

Research Papers

November 2026

Integrating Tactical UAVs into the Infantry Battalion

Jack Watling and Robert Tollast

RUSI

Disclaimer

The content in this publication is provided for general information only. It is not intended to amount to advice on which you should rely. You must obtain professional or specialist advice before taking, or refraining from, any action based on the content in this publication.

The views expressed in this publication are those of the authors, and do not necessarily reflect the views of RUSI or any other institution.

To the fullest extent permitted by law, RUSI shall not be liable for any loss or damage of any nature whether foreseeable or unforeseeable (including, without limitation, in defamation) arising from or in connection with the reproduction, reliance on or use of the publication or any of the information contained in the publication by you or any third party. References to RUSI include its directors, trustees and employees.

© 2026 The Royal United Services Institute for Defence and Security Studies

This work is licensed under a Creative Commons Attribution – Non-Commercial – No-Derivatives 4.0 International Licence. For more information, see <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

RUSI Research Papers, November 2026

ISSN 2977-960X

Publications Team

Editorial

Director of Publications: Alice Trouncer

Managing Editor: Sarah Hudson

Assistant Editor: Sophie Boulter

Assistant Editor: Liz Ottosson

Design

Graphic Designer: Zenab Hotelwala

Research Editorial

Head of Research Governance and Editorial: Elias Forneris

Cover image: Corporal Aaron J Stone / Ministry of Defence

Get in touch

www.rusi.org

enquiries@rusi.org

+44 (0)207 747 2600

The Royal United Services Institute for Defence and Security

61 Whitehall, London

SW1A 2ET

United Kingdom

Follow us on

Contents

1 Executive Summary

3 Introduction

6 Troops to Task in Uncrewed Systems Operations
6 Tactical Reconnaissance: Multicopter ISR
8 Tactical Strikes: FPV UAVs
10 Interception
11 Light Utility: Logistics and Bombing

15 Technological Development and the Uncrewed Systems Enterprise
15 Multicopter ISR
17 Tactical Strike
20 Interceptor Efficiency
22 Light Utility: Logistics and Bomber Efficiency

24 Capability Trade-Offs in Troops to Task
24 Mortars: Creating Competing Dilemmas
25 Snipers: Splitting Recce and Fire
29 Anti-Tank Guided Weapons: By Needle or Lance?
31 Machine Guns and the Fire Support Group
32 Logistics: Last-Mile Resupply
33 Infantry and Pioneers

37 Conclusion

39 About the Authors

© Royal United Services Institute

Executive Summary

Bringing uncrewed systems into the combined-arms tactics of units is a necessity. Doing so raises questions as to how companies and battalions should restructure to incorporate these capabilities and what legacy systems should be deprioritised. By examining the troops-to-task and effects deliverable by uncrewed systems, this paper endeavours to map the trade-offs when incorporating UAVs into a light infantry battalion – with a specific focus on the British Army and consideration of the wider context among NATO forces.

The paper finds that while uncrewed systems offer a range of tactical benefits, they do not reduce the personnel requirements of the force. In most cases, they complement rather than supplant existing capabilities. The challenge is therefore to determine the optimal balance of new and old tools.

The paper further finds that battalion reconnaissance is best converted to use UAVs, but that the skills of concealment, observation and stealth within existing recce and sniper platoons remain critical to successful UAV reconnaissance.

There is a complementary relationship between first-person view (FPV) UAVs and mortars, as well as between FPVs and anti-tank guided weapons. Transferring some capacity from mortar and support weapons to FPVs increases the reach and lethality of the force, but these tools should be used in combination.

All tactical activity must be supported by counter-reconnaissance capabilities. Adaptations to machine gun detachments can contribute to this role, but battalions should be supported by dedicated interception teams with appropriate sensors. This capability, however, is likely to be best attached to the battalion from the brigade, so that it remains integrated with the wider formation's air defence.

Uncrewed resupply offers opportunities to increase the survivability of logistics operations and to simplify challenges of terrain. Attrition of these systems should be expected to be high, however. Design of uncrewed logistics systems should therefore prioritise simplicity, low cost and reliability.

The enemy's adoption of uncrewed systems is likely to drive the force to operate with a higher level of dispersion. Nevertheless, infantry mass remains critical to taking and holding ground. Moreover, many uncrewed systems operators need to be competent

© Royal United Services Institute

infantry practitioners to be survivable and effective. Pioneers also remain in high demand, given the significant requirement for digging and handling explosives within the uncrewed systems enterprise.

There may be better ways of force-generating and task-organising uncrewed systems operations compared to simply swapping out roles within existing battalions. However, for the purposes of creating an illustrative comparison of the roles and troops to task that are necessary, this paper has retained the existing force structure. Irrespective of how the force is structured, uncrewed systems operators will need to train closely alongside other arms. It is also essential that regulation and training areas are optimised to enable this close and integrated training.

© Royal United Services Institute

Introduction

Uncrewed systems have been extensively employed on the battlefields of Ukraine and the Middle East. This has led NATO armies to realise that they need to integrate uncrewed systems into tactical forces, not only as a specialist attachment but as a core weapon system.

Armies have struggled, however, to evaluate how best to integrate these capabilities into established structures and battle drills; this has led to a corresponding challenge in force generation and training. Crucially, if the force is not expanded, few armies have determined which capabilities they can divest to operate uncrewed systems. It is easy to say that an infantry squad should be supported by uncrewed systems, but harder to identify clearly how many soldiers in an infantry company or battalion should operate them and how they should be organised. Militaries are adopting different approaches to this problem but have not yet settled on an optimal formula.

There is an extensive literature on the use of uncrewed systems in tactical ground combat, which has largely fallen into three categories. First, there are numerous studies that describe the aggregate effect of tactical UAVs on the battlefield: the density of orbits; duration of observation; and resulting transparency that shapes movement.[1] These studies, however, rarely address the size or structure of the uncrewed systems enterprise. Second, studies outline the specific performance characteristics, limitations and the tactics for employing specific uncrewed systems. These rarely examine how groupings of UAVs are used in combination with, or alongside, other arms.[2] Third, there is a body of work that draws on technology projection to hypothesise future uncrewed systems. Many of these projections assume a declining need for operators.[3]

This paper instead endeavours to map the effects achieved with uncrewed systems and the respective troops-to-task ratios across an infantry battalion. It provides an

1. See, for example, Mariano Zafra et al., 'Inside Ukraine's Kill Zone', *Reuters*, 23 July 2026.
2. Oleksandra Molloy, 'Drone Warfare in Ukraine: From Myths to Operational Reality – Part 1', Australian Army Research Centre, 11 March 2026, https://researchcentre.army.gov.au/library/land-power-forum/drone-warfare-ukraine-myths-operational-reality-part-1, accessed 29 August 2026.
3. P W Singer and August Cole, *Ghost Fleet: A Novel of the Next World War* (New York, NY: Houghton Mifflin Harcourt, 2015); David Hambling, *Swarm Troopers: How Small Drones Will Conquer the World* (London: Archangel Ink, 2015).

© Royal United Services Institute

overview of the trade-offs in converting capacity within a light infantry battalion to uncrewed systems operations. The battalion echelon was selected because this paper is intended to focus on the employment of tactical uncrewed systems within the close fight. Operations supporting brigade reconnaissance and deeper strike missions are often best facilitated by dedicated uncrewed systems units, as described in previous RUSI papers.[4] Just as scale at brigade level and above allows for specialisation, so too does it alleviate some of the trade-offs that appear at lower levels. This paper, therefore, focuses on the battalion and below.

Intimately related to the effective adoption of UAVs is a force's command and control structure,[5] its data tools,[6] and integration with the air defence enterprise[7] and electronic warfare (EW) capabilities.[8] While these areas are critical in successfully fielding a modern combined arms force, they are not addressed in this paper.

This paper is organised into three chapters. The first describes the structure necessary to maintain tactical uncrewed systems effects from reconnaissance, to strike, to interception or resupply. The evidence for this chapter is derived from observing multiple uncrewed systems units in Ukraine, interviewing the leadership of these units over an extended period, and comparing Ukrainian experiences with structures employed by Russia, Israel, Hezbollah and experimental units in NATO.

The second chapter examines where technological development can improve the efficiency or alter the personnel burden of fielding uncrewed systems. This involves examining extant technologies that are underused, and technologies at lower technology readiness levels that are conceptually sound. The basis for this chapter is largely engagement with industry and observation of trials, exercises and experimental operations.

The third chapter compares the efficacy and resource implications of current capabilities organic to a light infantry battalion – mortars, machine guns, snipers, anti-tank guided weapons, recce troops and so on – with uncrewed systems. The efficacy of extant equipment is derived from established operational analysis and

4. See, for example, Justin Bronk and Jack Watling, 'Mass Precision Strike: Designing UAV Complexes for Land Forces', *RUSI Occasional Papers* (April 2024), https://www.rusi.org/explore-our-research/publications/occasional-papers/mass-precision-strike-designing-uav-complexes-land-forces, accessed 28 August 2026.
5. Jack Watling, 'Supporting Command and Control for Land Forces on a Data-Rich Battlefield', *RUSI Occasional Papers* (July 2023), https://www.rusi.org/explore-our-research/publications/occasional-papers/supporting-command-and-control-land-forces-data-rich-battlefield, accessed 30 September 2026.
6. Robert Tollast, Noah Sylvia and Matthew Savill, 'Modern Targeting in European Militaries', RUSI Insights Papers (August 2026), https://www.rusi.org/explore-our-research/publications/insights-papers/modern-targeting-european-militaries, accessed 30 September 2026.
7. Jack Watling and Justin Bronk, 'Protecting the Force from Uncrewed Aerial Systems', *RUSI Occasional Papers* (October 2024), https://www.rusi.org/explore-our-research/publications/occasional-papers/protecting-force-uncrewed-aerial-systems, accessed 30 September 2026.
8. Jack Watling and Noah Sylvia, 'Competitive Electronic Warfare in Modern Land Operations', *RUSI Occasional Papers* (January 2025), https://www.rusi.org/explore-our-research/publications/occasional-papers/competitive-electronic-warfare-modern-land-operations, accessed 30 September 2026.

© Royal United Services Institute

planning assumptions. The aim is to identify where extant capabilities cannot be replaced, where uncrewed systems are a force multiplier for them, and where uncrewed systems offer a more efficient means of achieving effects. The paper concludes by presenting a side-by-side comparison of an extant British Light Infantry battalion and a straw-man New Model Battalion with a comparable number of personnel distributed across new equipment. This is not a prescription, as the UAV enterprise could be force generated and task organised differently. Nonetheless, mapping the UAV enterprise onto the current force structure provides a useful baseline for comparison.

© Royal United Services Institute

Troops to Task in Uncrewed Systems Operations

To outline the troops needed to operate uncrewed systems across a battalion, it is necessary to describe the tasks associated with the various systems and the numbers of platforms of each type required to deliver specified effects. This chapter therefore examines uncrewed systems tasks across the battalion echelon and below including tactical reconnaissance, tactical strike, interception and light utility.

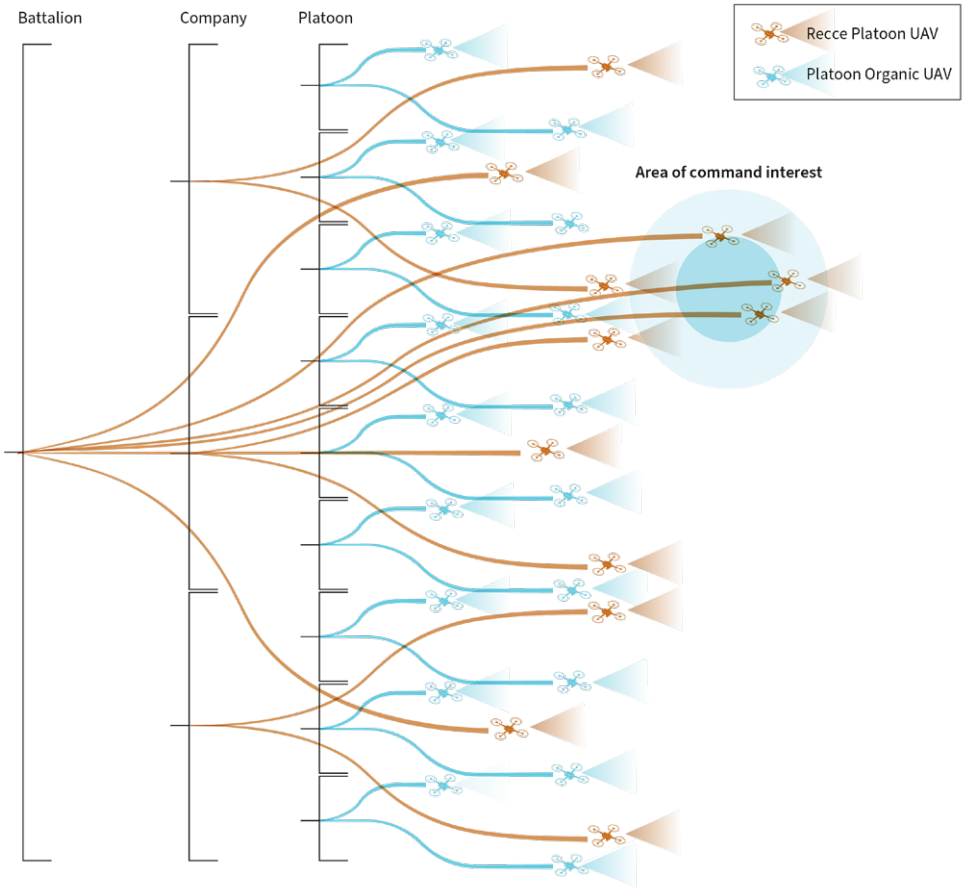
Tactical Reconnaissance: Multicopter ISR

The most significant impact of uncrewed systems on the modern battlefield is that they allow it to be kept under persistent observation, which lends precision to commanders in their movement of troops and application of fire. At the battalion level, this is delivered by orbits of multicopter UAVs, flown in relay 'orbits'. A force must maintain observation across its frontage and into some depth to support precision fires and offer friendly forces situational awareness. For this reason, Ukrainian recce teams tend to work with a density of two orbits per platoon frontage.[9] In addition, each headquarters has detachments of recce UAVs that are used to plug gaps or answer a commander's information requirements.[10] Thus, for a hypothetical battalion comprising three companies each of three platoons, it can be calculated that each platoon runs two orbits, each company headquarters two more, and the battalion headquarters six. This amounts to 30 orbits. With two operators per orbit, this leads to a total of 36 recce UAV operators organic to the battalion's rifle companies and a further 24 pilots in a recce platoon, as shown in Figure 1.

9. Author observations of and interviews with Ukrainian UAV teams, Ukraine, 2022, 2023, 2024, 2025 and 2026.
10. Author observations of and interviews with Ukrainian battalion commanders, Ukraine, 2022, 2023, 2024, 2025 and 2026.

© Royal United Services Institute

Figure 1: Density of Maximum Battalion Recce Orbits



Source: The authors. Graphic design by Alex Whitworth.

Note: A battalion would be unlikely to have all its companies forward and would hold some pilots in reserve such that the actual number of active orbits would be relative to the frontage of the unit, and around half the number displayed.

Each multicopter has an approximate endurance of 30–35 minutes on station, excluding transit time. Multicopters are generally flown on programmed routes by waypoint and then have their positions adjusted to orientate the camera. Each team must have at least one spare UAV to maintain an orbit, but realistically, a team needs additional UAVs in case one is lost. Teams must also carry spare batteries. One pilot focuses on flying and operating the multicopter while the other prepares the next UAV, handles communications and helps to navigate. UAV operators who are organic to rifle platoons receive force protection and help with digging in from the platoon.

UAV crews within a Ukrainian reconnaissance platoon operate differently. They generally sit further back and are mounted on light utility vehicles that are small enough to be concealed near a position. They are pushed out by the headquarters in response to threats anticipated by the G2 (intelligence) or information requirements identified by the G3 (operations) / G5 (long-term planning). A command post rarely operates all its orbits simultaneously; instead, it keeps some in reserve.

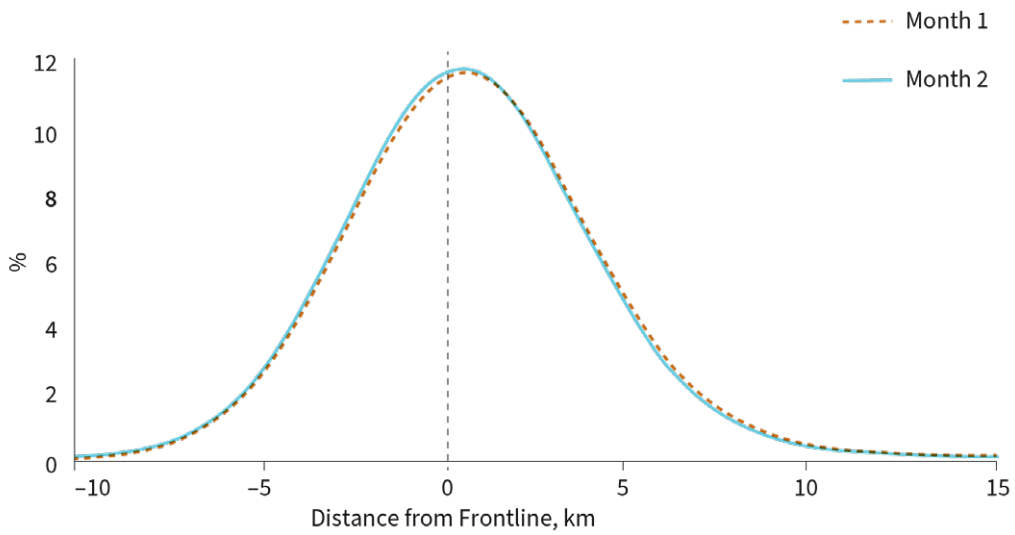
© Royal United Services Institute

Across a battalion, it is not unusual to lose 20–60 multicopters a week. Because of the electronic emissions of UAV operations, once a launch and control post is established, it generally remains useable for up to three days before the enemy has specifically located it and scheduled a deliberate strike with a large munition such as a glide bomb. Antennas can be offset, and launch points are not necessarily adjacent to a pilot's location, such that finding where to hit in order to kill the pilots can take some time. One implication of this is that UAV teams must operate in a dispersed posture, and while they may displace and move periodically, it is important that they do not inadvertently occupy an area that has only just been vacated.

Tactical Strikes: FPV UAVs

Tactical strikes with UAVs are primarily carried out using FPV UAVs that are either controlled via radio frequency (RF) or fibre-optic wire. An FPV team needs to infiltrate to a firing point, prepare its position and then conduct strike missions from it. Theoretical range may extend to 20 km or more. However, strikes generally require recce UAVs to find and track targets, and the combination of enemy EW, viable control horizons for RF control and latency means that for infantry units (not dedicated middle strike units), most engagements are actually within ±5 km of the frontline and thus about 2–7 km from the operator, as shown in Figure 2.

Figure 2: Distance from Ukrainian Forward Line of Troops of UAV Strikes against Infantry, Comparing Two Months



Source: Armed Forces of Ukraine. Graphic design by Alex Whitworth.

This underuse of potential range is partly a function of reconnaissance UAVs needing to transmit high-definition digital video for operators to identify concealed enemies. Digital video transmission (VTX) does not degrade gracefully compared with analogue signals used by FPVs: depending on terrain, at ranges greater than 5 km, sudden signal loss is possible.[11]

FPV teams are constrained by the same space and endurance (two to three days) considerations as recce crews. However, as they must deliver munitions (payloads are not recovered), they tend to have more equipment than their recce counterparts. An FPV team will generally have 30–50 FPVs, their batteries and associated ammunition and fuzes, a couple of control antennas, a generator or other means of charging batteries, food, water, entrenching tools, small arms and camouflage netting. In total, the team's load for three days of operation weighs about 1.2 tonnes. On arrival on the position, the team must dig a protected shelter for the pilot to operate from, conceal the stores, dig an area to prepare the fuzes and attach the munitions, have a concealed set of launch points and extend a cable to offset antennas. The size of the footprint of the unit, the amount of digging that needs to be done, and the fact that tasks such as arming and launching, versus piloting, occur in different locations, means that a typical FPV team comprises four or five people and infiltrates in vehicles.[12]

In Ukraine, FPV teams are generally force generated as a platoon within a battalion fire-support company but are deployed in two ways. First, a line of FPV teams occupies positions behind the first line of infantry fighting positions and is responsible for striking targets detected by the recce-UAV screen as they approach the unit's forward edge. Second, the battalion G2 and G3 proactively deploy groups of FPV teams to locations best suited – given the terrain – to allow them to work according to the commander's priorities, whether this includes massing effect on a specific area in anticipation of a larger enemy movement, or pushing for range to support offensive action. The screening teams work continuously against targets. The reserve teams generally conduct deliberate missions planned over 24 hours.[13]

Across a typical battalion frontage, one might expect six teams to be working as the forward screen and a similar number to be operating as part of the commander's mobile group, with a third grouping recovering from missions. Thus, the battalion probably has about 36 FPV pilots and about 54 additional personnel supporting FPV operations. In terms of equipment levels, with 12 teams operating at any given time and 30–50 FPVs fired per team every three days, with half of the teams firing in concentrated periods and the other half having a day to rotate, the battalion

11. Benjamin Remler and Julien Segre, 'The Curran Papers – No. 5: Jamming Uninhabited Aerial Vehicle Video Signals', *Armada International*, 5 February 2026, https://www.armadainternational.com/2026/02/the-curran-papers-no-5-jamming-uninhabited-aerial-vehicle-video-signals-electronic-warfare/, accessed 28 August 2026.
12. Author observations of and interviews with FPV teams, Ukraine, 2025 and 2026.
13. Author observations of and interviews in battalion command posts, Ukraine, 2025 and 2026.

© Royal United Services Institute

consumption rate of FPVs of all types is likely to sit around 500–700 FPVs fired per week. Note that this consumption rate is indicative of the number of engagements that can be carried out based on limitations of personnel, carrying capacity and the battlespace occupied by the teams. Commanders must, therefore, prioritise how they employ these fires as the efficiency of strikes varies considerably by distance, class of target and terrain where they are engaged. Consumption rates are also shaped by enemy action. If the enemy conducts a platoon-sized armoured assault, for example, it would not be unusual for the FPV teams to consume their entire allocation of ammunition in half a day's fighting.

Interception

The freedom of operation of the force is inversely proportionate to the density of enemy observation of its activity. If the enemy can maintain an orbit over friendly positions, it becomes dangerous to launch UAVs, move or carry out any other military activity. If the enemy observation screen remains in place, a force will suffer continuous attrition. Battalions therefore need a method for countering enemy reconnaissance and strikes.

Positioned slightly behind the FPV teams, interception teams depend on the sensors which enable their work. Interception teams use several detection systems, including acoustic and electronic direction-finding equipment, to passively detect UAVs, and small radar to guide interception. For short periods, sensors may be pushed out by dropper UAVs supported by radios on a mesh network to have a distributed laydown beyond the footprint of the unit. Usually, however, sensors must be connected to generators, powered by cables, and thus set up in advantageous terrain within the footprint of a unit. Because of the networking requirement, interception teams also need connectivity – usually achieved with a satellite uplink such as Starlink.[14]

Interception tasks may be broken into two distinct missions. Intercepting fixed-wing or strike UAVs requires high-altitude interception and is reactive to the enemy. This is generally achieved with dedicated interceptors such as Sting and Pivan-1: multicopter UAVs guided by radar and electro-optical sensors. Some teams also use bungee-launched fixed-wing UAVs to fly high and dive onto fixed-wing ISR drones, covering a larger area with more loiter time. In one operation, reviewed by one of the authors, it was necessary for an interception team to knock down four Russian Lancet-3M loitering munitions to protect the insertion of four vehicles carrying assault troops.[15]

14. Author observations of and interviews with tactical interception teams, Ukraine, August 2025; author observations of and interviews with air defence command posts, Ukraine, January 2026.
15. Author interview with Ukrainian officers, Ukraine, September 2026.

© Royal United Services Institute

The second task is the deliberate taking down of enemy multicopter ISR orbits to allow friendly forces to act. This is a prerequisite for allowing infantry to move, removing enemy overwatch of a friendly artillery or mortar position to enable it to fire, or knocking down enemy orbits during resupply or evacuation. These orbits will inevitably be replaced, but taking them down creates a window of opportunity for friendly action. This task is usually carried out using FPVs, guided by the sensor laydown.

For the protection of some critical sites – such as junctions where logistics are routed – it is often necessary for interception teams to have direct fire air defence to shoot down enemy strike UAVs. Historically the task of mobile fire teams, this is becoming a task for uncrewed ground vehicles (UGVs).

Interception teams tend to be inserted by vehicle and, because of the need to have a generator and monitor sensors, are dug in. They generally comprise five personnel, three of whom are on shift at any one time: one launches UAVs and makes sure sensors and communications equipment are working; one monitors the air defence picture and the net; and one pilots intercepts. There is a rotation, with the ability to wake everyone if there is a need to protect the interception team.

Unlike with FPV teams, the equipment laydown of an interception team is nonstandard. It is organised into an air defence platoon of approximately six teams with a mix of interceptors, sensors and UGVs, and adjusts its laydown based on the terrain. Furthermore, because teams are based around their sensors, they are liable to remain on position for longer than other uncrewed systems operators. Thus, resupply of the unit on the position is more important. Being slightly further back from the forward fighting positions, they are also generally exposed to fewer threats. Their main challenge is signature management of their infrastructure. In Ukraine, this capability is generally held at the brigade level but is critical in supporting all operations and so must be assigned to the battalion for it to conduct tactical actions.

Light Utility: Logistics and Bombing

One of the most important uncrewed systems operations in Ukraine is light utility, using multicopter UAVs and UGVs. Missions for light utility teams range from mining behind enemy lines, conducting strikes, dispensing sensors and communications relays and, most importantly, resupplying friendly forces with food, water, ammunition, batteries, fuel and medical supplies. While Russia uses fixed-wing UAVs for this role, Ukraine favours multicopter agricultural UAVs such as the Vampire. UGV teams often work in a similar manner, with the additional tasks of moving heavier ammunition and withdrawing casualties or setting up firing positions.

© Royal United Services Institute

Light utility teams tend to comprise five people and they work with three UAVs or UGVs, inserting in a van. The breakdown of skills across the team is two loaders, a communications specialist and maintainer, and a driver who also provides point defence. The fifth member of the crew is usually not co-located with the UAV, since it has an LTE (long-term evolution) link for operations in the rear or a satellite uplink for operations over enemy territory, and can therefore be piloted from safety some distance rearwards.[16] Pilots, therefore, are pooled and work in shifts – planning missions and then driving them before having a rest period.

Light utility teams tend to be set up in three baselines. The first baseline is established around the forward vehicle drop-off points for resupply. Pallets are cached and loads mounted on the UGVs and UAVs before being dispatched to recipients. The scale of lift available at this echelon determines how much lift capacity is sustained forwards, since lift operations require fuel and batteries. Each team generally operates three platforms, with one being repaired or recovered, one being loaded, and one being flown/driven at any given time. Demand is continuous, and because of the need to load and move the caches, the teams are generally outside and exposed, relying on depth and interception teams to protect them.

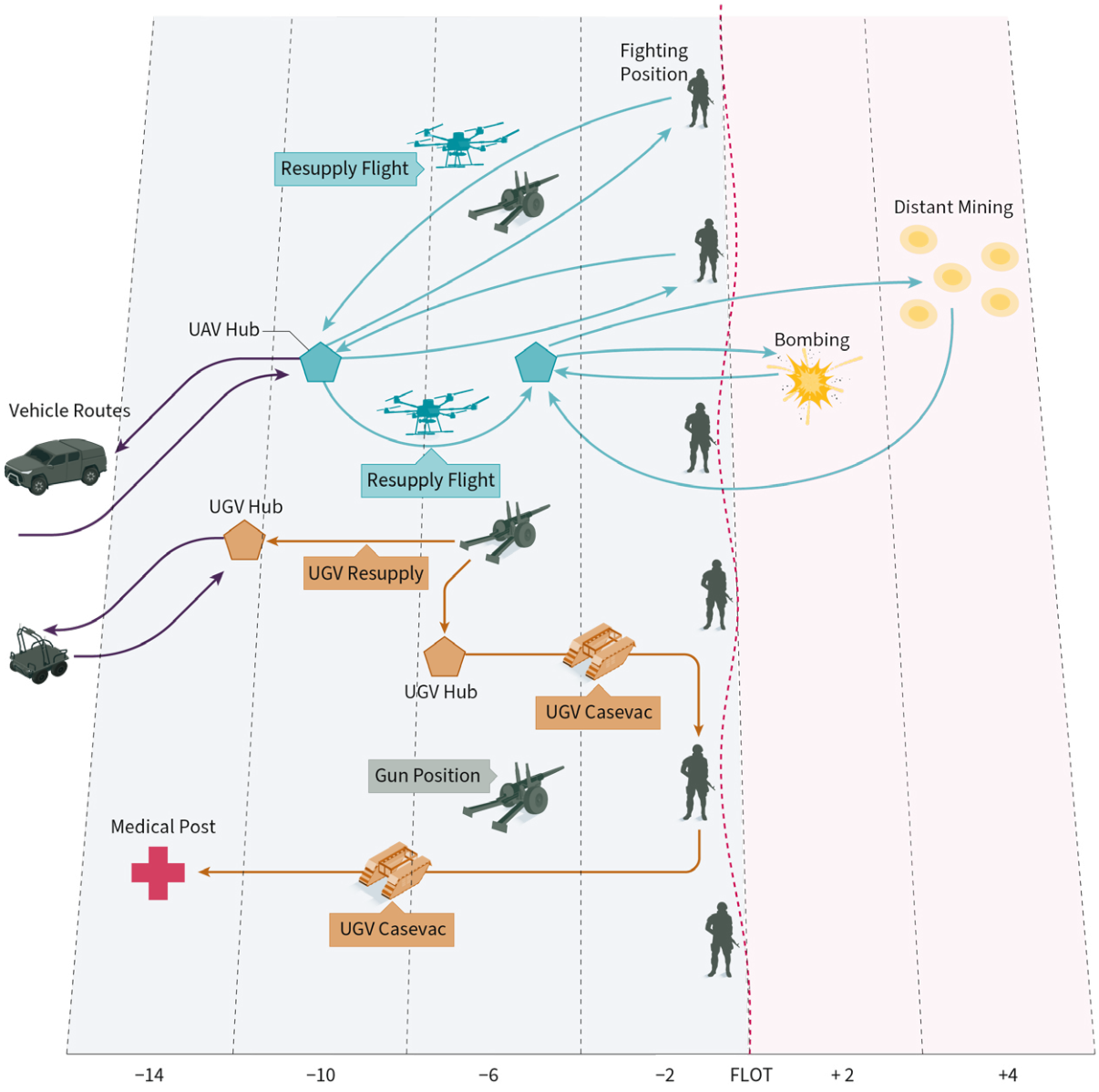
The second baseline conducts supply movements between and within the fighting echelon. If the first line of lift operations continuously pushes materiel forwards, the second baseline must move that materiel to the recipient when it is practical to do so. It may, for example, require coordination with an interceptor to knock down enemy observation of a position before conducting resupply. This echelon is also where UGVs intended to recover casualties are kept, so that they can reach casualties within a reasonable time. UGVs are shuttled forwards at night to these teams from the first line to keep them stocked with platforms. The process is outlined in Figure 3.

The third baseline is generally at the same depth as the second. However, rather than moving materiel laterally, it conducts pulsing operations at night over the enemy, dropping mines, caltrops, sensors or bombs. Because these UAVs can carry heavier payloads than FPVs can, and because the vertical drop of a munition can bypass many protection systems, they are often used to attack enemy caches, UAV positions, gun emplacements and other harder targets. During offensive operations, these UAVs can also resupply forces as they manoeuvre forward, allowing infantry to fight light without compromising endurance.

16. Author observations of logistics units during operations, Ukraine, August 2025.

© Royal United Services Institute

Figure 3: Uncrewed Light Utility Operations



Source: The authors. Graphic design by Alex Whitworth.

Ukrainian forces tend to track the intensity of these operations at brigade rather than battalion level. To take a sample Ukrainian brigade that makes extensive use of UGVs, the force conducted 824 resupply missions in a month with loads between 100 and 150 kg.[17] Light utility operations suffer from a high rate of attrition. The slow and low flight profile of utility UAVs make them easy to shoot down. UAVs and UGVs, meanwhile, are a priority target for enemy interception because throttling logistics limits activity. Even with an 80% success rate on missions, a battalion may expect to lose 10–20 utility UAVs/

17. Author interview with Ukrainian brigade staff officer responsible for uncrewed ground vehicle operations, Italy, August 2026.

UGVs per week. It is generally assumed that 50% of platforms supporting offensive action will be lost over the course of the operation.

In Ukraine, commanders maximise the number of these teams they have supporting their forces. The scaling of this capability within existing Ukrainian orders of battle is very inconsistent and almost no commander would consider it 'adequate' – more is more. In general, however, it is reasonable to assess that there would be around 12 teams across a battalion, with four recovering, four in the first baseline, and two each in the second and third baselines. The activity, therefore, comprises a company's worth of effort, with around 60 people directly involved, including about 10 pilots. This company also tends to hold additional functions including workshops, mechanics and planners who support the wider battalion UAV enterprise, although many of these functions sit at brigade level. Thus, the actual size of this element is often about 80 people.

In summary, across a Ukrainian battlegroup at full strength (which few are), UAV operations take up approximately 260 personnel including:

- a company of 80 personnel in the light lift and UAV maintenance enterprise;
- an air defence platoon of about 30 personnel;
- a strike company of about 90 personnel involved in operating FPVs, with about 36 pilots and attachments including infantry, communications specialists and munitions specialists;
- a reconnaissance platoon of approximately 24 personnel;
- about 36 recce UAV operators organic to the infantry.

A British Light Infantry Battalion at full complement comprises 561 personnel. Were Ukrainian levels of UAV use to be adopted by the British Army, approximately 45% of the formation would make up the UAV enterprise. It is therefore important to evaluate what the battalion loses by putting so many personnel into UAV operations, and how the remainder of the battalion should be structured and equipped.

© Royal United Services Institute

Technological Development and the Uncrewed Systems Enterprise

There is a prevailing assumption that the troops-to-task ratios for uncrewed systems operations can be drastically altered by integrating technologies that are underused in Ukraine. It is certainly true that the effects deliverable by a given number of operators can be increased by using more advanced uncrewed systems and that this can affect either the size of teams or the number of them needed. However, using these technologies also has significant cost implications, sometimes to a point where a force would struggle to maintain a sufficient volume of effects relative to legacy systems. This chapter, therefore, discusses the opportunities and implications of increasing capability sophistication for the classes of uncrewed system previously described.

The cost, survivability and lethality picture is not static. The cost of uncrewed systems remains vulnerable to price spikes due to the emergence of new EW systems and required countermeasures, or to rising prices of critical materials on international markets. Fibre-optic prices rose to five times their 2025 level in 2026, for example.[18] The next sections explore cost and efficiency trade-offs and subsequent personnel requirements.

Multicopter ISR

The promise offered by technological improvement for tactical ISR is greater endurance, flight performance and survivability. The baseline capability against which to measure improvement is Mavic and Autel UAVs. China's mass production places these systems at a highly competitive price point, so countries, including Ukraine, have

18. Olha Pokotylo, 'The Cost of Fibre Optic Cable for Drones has Increased 4–6 Times', *Defender Media*, 6 March 2026, https://thedefender.media/en/2026/03/fibre-optic-price/, accessed 20 August 2026.

built their own equivalents to avoid total dependency.[19] However, market forces tend to incentivise producers to differentiate their products from Mavics by offering larger, more ruggedised airframes supporting better optics, communications links and larger battery packs. France, Germany and the US have domestic production of recce UAVs at widely varying price points. Their features include Lidar-enabled obstacle avoidance, GNSS-denied autonomous night navigation and target tracking, and sensitive, high-definition thermal optics.

Proponents of more costly systems argue that resilience to EW allows them to complete more missions. Military-specific capabilities such as EW detection can enable a UAV to avoid being downed.[20] Similarly, larger, more powerful UAVs can continue to stream high-definition video over greater distances, although this requires ground stations to increase their mast height, risking exposure. In many NATO militaries, higher build quality and ruggedisation are needed to fly in extreme cold, high wind or from the sea. The result, however, is that the price point for recce UAVs can go from $2,500 per unit to more than $20,000.

A real step-change in ISR performance is arguably more likely to be achieved by a transition to fixed-wing UAVs. In Germany, for example, the Bundeswehr has procured man-portable fixed-wing recce UAS for the platoon level. These are hardened against EW and incorporate visual inertial odometry. Fixed-wing systems have greater range than quadcopters and can have several times their endurance.[21] Another trend in some NATO militaries is to combine UAV functions, such as multicopter recce strike platforms. These are loitering munitions but can return home if no targets are found, allowing recce functionality. This makes strikes more responsive. However, it does not reduce the number of recce orbits required, or strikes delivered, and drives the price per unit to tens of thousands of dollars.[22]

Ruggedised recce UAVs procured by NATO customers have not proven widely popular in Ukraine, often due to their high cost. While costlier recce UAVs may last longer than Mavics, they are not any more survivable against interception.[23] Given a steady loss

19. David Hambling, 'Mavic vs Shmavic: Ukraine Takes on the World's Leading Drone Maker', *Forbes*, 3 November 2025, https://www.forbes.com/sites/davidhambling/2025/11/03/mavic-vs-shmavik-ukraine-takes-on-the-worlds-leading-drone-maker/, accessed 20 August 2026.
20. Daniel Kosoy, 'Ukraine Tests Low-Cost Recon Drones as Russian Interceptors Change the Economics of Aerial Surveillance', *United 24*, 21 July 2026, https://united24media.com/war-in-ukraine/ukraine-tests-low-cost-recon-drones-as-russian-interceptors-change-the-economics-of-aerial-surveillance-20797, accessed 20 August 2026.
21. Anvil Labs, 'Fixed Wing vs. Multi-Rotor Drones: Endurance Comparison', 22 December 2024, https://anvil.so/post/fixed-wing-vs-multi-rotor-drones-endurance-comparison, accessed 20 August 2026.
22. Tyler Rogoway, 'Inside Anduril's Bolt-M Kamikaze Drone Program', *TWZ*, 23 January 2026, https://www.twz.com/uncategorized/inside-andurils-bolt-m-kamikaze-drone-program, accessed 21 August 2026.
23. Nikita Shendorovsky, « Елітна «солянка»: в ЗСУ розповіли, чому російський «Рубікон» справді ефективний » ['Elite "Hodgepodge": The Armed Forces of Ukraine Say Why the Russian Rubicon is Really Effective'], *Unian*, 9 January 2026, https://www.unian.ua/war/viyna-v-ukrajini-rosiyskiy-pidrozdil-rubikon-zabezpechuyut-u-prioritetnomu-poryadku-13250580.html, accessed 21 August 2026.

© Royal United Services Institute

rate, therefore, Ukrainian units have preferred to adapt Mavic variants – finding them versatile and user-friendly – and have used them for a wide range of missions without specialised adaptations.[24] Mavics have proven adequate for tasks such as artillery spotting and fire correction.[25]

There are two general observations on UAV technology. Recce teams are already small; given requirements to launch, pilot, recover and monitor the returns from orbits, technology does not offer much scope for reducing the size of the crew. Longer loiter times, greater range and high-quality video may reduce the number of crews necessary to cover a frontage. Integration into C4ISR and object detection may also help to reduce operator workload. Nevertheless, as active enemy counter-UAS activity is inevitable, technology only offers limited improvements in the number of orbits that must be sustained, at a price.

Tactical Strike

Technological improvements for FPVs offer the prospect of a higher probability of hit, greater warhead efficacy, improved terminal accuracy, and a lower technical and training burden. Overall, it is possible to significantly improve the effect deliverable by FPV teams, and to marginally reduce crew size.

The greatest efficiency gain available for FPV operations is to have purpose-built warheads, replacing the adapted munitions widely used in Ukraine. This has multiple benefits: a drone with a purpose-built directional fragmentation warhead may not require a direct hit; it becomes inherently more lethal than an adapted grenade, because the fragment size and blast pattern is target-matched based on the angle of attack. Fragmentation pattern and armour penetration can also be improved by using better materials such as tungsten fragments or exotic alloys with molybdenum instead of steel and copper.[26] Therefore, the probability of kill (Pk) increases while the training burden is reduced.

Factory-made warheads with high standardisation and safe arming devices offer both improved reliability and are safer to prepare, launch and deploy. This not only reduces accidents but can also ease the training burden, potentially eliminating the need for an explosives-qualified weapons technician as part of a crew. Such warheads – especially if they have proximity fuzes or other features – can be multiples of the price of first-

24. *DroneXL*, 'Ukrainian Army Uses DJI Mavic 3 to Precisely Guide Mortars onto Russian Troops', YouTube, 1 April 2022, https://www.youtube.com/watch?v=55R8kzyY2Uc, accessed 23 October 2026.
25. Alexei Hoffman, 'The Unmanned Fires Observer: The Army's Drone-Age Doctrine is Skipping a Crucial Part', Modern War Institute, 17 August 2026, https://mwi.westpoint.edu/the-unmanned-fires-observer-the-armys-drone-age-doctrine-rewrite-is-skipping-a-crucial-part/, accessed 28 August 2026.
26. Tim Guest, 'Raining Down from Above', *European Security and Defence*, 24 January 2026, https://euro-sd.com/2025/01/articles/42229/raining-down-from-above/, accessed 20 August 2026.

© Royal United Services Institute

generation FPV warheads. Yet they have a negligible failure rate compared with adapted conventional munitions and therefore fewer FPVs need to be launched to destroy targets.[27]

Another technological development is automating terminal guidance and extending control ranges. Beyond 10 km, interference – even for analogue video – can degrade image quality and introduce control latency. While this is adequate for stable flight, a drone accelerating at the target loses precision. A small error (failing to hit a vehicle sensor and hitting appliqué armour) can be the difference between stopping a vehicle or having no discernible impact.

Frequency propagation remains challenging. Long-range control links typically require altitude to keep line of sight between transmitter and receiver, raising the risk of early detection.[28] The Fresnel Zone – an area where solid objects, including vegetation, cause interference – also widens with range, as shown in Figures 4 and 5.[29] Long-range flight requires higher VTX power, which can increase the risk of interference among FPVs in the same strike package, reducing strike package size. These challenges can be alleviated by optimising choice of antenna and antenna placement, control-link receiver and receiver protocol.[30] Cost and weight are also factors; while fibre-optic control eliminates degradation, at 15 km, nearly 2 kg of spool would be required for the attack.[31] Given that many 10-inch FPVs carry a 3 kg payload, this leaves 1 kg for the warhead. Therefore, there is a training burden for the FPV team to understand context-dependent trade-offs in such an operation and a complex logistics pipeline of antennas, warheads and batteries.

The concept of a 'swarm' – whereby one operator controls multiple FPVs, which fly and conduct terminal flight autonomously – has become conceptually popular. It is hypothesised to increase the effect achievable by a single crew. In practice, however, it is still necessary to have a launch crew and pilot, while salvo launches put more strain on resupply. In certain contexts, such as attacking a concentrated mechanised target, this may be optimal to quickly wear down active protection system (APS) magazines. However, in many cases, individual engagements are more effective.

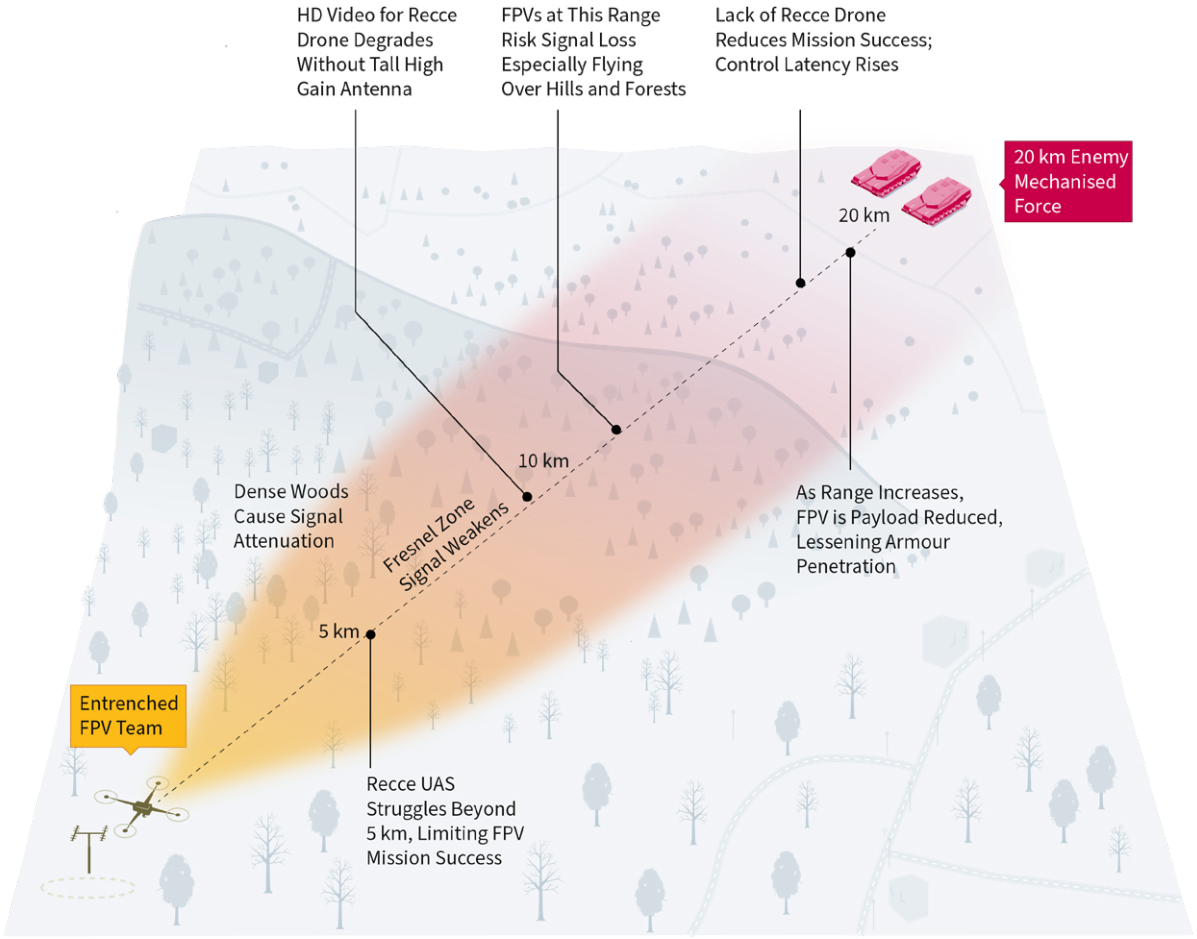
27. Vladyslav Khrystoforov, 'Overcoming "Homemade" and Hand-Held Explosions. How Ukraine is Developing the Production of Ammunition for Drones', *Mezha*, 20 January 2026, https://oboronka.mezha.ua/en/yak-ukrajina-buduye-virobnictvo-boyepripasiv-dlya-droniv-307877/, accessed 20 August 2026.
28. Unmanned Tech, 'Long Range Drone Communication: Antenna Selection and Range Testing', 24 March 2026, https://www.unmannedtechshop.co.uk/blogs/knowledge-base/long-range-drone-communication-antenna-selection-range-testing, accessed 20 August 2026.
29. National Training Center, 'The Fresnel Zone', https://nationaltrainingcenter.com/the-fresnel-zone/, accessed 20 August 2026.
30. Unmanned Tech, 'FPV Receiver Protocols: ELRS vs Crossfire vs Ghost', 11 April 2026, https://www.unmannedtechshop.co.uk/blogs/knowledge-base/fpv-receiver-protocols-elrs-vs-crossfire-vs-ghost, accessed 20 August 2026; Benjamin Remler and Julien Segre, 'The Curran Papers – No. 5'.
31. Information from commercial provider. This is a loose calculation based on a Ukrainian distributor selling 0.25-mm fibre-optic cable for drone operations, using 15 km rather than 20 km, because the length rarely translates to exact range. Total weight for 20 km is 1,883 grams.

© Royal United Services Institute

FPV development must consider the point at which FPVs are overtaken in reliability by anti-tank guided missiles (ATGMs). ATGMs are increasingly capable of engaging at extended ranges beyond 5 km,[32] and have significantly higher probability of hit and kill. With the proliferation of APS, it is likely that a collaborative approach is most effective. However, those advocating for technology to transform what is achievable by UAVs must consider that there is a point that combines price and performance, beyond which the utility of the capability against legacy systems changes.

In summary, in terms of the efficiency of FPV operations, technology offers the prospect of increasing the probability of hit and kill at longer ranges. This makes the munitions held by an FPV crew deliver greater effect. By standardising munitions, it should be possible to reduce both the training burden and size of an FPV crew from five to four.

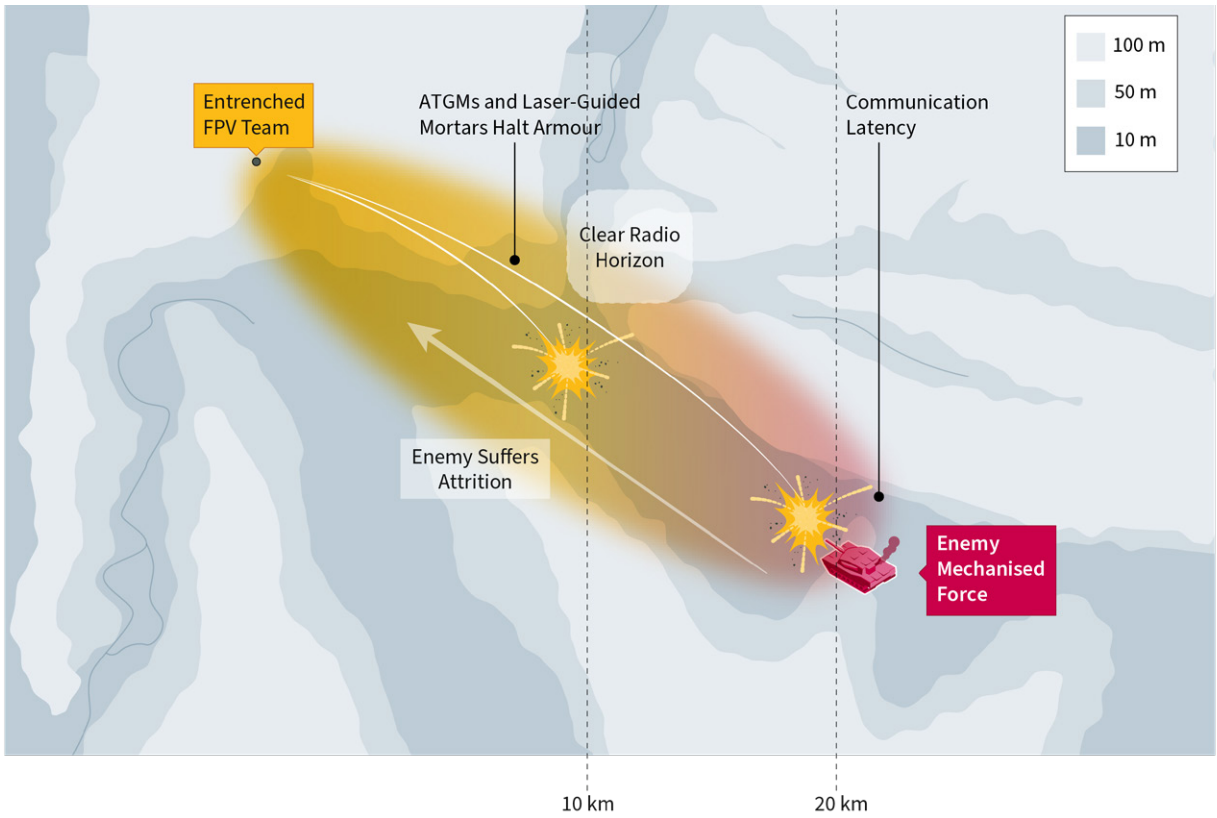
Figure 4: Long-Range FPV Attacks over Complex Terrain (RF Energy in the Fresnel Zone is Shown as Orange Mist)



Source: The authors. Graphic design by Alex Whitworth.

32. Author observations, Israel, December 2025; Alma Research and Education Centre, 'Hezbollah's Anti-Tank Threat', 8 March 2026, https://israel-alma.org/hezbollahs-anti-tank-threat/, accessed 20 August 2026.

Figure 5: Long-Range FPV Attack, Clear Radio Line of Sight from High Ground



Source: The authors. Graphic design by Alex Whitworth.

Interceptor Efficiency

Ukraine's approach to interception has developed in contact and has been through several iterations. NATO arguably has three opportunities to place itself in a more favourable position than Ukraine. First, NATO forces can use artillery or air-delivered munitions to attack pilots and launch crews of enemy UAVs more effectively. Second, updates to remote weapon stations may allow all machine guns to provide pop-up defence against many classes of UAV across a formation. Indeed, Ukraine has proven the efficacy of this approach, despite the slow adoption of such capabilities.[33] Third, the automation of intercepts from canister-launched systems is feasible and, while it may sit at a higher echelon, may significantly alter the laydown of forces dedicated to this task. It may be possible, for example, to augment air defence systems dedicated to engaging higher performance targets with such canisters.

Despite these opportunities to approach the problem differently, a battalion must nevertheless have the ability to counter enemy ISR when it suppresses the battalion's

33. Author observations of automated battalion air defence positions, Ukraine, May 2026.

© Royal United Services Institute

scheme of manoeuvre or holds critical nodes under observation and, therefore, risk. Moreover, it is important to consider the scale of the task. For example, Russia's 2nd Combined Arms Army contains an element of fixed-wing strike UAS teams roughly the size of a small infantry battalion (comprising 293 personnel). This has been allocated 89 Molniyas per day.[34] In one period of intense fighting in mid-2026, a Ukrainian interception team intercepted 61 Molniyas over an 18-hour period.[35] In terms of thinning enemy ISR to enable manoeuvre, Ukrainian units have, at times, had to intercept dozens of enemy UAVs. One unit intercepted 17 Mavic-style drones in an operation in late 2025.[36] Interceptors are also needed for Class II ISR UAS such as the Z-16. These drones can seek targets in the rear or operate in the close with a four-hour endurance and relatively high operational altitude up to 12,000 feet. Z-16s can also cue Lancet strikes against armour or act as radio relays.[37] Their maximum operating altitude bypasses canon fire, necessitating high-altitude interceptors.[38]

Technologies for counter-UAS activities are rapidly evolving and are increasingly integrated as an all-arms capability. Dedicated air defence troops providing a screen against enemy action are liable to sit at the brigade echelon. Nevertheless, considering the number of tasks involved in orchestrating the diverse means to defeat UAS and ensuring that a battalion can proactively degrade enemy ISR to enable its own manoeuvre, it is hard to envisage the personnel requirements falling below platoon strength. As such, about 30 personnel would be involved.

An interceptor platoon should possess enough magazine depth to parry continuous fixed-wing UAS orbits to protect friendly forces and be able to carry out dozens of interceptions per week against enemy defensive ISR screens. Even assuming high accuracy through AI-assisted targeting and autonomous target tracking, there remains the requirement to set up and maintain sensors, reload remote weapons and deploy interceptors. The personnel demand of these operations also stems from the need to sustain round-the-clock monitoring of the electromagnetic spectrum (EMS) and passive sensors, as well as maintaining the supporting infrastructure, such as generators for active electronically scanned array radars and EW. In summary, therefore, there is scope and a need to improve the technological performance of interceptors. However,

34. Rob Lee and Dmytro Putiata, 'Russia's Drone Line Experiment', Substack, 3 April 2026, https://twomarines.substack.com/p/russias-drone-line-experiment, accessed 21 August 2026.
35. Valentyna Romanenko, 'Ukraine's 118th Brigade Sets National Record by Destroying 61 Russian Molniya Drones in Single Day – Video', *Ukrainska Pravda*, 22 June 2026, https://www.pravda.com.ua/eng/news/2026/06/22/8040553/, accessed 21 August 2026.
36. *Radio Sprotyv*, « Зачистка неба у виконанні ЗБС групи Палка Каліноўскага! » ['Sky Cleanup by the Polk Kalinousky!'], YouTube, 27 December 2025, https://www.youtube.com/watch?v=qUupUmxl4MA, accessed 2 September 2026.
37. Sam Cranny-Evans, 'Unmanned Advantage: Russia's Drones and the Fight for ISTAR in Ukraine', *European Security and Defence*, 15 April 2025, https://euro-sd.com/2025/04/articles/43651/unmanned-advantage-russias-drones-and-the-fight-for-istar-in-ukraine/, accessed 21 August 2026.
38. Matthew Loh and Jake Epstein, 'A Ukrainian Arms Maker Says It's Got a New High-Speed Interceptor Built to Hunt Russia's Jet-Powered Shaheds', *Business Insider,* 23 July 2026, https://www.businessinsider.com/ukrainian-interceptor-drone-jetkiller-p1-sun-skyfall-jet-powered-shahed-2026-7, accessed 21 August 2026.

© Royal United Services Institute

this is unlikely to reduce the troops required for the task. Around five personnel per interception team, and about six teams, are needed to support a battalion's frontage.

Light Utility: Logistics and Bomber Efficiency

Technological developments in light utility platforms fall into two consequential categories: countermeasures and power. Countermeasures include onboard jammers, threat detection and automatic evasive manoeuvring. They are intended to reduce the otherwise high attrition rate of these platforms. Evidence from Ukraine suggests that this path of development, while driving up costs, has a modest impact on platform survivability.

Payload or range improvements from increased power are more consequential. Current loads of 15–45 kg on Ukrainian agricultural UAVs mean that many flights are needed to sustain positions, raising the risk of visual or EMS detection. If materiel is dropped offset from a position, meanwhile, recovery can be high risk.[39] It is also important to note that attrition of UAS will remain constant and, if the load is larger, so too is the lost materiel. Nevertheless, heavy carriage requires fewer flights for sustainment and allows additional types of mission (such as EW or dropping line charges), while extending range to enable support of offensive manoeuvre. There is undoubtedly an efficiency coefficient that considers payload and cost or logistical throughput compared with the cost of lost materiel. Another factor is that larger and more powerful light utility platforms offer more reliable sustainment in poor weather conditions.

The Armed Forces of Ukraine have delivered significant damage to Russian forces via bombing, owing to the accuracy of dropped munitions and the disruption delivered by dropped mines. 'Distant mining' arguably accounts for the majority of offensive drop missions.[40] While these tasks are useful, however, they are arguably a product of necessity. Israeli forces, for example, have achieved similar results using laser-guided 120-mm mortars and other munitions, with the targets designated by reconnaissance UAVs. Given the high attrition of dropping platforms, it is doubtful whether this mission set is optimal for future investment among NATO militaries. NATO militaries may also find that more effective strike UAVs include those that can fire rockets or more complex payloads, something that Ukraine has experimented with but struggled to increase at scale.[41]

39. Preston Stewart, 'Frozen Front: The Brutal Reality of Winter Combat', YouTube, [4.52], 12 February 2026, https://youtu.be/GYxmTZDQawc?is=29GDXKv0cMUA7NDM, accessed 31 August 2026.
40. Returns of Ukrainian Corps equipment expenditure to the Ukrainian General Staff for April–May 2026.
41. Author observations of experimental Ukrainian UAV units, Ukraine, August 2025.

© Royal United Services Institute

On UGVs, speed of movement is the primary area where technological development offers efficiency. At present, latency in command links and sensor limitations for autonomy mean that UGVs are slow, contributing to their high loss rate. Accelerating their movement is achievable. Uncrewed resupply remains attractive due to the lower risk personnel are exposed to, not its greater survivability compared with crewed platforms. Thus, there is an imperative to drive down cost if the payoff of using these systems is to be realised.

Across the four classes of tactical uncrewed system reviewed in this paper, therefore, there are improvements in technical performance that can be achieved by advances in technology. This offers the prospect of the same number of crews delivering greater effect. There are, however, only modest savings in personnel that are viable, given the need to set up, maintain, load and exploit the data generated by uncrewed systems. On balance, efficiency may increase, but crew requirements are likely to only marginally decline as a result.

© Royal United Services Institute

Capability Trade-Offs in Troops to Task

If British forces are to incorporate uncrewed systems into their battalions without expanding the number of personnel in the force, the question is what capabilities, burden of training and structures are to be adjusted to make space for uncrewed systems. In some cases, this may simply be a question of swapping one capability for another. However, uncrewed systems are often complementary rather than simply a better substitute for existing arms. As such, the appropriate balance among these elements needs to be considered. This chapter discusses these trade-offs between uncrewed systems and extant capabilities within an infantry battalion. The best way to look at this is to compare weapons systems including mortars, snipers, anti-tank guided weapons, machine guns, man-portable air defence systems, pioneers and infantry with the effects achievable by uncrewed systems, and the relative training burden placed on the force. To that end, it is first useful to compare the training requirements for different uncrewed missions, outlined in Table 1.

Mortars: Creating Competing Dilemmas

There is a narrative that mortars are rendered obsolete by UAVs, as they are short ranged and deliver similar-sized munitions with less accuracy. The reality is more complex;[42] a mortar team may expect to deliver an initial round against a target under UAV observation, then a corrective round, followed by landing a round every five seconds on target for up to a minute.[43] An FPV team can expect to deliver an initial strike, but there is then around a two-minute delay before a second strike arrives. The

42. Jack Watling and Nicholas Waters, 'Achieving Lethal Effects by Small Unmanned Aerial Vehicles: Opportunities and Limitations', *RUSI Journal* (Vol. 164, No. 1, 2019), pp. 40–51.
43. Based on concentrated fire rate. A crew is unlikely to maintain this rate of fire for longer, owing to a shortage of accessible munitions. Fire may be slower, delivering suppressive effect over a longer duration.

© Royal United Services Institute

number of FPVs needed to kill an enemy soldier in Ukraine is between five and seven.[44] A mortar, by contrast, delivers a sustained effect against an area. Targets disperse if they know they are under observation from UAVs and fear being bracketed by mortars. This dispersal dissipates their combat power and the protective firepower they can use against drones, them easier for UAVs to engage. Mortars – even when not firing – therefore have a shaping impact on behaviour that sets up targets for UAVs.[45] Moreover, mortar performance does not deteriorate in bad weather.

The impact of these weapons systems is even more devastating when used in combination. A mortar causes enemy troops to dive to the ground to minimise their exposure to shrapnel. In this position, they are vulnerable to FPVs. By contrast, a soldier attacked by FPVs is well advised to run into a treeline, forcing the FPV to slow down and then to fire at it. Being upright, however, makes the soldier vulnerable to mortar fire. A devastating tactic, therefore, is to either pin infantry in open ground with a mortar and then kill them with FPVs, or, conversely, to achieve an initial hit with an FPV to force troops to run into a treeline that is pre-sighted for the mortar and then bracket them with it.[46]

The fact that mortars and UAVs are complementary does not mean that the introduction of UAVs leaves the mortar platoon unchanged. First, mortars must be dug in carefully to be survivable in the face of the UAV threat. Their unmasking should be coordinated with interception teams. Furthermore, working with FPVs often reduces the number of bombs a mortar must fire to achieve effect. The likelihood is, therefore, that a mortar platoon may give up some of its barrels. It may also adjust the training of its mortar fire controllers to manage fire using UAVs. In terms of the training burden, the introduction of UAVs therefore increases the training required for mortar operators.

Snipers: Splitting Recce and Fire

Whereas mortars have a complementary relationship with uncrewed systems, snipers are more readily displaced by them. Snipers may be characterised by two functions: as reconnaissance troops; and as expert marksmen. In terms of maintaining effective observation, multicopter UAVs are far more efficient and expose the operator to less risk than a sniper attempting to bring a target into direct observation. Similarly, compared with sniper fire, an FPV has greater range and a higher Pk and exposes the shooter to less risk. However, whereas a sniper combines these functions, they are very different skill sets for UAV operators.

44. Data provided by Ukrainian General Staff.
45. Author interviews with Ukrainian infantry defending Pokrovsk on impact of enemy UAV and mortar fire, Ukraine, March 2026.
46. Author observations of tactics, Ukraine, May 2026. The author observed these from a command post.

© Royal United Services Institute

Table 1: International Uncrewed Systems Training Burden by Category

Course Type	NATO Elite Infantry	NATO Regular Infantry	NATO Regular Infantry: High Burden	NATO Special Forces	Private Course: Low Burden	Private Course: High Burden	Ukraine: Low Burden	Ukraine: High Burden
FPV	15 days:[47] US Marine Corps (USMC) Attack Drone Operator Course 16 days:[48] British Paratroopers one-way attack course 20 days: French Foreign Legion[49]	60 hours:[50] Lithuania security forces; minimum viable course duration	15–20 days:[51] Bundeswehr (includes assembly)	Eight days:[52] Navy SEALS 15 days:[53] US Army Special Operations Command (same as hybrid course for recce)	10 days,[54] including build	30 days for military;[55] including hunter-killer operations	Six days;[56] recruits may already have UAS exposure in basic training[57]	Up to 42 days[58] including theory and hardware understanding; separate courses for advanced UAS communication can last 15 days [59]

47. 1st Marine Division Schools, 'Attack Drone Operators Course (ADOC)', https://www.1stmardiv.marines.mil/Units/Division-Schools/Attack-Drone-Operators-Course-ADOC-/, accessed 5 November 2026.
48. George Allison, 'British Soldiers Trained to Fight with FPV Drones', *UK Defence Journal*, 2 September 2025, https://ukdefencejournal.org.uk/british-soldiers-trained-to-fight-with-fpv-drones/, accessed 5 November 2026.
49. Author discussion with French officer, Lille, May 2026.
50. Baltic Viper, 'Drone Pilot Training Courses for Military, Security & Enterprise', https://balticviper.com/drone-pilot-training-courses-for-military-security-enterprise/, accessed 5 November 2026.
51. Robert Wallenhauer, 'German Armed Forces Use Homemade FPV Drones in NATO Exercise', *Table.Briefings*, 13 March 2026, https://table.media/en/security/news/german-armed-forces-use-homemade-fpv-drones-in-nato-exercise, accessed 5 November 2026.
52. Nicholas Slayton, 'Navy SEALs Want to Start a 10-Day School to Learn Drone Warfare', *Task & Purpose*, 17 November 2025, https://taskandpurpose.com/news/special-operations-fpv-drone-training/, accessed 5 November 2026.
53. Zita Ballinger Fletcher, 'SOCOM Wants to Train Operators to Build, Wield FPV Drones', *Defense News*, 13 November 2025, https://www.defensenews.com/unmanned/2025/11/13/socom-wants-to-train-operators-to-build-wield-fpv-drones/, accessed 5 November 2026.
54. Aerobot Labs, 'FPV Drone Build & Pilot Training Certificate Course', https://aerobotlabs.com/fpv/, accessed 5 November 2026.
55. RSI Europe, 'FPV Drone – Loitering Munition Training', https://rsieu.com/fpv-drone-loitering-munition-training/, accessed 5 November 2026.
56. Paola Peduzzi and Kristina Berdynskykh, 'In the Kyiv Hangar Where Civilians Go to Drone Classes', Il *Foglio Europeo*, 7 November 2025, https://foglioeuropeo.ilfoglio.it/en/in-the-kyiv-hangar-where-civilians-go-to-drone-classes/, accessed 5 November 2026.
57. Unmanned Systems Forces, 'What is Basic Military Training (BMT) in the Unmanned Systems Forces?', https://usforces.army/en/training, accessed 5 November 2026.
58. WeTrueGun, 'Training to Become a UAV Pilot: FPV School UKRAINE', 3 April 2025, https://wetruegun.com/en/fpv-school-ukraine/, accessed 5 November 2026.
59. KRUK UAV Operator Training Center, 'KRUK UAV Operator Training Center', https://kruk.in.ua/en, accessed 5 November 2026.

© Royal United Services Institute

Course Type	NATO Elite Infantry	NATO Regular Infantry	NATO Regular Infantry: High Burden	NATO Special Forces	Private Course: Low Burden	Private Course: High Burden	Ukraine: Low Burden	Ukraine: High Burden
Recce	Five days;[60] notional, based on manufacturer course and requirement to make small repairs	Four days;[61] 10 days (Austrian army, includes civilian airspace deconfliction, theory)[62] 15 days, British Army[63]	Master trainer small uncrewed aircraft systems course, 20 days (including intra-drone communications)[64]	15 days;[65] hybrid course involving FPV, assembly, software and repair	Three hours,[66] comprising a safety and legal briefing	Five days;[67] includes theory, police and fire service	Five days,[68] but intensive, with software and EW aspects	14 days;[69] special aerial reconnaissance course

60. Skydio, 'Skydio Academy', https://www.skydio.com/skydio-academy, accessed 5 November 2026.
61. Stephanie Snyder, 'Fort Benning Prepares Soldiers to Fly, Fight with Drones', US Army, 8 August 2025, https://www.army.mil/article/287696/fort_benning_prepares_soldiers_to_fly_fight_with_drones, accessed 5 November 2026.
62. Jürgen Zacharias, 'How the Armed Forces Train Drone Operators', *Militär Aktuell*, 3 September 2024, https://militaeraktuell.at/en/how-the-armed-forces-train-drone-operators/, accessed 5 November 2026.
63. Defence Equipment & Support, 'Parrot Drone Boosts Army's ISR Capabilities', 12 November 2024, https://des.mod.uk/parrot-drone-boosts-armys-isr-capabilities/, accessed 5 November 2026.
64. Derrick Guyton, 'The SUAS Master Trainer Course', *Infantry* (Spring 2026), https://www.lineofdeparture.army.mil/Journals/Infantry/Infantry-Archive/Spring-2026/The-SUAS-Master-Trainer-Course/, accessed 5 November 2026.
65. Alain Servaes, 'US Special Forces Green Berets Gain Tactical Drone Capability for Recon and Targeting', *Army Recognition*, 5 March 2026, https://www.armyrecognition.com/news/army-news/2026/u-s-special-forces-green-berets-gain-tactical-drone-capability-for-recon-and-targeting, accessed 5 November 2026.
66. Drone School UK, 'Learn to Fly a Drone in 3 Hours', https://droneschooluk.co.uk/, accessed 5 November 2026.
67. Eagle Eye Innovations, 'Emergency Services', https://eeinnovationsltd.com/emergency-services/, accessed 5 November 2026.
68. Dronarium Academy, 'Combat Multirotor Drone Course', https://www.dronarium.academy/en/courses/multirotori, accessed 5 November 2026
69. KRUK UAV Operator Training Center, 'KRUK UAV Operator Training Center'.

© Royal United Services Institute

Course Type	NATO Elite Infantry	NATO Regular Infantry	NATO Regular Infantry: High Burden	NATO Special Forces	Private Course: Low Burden	Private Course: High Burden	Ukraine: Low Burden	Ukraine: High Burden
Logistics	Five days,[70] with geofencing for safety (USMC)	10 days,[71] (including assembly)	Course may significantly extend through EW, communication, mothership operations and stand-off attack	See NATO Regular Infantry	Approximately 20 days,[72] depending on payload	N/A	30 days depending on prior UAS experience	Up to 40 days,[73] including software focus

Note: Some courses are shortened depending on requirements and prior experience. Training day length varies, with some special forces favouring intensive courses under two weeks, while some Ukrainian courses take place over multi-month, part-time training. Short FPV courses are considered inadequate but have been used in Ukraine to generate mass. Recce drones are optimised to hover, and civilian users may learn in a few hours, but there is evidence that this is inadequate for professional use. Additional training for recce includes spotting and correcting artillery fire, and though heavy lift drone flying can be quickly learned by recce operators, additional training for airspace deconfliction, visual navigation and safely loading payloads is required.

70. *SURVICE Engineering*, 'Marines Are Trained to Operate the TRV-150 Within 5 Days', YouTube, 22 October 2024, https://www.youtube.com/shorts/sw4q6taQM1c, accessed 5 November 2026.
71. Alison Strout, '1st TSC Displays Technological Advancements with TRV-150 Drone', Defense Visual Information Distribution Service (DVIDS), 10 April 2025, https://www.dvidshub.net/news/499808/1st-tsc-displays-technological-advancements-with-trv-150-drone, accessed 5 November 2026.
72. Flyby Technology, 'The World's First BVLOS Training School', https://www.flybydronetraining.co.uk/news/the-world-s-first-bvlos-training-school, accessed 5 November 2026.
73. Illia Volynskyi, 'Strikes at 60 km, Mining of Rear Areas and Air Evacuation of the Wounded. All About Our Drone Bombers That Scare the Russians', Oboronka, 14 October 2025, https://oboronka.mezha.ua/en/bomberi-abo-baba-yaga-yak-pracyuyut-ukrajinski-vazhki-kopteri-305559/, accessed 5 November 2026.

© Royal United Services Institute

Reconnaissance may be more effectively carried out by UAV, but the skills of concealment, independence and the methodology of observation used by snipers remain relevant. Moreover, during periods of bad weather or in complex terrain such as an urban environment, direct observation may be necessary. There is enduring value in the reconnaissance skills taught to snipers, although concealment techniques need to become better optimised at countering multispectral and overhead observation.[74] The training burden for current snipers is approximately nine weeks,[75] excluding selection and testing phases. If UAV recce is taught in two weeks (as detailed in Table 1), thereby replacing the marksmanship element, the remainder of the sniper modules retain their relevance.

In most contexts, the shooting element of sniping is now best delivered by a force's FPV teams. Weather conditions that are unfavourable to FPVs are also probably prohibitive to sniping. Precisely because FPV teams can operate from a greater distance and beyond line of sight, there is less of a requirement for these operators to have the recce skills critical to sniping. In urban or other complex terrain, direct fire may be more effective. For example, if the purpose of a firing position is to disrupt enemy movement across a road, the latency between detection and an FPV reaching the target before it enters cover (compared with a direct fire weapon in overwatch) makes the latter more effective.[76] This, however, is more akin to marksmanship, over shorter distances, than sniping. It seems that reform of a battalion's reconnaissance training towards UAV employment is feasible, taking time previously used to train shooting and putting it into UAV operations, so long as there is training in marksmanship for the infantry.

Anti-Tank Guided Weapons: By Needle or Lance?

Popular commentary often compares FPVs very favourably with anti-tank guided weapons. The reality, as with mortars, is more complex.

A modern ATGM has a high Pk. Statistics of ATGM consumption by units are misleading because they include many engagements against static positions and other targets. Engagements at the limit of a weapon's range are also liable to reduce the Pk. APS also reduce the standalone Pk of ATGMs, although such systems are vulnerable to damage from fragmentation.

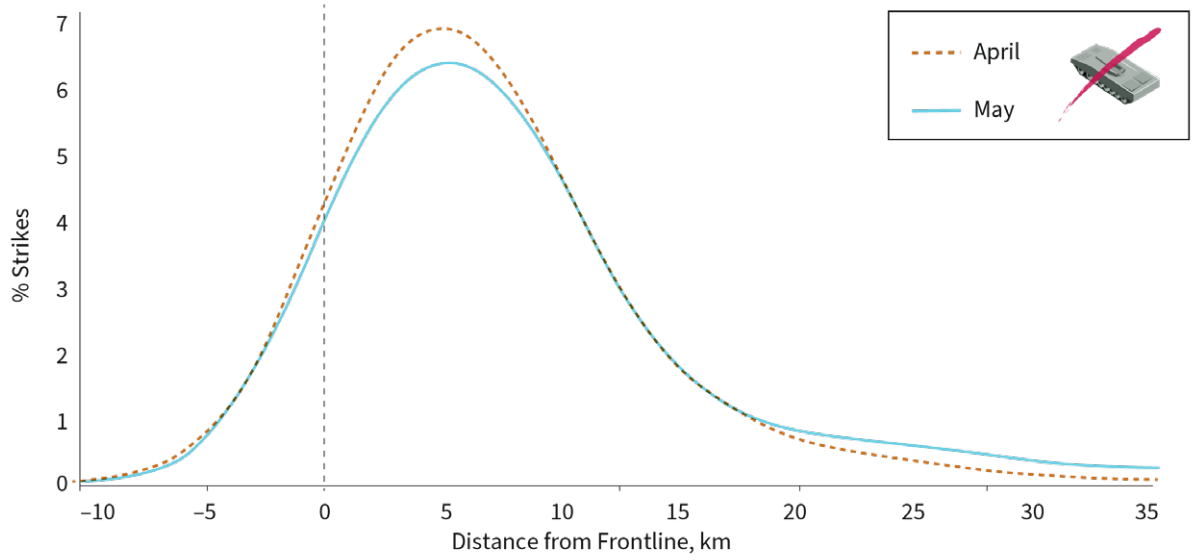
74. Author observation of testing of concealment approaches under scrutiny by modern ISR, UK, 2021.
75. British sniper courses run to 11 weeks but include selection and testing.
76. Nick Reynolds, 'Hunter and Hunted: Snipers on Sensor-Dense Battlefield and Lessons for Combining Arms', *RUSI Journal* (Vol. 171, No. 5, 2026), pp. 138–52.

© Royal United Services Institute

FPVs, by contrast, have a very low Pk against armour. An armoured vehicle with appropriate modifications can expect to survive over 15 hits.[77] The probability of being immobilised or critically damaged increases at around 20 hits. Killing a tank with FPVs has been observed to require 40–100 FPVs in some cases, factoring in misses caused by vehicle-based EW and adapted armour.[78] The issue is not just the number of munitions and the time it takes to hit a vehicle this many times but also the proportion of a force that can be taken up with trying to knock out a single armoured vehicle.

The inefficiency of FPVs against armour in single engagements is misleading. Vehicles have a large signature, so are reliably detected at ranges beyond 15 km and can be acquired while an FPV transits the battlespace. Where most ATGMs have 2–4 km of range – except for some long-range systems such as Spike-NLOS – an FPV can hold vehicles at risk beyond 12 km, as shown in Figure 6. By holding a target at risk over such distances, it becomes possible to persistently inflict losses on armour and to force it to move if it does not want to be immobilised out of contact. Forcing movement increases the vulnerability of armour to mines and exposes it to crossing killing areas for artillery and ATGMs. Moreover, damage from FPVs to APS, sights and other protective systems can significantly increase the Pk of ATGMs against advanced forces.

Figure 6: Engagement Distances with UAVs Against Vehicles, Comparing Two Months



Source: Armed Forces of Ukraine. Graphic design by Alex Whitworth.

On balance, therefore, the anti-tank platoon of a traditional infantry battalion seems like a prime candidate to have its personnel trained as FPV operators, while retaining some ATGMs as a hard backstop. A relevant example is the IDF, which has made significant use of longer-range ATGMS like Spike-NLOS alongside FPV teams in its

77. Author observations of Ukrainian repair of battle-damaged armoured vehicles, Ukraine, August 2025.
78. Author reviews of after-action reports from the Armed Forces of Ukraine on engaging armour.

© Royal United Services Institute

'multi-dimensional unit' (Unit 888 Refaim). Companies of this unit were able to effectively screen ground using combinations of UAVs and ATGMs in Gaza and have been effective in countering enemy long-range strikes in Lebanon. In Ukraine, too, many Stugna-P operators transitioned to FPVs, not because the former was ineffective but because they struggled to acquire reloads for Stugna-P. In some units, however, FPV teams retain Stugna-P so that the anti-tank platoon has expanded the battalion's lethality against a wide range of targets.

There is an open question as to whether loitering munitions (such as Russia's Lancet-3M, Helsing's HX-2 or systems such as Switchblade 600) may replace ATGMs because they have greater range and are more flexible. Unlike FPVs, however, these munitions do not have a major cost differential when compared with ATGMs. They have greater range, and in some cases a smaller warhead, while their slow speed makes them susceptible to being shot down. At present, a mix of FPVs and ATGMs seems sensible at the battalion echelon, although if the force can layer these effects, integrating intermediate categories of UAVs is not precluded from their concept of operation. Emerging loitering munitions make more sense as part of a middle strike function at brigade.

Machine Guns and the Fire Support Group

The evidence from contemporary battlefields shows the continuing importance of machine guns and fire support. As a weapon organic to manoeuvre elements, they remain critical because of the weight of firepower they can concentrate. In supporting attacking forces, the base-of-fire groups of machine guns, however, are likely to face challenges. They expose their positions from the point at which they engage, and they are also slow to displace because of the tripods and ammunition that they must carry. This makes such a baseline an optimal target for FPV strikes.

Conversely, machine guns in the sustained fire role are potentially much more capable of engaging FPVs and other UAVs. In this role, heavy machine guns mounted on remote weapon stations have shown that they can reliably shoot down Geran one-way-attack UAVs and even cruise missiles,[79] while machine guns have consistently engaged multirotor ISR UAVs and can shoot down FPVs. They are much more capable of doing this if they are automated turrets.

There is an opportunity to make the Machine Gun Fire Support Group a complementary component to a battalion's air defence detachment, so long as it has the command-and-control links to come under direction of the air defence cell in the battalion headquarters. There is also a strong argument for machine guns to be mounted on remote weapon stations (RWS) atop UGVs. This provides the accuracy to

79. Author observations of Sky Sentinel engagements, Ukraine, March and May 2025.

© Royal United Services Institute

engage UAVs and allows machine gun baselines to engage in direct fire support without exposing their crews, while also having the ability to self-defend against UAV strikes. UGV-mounted RWS also present the opportunity to mount acoustic and electro-optical sensors. The crews at this point become maintainers and operators for these systems. While it takes around five personnel to maintain and operate one of these systems, it is also feasible for the same team of five to oversee a group of up to three UGVs. Thus, it could increase the number of machine guns in the Fire Support Group without expanding the number of personnel assigned to the task. There are drawbacks to this trade-off. While highly effective in many types of terrain, it will struggle in marshes and mountainous or extremely uneven ground. As it is entirely feasible to dismount weapons from RWS, however, this does not obviate the advantages of this being part of a battalion's inventory.

Logistics: Last-Mile Resupply

The roboticisation of last-mile resupply brings several opportunities. First, moving to UAV- and UGV-based resupply reduces the risk to logisticians transiting the battlespace near the frontline, in an environment where enemy reconnaissance and fires extend throughout the battalion's rear area. This reduces attrition, improves morale and allows sustainment operations to be attempted even under highly unfavourable conditions. Another advantage is that UGVs can have a lower profile than crewed vehicles for an equivalent volume of supplies moved. UAVs, meanwhile, can enable resupply across impassable terrain.

Turning to robotised logistics does not significantly reduce numbers of personnel required. Maintaining the vehicles, loading them appropriately, planning their movements and piloting them are personnel-intensive activities. It is also important to acknowledge that both crewed and uncrewed logistics operations on the modern battlefield see a significant attrition of platforms. In Ukraine, crewed civilian 4x4s often make shuttle runs with supplies. Because of their signature, they must drive quickly. This often sees vehicles written off through damage to their chassis.[80] Where 4x4s remain in the contact area – such as when they are used to insert FPV teams – they are usually detected and struck, leaving the team – minus its UAVs and munitions – to walk out. For UGV and UAV resupply missions, these are continuously intercepted.

Given the low survivability of the platforms, the overwhelming priority for effective logistics operations – crewed or uncrewed – is the low cost, ruggedness and reliability of the base platform. Without integrated communications and sensors, a rugged crewed buggy may be cheaper. However, a satellite navigation antenna and cameras may be a worthwhile investment to increase crew survivability. The crewed system can

80. One of the authors observed this directly in Donbas, January 2025.

© Royal United Services Institute

be used by the rear logistics echelon and the uncrewed systems prioritised for the resupply of the fighting echelon in contact. Fundamentally, however, these systems – crewed and uncrewed – are consumables and should be procured as such.

Infantry and Pioneers

Infantry and pioneers are a force's centre of gravity. They ultimately determine whether ground is taken and held. Even if lethal effect is increasingly delivered by stand-off weapons, it is the infantry that must carry out the decisive killing. Even in the highest-density parts of the front in Ukraine, eliminating Russian forces from their dugouts and occupied buildings comes down to extremely close-range infantry combat. The layers of protection around these sites minimise the utility of robotics in this task. At the same time, with a growing requirement for personnel to operate stand-off weapons and uncrewed systems, the largest personnel pool in a battalion is likely to be its infantry. Thus, it is valid to ask whether infantry should be prioritised for conversion into UAV operators, with a different weighting within the force.

Infantry combat in Ukraine has been shaped by declining force densities such that engagements are usually between fireteams of three personnel.[81] Interestingly, in Israel and Palestine, IDF fires have caused Hamas to similarly fight in groups of three personnel.[82]

The smaller groupings of infantry, however, do not necessarily reduce the number of troops in the battlespace. In Ukraine, the intermingling of lead elements has created an extensive requirement for support troops to be protected. There is also the need to conduct mopping-up operations after terrain is taken. Thus, infantry in reserve must often assault positions in the rear to consolidate control. At the same time, established platoon and company tactics (of having three manoeuvring elements that rotate) have been disjointed by the need for counter-reconnaissance as a prerequisite for manoeuvre.

If infantry tactics are evolving to reflect the need for dispersal, survivability and, where possible, the concentration of enablers to facilitate manoeuvre, there is a logic to preserving as much infantry in the force as possible. However, without the enablers, the infantry cannot succeed, and so in practice the number of infantry is likely to be lower than in extant infantry battalions. It should be noted that even if UAV operators are not assault infantry, they must operate as combat troops and have many

81. Jack Watling, 'Emergent Approaches to Combined Arms Manoeuvre in Ukraine', RUSI Insights Papers (October 2025), https://www.rusi.org/explore-our-research/publications/insights-papers/emergent-approaches-combined-arms-manoeuvre-ukraine, accessed 2 September 2026.
82. Jack Watling and Nick Reynolds, 'Tactical Lessons from Israel Defense Forces Operations in Gaza, 2023', *RUSI Occasional Papers* (July 2024), https://www.rusi.org/explore-our-research/publications/occasional-papers/tactical-lessons-israel-defense-forces-operations-gaza-2023, accessed 2 September 2026.

© Royal United Services Institute

overlapping skills. It makes sense to teach UAV operators as infantry first, as they must carry heavy loads, administer themselves in the field, protect themselves, dig, and fight in coordination with infantry. Finally, the breaking down of the force into smaller packets means that concentrating pioneer and other enabling capabilities into a standalone platoon does not make sense. The ability to handle explosives and excavate and build temporary structures must be distributed across the force such that pioneers should be available within each company. Again, while mechanisation and even automation of digging may be possible, there will remain a significant dependency on manpower for these tasks.

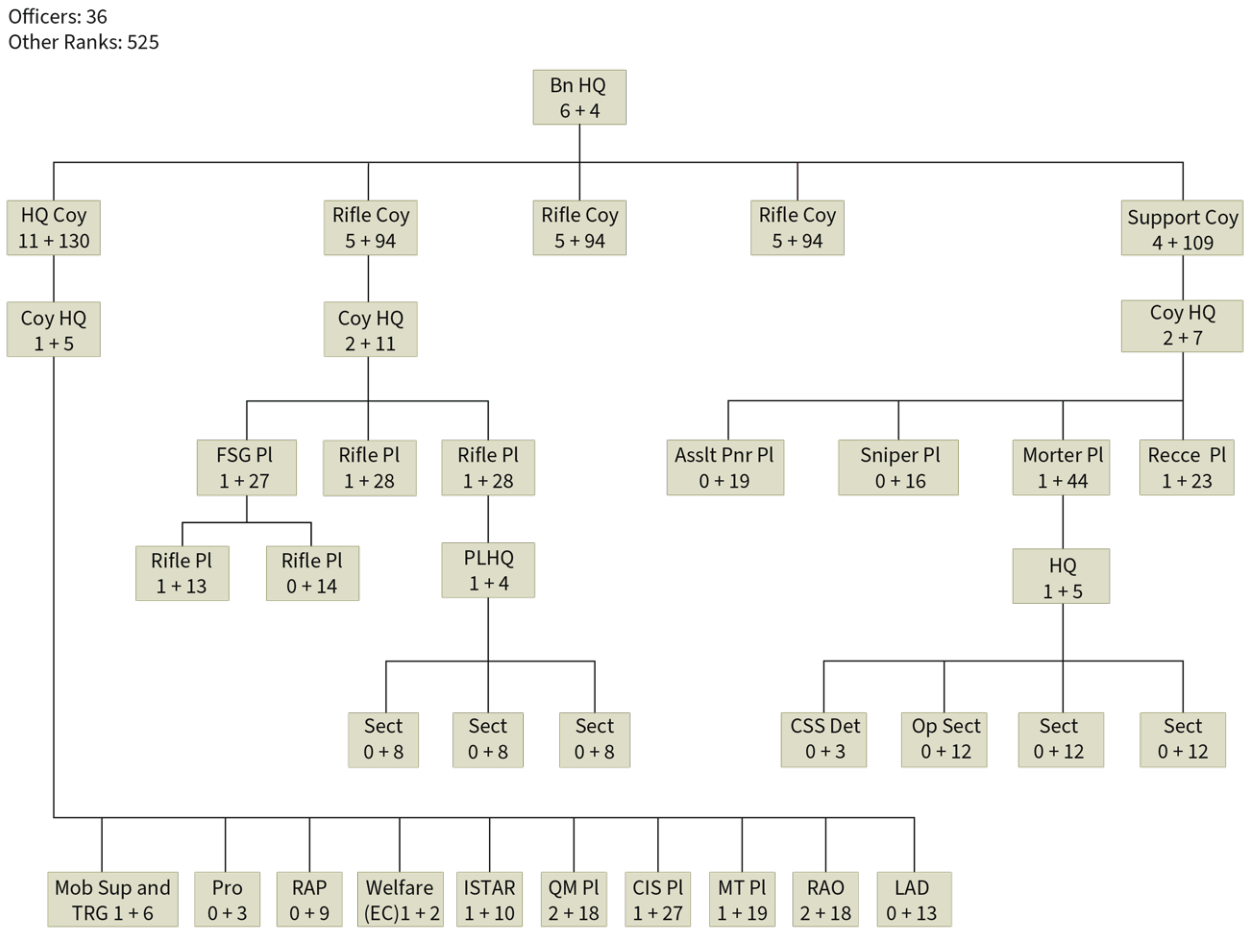
In summary, therefore, these conclusions can be drawn about the trade-offs within the current capability mix of a battalion:

- A battalion should retain its mortars, as they are enhanced by UAV observation and complement effects achieved by FPV.
- The reconnaissance skills of snipers should be retained but paired with UAV operations rather than shooting. Training capacity for marksmanship can be moved to the infantry.
- ATGMs should be retained in smaller numbers but the anti-tank platoon is well suited to force-generating FPV operators.
- Fire support groups can contribute effectively to air defence. However, dedicated interception teams, while essential for a battalion's operations, need to be integrated within the wider air defence picture and are more likely to be grouped at brigade and attached to the battalion rather than held organically.
- Uncrewed logistics increases survivability but is no more efficient. It is an area where more is more, and where a significant reduction in personnel is unlikely.
- A force should endeavour to retain infantry mass and distribute skills such as pioneers across its infantry sections.

As an initial exercise, the existing order of battle of a British Light Infantry Battalion (see Figure 7) can be taken to show how personnel could be redistributed to generate uncrewed systems capabilities across the unit (see Figure 8). The following strawman is not a prescription; in practice, many of the elements would be task organised differently. However, it does illustrate the trade-offs.

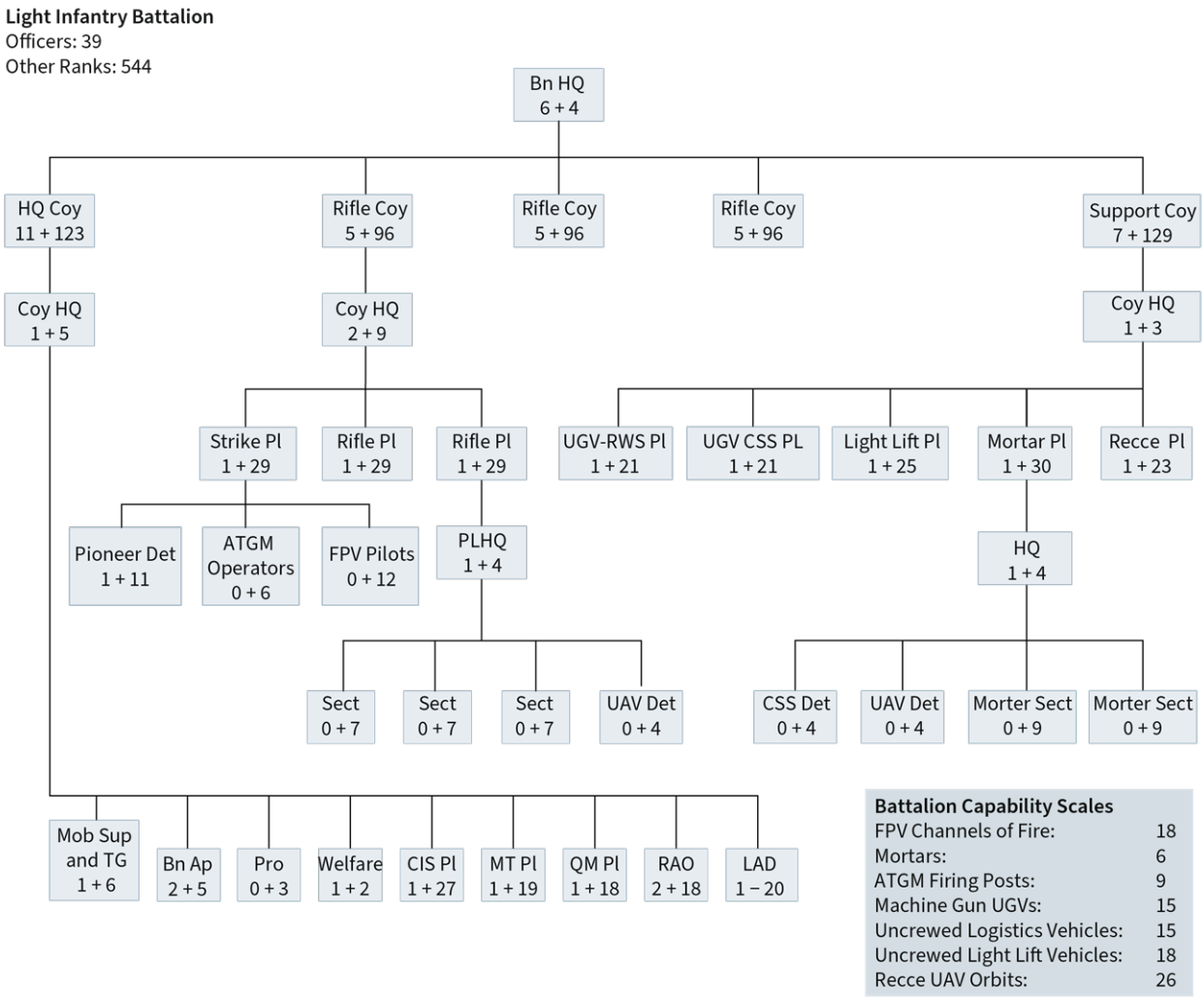
© Royal United Services Institute

Figure 7: British Light Infantry Battalion Order of Battle



Source: British Army Staff Officer's Handbook. Graphic design by Alex Whitworth.

Figure 8: Strawman New Model Battalion Order of Battle



Source: The authors. Graphic design by Alex Whitworth.

Conclusion

It is clear from contemporary conflicts that to remain effective, ground forces need to use uncrewed systems in their operations. How militaries field these capabilities is not preordained and there is not necessarily a single optimal answer, partly because the efficacy of the uncrewed systems enterprise depends on what it is integrating with, as much as how it is itself organised. Nevertheless, at the tactical level – where uncrewed systems coexist intimately within a combined-arms system – there are constraints that prevent units expanding in size. These include avoidance of concentration of personnel in too small a piece of battlespace, and the avoidance of overburdening commanders by presenting them with too many tools for them to coordinate. This means, however, that UAVs must displace, and not just augment, the extant responsibilities of a part of the force. This paper has not sought to prescribe what should be displaced, but rather to articulate what the trade-offs are so that force design can realistically reflect the troops to task required to generate an anticipated level of effect using uncrewed systems. There are some important conclusions that force planners must bear in mind.

First, contrary to a general perception that uncrewed systems reduce the personnel requirements in the force, uncrewed systems have substantial crew requirements. There is no discernible saving in personnel by adopting uncrewed systems relative to extant crewed capabilities. Force planners should not, therefore, assume any reduction in personnel requirements.

Second, automation and other technological trends in uncrewed systems do not promise to significantly reduce the number of personnel needed in the uncrewed systems enterprise. However, they do offer the opportunity to increase the range, efficacy, reliability and efficiency of the uncrewed enterprise, or to increase the survivability of the force, at a cost. A critical challenge for force planners is to judge at what price point these gains become unsustainable and thus counterproductive. Force planners must judge the point of sufficiency regarding technological sophistication.

Third, the tactical benefits of UAVs should never be looked at in isolation. Effective systems of fighting present the enemy with competing dilemmas, simultaneous threats against which an optimal countermeasure to one will increase exposure to another.

© Royal United Services Institute

Thus, when looking at the scale of an optimal uncrewed systems enterprise within a force, force planners should examine combinations of capability, sometimes between uncrewed systems and sometimes between uncrewed and crewed systems.

Fourth, to successfully transfer to a UAV-enabled force, it is necessary to match training time to these tasks and to provide a regulatory environment that allows that training time to be fruitfully used. Here there are multiple challenges. How, for example, are infantry to practise engaging aerial targets in 360 degrees, and how are officers to exercise control of fire, all while maintaining range safety? Without a mechanism to realistically train, the force cannot realise the benefits of these new tools and will struggle to conceptualise the frictions that emerge across a combined-arms force.

Ultimately, the British Army has concluded from observing the conflict in Ukraine, and from its own experimentation and force development, that UAVs will play a key role in its future. Making the transition to a force enabled by uncrewed systems, however, will require uncomfortable changes at the tactical level to doctrine and force structure, and thus the distribution and burden of training. It is important that these changes are made with open eyes to what is lost as well as gained, but also with an open mind as to how such a force can increase its ability to sense, strike and ultimately survive and manoeuvre on the future battlefield.

Force generation does not necessarily have to follow the extant battalion structure. Task organisation could see capabilities pooled and then battle-grouped around specific mission sets. While such concepts merit examination, they are much harder to compare with the extant force and its training cycles, and so this paper has framed the future force as a rerolling within existing structures. Irrespective of how the force is structured, the ratios and tasks outlined in this paper, and thus the trade-offs, remain relevant.

© Royal United Services Institute

About the Authors

Jack Watling is the Senior Research Fellow for Applied Military Sciences at RUSI. Jack works closely with the British military on the development of concepts of operation and assessments of the future operating environment and conducts operational analysis of contemporary conflicts. Jack is the author of *Statecraft: The New Rules of Power in a Divided World*, and *The Arms of the Future: Technology and Close Combat in the Twenty-First Century*. Jack's PhD examined the evolution of Britain's policy responses to civil war in the early 20th century. He has worked extensively with the Armed Forces of Ukraine during Russia's full-scale invasion, across NATO, and in Iraq, Mali and Rwanda, on Yemen and further afield.

Robert Tollast is a Research Fellow for Land Warfare at RUSI. Previously, he was an Assistant Foreign Editor at *The National* in Abu Dhabi and Military Affairs Reporter. He has also worked in risk analysis focused on the Middle East in the private sector and later advised the Iraqi Ministry of Foreign Affairs.

© Royal United Services Institute

195 years of independent thinking on defence and security

The Royal United Services Institute (RUSI) is the world's oldest and the UK's leading defence and security think tank. Its mission is to inform, influence and enhance public debate on a safer and more stable world. RUSI is a research-led institute, producing independent, practical and innovative analysis to address today's complex challenges.

Since its foundation in 1831, RUSI has relied on its members to support its activities. Together with revenue from research, publications and conferences, RUSI has sustained its political independence for 195 years.

© The Royal United Services Institute for Defence and Security Studies

RUSI is registered as a charity in England and Wales

Charity number: 210639

VAT number: GB752275038