Good afternoon everyone, I am sorry that I am only joining the group for this one panel and remotely as it is 5AM here. I am in South Korea where I just conducted a New Generation Warfare Centre International seminar for the Republic of Korea National Assembly addressing the Future of Attack Helicopters and Drones. The seminar included the former Combined Forces Korea 4-star Commander, a former LTG Deputy of INDOPACOM, and a few other warfighting and technology experts. We directly addressed the topic of this panel: are Ukraine's Technology Innovations leading to a Shift in the Fundamental Naturen of Warfare? The answer is an absolute NO. Without question, drones and unmanned/ autonomous/artificial intelligence-enabled capabilities will continue to evolve and constitute an increasing share of high-end warfighting combat potential in the future. However, drones and other unmanned systems will be working in concert with many other existing warfighting systems – many of which are still evolving – to work collaboratively with drones both in offensive and defensive combat actions, as well as with other new capabilities that are in development and still to be fielded. Let me explain why this is true.

First, future conflicts are never the same as past conflicts, and lessons drawn from the past may or may not be applicable for a variety of reasons: different geography, the nature of the conflict, political constraints, or because still new methods and means emerge. Let me give you some examples from Russia's war in Ukraine that makes this particular conflict unique.

First the Russian General Staff recommended against Putin's invasion of Ukraine; and I personaly believe that they understood what almost all analysts seemed to miss – that the endemic level of corruption in the Russian Military had greatly impacted their readiness. Given the General Staff's military-technical recommendation, Putin turned to his intelligence services for a political-military solution. The plan they gave him was – essentially – a "political coup" – and when that "coup" collapsed, Russian troops failed in an attack they were not trained to execute and Russian equipment failed to perform in the combat actions for which they were not designed.

On the Ukrainian side there were so many limitations.

First they had Limited long-range strike systems and we, the US, restricted the authorities for use – how various means could be employed, when particular combat actions could be undertaken, which targets could be struct, and even constraints upon their ability to strike across the border; in a word, the Ukrainians were disasterously micromanaged by our White House. Had it been American troops fighting, the first principle of any US engagement against Russia would be to use our vast aviation capabilities to establish air superiority, and Where possible, precision long-range strikes to kill Russian systems beyond their range of effectiveness – essentially killing the archer as opposed to trying to intercept the arrows. Unfortunately, Ukraine is primarily defending against the arrows although maybe that can change once the Flamingo is in production or if the US providedTomahawk missiles.

While Ukraine has a fairly dense S-300 based air defense network to defend their military forces, they have limited capability to stop Ballistic Missile or the Glide Bombing profiles. Ukraine also has little protection for their energy or civilian infrastructure. Furthermore, the scale of the drone and missile raids were challenging for their defense systems to handle. Had it been the US fighting, we'd be striking the launch locations and would have as a first priority destroyed the major Russian drone assembly plant east of Kazan. Actually, Ukraine has hit this facility a number of times, but they lack the mass to destroy the large manufacturing facility there. That wouldn't be true if western capabilities were involved.

Twice in this conflict, Ukraine had an opportunity to strike and destroy a significant amount of Russia armored capabilities that were retreating, and the US administration would not allow this in fear of escalation. That would have gone a long way to reduce Russia's warfighting capability.

During one 9-month period, Ukraine was constrained from counterattacking the occupying forces which allowed Russia to essentialy prepare a Front Defensive Operation involving extensive fortifications incorporating minefields as dense as 5-kilometers.

As you all know, the lives of Russian soldiers have little value, and so they have been traded for terrain that can be measured in meters, whereas Ukraine has been grudgingly trading territory for the lives of Russian soldiers in an attempt to preserve its forces.

Another thing that a Western force would possess that is not prevalent in Ukrainian capabilities is the ability to fight at night. Russia is not very good at this either and it would be another capability balance in favor of the West, but unfortunately Ukraine only has limited capabilities in this area.

All of these factors led to the current static or slow moving front, so the current drone war evolved as a way to fight in this constricted environment of limited-scale capabilities means. Instead of the maneuver warfare planned by the Russian General Staff, Putin has enmeshed his army in a protracted war not all that different than the trench-warfare of the First World War. A war – by the way – that led to the collapse of the Imperial Russian state!

I do want to complement Ukraine for what I think is a Revolution in Military Affairs, but it is not the so-called revolution being touted by many so called experts. The revolution produced by the Ukrainians is their Innovation Cycle involving the rapid assessment of enemy technical adaptation and deployment of countering innovation. This to me is the true lesson all can learn; while it has been most visibily applied to drones, I don't think drones themselves are any more a "revolution" than was the deployment of anti-tank guided missiles (ATGMs) in the 1970s which – by the way – was also characterized at the time as a "tactial revolution in military affairs".

When the ATGMs were first deployed there was much debate about how this might be "the end of tank." The Soviets adapted by mechanizing their artillery and increasing the number of "tubes" by 50% to suppress the troops attempting to employ ATGMs – which had to be guided to their target. As the ATGMs got better, new "defensive means" were developed for the tank, such as new armor or active systems such as Trophy to defend against the evolving threat. I read just the other day that Ukraine was successfully using their M1 tanks to help advance against Russia, only losing one due to a breakdown and equipping them with some counter drone capabilities. Perhaps M1s weren't so effective with the fixed front dominated by drones but once they got the chance to move and fight in a more mobility based conflict, which I believe was likely due to denying Starlink to Russia, these armored capabilities began to become important again. Furthermore, all along the Bradley vehicles were being heavily used even in the drone-heavy environments, taking many cautionary measures to reduce the effectiveness of drone attacks. This is just an example of how emerging technologies provide both a short-term advantage and provoke new technologies and employment techniques, resulting in not "revolution," but "evolution."

So that leads me to caution that, for a short while, in a unique war, FPV and other types attack drones have had an advantage. But that is quickly going to come to an end. There are now a plethora of new counter-drone system, using different technologies that are already at various stages of development, testing and fielding. New systems are being field based on Lasers; new Electronic Warfare systems; and to address even the wire-guided drones that are not susceptible to jamming, new high power microwave systems exists. I saw a demonstration of one vendor wiping out about 75 FPV drones out the sky in a very short burst of energy and this capability is being miniaturized to be deployed on drones themselves. There are low cost advanced kinetic missile interceptors with rounds planned in the same range of some drones in the $5-10K range, so even so-called "hard-kill" solutions doesn't need to be a half million dollars missile against a low cost drone. Many of these capabilities are being designed to be employed by more traditional armored platforms, expanding their effectiveness even in the face of the evolution of drone capabilities.

Finally, in design are new air and missile defense architectures, which will include defense against a range of new drone types. This will involve multilayered defense systems which can move with the troops as they fight, be deployed around high value infrastructure, and part of what you hear called the "drone wall" along NATO's Eastern Front Defense Line – that is misnamed in that it will be designed more comprehensively to address all concerning air and missile defense threats.

I'll give you a last example from Israel of why this is an evolution not a revolution, one of the few other countries to experience major conflict in the last few years.

Israel questioned the value of their attack helicopter after observing the drone effectiveness of Azerbaijan drones against Armenian tanks and armored vehicles in the 2nd Nagorno-Karabakh War and, subsequently, in Russia's war against Ukraine. However, those concerns completely changed after the October 2023 Gaza Black Saturday Attack, the 2024-2025 Iran Air & Missile Attacks, and the war in Gaza. The Isreali manned AH64 *Apache* attack helicopter became THE critical force multiplier to direct fires against a broad distributed attack by Hamas – one report quotes the Isreali military as noting that "it is all we had" on that dark moment in the history of Israel. It was also the essential means by which to control the battle space in Gaza as the Isreali response to the October 2023 assaults unfolded. And, finally, against Iran these same helicopters proved very effective in hunting and chasing down many Iranian drones which slipped through either the Isreali *Iron Dome* system or their higher end ballistic and cruise missiles defenses. So the one country other than Ukraine, who has had to face some major attack, is not electing to take an all-drone approach. They are adapting and upgrading their systems to be more effective against drones with a measured evolutionary approach.

My bottom line is that while we have much to learn from the war in Ukraine, that war is unique and not every experience in that war will apply in the same way and to the same extent to conflict in other locations.