 700 of them are Shaheds, Gerberas, and Gerans, so all other things are trying to attack guys on the battlefield.

Ms. Bondar: Yeah, it's a crazy mix of threats and the amount of threats and their sophistication and –

Captain Maslii: I can talk about, like, deeper territory of Shaheds, of –

Ms. Bondar: Yeah. Yeah, if you could continue. (Laughs.)

Captain Maslii: Because, you know, we have two guys on the front, so it's the most difficult place to be at, and we are being in the depths of the territory. My unit, my brigade, is defending Kyiv as a major asset, including Chernobyl nuclear plant and many other critical infrastructure assets. And, of course, like, guys at the frontline are, like, heroes. They have the most difficult situation, but we need to provide supplying ammos. Like, whatever they need, they need a lot of stuff. So, as a country, we need to keep people also safe.

And we don't see much of these little drones, like, less than class three. Class three is Shahed and above. But we face much more explosive material load and threat – I would say, like ballistics missiles, cruise missiles. And there are some places in Ukraine which are not having this layer, which Zhan was talking about, because from the north and from the south you don't have a lot of corps staying there, just air defense units.

And for pity, we cannot bring much of surface-to-air or ground-based air defense units as you may call it, closer two guys, because they will be destroyed over there. Systems like Patriots, NASAMS, HAWK, RST, they stay away from the front line and protecting major assets. Like, each unit has its own asset to protect.

But what is important to say, that a tactic of Shaheds, which you mentioned, that altitude and roads is changed. And the thing that is – took us a lot of time is to build exactly what also Zhan mentioned, is command-and-control system which integrates all the layers starting from units responsible for ballistics missiles interception, which are Patriots; including all the units responsible for cruise missiles interception; including units who are responsible for Shaheds; mobile fire teams equipped with MANPADS and drone

interceptors, machine guns, EW. All these layers need to work simultaneously and decision need to be made very fast.

Because our main job is to survive for a long time. We are not seeing war coming to the end, so we're sure that it will take much more time. And we need to be very cost effective on our side because equipment that we operate is very costly and interceptors are way too expensive to spend them just for Shahed, for example.

Ms. Bondar: We've seen this in the Middle East. (Laughs.)

Captain Maslii: Yeah. We've seen this in Ukraine in the past too, but not – we are not seeing that in Ukraine anymore.

Ms. Bondar: Well, that's really impressive.

So, basically, from what I understand, all these countermeasures – kinetic, non-kinetic – everything's integrated within one command-and-control system, right? So is it some sort of, I don't know, software which manages it all, or it's like a mix of, I don't know, different products that are working together? You know, we have a lot of conversations right now here in the Pentagon about using of AI. And just recently the minister of defense, Fedorov, announced the new system which will integrate AI and build a counter-UAS big system. If you could share a little bit more about this. If it's still secret, fine. (Laughs.)

Captain Maslii: There is an initiative coming from Minister of Defense Fedorov, and our minister of defense is great in digitalization. You can see how Ukraine changed over the years, helped due to his efforts and his views, and I'm sure it will be implemented and something very good will come.

But in war, you have to have interim solutions which are in place very fast and also think about long-term solutions. So I had a lot of discussions here also about how you build this system altogether, because war changed a lot with the drones and because every kid can build a weapon in his garage today. And we don't have, like, one system that integrates it all together, but it's probably not what we need to look for. But we need to split it into, like, layers as well, because you don't necessarily need the guys with main pads to be connected to the secret system where, like, big units operating, because their location is a secret. A lot of information related to those southern units are a secret. So we need to find the proper balance and actually need to change.

I built a lot of systems, and some systems are duplicating one another because we had to bring choice to military to choose from. And the best will survive and will be taken further for years ahead. So for your question whether we have one now, like, it's close to that, but not necessarily one. And we have a lot of different systems. Some of them are AI-enabled, especially for analyzing and trying to understand what the pattern of attack may look like, what is the preferable pattern of attack, what is the, like, ratio between – like, interception ratio comparing to certain parameters of the attack and our readiness and our tactics. So, yeah, we are really moving forward in implementing key item.

And we saw in Pentagon be – like, saying, like, I want you to use AI in U.S. Army. We want to say. (Laughter.)

Sr. Lt. Vorobiov: But it's still the decisions are on the people, and so we don't take the people out of decision-making process. They still are – they every – I think that all the time the man should decide the last word, not the AI, because otherwise we'll be in "Terminator" or something like we are not looking for.

Ms. Bondar: Skynet.

Sr. Lt. Vorobiov: Yes, that.

Ms. Bondar: Killer robots and –

Captain Maslii: Yeah, yeah.

Ms. Bondar: Yeah, we want to avoid that scenario. We already have enough troubles in this world.

And, yeah, and started talking about people; let's talk about people aspect and human aspect in this context, specifically training and preparation of forces. Maybe we can again start a little bit broader, how training looked like before and especially with drone warfare and everything how it has changed. I see that this topic – (laughs) – triggers some smiles and maybe, yes, we have – you have some interesting insights to share.

Ms. Honcharuk: I will start with just for everyone to understand that all three of us here didn't have any prior military experience before full-scale invasion. We were civilians. Like, I worked in finance. Max had a business. Zhan was a seaman. So we had very different backgrounds and didn't have any military education. Like, I didn't do any even basic training.

Sr. Lt. Vorobiov: No, no, no, no.

Ms. Honcharuk: So didn't Zhan.

And Ukraine army quadrupled, like, in a day, like, in 2022. Mostly it was civilians just joining in the interim to protect the country, which is very different from what U.S. military looks like and others as well.

But because of that, I feel like there's many advantages to this as well because we didn't come in with a box that usually people are being put in when they do either basic training or when they do general military education, and we could think out of the box. That enables so much, like, enthusiasm and initiative, because if you don't know, you know, where the edges of the box are you don't think in it.

So people with their own initiatives just starting initiate different things, like air defense, which was something that just regular people in the army said why don't we try to take down drones with drones; that makes sense. And many thought they were crazy. Many thought that wouldn't work. That took some time convincing. And in Ukraine army you first have to show results before commanders say, OK, that makes sense, let's do this unofficially in our unit. And then when it goes back to the Ministry of Defense, the Ministry of Defense is like, OK, maybe we need to do air defense units, though. So it is very much coming from the very, like, frontline experience that operators themselves or people on the frontline themselves understand that things need to be different, and then showing those results.

This is just my, of course, take on it.

Sr. Lt. Vorobiov: For me – at the beginning after infantry phase for me myself, it was half a year or something when we was pushed to create a brigade, the Third Assault Brigade. It was necessary to create the air defense platoon. And commander of battalion just came and said, OK, you will be the sergeant of it, I think you can be a commander of it, et cetera. And at that moment I just google typed: What MANPAD do we have? OK, Stinger. OK, video on YouTube. And that was the training procedure there. (Laughter.) After that, we go to polygon. We have some old Soviet, like, Igla MANPAD and something, and we were – all our training at that moment was take out of the box, put on the shoulder, put in the box; you should make it in 17 seconds. That's it. At that moment, it was like that.

Now, after three-and-a-half years, I am – my main mission, my main role is I am head of – chief of training department for air defense for the corps level, which is I think approximately 5,000 people involved in air defense itself. So it's totally about 50,000 – we are growing – but 5,000. And three years ago I was just the Stinger on the shoulder, and now I am responsible for that procedures at all.

And it's totally different now, most of all because of the type of threats changed just a lot. At that moment we had – we were looking for drones at that moment in the sky. Now drones looking for us. At that moment I have few of them; now 600 per week destroyed – on the destroyed, and much more identified. They run away. We are chasing them. So at that moment few helicopters a day; now no helicopters at all. Now seven per month because they run away from our Stinger. And they also afraid of our interceptor drones. About $1,000 drone, can damage, and we saw it on the video can destroy the helicopters in the air, on the ground, doesn't matter.

So, in general, to understand what is the training procedures, so usually in armies they look like you have a time you go to polygon, you live in some underground, on the ground, doesn't matter. You can eat good. You can sleep good. You can train good. Nowadays, once we come to the corps level, my chief of our whole air defense told me you need to create a school of air defense just out of government site, out of headquarters, just our Third Army Corps school for defense. Our commander, Andriy Biletsky, gives permission for this because he totally understand why we see the impact of air defense on the ground. And without any jurisdictional power, without any money for this from the government and headquarters of army, we just took it one place in Ukraine and start building. Now it's a

year passed. The last thing I need to do is to provide the electrical cables – and it's already now – just now guys are working on it – and we will have our own school of air defense.

But for your understanding, it's far away from the frontline. I collect all training officers of brigades and tell them, guys, in a few days before I leave we will have a training facility with everything you need out of the front line. Your guys can sleep, eat well, et cetera. How many of them you will give it to me? And they said, zero. And I said, why? Because it's much easier and faster to train them directly on the battlefield. And I totally understand them because I was the same one-and-a-half year(s) ago. I was on that level, on brigade level, and when somebody called me and said you should send 10 of your guys to some polygon or something I said, I can make it here and the guys will still work. But – and I want to cry because I build that school and now nobody need it, but we totally change the procedure of training. Of course they are joking; they will give me guys because we have our own sergeant corps inside of the corps and we have our own instructors, not the – not the old guys instructors. And that's how it works.

And to understand how rapidly and how much we had to do, one year ago when the corps started – one and a little – we have a meeting with the headquarters of air defense in 11 – I don't – I think it's 10 to 11 corps, so most of them from the land forces headquarters, so chief of air defenses. At that moment already I was a junior lieutenant; they all are colonels, at least colonels. At that moment already one year of drone interceptor dominance was in the air, but still we were just trying to start intercept by drones Shaheds. It's only they growing in numbers, and we just start. And there was some headquarter of the whole army or headquarters of air defenses, and that guy, the top one, ask: Guys, who believe that it will be possible to intercept Shaheds by interceptors? And the only guy who lift his head, it was me. And I was just looking on that colonels without – we already one year of destruction – Orlan, Zala, Supercam, Lancet, all of them – and they don't – and still don't believe. They said it will not work.

As you see now, it works. And that's the thing we should still do work on. We should, you know, spread the young minds in the –

Ms. Bondar: I have so many questions related to that, yeah. (Laughs.)

Ms. Honcharuk: On the general level there is now added a component of anti-drone operations inside basic training that everyone's going through. And that's just operating shotguns and training to try to kill type-one drones when you're in positions, something that we don't see being done in other armies now.

Ms. Bondar: Yeah. Well, OK. This is so insightful. Let's just probably take –

Captain Maslii: OK, I will skip mine because –

Ms. Bondar: No, no, no, please have your comment.

Captain Maslii: No, because those units that you provided, they do require training because you are not providing them to us without training. So – but what we're doing – this is essential to mention – that we try to spend as much efforts and budget from our allies. So we also do the procedure when combat experience groups and training next groups. So next systems that we provide not necessarily and not taking so, like, months and months of training, is just go for a formal week or two and the rest are being trained in Ukraine. So this is also what happened.

Ms. Bondar: You mentioned a very important fact – thing. You mentioned crews, because drone warfare is a crew-based warfare. And from my experience and conversations with Western militaries, we're a little bit far from understanding what that actually means because very often I hear that drones warfare is, like, we need to make every infantryman a drone operator. So could you please explain us a little bit more how these drone units work, how the crew is built for air defense and just for the frontline units? Like, how – and how you train the separate, I don't know, specializations within these crews and units.

Captain Maslii: There are crews for ground-based air-defense units which operates, like, heavy equipment, and there are what we call mobile fire teams in the depths which operates MANPADS, machineguns, drone intercepts, and similar. So that's very different. And then the frontline is also a little bit different because you need to be adaptable to the situation. But in the depths of the territory we have crews that are also interchanging their members. We're just mixing things a lot. And sometimes one crew can be equipped with multiple tools, like – (inaudible) – drones and machineguns and MANPADS. And some end up with even all sensor.

So that's, like – usually crew is, like, three, four, sometimes two people, whatever we have at our disposal. We have thousands of them. And the big thing is to connect them all together regardless of whether they're close to the border of Ukraine, whether they're in some forest where there is no communication. We need to provide them with the tools first to see friendly, like, targets and to see hostile targets and distribute the fire between them; to also be cost effective and make sure that whatever kind of attack will be applied that night or day crews will have enough ammos to take care about everything, like, in a good way.

Sr. Lt. Vorobiov: For the lower level, it goes – a crew go from two people, I think, because it's a pilot and second pilot. When you don't have any sensor role, you have eyes and video from the drones. So one guy's operating and looking at that, and the other one is just, you know, on back of him. Just maybe he will see first.

How it started and how it's going, I don't have a lot of information about offensive things, offensive drone, but it's more or less the same because in the beginning, two years ago when I came to commander and said we will try to do intercept, he said, OK, you can – you can try.

Ms. Bondar: Good luck. (Laughter.)

Sr. Lt. Vorobiov: Yes. We trained for this. We have one guy in the team who already was involved in it before in offensive way. And when we came to the battlefield after our training, we didn't have the sensor, the radar on the battlefield. It was impossible in that moment to start to intercept missile with radar. It was the last puzzle. And to not lose our experience that we have on a polygon, we start ground missions. So interceptions for my team starts from just ordinary FPV things on the ground. So we are hitting the dugouts, the people, something like this.

And the one minor change that we receive the radars we understood that we can do, we can fly to the sky. The only thing that was changed is just we add some servo to the cameras that – because when you are attacking something on the ground it's down of you all the time. It's under you. But in the air, it can be anywhere. So just one thing, the same drone with the servo, and you can just look up and down. That's all. So the principle of operation is the same.

But the targets is not the same. They are moving. You are moving and they are moving, and much faster than ground targets. So we need a lot of time to understand how to, because for example if I will take my operator who know how to destroy Mavic-type drones, type one, all size, and ask him to destroy Shaheds, it will be not a big problem for him because it's from small to big. But otherwise it's not working. Guys who destroy Shaheds, he need two to three months just to be a specialist.

So on the lower level, it's two people in interceptor team. When you go higher, when you need to destroy ISR type-two – class-two, class-three drones, in addition you have a radar guy, for example. In addition, you should have a guy who will, when it's rapidly one by one drones are moving, the other separate guy who working especially with explosive, because it's dangerous and you need to know how to do it. And one of two people cannot make it because they are tired and mistake may come, and we don't want mistakes. More or less, it's like this. From two to four people in general depends on what you are doing.

Ms. Bondar: And they are pursuing training together, so they learn how to work –

Sr. Lt. Vorobiov: Like – yes. Of course they can be replaced, but the best way for me is to have, you know, close relationships team. And it's much better because they know the strengths and the weaknesses of each other, and it works.

Ms. Bondar: Right.

Ms. Honcharuk: I think the misconception that every, you know, infantryman should be a pilot comes from the fact that people might – some people might think that you can replace infantry with drones. And that's, in our experience, never going to happen because, well, first of all, if you don't have boots on the ground, you don't control, certainly, any territory. So why do you – how would you know where your defense operations is if you don't have anybody there? So it's number one.

And then, second, like, all of the drones, air defense, medics, EW, all technology as well, all of them are just services for the infantry. The infantry is the king or the queen –

Sr. Lt. Vorobiov: Of course. The ruler.

Ms. Honcharuk: (Laughs.) I would say both. The ruler – the ruler of the battlefield, and everyone else is just serving them and making sure their life can be a bit easier. That's the reason why we started using unmanned systems in the first place, just to make life easier for the infantry and save their lives.

Ms. Bondar: This raises a very interesting question – well, maybe, like, indirectly, but related to this. So, you know, we're watching how defense industry is being developed, how defense technology is being developed, and we've seen that it's moving towards robotization, robotics, AI, and everything's becoming more and more autonomous. So what do you think? Like, where is the place for autonomy, for robotics? I already heard that it will never replace people, but to which extent do you think AI can be integrated into real war, especially at the edge, those devices? And how much decision-making we can delegate?

Captain Maslii: I think that it will replace people in a big part. My background is 18 years in managing software company, so, like, I'm kind of more, like, optimistic in some sense – or pessimistic; I don't how you call it –

Ms. Honcharuk: I always liked that.

Capt Maslii: Yeah, I always like that. But AI is still in a very, like, rapidly-developing cycle. And I think that, for example, on the frontline we have drones that are being, like, managed by people with RF connection and some with fiber, and those fiber are very, like, difficult –

Ms. Bondar: – to jam.

Capt Maslii: – to deal with. But the next step, it will be autonomous, as you mentioned. So you mentioned an autonomous drone that can do stuff like solving the problem by itself, no input, the mission is – accomplish the mission is just to fly somewhere, whether it's on the frontline or on depth territory, sit somewhere, just consume a little battery, wait for others to come, like hear for something to just get closer, wait for car, for people, for whatever. So I think that AI is the next big thing, like, huge thing, will just flip the picture what – of what we have with drones – with drones today. And it will be, like, two-players game. Like, they will offense, we will defense and also offense them, so – with same tools. But it is the next.

Ms. Honcharuk: It's not going to replace infantry.

Capt Maslii: Yeah, no, no not replace infantry, definitely. But it will –

Ms. Bondar: Augment. Let's go like that.

Capt Maslii: Augment, yeah.

Ms. Bondar: (Laughs.)

Capt Maslii: And in a big sense replace the need to have very, very, like, experienced operator, because it will help a lot to navigate.

Sr. Lt. Vorobiov: Because just one example, I think it's not a secret for anybody that AI should learn from something. And if we will take one example of one Shahed, of 100 of Shaheds, so most of them, as you said before in the beginning, fly high, and it's much – it's pretty – so we have drones with AI already. It's not too secret anymore. And much easier for those drones find a target on the – how to say – (in Ukrainian)?

Ms. Honcharuk: On the background?

Sr. Lt. Vorobiov: On the background of the sky. So we – there is a – Shahed. So it's much easier to understand, "OK, there is a Shahed" for AI; I will intercept it.

Ms. Bondar: OK.

Sr. Lt. Vorobiov: OK. And we learn them to do this day by day, hundreds of them, thousand of them after. And AI looks good in this.

And after that, the drone came to 50 meters. And now our AIs, it was very powerful in the high sky, looked down and it's background of forest, and it's for people – for a guy who is on the back, he can understand this is Shahed easier on the other – on every background, this is a Shahed. But AI don't do this. It's just trying to be a human mind, but it's not a human mind.

And that example, that we are creative. AI is – we think that it's creative, it can do something, but it's just, you know, replicate what we have in our brains. And until the man exists it can imagine something that AI cannot, and that's why we need the human in the loop. I would never prefer 100 system controlled by AI to 50 system controlled by human, because I believe to the people not to the computer.

Ms. Honcharuk: I guess that's where it is because technology on the battlefield, and the battlefield, and the tactics change so rapidly. You will always have to teach additionally whatever AI model that is. And the lag while you're teaching is somebody's life lost, and we cannot afford this further.

Ms. Bondar: Completely agree. And let's talk a little bit about tactics, as you mentioned. So, again, it reflects on training, how you prepare people, technologies, adaptation. So how often would you say tactics changes which requires changes in TTPs and doctrine and everything in Ukraine on average? I understand it's really hard to evaluate – (laughs) – and, like, have separate stages, but on average, like, what is your feeling?

Ms. Honcharuk: Well, previous minister of defense said every four months, which I think more or less we can agree with.

Sr. Lt. Vorobiov: Yes. When it become from just trying to come and usual usage, it's, I think, up to four months. So first they need to check it out, is it working or not. After that, it starts.

So, again, on example of Shaheds, which is very good, showed in that report of Snake Island defense of sky, first they fly low. Why? Because it was Iranian Shaheds. They was unable to do other things. We create mobile firing team just with a Browning gun, da-da-da, finish the story. OK. They just do like this: OK, let's try to go higher. They go higher, out of range of these guns, and they start overtaking us. Then interceptors appear. We start intercepting them at high. They again do like this and counter. So, OK, their destruction rate or interception rate by shot – by guns was, for example, numbers is – just from my head – 10 percent. For interceptors, it's 50 percent. So maybe let's go down again. They go down again, but by the same – and why? Because our radars can see high; they cannot see low. So we can go again down above the line of – the line of see of radars. But our guys are still there and they are still shooting, and they have now – you know, so they decided not to send the Shaheds; they cannot do this.

But they send it now like a sandwich. And sometimes we saw – I don't know, I think maybe you too – but they are going, like, one over another, a few hundred or a few thousand feet of difference. It make hard for radar to understand because it's on the – over and the radar, you know, it's on the same point but on a different head, and it go a little bit crazy. And it's – and it's sometimes triple sandwich. And that's how they're doing it.

So before it was they moving in a line. Now they go in – because if you are moving in a line interceptor team can destroy first, then second, then third. It's easy, just one by one. Now they are moving tens of them at the same moment like swarm. Some of them have one ahead like the main guy on scene and few of them, and he's just – you know, he have a camera. He's looking on the ground: OK, somebody shooting me. Let's go right. Let's go left. If this destroyed, other one become a leader. And, yeah, it's crazy, but it's what's happening.

Ms. Bondar: That looks like a real swarm. I mean, it's not just a mass attack. It's like a real swarm where you have collaboration between systems and –

Sr. Lt. Vorobiov: Yes, they have their translators on each other that one is go to the big city or facility and just start loitering around and the other, you know, just following him. They have big command-control stations over the borders on the big masts on the hundred feet, of tens of feet, which are letting them control, like, FPV, but Shahed FPV. Yeah, it's also happened.

Ms. Bondar: Well, that requires a response and that requires constant adaptation.

OK. You know, it's been very insightful and I'm pretty sure, unfortunately, we just scratched the surface on what's going on in Ukraine. But if you were to give, like, one insight or – not a lesson, I don't like this word, but just insight what Western militaries might change that

would help them to adapt faster and – or might change everything for them in terms of at least defense, what would that be?

Captain Maslii: First of all, we're always sending this data back to all of our allies, and Western military are well aware about what – what need to do. And you guys are very good in everything, so be safe. Like, it will – it takes probably a longer time that it should take, but – for adaptation, but you guys are very good in everything. We like not really to teach you but just to share experience and provide this – like, in this rapid war to what we need to get prepared for. And the rest is not in the end; we're just in the middle of it. It will just take another few steps and another flip from the – from the technology perspective.

So one thing is that I think the most important right now is to adaptation speed. You just need to change or die. That's how it works. Very simple.

Ms. Bondar: Very persuasive. (Laughs.)

Ms. Honcharuk: The simple answer to this is let Ukraine teach you, obviously. But I mean, we spend almost a week here in Washington, and we also – we're trying to understand, you know, the whole system, the whole process that you guys go through to even deploy something – you know, a new technology. And it seems to be very complex, both –

Ms. Bondar: It is.

Ms. Honcharuk: – procurement process and qualification processes. And sometimes you just have to be more agile. The Ukrainian – many Ukrainian brigades in our corps, in – is in that list, operate like a startup.

Ms. Bondar: Mmm hmm.

Ms. Honcharuk: It's very agile. We know we can call, like, chief of air defense right now and be, like, yeah, what's up – (laughter) – if we need help with something, and that's normal for us. But that allows for so much flexibility in terms of trial and error, and it's the only way you can – you can understand what works for you guys is try, fail, try, and fail.

Ms. Bondar: Yeah. So there should be balance just between institutional rigidness and adaptations.

Sr. Lt. Vorobiov: For me, as Max already said that we gave our experience all the time. But if you don't want our experience because U.S. and NATO is pretty good in the global things, strategical things, the suppression of air defense of the enemy, just sending thousands of planes there, it's OK – strategical level and high operational level. But on the tactical level, on the land forces level, we are the most advanced. Russians and we are, but I don't think that you want to work with the Russians. So that land forces experience, that tactical experience, is the main thing that we have. And that experience washed in blood of our people, of our brother in arms. So we don't want anybody to lose some and just come and get it.

As we speak with a lot of people here in Washington and we know that military – at least military, they totally understand that because we speak with the colonels and I ask them, do you need our experience? OK. Of course you have mobile warfare in your minds and your doctrines, but still, are you interested in what we have? And they said we are not looking for trenches warfare, but trenches warfare may look for us. And that's why, of course, we need your experience. So your military just working on this, believe me.

We just need to make it faster and not only, you know, on the higher level of minister of war-minister of defense connection. We should connect soldier to soldier, sergeant to sergeant and officer of each level because it's – you know, we will be – we will have a brotherhood already. We need to make it as strong as possible because we are stronger, you are stronger. We are not the guys who are just asking for help; we can provide help. Just come and get it.

Ms. Bondar: Definitely. That's hundred percent. And I just wanted to say my personal thank you to you especially, protectors of Ukrainian skies and defenders, because my family is still in Kyiv and I'm really thankful for what you do for protecting Ukrainians and the free world. And thank you for being here today with us, and thank you for joining us today.

(END.)