



BRIEFING PAPER

Modern Warfare: New Realities

Present defence strategies, their vulnerabilities, and the case for adaptable low-cost platforms

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It's often said that generals practice winning the last war and are thus perpetually unprepared to fight the next one. There's no small degree of truth in this because the past is pleasingly predictable and current senior officers rose through the ranks on the basis of their ability to fight that last war.

Unfortunately, reality tends to ignore what's convenient and predictable. Moreover, as NATO has never fought a war against a near-peer adversary, it has never been forced to confront the fact that a great many assumptions baked into NATO doctrine are unfortunately quite wrong.

For decades the West faced off against the Soviet Union in what was termed The Cold War. In reality the war was sporadically hot, but only in far-away places in which death and destruction wouldn't inconvenience Western citizens. These small wars were generally inconclusive and had no significant impact on shaping NATO doctrine, which continued to assume a major Soviet armored push through the Sulawesi Gap.

NATO's so-called strategy was to attempt to impose significant up-front costs in order to force the Kremlin to the negotiating table. Unmentioned was the obvious conclusion that the USSR would keep a non-trivial portion of whatever territory it captured during its invasion and NATO would accede to Soviet "peace" conditions that would leave it irrevocably weakened and thus even less capable of obstructing a future Soviet advance.

Worse yet was the total failure of Western military officers, politicians, intelligence operatives, and analysts to understand that the Soviet mentality was so totally different from Western assumptions that the NATO strategy would never have worked. The Soviets would simply have accepted enormous losses of manpower and materiel and kept on pushing until NATO ran out of munitions and had to surrender completely.

Stalin's use of blocking units to ensure that hapless Russian troops had to advance even when few had even rudimentary weapons was regarded in the West as an aberration, the result of exigent circumstances. Western historians, military analysts, and NATO planners simply refused to acknowledge that Russian commanders have **never** cared about the lives of those they command. For a Russian officer, soldiers are there to be exploited and used up regardless of the utility of their deaths. NATO doctrine always projected Western notions onto Soviet planners and this was always categorically wrong. Ukraine is merely the most recent battleground upon which the total indifference of Russian leadership to Russian lives is on display. History is replete with identical lessons, none of which the West appears capable of absorbing.

NATO was thus doomed to failure thanks to constant Western misperceptions.

Unfortunately, even with access to Soviet archives after the collapse of the Soviet Union in December 1991, Western perceptions of Russian tactics failed to change. Even today, with Russian tactics on full display in Ukraine, Western assumptions remain totally incorrect.

Lest any reader imagine that NATO would have absorbed important lessons and adapted had NATO troops ever been confronted with reality, the US-led supposed “war on terror” proves the contrary. NATO adopted the 5.56mm round for its primary infantry weapons due to the entirely erroneous notion that enemy forces would perform as NATO doctrine imagined. The idea was that using a 7.62x51 NATO cartridge would be far more likely to kill enemy personnel and therefore (in NATO logic) this was undesirable. Instead, the 5.56 round would wound the recipient and thereby – in NATO’s imagination – require one or two companions to escort the wounded soldier from the field. This, in theory, would lead to a reduction in enemy force of three personnel whereas an outright kill would reduce the enemy by only a single soldier.

Alas, no one remembered to tell ISIS and Taliban insurgents of this important assumption. These adversaries simply ignored their wounded colleagues and pressed on. A report written by members of the UK 22 Special Air Service a few years after the commencement of counter-insurgency operations in Iraq and in Afghanistan was brutally critical of the 5.56 round. The report details dozens of instances in which NATO troops had died because of the round’s inadequacy. The report strongly recommended re-adoption of the far more effective 7.62 round. The report was ignored. Too many careers and too much money had gone into providing NATO troops with the means to deliver lots of 5.56 rounds downrange due to lessons learned in the Viet Nam war decades ago. It was politically and economically infeasible to adapt to modern reality. And so NATO personnel continued to die unnecessarily.

The same type of situation currently precludes NATO from being able to counter Russian aggression. For all the hundreds of reports that have been written on the nature of conflict in Ukraine, no meaningful change has occurred.

In Europe, *Exercise Hedgehog* (December 2025) and *Exercise Aurora* (April 2026) demonstrated how a tiny number of Ukrainian troops playing OpFor were able to defeat multiple NATO battalions within hours despite those NATO battalions having enjoyed months to rehearse and move personnel and equipment into theatre, which were advantages no real conflict would confer and thus this kind of fantasy game-playing ensures an even more catastrophic outcome for any NATO force attempting to counter Russian aggression in real life.

Multiple Russian incursions into NATO airspace have revealed NATO’s political incapacity for firm response. Moreover, NATO lacks the GBAD capabilities needed to handle cheap Geran II attack drones. Interception via PAC3 interceptors at \$4 million per round is a superb illustration of the shot-exchange problem (as the USA amply demonstrated in the Gulf earlier this year) but few European nations can afford that level of blind profligacy. Scrambling F-16 fighters is marginally better, but at around \$27,000 per flight hour and with potential loss of aircraft due to ingestion of drone fragments, it is hardly a scalable approach to a full-on Russian attack.

Some tiny gestures to adapting have been made but these have all been without exception totally inadequate. Infantry personnel are being provided with tiny numbers of FPV drones, none of which would survive more than a few minutes in today’s real battlespace. Meanwhile, new entrants and existing players in the defense manufacturing sector are assiduously looking in the rear-view mirror and seem incapable of understanding that yesterday’s adaptation is already out of date.

As we will see later in this document, copying Sting-type interceptor drones at the very moment they are becoming redundant thanks to Russia powering its latest generation of Geran drones with turbojets means European NATO members will continue to have no way to cope with drone swarm attacks. Nor will planned ISR drone procurement fare any better, for reasons we will also discuss later in this document.

NATO is at the present moment unable to counter even moderate Russian aggression, much less any serious incursion.

Yet Russia is not strong. Its economy is suffering, its military comprises mostly drunken brutalized rabble and poorly-trained conscripts, and its technologies are behind the power curve. Unfortunately for Europe, an adversary does not need to be strong in order to win: it simply needs to be less weak and incapable than the enemy it seeks to crush.

That is the situation facing Europe today.

The USA is now at best a highly unreliably semi-ally and at worst an adversary that on many occasions clearly supports Russian objectives. The rest of NATO is attempting to compensate for decades of under-investment and failure to prepare, but as always national interests result in failure to coordinate, failure to standardize, and failure to build the capabilities necessary for any significant increase in the output of essential precursors and other components. Worse yet, with China controlling 90% of all refined rare-Earth minerals which are essential for nearly every weapons system you can name, the West has an enormous strategic vulnerability that will take a decade or more to minimize.

And meanwhile NATO strategy, as demonstrated in *Hedgehog* and *Aurora*, remains trapped in the past.

Not surprisingly, therefore, NATO procurement strategies are also trapped in the past and guarantee money will be squandered in huge quantities for very little in the way of operational capabilities suitable for the modern battlespace.

It is this gulf between current procurement strategies and the needs of modern warfare that this paper will focus on.

Let's begin with examining two equally false theses.

The first false thesis: modern equipment makes drones irrelevant

The first is that modern shiny NATO equipment will be so effective against a near-peer adversary that the so-called Drone Revolution seen in Ukraine is largely irrelevant. This argument proposes that Ukraine has only relied on drones to such a great extent because it lacked conventional weapons systems but as NATO has modern weapons and capabilities that Ukraine lacks, NATO has the ability to use combined arms to prosecute its traditional strategy of rapid maneuver warfare. And perhaps one day European NATO members will have sufficient stockpiles that they'll still have something to fire at Russia after the initial forty-eight hours of high-intensity combat.

While it is absolutely true that conventional weapons such as artillery and aircraft continue to have very important roles to play, the “drones are irrelevant” argument fails entirely to understand how **quantity now has a quality all of its own**. The battlespace is now almost entirely transparent and the gap between detection and elimination can be as little as a few seconds. This is not a battlespace in which NATO-style massing of armor days in advance can lead to anything more than a very costly series of unwanted rapid explosive disassemblies.

A handful of F-35s flying sorties into contested airspace to deploy a very limited number of munitions will have very little bearing on the outcome of a series of relentless “meat wave” Russian assaults. Leopard II tanks, along with their Challenger and Abrams equivalents, have shown how tremendously vulnerable conventional armor is nowadays. Russian commanders don’t care if thousands of infantry and logistics personnel are slaughtered; there will always be more meat to throw into the grinder. There will always be just enough factories scattered across the vast territory of Russia to provide more munitions. Russian leaders do not care if the civilian population suffers and they do not have to respond to such suffering. In conflict this provides an enormous advantage over the democracies which must always be responsive to the self-centric desires of the great mass of voters.

NATO does not grasp this basic reality of Russian mentality and lacks the munitions and the political will necessary to deal with such tactics.

Worse yet, NATO bases are essentially undefended. There are no bunkers in which aircraft can be placed to secure them against Spiderweb-style attacks, much less anything more sophisticated. Armored vehicles unless protected under bunkers are likewise vulnerable to such attacks as well as by interdiction by conventional artillery and man-portable anti-tank weapons. NATO logistics centers are equally as vulnerable as are NATO military bases of all kinds. Even a modest pre-emptive strike by Russia would eliminate a huge percentage of NATO capability instantly. A burned-out F-35 on the tarmac is not an asset that will prove effective in countering Russian aggression. A devastated munitions depot will not supply essential munitions to forces that already have a gross insufficiency of them.

So shiny modern weapons systems may in fact be almost entirely irrelevant in a real war with Russia.

The next, and slightly more sophisticated version of the “drones don’t matter” argument is that NATO is trying to develop very expensive hi-tech anti-drone solutions such as energy weapons. The drawbacks to this argument are severalfold. Firstly, given the expense and manufacturing complexity, such anti-drone systems will always be in short supply relative to the millions of drones operating in the battlespace. Secondly, such systems rely on good weather; fog, smoke, and other airborne obstructions degrade their utility dramatically. Thirdly, such systems are profoundly vulnerable to being overwhelmed. As these directed energy systems will be prime targets it is easy to predict their rapid destruction, rendering their supposed benefits irrelevant. Moreover, as these devices require enormous amounts of electricity, they will for the foreseeable future be mounted on heavy vehicles and thus unsuited for defending infantry and other rapid-assault forces.

On the expensive end of the spectrum a similar addiction to highly expensive weapon systems is driving the development of so-called “loyal wingman” drones that will be sent ahead of fighter jets into contested airspace to perform missions that would be otherwise too high-risk for conventional mission profiles. The notion is that such “loyal wingman” drones are cheaper than modern fighter jets and because they are

uncrewed they don't risk loss of a pilot. Yet at an average projected cost of \$50 million per unit such drones are hardly going to be regarded as attritable and they are obviously going to be in limited supply. Once again our obsession with eye-wateringly expensive equipment in limited numbers fails to account for the evolution of battlefield tactics.

The second false thesis: copying the past can secure the future

The second false thesis is that European NATO members can compensate for the withdrawal of the USA from NATO and for changes in the modern battlespace by copying what worked in the past. This is an equally pernicious mistake and has already led to hundreds of millions of Euros being invested in systems that are hopelessly redundant even before they complete the manufacturing process.

To see why this is the case, let's take two examples: small interceptor drones, and large ISR drones.

Today, several Western companies are churning out copies of the Sting interceptor pioneered by the Ukrainian company Wild Hornets. These are FPV-style drones designed to counter the Shahed-Geran II type of one-way attack drones. They are launched from the ground and "flown" FPV-style by a human operator. Until recently the Sting was a quite successful drone despite having to expend the majority of its battery power fighting Earth's gravity. Today the efficacy of the Sting interceptor drone is declining rapidly because Russia has adapted.

Geran II attack drones are no longer being powered by two-stroke petrol engines turning an external propeller. Today, an increasing percentage of Geran II and similar attack drones are powered by small turbojets which enable them to fly much faster. Against these turbojet-powered Russian attack drones the Sting interceptor is largely ineffective. There is no equation by means of which sufficient battery power does not result in greater mass which in turn defeats the advantage of greater battery power. Earth's gravity gives the turbojet-powered attack drones a decisive advantage.

The next problem is that the Sting interceptors are flown manually, which means one pilot per drone. Even before Russia began powering its Geran attack drones with turbojets to out-run the Sting interceptors, Russia was still able to penetrate defended Ukrainian airspace by sheer force of numbers. And in conditions of poor visibility the Sting interceptor struggles despite the very sophisticated computerized systems that support Ukraine's air defense capabilities.

Thus Western companies making copies of the Sting are making a product that is already becoming irrelevant. Unfortunately the supposedly "innovative" startups making such drones are in reality not innovators but copiers, and they are copying designs that are already becoming inutile.

Copying what worked yesterday guarantees failure tomorrow.

Now let's turn to ISR drones. The USA pioneered the use of ISR drones more than twenty years ago. The MQ-9 Reaper and the Global Hawk are top-of-the-range assets that have historically provided very good situational awareness of the battlespace below. But yesterday they were being used to provide information about battlespaces in which the enemy lacked GBADs and had very few MANPADS.

Unfortunately, Western ISR drones are very expensive relative to the capabilities they provide and as the US attacks on Iran have shown, they are horrifically vulnerable to being destroyed. The USA spent an estimated \$200 billion and vast amounts of ordnance attempting to eliminate Iran's ground-based air defenses and yet despite all of that effort and expenditure the USA lost more than thirty MQ-9 Reapers over Iranian airspace in less than one month. This tells us precisely how survivable these current-generation ISR assets will be in any conflict with Russia or China.

Naturally, as the major defense contractors have spent the last eight decades designing and building ever-more-complex and ever-more-costly systems, their immediate reaction has been to propose vastly more expensive ISR drones. These, we're told, will fly higher and faster and thus be able to evade interdiction by GBADs of all kinds.

Unfortunately the fantasy of eye-wateringly expensive high-speed high-altitude ISR drones is a dead-end. It is a backward-looking approach that is doomed to fail. As these high-speed high-altitude ISR drones will be extremely costly, only a few will be made. As speed and height are supposed to defeat interdiction by GBADs, this means that overpasses will be brief and regardless of the sophistication (and expense) of sensors a continuous highly detailed view of the battlespace will be impossible. Yet in a world presenting very dispersed and very mobile targets, it is precisely a continuous and detailed view of the battlespace that is needed.

As Europe can't afford to squander money on hyper-fast ultra-high-flying reconnaissance drones the supposed solution is to build cheaper slower lower-flying copies of the old US MQ-9 Reaper. As the US version, which flies higher and faster, has already been shown to be non-survivable even when operating over the airspace of a heavily-suppressed third-world country with limited GBADs, the European option is obviously a total waste of time and money.

One may wonder how so many people can be so very wrong in the face of overwhelming data that shows them to be wrong, but human nature has always been thus. It is always easier to cling to the familiar, even when this yields disastrous outcomes, than to attempt to engage with a new reality. World War II yielded dozens of examples of what happens when backward-looking solutions face forward-looking adversaries. One need only mention the words *Maginot Line* and *Blitzkrieg* to encapsulate a long and sorry tale of persistent human incapacity to look forward instead of backward.

We can understand why the major defense contractors are peddling very expensive pseudo-solutions to the new challenges the modern battlespace presents. Cost-plus contracts are conducive to ensuring high prices. After all, a defense company makes only \$20k margin on a \$200k system but that company can make \$12 million on a \$120 million system. And the old-style defense contractors are full of people who look at any problem and immediately conjure up a complex and expensive solution because this is what they've been doing for their entire professional careers.

Meanwhile bureaucrats, military personnel, and politicians are all incentivized to play it safe and go with whatever eye-wateringly expensive complex shiny new system is being sold to them as "the best" solution to whatever problem is out there. This is a recipe for failure.

Indeed, so failure-prone is this approach that the USA is famous for having spent sixty years and tens of billions of dollars *not* providing a modern self-propelled artillery system, twenty years and tens of billions of dollars *not* providing a replacement for the old Arleigh-Burke class destroyers, and a great many other very expensive failed procurement programs scattered across the last forty years testify to a fundamentally broken approach to providing defense solutions.

Costs per unit are now so high that only tiny numbers of platforms are built. The F-22 program was supposed to deliver 750 air dominance fighters; the actual number ended up being 187, of which around 147 are combat-capable with the rest being trainers and other non-combat types. Even a nation as wealthy and as profligate with taxpayer money as the USA runs into the hard wall of economic reality.

Europe has less money, far less political will, and a much greater urgency. Its present course of doing the wrong things in the belief these will somehow help deter further Russian aggression is doomed to fail. European nations remain committed to squandering money on fantasy projects to produce 6th generation fighter jets that in the most wildly optimistic scenario won't be available until the mid-2040s and nuclear submarines that likewise won't be available until around the same time.

Yet military analysts and the intelligence community are warning that a Russian attack on NATO member territory is likely going to occur before the end of this decade. For all the talk of urgency, European NATO members are showing very little sign of engaging with reality.

Sitting quietly in the corner seemingly unnoticed by anyone within NATO are additional major problems that the withdrawal of the USA from NATO will expose at precisely the worst possible moment.

The USA provides nearly all the command and control infrastructure upon which NATO relies, as well as a great deal of its signals intelligence. In a world of anti-satellite interdiction, launching a few European military communications satellites is a brilliant example of looking in the rear-view mirror. It is implausible to imagine that in a hot war Russia and China will not use their orbiting assets to eliminate inconvenient European and US satellites. As for Starlink, it is a US company run by a drug-dependent supporter of totalitarianism who openly favors nationalist-populist neofascists across Europe. In time of war, relying on Starlink as a communications enabler is like relying on a bucket owned by your worst enemy to bale out your leaking canoe.

Europe is also lacking in AWACS capability and in time of war long-range Russian air-to-air missiles mean that any existing European air assets will have to operate far from the battlespace, dramatically reducing their utility. AWACS, even the latest generation utilizing commercial and business jets, will always be too costly and too slow to manufacture to ensure sufficient quantity to recover from inevitable losses.

So now we have a looming threat of minimal European NATO command & control and severely compromised AWACS capability.

Unfortunately things get worse.

Let's consider the fact that wars are won or lost in no small measure because of logistics. Long gone are the days when a relatively small band of infantry could march long distances and self-provision by stealing from unarmed civilians as they went. It worked for Alexander from 334 BC and semi-worked for Guillaume in 1066 but by Napoleon's fateful invasion of Russia in 1812 the collapse of his supply lines proved catastrophic. Modern warfare has only increased reliance on logistics as a key enabler.

Which is unfortunate for European NATO members in two very different ways.

Firstly, with the continuing withdrawal of the USA from NATO, the organization's most logistics-capable member is no longer a reliable source of logistics assets and coordination. Unfortunately for European NATO member nations, none of them have anywhere near the logistics capability necessary to compensate. Indeed, things are so dire that more than a decade ago the senior US general in command of NATO logistics in Europe wrote a lengthy report pointing out that in the event of a real war, very little essential equipment and materiel could get to where it was urgently needed. Roads, bridges, and railway infrastructure all lack the capacity to deal with modern heavy armor. Warehouses are too far from where the supplies within them would be needed. Airlift capacity is meagre at best. Nothing has been done over the last ten years to address these problems.

When we add in the factors of the modern battlespace in which delivery of essential supplies on the "last mile" is nearly impossible due to the skies being saturated by enemy drones, we can see that any NATO troops unfortunate enough to find themselves in contact with Russian forces would quickly deplete their supplies with little realistic hope of the logistics chain being able to deliver more.

There is no meaningful last-mile capability. All current NATO options are non-survivable in a modern conflict with Russia, which has learned lessons NATO has entirely failed to notice. Ukraine has pioneered the Baba Yaga heavy lift drone but it can only handle loads of under 40 kg. Ground drones can handle more but are easier to interdict. There is no current adequate means of resupplying troops who are positioned within twenty kilometers of the enemy.

European NATO members have one last problem: persistent Russian GPS spoofing and jamming means that systems relying on satellite navigation systems are at risk. Electronic warfare is one problem but the more fundamental risk is physical destruction of global navigation system satellites. Russia and China have demonstrated clear capability to interdict Western satellites and have pre-positioned such "orbital killers" in readiness for use. When Russia invades Europe it is not implausible to imagine that a great many military and civilian satellites will suddenly become unavailable. And as noted earlier, even if European NATO members invest in Starlink terminals their efficacy has to remain in serious doubt due to the fact Starlink is a US company run by a CEO whose mental state can charitably be described as Messianic and whose restrictions on Ukrainian use of Starlink are well documented.

In short, NATO is in an extremely unenviable situation and doesn't even realize how dire its situation truly is.

It is with all of these factors in mind that **Multum Aero Systems** was founded to produce cost-effective essential capabilities that are forward-looking rather than trapped in the past.

The next section of this document will discuss the company's first product, named SkyGhost.

SkyGhost: One Platform, Many Solutions

We begin this section by recapitulating the problems faced by European NATO members as the USA *de facto* withdraws from NATO and Russian aggression mounts with every passing month. European NATO members have:

- No effective way to counter Russian “meat wave” infantry attacks.
- No credible air defenses against Russian saturation attacks using combinations of cheap Geran II turbojet-powered drones, Kh47M2 Kinzhal missiles, glide bombs, and intermediate-range ballistic missiles.
- No realistic way to monitor contested airspace as their limited number of AWACS must operate out of range of Russian long-range air-to-air missiles.
- No survivable ISR assets, and thus they will find it very difficult to maintain situational awareness of the battlespace.
- Serious difficulty communicating, due to loss of US C2 assets combined with relentless Russian electronic warfare, physical attacks on communications infrastructure, and cyberattacks.
- No meaningful logistics capability suitable for the modern battlespace.

Traditionally each of these problems would be addressed by a separate single-role system which in turn would induce relatively high cost per unit as well as being extremely vulnerable to adversary adaptations which would render the solution less effective.

Instead of the one-role-per-system at high per-unit cost, Multum Aero Systems understands there is a far better alternative: **a multi-role aerial platform designed not merely to meet today’s needs but also inherently adaptable to the needs of tomorrow** – needs we can’t even reliably predict today.

The SkyGhost aerial platform was designed from the outset to enable quick and cheap manufacturing so that hundreds and even thousands can be produced rapidly within an affordable national budget. The SkyGhost platform is capable of carrying up to 300kg in an internal payload bay while simultaneously being extremely low-observable across radar, thermal, and acoustic domains and thereby much more survivable than any conventional and also expensive air assets.

SKYGHOST AT A GLANCE

300 kg

INTERNAL PAYLOAD

120–160 km/h

CRUISE SPEED

10,000 m

OPERATING CEILING

€250,000

TARGET UNIT PRICE

Finally, SkyGhost and any assets it contains can be **semi-autonomous or fully autonomous**. In semi-autonomous mode a human pilot/mission commander is in control and SkyGhost will only default to fully autonomous mode if communication between the SkyGhost and the control signal fails. In fully autonomous mode, enemy electronic warfare is rendered irrelevant and SkyGhost performs its mission profile and any target identification and interdiction tasks without human intervention. To preclude GPS spoofing or jamming, SkyGhost units also contain independent low-drift inertial navigation systems and the onboard flight control module automatically cross-checks GPS data to INS data. When a meaningful discrepancy is detected, SkyGhost ignores the GPS input and defaults to INS data. SkyGhost can thus operate in highly complex contested environments with little or no strain on human operators.

We shall examine each component of the SkyGhost philosophy in turn to see why this one platform can meet many European NATO requirements at an extremely low per-unit cost.

We can begin with the design philosophy that recognizes we are in a world in which quantity is essential. SkyGhost is therefore designed to be **as cheap and easy to manufacture as possible**. SkyGhost utilizes civilian off-the-shelf components for structural elements and propulsion, thereby reducing cost and minimizing the risk of supply chain bottlenecks. Components include aluminum tubing, plywood, hybrid petrol-electric powertrains, minimal batteries, ducted fans, all wiring, and fractional-horsepower motors and actuators for controlling elements like the cargo bay doors and flight control surfaces.

Multum Aero Systems provides the hardware-based AI modules that perform flight control, mission control, sensor interpretation, target identification, and target interdiction. Multum Aero Systems also provides the radar-absorbent “skin” that renders the already low-observability SkyGhost essentially non-detectable by radar systems. Everything else is off-the-shelf and thus can be sourced locally.

The **low observability** that maximizes survivability is achieved via a blend of approaches. SkyGhost is a flying wing with a very low radar cross-section. Its hybrid propulsion system (which provides mission durations far in excess of any purely electric propulsion system while weighing far less) is internal with heat vented to the upper surface so the SkyGhost thermal signature is almost non-existent and its acoustic signature is likewise almost non-existent. SkyGhost utilizes a proprietary low-cost ultra-thin polyester “skin” impregnated with ultra-thin carbon fibre strands that absorb all civilian and military radar waves and radiate them out as heat. With SkyGhost cruising at speeds between 120 km/h and 160 km/h the modest heat generated by such radiation will be less than 3 degrees Celsius and thus undetectable. SkyGhost is therefore impervious to interdiction by Fox-2 and Fox-3 missiles and provided it operates higher than 3,000 meters above ground level it will be out of range of ground-based anti-aircraft auto-cannon fire.

Unlike expensive and easily abraded anti-radar coatings on stealth fighter jets, the radar-absorbing skin of the SkyGhost is cheap and durable due to SkyGhost’s far lower airspeeds. Whereas an F-22 requires 47 hours of maintenance for every one flight hour, SkyGhost will perform hundreds of flight hours with very minimal maintenance.

The total cost of acquisition and operation, therefore, is a miniscule fraction of a more conventional aerial platform while being much more survivable even in heavily contested airspace.

Now let us consider some of the many roles SkyGhost can fill.

Defense against drone swarms

SkyGhost can provide a highly effective and resilient defense against swarms of one-way attack drones such as the old-style and new-style (turbojet powered) Geran II / Shahed drones. By placing inside the cargo bay of the SkyGhost a low-cost 100w look-down phased-array radar with a 20km radius of view at an altitude of 3,000 meters (the radius obviously increases with altitude) and with SkyGhost remaining on station for extended mission durations, SkyGhost can detect incoming drones regardless of weather conditions. SkyGhost has a maximum practical altitude of 10,000 meters above which detection and interdiction become less effective.

Upon detecting adversary one-way attack drones, SkyGhost adjusts its course to match that of the incoming drones and then uses proprietary onboard AI to select targets, assigns interceptor drones to each target, and guides each interceptor drone onto its assigned target while simultaneously compensating for potential enemy evasive maneuvers, loss of interceptor drones, and other variables.

By communicating with the interceptor drones via fibre-optic thread, no enemy jamming can occur. By utilizing onboard AI so that everything is fully autonomous, no jamming can occur. And because SkyGhost operates *above* the enemy drones, interceptor drones no longer fight Earth's gravity but instead take advantage of it. This single factor renders the turbojet of the new Geran attack drones ineffective for evading interdiction.

This use-case returns Sting-type interceptor drones into the realm of high effectiveness while scaling far beyond anything possible when one-pilot-one-drone operation is required.

Battlefield awareness

SkyGhost can loiter over the desired area and utilize sensors stored in its cargo bay to provide vital information relayed via real-time data streams using focused microwave data links to command and control centers on the ground as well as to local commanders empowered to make tactical decisions based on battlespace information.

Provided SkyGhost operates above the limit of ground-based anti-aircraft guns (3,000 meters) it is essentially untouchable. Only an adversary fighter jet using an auto-cannon could interdict it, but such a jet would be highly vulnerable to any friendly MANPAD or GBAD assets within the area. This is precisely why neither Russian nor Ukrainian jets operate anywhere near the grey zones and the nominal front lines. Risking a \$80 million Su-35 to interdict a \$200k SkyGhost isn't the kind of decision that would result in the enemy commander remaining in post for very long.

A low-cost alternative to AWACS

The astute reader will have realized that its low-observability combined with an operating ceiling of above 10,000 meters means that SkyGhost can provide a very low-cost alternative to conventional AWACS provided it does so in a teaming configuration.

This is how such a teaming configuration works: three SkyGhosts carry radar emitters; separated by many kilometers from each other they operate at a distance behind the lead SkyGhost carrying a passive radar array. The first SkyGhost sends out a radar beam for a specified duration and then switches off. At this point the second SkyGhost sends out a radar beam for a specified duration and then switches off. Finally the third SkyGhost sends out a radar beam for a specified duration and then switches off, with one of the other SkyGhosts resuming transmission in a continual game of on-and-off. Meanwhile the passive radar in the leading SkyGhost records return signals resulting from the transmissions of its team-members behind it.

From the perspective of the adversary, three (or more) different radars in three different locations are briefly turning on and off but there is no way to detect the SkyGhost in which the passive radar receiver is located.

In theory the enemy can launch anti-radiation missiles against the SkyGhosts that are intermittently transmitting in random sequence but with targets appearing only briefly and moving between being switched on and going silent this would require a lot of missiles in order to be an effective counter-measure. Meanwhile the passive receiver in the leading SkyGhost is relaying vital data to ground control centers.

While this does not match the full range of capabilities in a conventional AWACS it does provide significant utility at a tiny fraction of the cost and thus permits saturation views of battlefield airspace in a way no longer possible using conventional AWACS.

Command and control networks

With satellites being vulnerable to both jamming and physical interdiction, with terrestrial wireless networks vulnerable to electronic warfare and ground stations vulnerable to attack, mobile forces need resilient ways to communicate with each other and with headquarters elements.

SkyGhost can provide a rapid aerial mesh network with multiple redundancies, utilizing direct-to-receiver microwave transmissions and/or laser transmissions when atmospheric conditions are favorable. Being constantly in motion, SkyGhost units are difficult to target with counter-microwave jamming and in extremely adverse conditions fibre-optic thread can be used to carry transmissions between SkyGhosts and if necessary even down to ground units.

Last-mile logistics

Next we can consider the problem of last-mile (or, more accurately, last-thirty-kilometers) logistics. As noted earlier, drone saturation has made conventional delivery methods extremely hazardous. Ukraine has attempted to circumvent Russian interdictions by using the Baba Yaga heavy-lift drone but in addition to having a limited (40kg) payload it is vulnerable to Russian FPV drones. Autonomous ground vehicles overcome the weight capacity issue but are very vulnerable to interdiction by Russian FPV drones.

A single SkyGhost can carry 300kg of supplies and when over the destination can release the supply palette. This can be guided autonomously onto its target in the same way as one can guide a glide bomb. Landing the palette can be accomplished either by a crumple cage positioned beneath the palette to absorb the impact or by means of a parachute deployed just before landing and steered toward its final destination. Or a combination of the two approaches can be utilized. The SkyGhost itself can then be reused to resupply other positions in the same manner.

Carrying the battle to the enemy

In addition to the use-cases above, SkyGhost can also be utilized to carry the battle to the enemy. As SkyGhost has minimal radar, thermal, and acoustic signatures, conventional anti-aircraft weapons have less utility against it, resulting in adversary interdictions relying on the use of fighter jets employing auto-cannons. This engagement necessarily must occur at close range (an Su-35 autocannon has an effective range of between 200 to 800 meters against an aerial target).

Should a SkyGhost be sent into enemy airspace armed with sensors to detect adversary aircraft and should that SkyGhost happen to have one or more air-to-air missiles such as the AIM-120 or the MBDA Meteor, this would permit SkyGhost to engage the enemy aircraft long before it achieved sufficient closure with SkyGhost to utilize an auto-cannon. SkyGhost thus presents a very cheap yet highly effective way to degrade adversary capabilities in the air.

Naturally ground targets can be attacked using the same principle: one or more SkyGhosts equipped with relevant sensors and ground-attack munitions would be a very low-cost yet high-effect method of damaging and destroying enemy ground positions and bases.

These use-cases demonstrate some of the utility SkyGhost can provide. As the SkyGhost aerial platform is intentionally multi-purpose it can be adapted for new use-cases as needs arise.

The point of this exegesis is not to claim that SkyGhost can perfectly duplicate or provide all essential battlefield services. Rather, the purpose is to demonstrate that a great deal of capability can be provided at an extremely low per-unit cost, thus freeing funds for far more expensive high-end systems such as interceptor missiles capable of interdicting intermediate-range ballistic missiles and quasi-hypersonic missiles that SkyGhost will never be capable of defeating.

With a target per-unit (empty) price of around 250,000 Euros SkyGhost is sufficiently low-cost that losses are acceptable, which in turn means that SkyGhost can operate in highly non-permissive environments in which other assets would be too costly to expose to risk. This inherent attritability combined with SkyGhost's low observability enables a wide range of mission types for which either very expensive high-end systems would be required or for which human beings would be exposed to significant danger.

In a world in which quantity is becoming an essential asset, SkyGhost offers an unbeatable combination of multiple capabilities combined with low-cost and rapid manufacture. Hundreds and even thousands of SkyGhosts are affordable by even the smallest NATO members, as well as by nations that may have to protect extensive borders with modest budgets.

There are several dual-use applications for non-stealth SkyGhosts, two of which this paper will briefly consider.

Disaster relief

The first obvious civilian use of SkyGhost is in disaster relief. There are many nations in which the rainy season washes out roads or turns them into impassable mud. Meanwhile, villages are damaged, water and electricity supplies are interrupted, and urgent provision of food, potable water, and medical supplies is required.

Without traversable roads, such supplies must either be air-dropped, which can result in supplies landing too far from habitation to be reachable, or transported by helicopter. Helicopters are often in short supply and are expensive per flight-hour.

SkyGhost can transport 300kg of essential supplies at a low cost per flight-hour to remote and inaccessible locations and can air-drop these supplies from as low as twenty meters above ground, thus enabling precision drops with minimal palette protection required.

Environmental monitoring

Another civilian use of SkyGhost is in environmental monitoring. As climate change leads to more extreme weather events, fires are an increasing hazard in many parts of the world. Satellites such as NASA FIRMS have resolutions of around 200–500 square meters and they overfly only twice per day. This means that by the time a fire is detected it is already large, and large fires are more difficult to extinguish than small fires.

By operating on station above prone-to-risk areas and using cost-effective thermal detectors, SkyGhost can detect ground fires when they are only a few meters in size. This enables much more rapid and precise response which in turn means far more fires can be extinguished before they can grow to pose a meaningful hazard. Moreover, unlike conventional small drones for fire detection, SkyGhost units can carry 250kg of fire-suppressant material so that a small fire detected early can be extinguished automatically, further minimizing risk to human lives and dramatically reducing the cost of ongoing fire suppression activities. There is no other fire-detection and fire-suppression combination in the world that is remotely close to being as cost-effective as using SkyGhost in this role.

Multum Aero Systems operates a multi-mode business model in order to maximize the speed with which SkyGhost units can be manufactured and provide operational capability. These modes are described below.

Full-service manufacturing

In this model, clients contract with Multum Aero Systems for delivery of fully-functional SkyGhost units either empty (e.g. ready to fly but with nothing in the cargo bay) or configured for a particular mission type (e.g. with the components necessary to detect and interdict incoming one-way attack drones, or set up to perform AWACS duties, or set up to perform logistics roles, etc.).

Co-production joint ventures

In this model, Multum Aero Systems licenses the design of SkyGhost and provides the various firmware and software modules required for all SkyGhost operations, as well as the radar-absorbing “skin.” Manufacturing and sourcing of all other components and materials is the purview of the joint venture partner, enabling them to select the most appropriate inputs for their region and requirements.

In all cases Multum Aero Systems supplies the hardware and software necessary for customers to program mission profiles, select semi-autonomous or full-autonomous modes, incorporate novel payloads & capabilities into the overall mission set, and maintain each SkyGhost unit for operational readiness.

To learn more, please contact Multum Aero Systems at
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