THE ANTAL PAPERS LEADERSHIP • WARFARE • ADAPTATION

Operation Vivaldi Case Study Report

All-Arms Combat and the restoration of maneuver

Colonel John Antal, U.S. Army (Ret.)

Prepared for professional military discussion at the NATO Mountain Warfare Congress
Zakopane, Poland | October 2026
Research cutoff 17 October 2026

A professional military study of offensive adaptation in a battlespace shaped by persistent sensing, robotic systems, and precision strike.

Central argument — Integrated shaping operations can create temporary local Drone Superiority. Ground forces must exploit that opportunity, consolidate gains, and sustain the fight.

Executive Assessment

Operation Vivaldi illustrates how a force can recover freedom of maneuver in a battlespace dominated by persistent sensing and precision strike. Ukraine's 3rd Army Corps combined preparation, secrecy, logistics interdiction, counter-reconnaissance, electronic warfare, unmanned systems, conventional fires, and ground action north of Lyman. The operation was publicly announced on 15 September 2026, after earlier fighting under an information blackout.[1]

On 14 October, Brigadier General Andrii Biletskyi claimed cumulative recovery of 277 square kilometers and 16 settlements. Reuters reported the claim but could not independently verify the battlefield figures. These gains are significant locally. They do not establish a theater-wide breakthrough or the defeat of Russia's wider campaign.[2]

The central military innovation was integration. Ukrainian forces attacked the systems that enabled Russian forces to observe, strike, reinforce, and sustain. Ground forces then exploited local opportunities. Robotic systems assumed selected dangerous tasks, while infantry and other conventional forces established control.

I describe this evolution of Combined Arms as All-Arms Combat. It combines human judgment, robotic systems, resilient command, fires, protection, and sustainment into a continuous sense-and-strike fight. Vivaldi offers evidence of this direction of development. It does not prove that Ukraine has formally adopted an offensive doctrine under that name.

Principal findings

- Preparation against the enemy's support system can reopen opportunities for ground maneuver.
- Local Drone Superiority is temporary. It must be created, exploited, and renewed.
- Robotic assault, engineering, and logistics are most useful when integrated with conventional forces.
- Command integration and sustainment determine whether tactical gains endure.

Terminology status — All-Arms Combat and the capitalized Drone Dominance concepts used here are John Antal's proposed analytical terms. The definitions in this report are not promulgated U.S. or NATO doctrine. No claim is made that Ukrainian orders used these terms.

1 Francis Farrell, "Analysis: Through the Fog of War, Ukraine Reveals Operation Vivaldi Counterattack near Lyman," The Kyiv Independent, September 15, 2026. https://kyivindependent.com/analysis-through-the-fog-of-war-ukraine-goes-on-operation-vivaldi-counterattack-near-lyman/

2 Reuters, "Ukraine Says It Frees More Territory in Donetsk Region Counteroffensive," October 14, 2026. https://www.reuters.com/business/aerospace-defense/ukraine-says-it-frees-more-territory-donetsk-region-counteroffensive-2026-10-14/

1. Operational setting and the four seasons

The operational problem was the Russian salient north and northwest of Lyman. Russian pressure threatened the northern approaches to the Sloviansk–Kramatorsk defensive area. The 3rd Army Corps operated with subordinate and attached formations against a force supported by the Russian 20th and 25th Combined Arms Armies. Public sources do not establish a complete order of battle for every action.[3]

Wooded ground, settlements, ravines, and threatened roads shaped movement. Russian infiltration created a second problem: apparent front lines concealed hostile groups between and behind Ukrainian positions. Restoring control therefore involved clearing infiltrators as well as recovering occupied terrain. These are different measures of progress.

Public announcement chronology

Period or announcement	Reported action and result
Before 15 September	Preparation and fighting under information silence. Stabilization, counter-infiltration, coordination, and interdiction preceded public disclosure.
Season one 15 September	75 km² cleared of infiltrators; 10 km² liberated, including Serednie. These categories should remain separate.
Season two Around 20 September	Shandryholove and Derylove recovered; control of Drobysheve established. Reported cumulative restored control about 125 km².
Season three 28 September	Actions around Nove, Ridkodub, Katerynivka, Karpivka, and Novomykhailivka. Reported addition of 51 km²; cumulative 176 km².
Season four 14 October	Zelena Dolyna, Lypove, and Kolodiazi recovered. Corps reported 101 km² added and completion of its four seasons.

Table 1. Announcement dates identify public reporting, not precise start and finish dates of combat. The chronology combines the corps' releases, contemporary reporting, and the supplied case study.[4][5]

The reported cumulative totals mix areas cleared of infiltration with areas described as liberated. The sequence should not be converted into a daily advance rate or a single uniform measure of newly captured ground. The analytical framework later in this report organizes military functions rather than reproducing these announced seasons.

Ukrainian units included the 3rd Assault Brigade, mechanized formations, reconnaissance and anti-tank elements, unmanned units, border guards, and special operations personnel. Their integration matters more to this study than an incomplete unit roster.

3 Robert G. Rose, "An Overture to Victory: Operation Vivaldi and Ukraine's Path to Battlefield Decision," Modern War Institute, September 24, 2026. Author analysis, not official U.S. Army doctrine. https://mwi.westpoint.edu/an-overture-to-victory-operation-vivaldi-and-ukraines-path-to-battlefield-decision/

4 Third Army Corps, "Operation Vivaldi," entries of October 14–15, 2026, accessed October 17, 2026. https://ab3.army/en/operations/vivaldi/

5 Grace Mappes and George Barros, "Russian Offensive Campaign Assessment, September 28, 2026," Institute for the Study of War and Critical Threats Project, opening assessment. https://www.criticalthreats.org/analysis/russian-offensive-campaign-assessment-september-28-2026

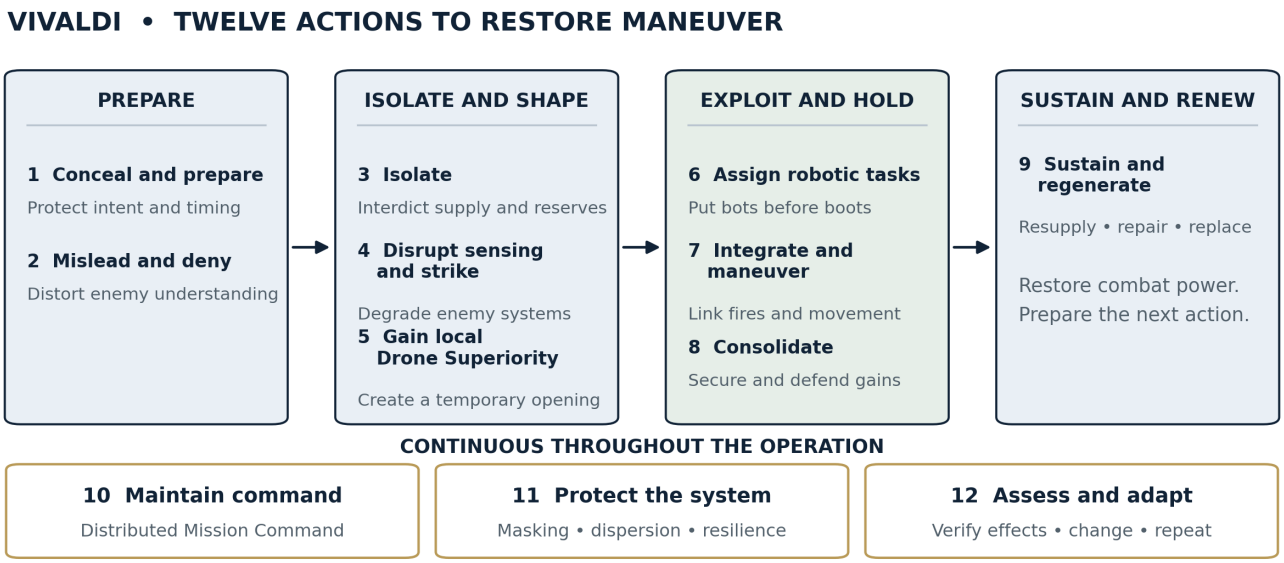

Figure 1. The report's twelve-action framework applied to Vivaldi. Actions 1–9 overlap; command, protection, and assessment continue throughout. These analytical groupings are not Ukraine's four announced seasons or a verified Ukrainian operations order. Author's reconstruction using the Drone Dominance framework.

2. The All-Arms Combat framework

The following definitions express the conceptual distinctions in my Drone Dominance framework. They are author-proposed definitions for professional discussion. Familiar underlying ideas, including mission command, combined arms, dispersion, and sustainment, already have doctrinal foundations.

All-Arms Combat — The next evolution of Combined Arms: the continuous, simultaneous integration of human forces, unmanned and robotic systems, sensors, networks, electronic warfare, fires, protection, and sustainment into a unified sense-and-strike system that generates converging effects and enables maneuver.

Drone Dominance — The strategic national condition in which human intelligence, artificial intelligence, and production scale generate and sustain unmanned systems and countermeasures for persistent sensing and strike. Its purpose is to enable Drone Superiority and joint freedom of action. HI × AI × PS = DD.

Drone Superiority — Control of the sense-and-strike fight within a defined place and period, sufficient to permit friendly maneuver without prohibitive interference while denying the enemy effective detection, targeting, and attack. It is relative, local, contested, and perishable.

Land–Air Littoral or LAL — The decisive low-altitude battlespace immediately above the ground where unmanned systems, persistent sensing, networks, electronic warfare, and ground forces converge to compress decision cycles and enable fires and maneuver.

Ground Strike Zone or GSZ — A commander-designated, time-bounded, four-dimensional battlespace volume, defined by width, depth, altitude, and time. Within it, sensing, targeting, electronic warfare, counter-UAS, fires, and maneuver are integrated to create local Drone Superiority and accomplish the ground mission.

Fighting in Real-Time — Combat in which sensing, orientation, decision, and action form a continuous, compressed cycle. Shared information and timely authority allow forces to act before an opportunity closes. AI may assist orientation; human judgment remains responsible for decisions.

Distributed Mission Command — The execution of mission command across dispersed formations through shared understanding, delegated authority, and resilient networks. Multiple trained command nodes can maintain or assume command functions when another node is disrupted or destroyed.

Distributed Logistics — Resilient sustainment through dispersed, mobile, masked, and redundant arrangements. Smaller deliveries, multiple routes, pre-positioned stocks, and robotic delivery where practical reduce exposure and preserve support under persistent observation and attack.

Scale and status matter — Drone Dominance describes national capacity. Drone Superiority describes a condition in the fight. A GSZ focuses effects in space and time; it is not an established NATO control measure. These definitions do not imply that Vivaldi demonstrated AI orchestration, autonomous swarms, or a verified command-node succession architecture.

3. What changed in Combined Arms

Combined Arms already seeks complementary effects that place the enemy in a dilemma. Army doctrine also addresses convergence across domains. All-Arms Combat builds on those foundations. Its proposed distinction is the persistent integration of human and robotic capabilities through the sensing, decision, strike, maneuver, and sustainment cycle.[6]

Military function	All-Arms Combat implication
Reconnaissance	Find the enemy, expose its sensing and strike system, and create the conditions for local Drone Superiority.
Fires and maneuver	Mass effects from dispersed forces, then maneuver to exploit local Drone Superiority.
Protection	Integrate masking, counter-reconnaissance, electronic warfare, and counter-UAS to protect the entire fighting system.
Command	Employ Distributed Mission Command to empower dispersed leaders, share understanding, and sustain command when nodes or networks are disrupted.
Sustainment	Distributed Logistics integrates delivery, repair, battery resupply, recovery, and replacement into the operation from the outset.

Table 2. Author's conceptual interpretation. These implications extend existing combined-arms practice; they are not a claim that earlier doctrine excluded integration or simultaneous action.

Why Vivaldi matters

The operation's reported methods link three fights. The first is against the enemy's understanding. The second is against the sensors, weapons, and support system that make movement dangerous. The third is the ground fight to seize, clear, and hold. The commander must connect them. Winning one while neglecting another can leave an apparent success without an exploitable result.

Calling this a new generation of offensive warfare is a proposition to test. The stronger evidence concerns changed methods and relationships: unmanned systems broaden the options for imposing risk, continuous observation compresses opportunities, and exposed sustainment can halt an advance before the objective is reached.

6 Headquarters, Department of the Army, ADP 3-0, Operations (Washington, DC, March 21, 2025), discussion of combined arms and convergence. https://rdl.train.army.mil/catalog-ws/view/100.ATSC/36874736-5A16-4782-B0DC-62758B132F31-1743173767793/ADP3_0.pdf

RUSI's earlier research describes a comparable sequence of surveying, isolating, degrading, fixing, suppressing, closing with, and consolidating against the enemy. That 2025 study is useful context. It predates Vivaldi and cannot verify the corps' 2026 actions.[7]

A system rather than a platform

A drone count measures inventory. It does not measure freedom of action. A useful military assessment asks whether the force can detect an opportunity, decide in time, deliver the required effect, move, and continue to fight. Vivaldi's enduring value lies in examining that relationship across multiple capabilities.

4. Conceal preparations and isolate the enemy

Operational security protected opportunity

Contemporary reporting describes strict information silence and Russian confusion about Ukrainian progress. It also describes the corps bringing formations together in a coherent sector and sharing practices across units. These observations support the importance of organization and secrecy, although they do not disclose the complete preparation plan.[8]

Military assessment — An observed preparation need not reveal its purpose. The practical objective is to prevent the enemy from correctly identifying the main effort and responding in time. Masking, deception, and operational security should be assessed through their effects on enemy decisions. Surprise alone does not establish which measure caused it.

Interdiction attacked the capacity to fight

The corps reported 36,000 strike missions during the first stage. LB.ua described an interdiction effort expanding from about 50 to 120 kilometers from the front. Reported targets included fuel, ammunition, transport, communications, and command facilities. The corps claimed pipeline disruption and relocation of fuel arrangements toward Voronezh. These are attributed accounts, not independently audited measures of destruction.[9]

Military assessment — The operational value of interdiction depends on what the enemy can no longer do. Delayed fuel, batteries, spares, or crews can reduce the availability of jammers and drones. The relevant measures include interruptions to observation, slower reinforcement, and reduced responsiveness of fires. A long target list is insufficient evidence of those effects.

Counter-reconnaissance reduced interference

ISW's 19 September assessment reports dedicated coordination channels, attacks on drone launch sites and operators, air defense, electronic warfare, and severed supply routes. Ukrainian officers claimed these actions pushed Russian drone units back and caused Rubikon elements to relocate. ISW also described an EW-supported protective effect moving with Ukrainian forces.[10]

---

7 Jack Watling, Emergent Approaches to Combined Arms Manoeuvre in Ukraine (London: Royal United Services Institute, October 23, 2025), "Emergent Concepts in Combined Arms Manoeuvre in Ukraine." This study predates Vivaldi and supplies comparative context. https://www.rusi.org/explore-our-research/publications/insights-papers/emergent-approaches-combined-arms-manoeuvre-ukraine

8 Francis Farrell, "Analysis: Through the Fog of War, Ukraine Reveals Operation Vivaldi Counterattack near Lyman," The Kyiv Independent, September 15, 2026. https://kyivindependent.com/analysis-through-the-fog-of-war-ukraine-goes-on-operation-vivaldi-counterattack-near-lyman/

9 LB.ua, "Third Army Corps Releases Details of Operation Vivaldi and Strikes on Occupiers' Logistics," September 16, 2026, reporting corps statements. https://en.lb.ua/news/2026/09/16/41988_third_army_corps_releases.html

10 Nikolai Sundstrom et al., "Russian Offensive Campaign Assessment, September 19, 2026," Institute for the Study of War and Critical Threats Project, opening assessment. https://www.criticalthreats.org/analysis/russian-offensive-campaign-assessment-september-19-2026

Military assessment — This is the clearest link to local Drone Superiority. The attacker seeks enough reduction in hostile sensing and engagement to permit the next action. The condition must persist during movement and consolidation. An opening that closes before the assault or resupply arrives has little operational value.

The 120-kilometer interdiction figure describes reported reach against support systems. It should not be drawn as the boundary of a verified Ukrainian GSZ. The supporting fight may extend well beyond the volume in which the ground commander concentrates effects.

5. Robotic systems changed the allocation of risk

Robotic engineering

The corps reported ground robots clearing approximately 30 kilometers of routes near Shandryholove over two nights. The public account does not establish lane widths, obstacle density, the full proofing standard, or performance against every mine type. The useful finding is combat employment of robotic engineering support. The report does not endorse the accompanying claim of a world first.[11]

Military assessment — Remote systems can reduce the time personnel spend exposed during route work. They still require engineer judgment, reliable control, recovery, and confirmation that the route meets the supported force's needs. A route cleared for one small vehicle does not automatically support a mechanized formation.

Aerial delivery of ground robots

Accounts attributed to NC13 describe the Gryphon method: heavy aerial drones delivering ground robots beyond the immediate front for selected missions. Published descriptions associate this method with Vivaldi. They support the existence of an air–ground robotic combination; they do not establish reliable deep insertion under all conditions or independent machine decision-making.[12]

Military assessment — Combining aerial mobility with ground persistence expands how a commander can reach a position without first exposing soldiers. The principal innovation is the relationship between systems. Its utility depends on terrain, communications, payload, weather, and the ability to identify and assess the mission's effect.

Robotic demolition and strongpoint attack

Reporting on season three describes armored personnel carriers converted for remotely controlled explosive attacks against fortifications. Sources disagree on whether the vehicles were BTR-60s or BTR-80s. The report therefore retains the broader identification. ISW linked their approach to the apparent reduction of Russian drone interference, while acknowledging this as an assessment.[13]

Military assessment — Such employment illustrates an effort to deliver destructive effect while reducing crew exposure. It does not establish that these vehicles can replace engineers, tanks, or infantry. Mission completion requires more than impact footage: the force must establish whether resistance remains and whether the position can be controlled.

11 LB.ua, "Third Army Corps Becomes First in the World to Deploy Robotic Demining Systems in an Offensive," September 24, 2026, reporting corps claims. The historical priority claim is not adopted in this report. https://en.lb.ua/news/2026/09/24/42838_third_army_corps_becomes_first.html

12 Kateryna Lisunova, "Washington Should Pay Attention to Ukraine's New Robotic Counteroffensive," The Kyiv Independent, opinion, October 2, 2026, citing NC13. https://kyivindependent.com/washington-should-pay-attention-to-the-new-ukrainian-robotic-counteroffensive/

13 Grace Mappes and George Barros, "Russian Offensive Campaign Assessment, September 28, 2026," Institute for the Study of War and Critical Threats Project, opening assessment. https://www.criticalthreats.org/analysis/russian-offensive-campaign-assessment-september-28-2026

Bots before Boots

Bots before Boots is an author-proposed principle for allocating risk. Use machines first when they can perform a dangerous task effectively. Preserve an alternative when terrain, links, identification, or mechanical failure prevents completion. A robot-first approach is a command choice, not a fixed sequence imposed on every assault.

6. Exploit the opening and hold the ground

Deception supported the main effort

For season three, Biletskyi described a feint toward Zelena Dolyna that diverted attention from Nove. ISW reported this account alongside the corps' claimed territorial gains. It offers a specific reported deception mechanism. It should not be expanded into proof of the complete Ukrainian deception plan or of uniform Russian command collapse.[14]

Military assessment — The important question is whether the enemy committed attention, reserves, or fires away from the decisive action. Commanders should distinguish that result from the confusion caused by attrition, delayed reporting, or a changing front.

Artillery and infantry remained essential

Field reporting from the Lyman sector, Donetsk Oblast, Ukraine, describes 66th Mechanized Brigade drone crews and HIMARS contributing to attacks on a Russian artillery position. Accompanying photographs of the crew are dated 11 August 2026. The text does not separately date the engagement or disclose the target's precise location. Published on 8 October 2026, the account describes an initial apparent hit followed by observation that the target survived, requiring further action. It illustrates coordination and the continuing need for assessment.[15]

Military assessment — A sensor feed, a strike, and an advance are separate events. All-Arms Combat connects them through a decision about what the ground mission requires. Artillery can supply effects that small drone payloads cannot reliably deliver. Infantry and protected mobility allow the force to enter positions, overcome surviving resistance, manage prisoners, and establish control.

Breaching fundamentals still apply

Where the objective requires an opposed breach, suppress, obscure, secure, reduce, and assault remain the doctrinal fundamentals. Secure means preventing enemy interference with reduction and passage. Reduce means creating lanes through or over the obstacle. Robots may support these functions; they do not change their purposes.[16]

The public record does not demonstrate that Vivaldi executed one uniform SOSRA drill throughout the sector. Nor does the public record establish the use of autonomous drone swarms with drones communicating and coordinating their actions with one another. In this report, coordinated drone employment means multiple systems supporting a common action, without assuming machine-to-machine autonomy.

14 Grace Mappes and George Barros, "Russian Offensive Campaign Assessment, September 28, 2026," Institute for the Study of War and Critical Threats Project, opening assessment. https://www.criticalthreats.org/analysis/russian-offensive-campaign-assessment-september-28-2026

15 Diana Delyurman, "Drones above, Robots below — Inside Operation Vivaldi, Ukraine's Push to Recapture Territory in Donetsk Oblast," The Kyiv Independent, October 8, 2026. https://kyivindependent.com/inside-operation-vivaldi-how-ukraine-uses-drones-robots-to-liberate-territory-in-donetsk-oblast/

16 U.S. Army Infantry School, ATP 3-21.8 Doctrine Supplement, appendix H, "Breaching Fundamentals," accessed October 17, 2026. https://www.benning.army.mil/Infantry/DoctrineSupplement/ATP3-21.8/appendix_h/ObstacleReduction/BreachingFundamentals/index.html

Consolidation converted movement into control

Military assessment — Exploit the tactical opportunity to seize the objective, consolidate gains, and establish a resilient defense. The force needs observation, defensive fires, protected resupply, casualty evacuation, and replacement of exhausted troops. Enemy infiltration and local counterattack remain possible after a position changes hands. A rolling GSZ is my proposed way of thinking about moving the protected concentration of effects forward. It is not a verified Vivaldi control measure.

7. Command and sustainment preserved combat power

Fighting in Real-Time required decisions

Vivaldi's reported coordination provides a useful illustration of Fighting in Real-Time. The concept concerns the relationship between information and action. More real-time video does not automatically produce better command. Rapid, effective decisions depend on timely analysis and sound judgment. A leader must understand what the information means, what authority is available, and what action will exploit the opportunity.

Military assessment — The command process should continue when one sensor, headquarters, or communication path fails. Leaders require intent, boundaries, priorities, and a shared understanding of risk before links deteriorate. Decision speed must remain consistent with positive identification, fires coordination, and the commander's responsibilities.

Distributed Mission Command

Mission command must be trained before it can be trusted in combat. Soldiers must master basic skills, and units must develop tactical competence. Commanders must then build on that foundation by routinely training through mission orders, clear intent, and delegated authority. Subordinate leaders need repeated practice making decisions and exercising disciplined initiative. A unit cannot be expected to execute mission command under fire if its training has required permission for every action.

Army mission command rests on competence, mutual trust, shared understanding, commander's intent, mission orders, disciplined initiative, and risk acceptance. My Distributed Mission Command concept applies those principles through dispersed, resilient arrangements suited to persistent observation and attack.[17]

The available sources do not reveal a complete Vivaldi network architecture, its degree of decentralization, or how succession of command was arranged. The case therefore supports a requirement for integration. It does not prove that the corps implemented every element of my Distributed Mission Command model.

Distributed Logistics

The Kyiv Independent observed UGV delivery of supplies in the Lyman sector. One 66th Brigade team reported 100–150 missions per month and coverage of most logistics for its battalion. The reporter also observed movement being held during a Lancet warning.[18]

Military assessment — Distributed Logistics requires delivery capacity, not simply a fleet of robots. The formation must sustain ammunition, fuel, batteries, medical support, spares, repairs, and trained operators. Dispersing loads reduces the consequences of a single loss but can increase coordination and maintenance demands.

---

17 Headquarters, Department of the Army, ADP 6-0, Mission Command: Command and Control of Army Forces (Washington, DC, July 31, 2019), chapter 1. See also Combined Arms Center, "Combined Arms Center Launches New Mission Command Doctrine," August 8, 2019. https://www.army.mil/article/225414/combined_arms_center_launches_new_mission_command_doctrine

18 Diana Delyurman, "Drones above, Robots below — Inside Operation Vivaldi, Ukraine's Push to Recapture Territory in Donetsk Oblast," The Kyiv Independent, October 8, 2026. https://kyivindependent.com/inside-operation-vivaldi-how-ukraine-uses-drones-robots-to-liberate-territory-in-donetsk-oblast/

Claims that robots performed 80 percent of logistics or 90 percent of casualty evacuation appear in commentary, but their unit, period, denominator, and measurement methods are insufficiently clear for corps-wide conclusions. They are not used as planning factors here.

Distributed Logistics range and mountain limits

Published range examples as of October 2026 — Open sources do not establish a single reliable range or mountain reduction factor for robotic-enabled Distributed Logistics. Control-link reach, total travel distance, and recoverable delivery radius are different measures. The following examples are not confirmed Vivaldi performance or universal limits.

Ground systems — Ukraine's Ministry of Defence lists SIRKO-S1 control reach as up to 3 kilometers with line of sight, extendable to 10 kilometers with a repeater. Terrain can interrupt that link before the vehicle exhausts its energy.[19]

The ministry lists Bizon-L with a payload up to 300 kilograms and an operational range up to 50 kilometers. That headline figure does not establish a loaded out-and-back radius or a mountain performance standard.[20]

Aerial systems — DJI lists FlyCart 30 maximum flight distance as 16 kilometers with a 30-kilogram payload and dual batteries, measured at sea level without wind. This is flight distance, not a 16-kilometer delivery radius with return and reserve. Actual mission radius depends on the outbound and return loads, climb, wind, and energy reserve.[21]

Mountain evidence — In its 2024 Everest trials, DJI reported carrying 15 kilograms over a 2.7-kilometer route with 700 meters of elevation gain, from approximately 5,300 to 6,000 meters above sea level. It reported 43 percent battery remaining after the round trip. Terrain-related signal obstruction required adjustments to the operating locations. This demonstrates a specific civilian mountain delivery, not a combat-tested range.[22]

Author's assessment — For tactical drone-enabled Distributed Logistics today, I assess a practical maximum range of roughly 20 kilometers in open terrain and 10 kilometers in mountainous terrain. These estimates reflect current robotic systems capabilities and my understanding of military operations. They are operational planning judgments, not verified averages, universal technical limits, or demonstrated Vivaldi performance. Each mission still requires validation against payload, route, communications, enemy interference, and delivery and return requirements.

Planning implication — Determine loaded delivery and return performance on the actual route. Steep or broken ground, altitude, cold, wind, communications obstruction, and enemy interference can reduce useful reach or prevent a mission entirely. No defensible universal percentage reduction emerges from these sources. Route trials must establish payload delivered, round-trip time, reserve, link reliability, and recovery options.

Robotic resupply and casualty evacuation reduced the need to expose soldiers on threatened routes. The robots remained vulnerable to enemy sensing and strike, but their loss did not carry the same human cost as losing a crewed vehicle.[23]

The sustainment test

An offensive culminates when support cannot keep pace with demand. A local gain is useful only if the force can sustain the new position and regenerate the sensing, protection, and fires needed for the next action. That is the operational purpose of integrating Distributed Logistics with the maneuver plan.

---

19 Ministry of Defence of Ukraine, "Mine Action, Demining, and Logistics: How the SIRKO-S1 Ground Robotic System Supports Ukrainian Military," March 25, 2025. Published control-link limits, not a mountain-tested delivery radius. https://mod.gov.ua/en/news/mine-action-demining-and-logistics-how-the-sirko-s1-ground-robotic-system-supports-ukrainian-military

20 Ministry of Defence of Ukraine, "Bizon Enters the Battlefield: Defence Forces Receive a UGV Capable of Carrying up to 300 kg," April 23, 2026, technical specifications. https://mod.gov.ua/en/news/bizon-enters-the-battlefield-defence-forces-receive-a-ugv-capable-of-carrying-up-to-300-kg

21 DJI, "DJI FlyCart 30 Specifications," maximum flight distance, accessed October 17, 2026. Manufacturer data obtained at sea level in windless conditions. https://www.dji.com/flycart-30/specs

22 DJI Enterprise, "Delivery Drones on Mount Everest," June 5, 2024, "15 kg Payload at 6,000 Meters Altitude." Manufacturer-reported civilian trial; no hostile interference. https://enterprise-insights.dji.com/blog/delivery-drones-on-mount-everest

23 LB.ua, "Third Army Corps Becomes First in the World to Deploy Robotic Demining Systems in an Offensive," September 24, 2026, reporting corps claims. The historical priority claim is not adopted in this report.
https://en.lb.ua/news/2026/09/24/42838_third_army_corps_becomes_first.html

8. Implications for NATO and mountain warfare

The following implications are the author's deductions for NATO training and force development. Vivaldi was not a high-mountain operation. Its wooded and restricted terrain offers useful questions for mountain forces, but its distances, platforms, and reported performance cannot be transferred directly.

Treat terrain as a four dimensional problem

Length × Width × Height × Time. Height includes ground elevation and the Land–Air Littoral above it.

A covered approach on the ground may remain exposed from above. Ravines and reverse slopes can interrupt enemy observation while also restricting friendly communications and movement. Exercises should test how terrain protects the force from different sensors and where it creates new vulnerabilities. Ground elevation must inform the LAL picture and the vertical limits of any proposed GSZ.

Drone Superiority is a temporary condition that must be maintained. It can be lost when enemy drones, sensors, or supporting fires regain enough effectiveness to prevent friendly maneuver without prohibitive interference. Commanders must therefore assess both the space they can control and the period during which they can exploit that control. Time is the fourth dimension: an opening matters only if the force can act before it closes.

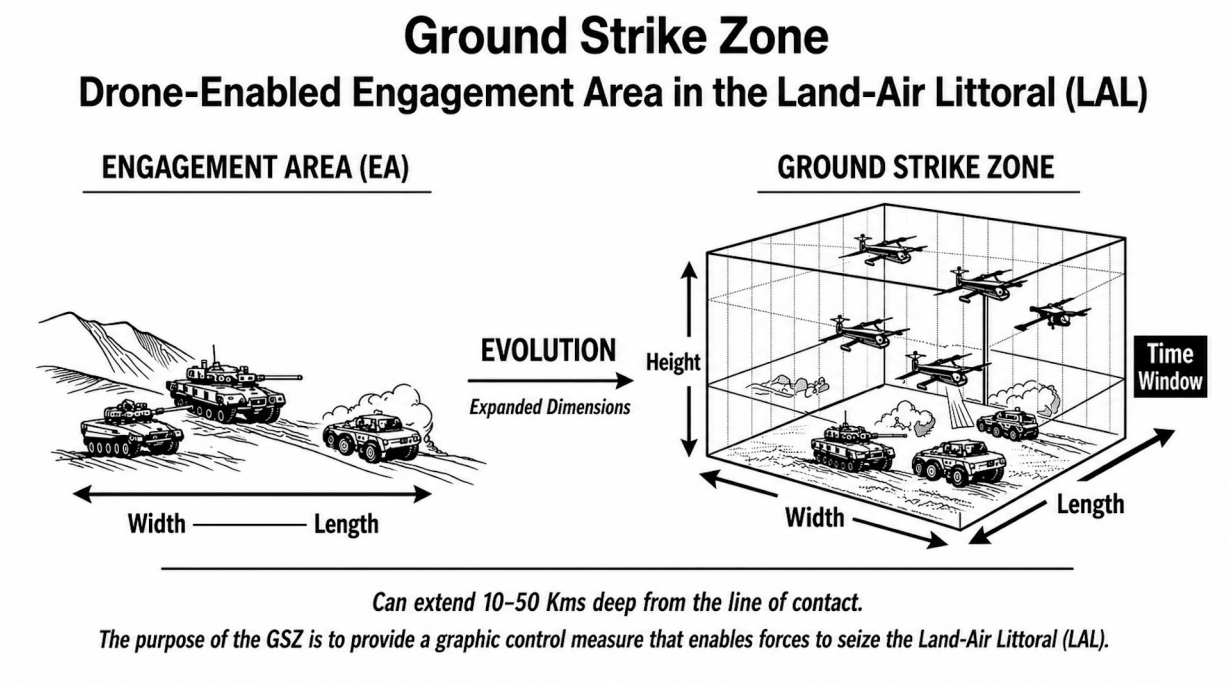

Figure 2. John Antal's Ground Strike Zone concept integrates width, length, height, and a time window. The GSZ is an author-proposed control measure, not promulgated doctrine. The 10–50 km depth shown is illustrative, not a fixed requirement or verified Vivaldi boundary. Illustration supplied by the author.

Test the complete delivery system

Mountain units should assess payload, endurance, slope, surface, weather, and recovery together. UGVs that work on roads may fail on narrow or broken routes. Aerial delivery can bypass some obstacles while remaining limited by wind, cloud, icing, and lift. The useful measure is dependable delivery to the supported force under the expected threat.

Protect the few usable routes

Restricted routes make resupply, evacuation, and reinforcement predictable. Counter-UAS and electronic protection must cover the sustainment effort as well as the assault. Dispersion requires practical alternatives:

routes, locations, stocks, and means of delivery. Merely dividing a depot does little if every load must cross the same exposed point.

Integrate the spectrum and airspace

Friendly electronic attack can interfere with friendly drone control and navigation. The force must coordinate frequencies, airspace, fires, and authorities while preserving options when links fail. Allied interfaces must allow shared understanding without assuming every nation uses the same systems. These are training requirements derived from the operational problem, not verified details of Vivaldi's communications plan.

Build units that can learn under pressure

Operators, infantry, engineers, intelligence personnel, fires teams, and maintainers should train as a formation. Rehearsals should include enemy adaptation, equipment losses, disrupted navigation, and unavailable headquarters. A unit should be judged on whether it completes and sustains the mission after its preferred method fails.

RUSI warns against copying Ukrainian practices without accounting for differences in forces, resources, and campaign requirements. NATO should test the underlying relationships while preserving the benefits of joint airpower, engineering capacity, and multinational sustainment. Access to those capabilities can change the problem substantially.[24]

9. A framework for commanders and staffs

This twelve-action framework is my analytical reconstruction for study and exercises. It is not a Ukrainian operations order. Actions overlap, continue through the fight, and should be adjusted to the mission and enemy response.

Action	Decision or condition to assess
1 Conceal and prepare	Can the enemy correctly identify our intent, main effort, and timing?
2 Mislead and deny	What enemy decision is deception or information denial intended to change?
3 Isolate	Can the enemy still reinforce and sustain the objective effectively?
4 Disrupt sensing and strike	Can hostile observation still generate timely, accurate attacks?
5 Gain local Drone Superiority	Is freedom of action sufficient for the mission, and for how long?
6 Assign robotic tasks	Which missions can machines complete while reducing personnel exposure?
7 Integrate and maneuver	Are fires, engineers, EW, unmanned systems, and ground action mutually supporting?
8 Consolidate	Is the objective controlled and protected against infiltration and counterattack?
9 Sustain and regenerate	Can supplies, repairs, replacements, and medical support sustain the new posture?
10 Maintain command	Can subordinates act within intent if headquarters or networks are disrupted?

24 Jack Watling, Emergent Approaches to Combined Arms Manoeuvre in Ukraine (London: Royal United Services Institute, October 23, 2025), "Emergent Concepts in Combined Arms Manoeuvre in Ukraine." This study predates Vivaldi and supplies comparative context. https://www.rusi.org/explore-our-research/publications/insights-papers/emergent-approaches-combined-arms-manoeuvre-ukraine

Action	Decision or condition to assess
11 Protect the system	Are operators, relays, command nodes, repair sites, and routes protected?
12 Assess and adapt	What actually changed, what remains dangerous, and what must change next?

Table 3. Author-proposed planning questions. A GSZ must remain compatible with existing boundaries, fire support coordination measures, airspace control, and command responsibilities.

Measure military effect

Useful indicators include successful enemy observations that lead to strikes, the time required to obtain support, delivery reliability, robot mission completion, personnel exposure, and the ability to hold the objective. Drone sorties and strike counts provide workload data. They require context before they can indicate combat effectiveness.

10. Final assessment and evidence limits

What Vivaldi demonstrates

The available record supports a serious study of offensive adaptation. The corps combined an extended shaping effort with local ground action. Reported robotic engineering and assault widened its options. Observed coordination and robotic logistics show how the less visible parts of the system supported combat.

My assessment is that Vivaldi illustrates an emerging path toward All-Arms Combat. The principal change is the integration of human forces and machines across the whole fight. Drone Superiority creates an opportunity in the LAL. Ground forces exploit it. Distributed Mission Command and Distributed Logistics help preserve and renew the advantage. These are analytical relationships, not proof that every element of the framework was demonstrated.

What remains unproven

The corps reports approximately 8,000 Russian personnel losses and claims that the operation prevented an outflanking effort, protected the Kharkiv–Sloviansk highway, and compelled redeployment of part of the 1st Guards Tank Army. These remain Ukrainian claims. Public reporting does not provide a complete casualty methodology, Ukrainian losses, a full force ratio, or the long-term costs of holding the gains.[25]

Specific claims about a commander called Marshal, a Black Mamba unit, and 19 Russian officers were not corroborated sufficiently for inclusion as findings. The exact scale of autonomous behavior and the robustness of robotic operations against a fully recovered defense also remain uncertain.

How to use the evidence

Official corps statements are primary evidence of what the command claims. Field reporting supplies direct observations but covers selected units and moments. ISW provides analytical assessment and geolocation-based context; it also relies on belligerent reporting. Reuters explicitly qualifies battlefield totals. Several outlets repeating the same unit release do not constitute independent confirmation.

Footnotes identify the underlying sources used in the report.

Judgment for the professional military audience

Vivaldi should drive experimentation in how formations regain freedom of action under persistent observation. Its importance extends beyond a territorial total. It shows a force working to make the enemy's combat system

25 Third Army Corps, "Operation Vivaldi," entries of October 14–15, 2026, accessed October 17, 2026. https://ab3.army/en/operations/vivaldi/

less effective before committing and sustaining ground maneuver. NATO should examine that method, test its limits, and adapt it to its own forces.

All-Arms Combat is my proposed next step in the evolution of Combined Arms. Its test is practical: can the formation integrate people, machines, fires, command, and sustainment well enough to seize the initiative, accomplish the mission, and continue fighting?