The Market for Multispectral Camouflage

"The hider-versus-finder competition is real. Losing this competition has enormous and potentially catastrophic consequences."

U.S. Military Strategy Document

A Pickwick Market Intelligence Report

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Introduction, Purpose & Scope

You've probably seen it on the news – a speeding military vehicle pursued by armed drones. The life-or-death race ends with a fiery blast as the aircraft slams into its target. Often the chase occurs at night, unfolding in ghostly black-and-white video from the drone's night-vision camera.

Engagements like these, multiplied by the thousands, demonstrate the battlefield impact of ubiquitous armed UAVs (Unmanned Aerial Vehicles, or drones), which are transforming warfare from Ukraine (UKR) to the Middle East and even Myanmar.

More than ever, the classic military maxim applies: "If the enemy can see you, he can kill you." Modern UAVs can both see *and* kill, helping create a wartime environment of "Persistent ISTAR" (Intelligence, Surveillance, Target Acquisition and Reconnaissance). Drones equipped with sensors and weapons – combined with other intelligence, surveillance and targeting systems, to which UAVs are increasingly linked – place military assets at constant risk of detection and immediate attack.

The military technology "measure/countermeasure cycle" describes how a new innovation (measure) leads to responses (countermeasures). Just as machine guns spurred the deployment of tanks, and jet bombers drove adoption of air-defense missiles, Persistent ISTAR demands new countermeasures to protect troops and equipment.

This report documents the growing market for a crucial response to Persistent ISTAR: "Multispectral Camouflage." Such camouflage (camo) conceals military assets from UAV-borne and other sensors that detect emissions along the electromagnetic spectrum, from visible light and infrared waves to radar. The requirement for multispectral camouflage is simple: If the enemy cannot see you, he cannot kill you.

Western military doctrine emphasizes CCD (Camouflage, Concealment and Deception). This report covers the first two. Not included is analysis of battlefield decoys and EW (Electronic Warfare). Focused on camouflage for ground combat equipment, unmanned systems and troops, the report does not cover classified "stealth" technologies or the over-all market for camo uniforms. It analyzes the addressable US and allied-nation camouflage market, not including products from or spending by Russia and China.

Written for defense executives, military officials and investment professionals, this report aims to provide practical insights on the multispectral camouflage market, its participants and growth prospects.

ISTAR in Ukraine
(Sources: UKR MoD/Shutterstock)

Authors

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Sponsor

This report is sponsored by DECPT, the provider of "*Camofoil*," adjustable nanotech-based stick-on multispectral camouflage. DECPT is a consulting client of Pickwick Capital. www.decpt.dk Contact: info@decpt.dk

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Executive Summary

The multispectral camouflage market is poised for significant growth, driven by the evolving demands of modern warfare, particularly the need to counter "Persistent ISTAR" (Intelligence, Surveillance, Target Acquisition and Reconnaissance).

As demonstrated by combat in Ukraine and the Middle East (and wargaming for possible conflict with the People's Republic of China), Persistent ISTAR is created by the addition of omnipresent, armed UAVs to existing ground, aerial and space surveillance and targeting systems.

ISTAR environments make concealment essential for survival against technologically-advanced peer and near-peer adversaries. This places a premium on "signature management," the reduction of telltale electromagnetic signatures – from radio signals to heat emissions – generated by individuals, combat platforms and units. Never has the battlefield's "hider-versus-finder" competition been more complex, or important.

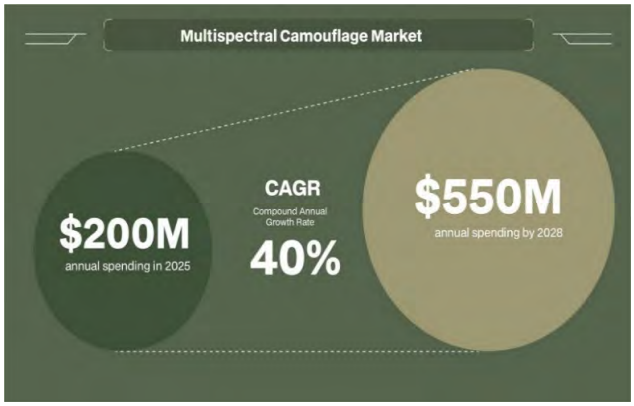
"Multispectral camouflage" is a key component of signature management, designed to prevent military assets from being discovered by sensors operating along the EMS (Electromagnetic Spectrum), from visible light to infrared emissions to radar.

Artillery Piece Under Fibrotex Camouflage Net
(Source: US DoD)

The multispectral camouflage market for ground forces (plus certain maritime and aerial assets) is often divided into a triad of solution types: those for moving equipment such as tanks; static assets such as command posts; and individual troops.

Products include camouflage nets that cover static positions or are placed on vehicles; specialized uniforms and covers for individual soldiers; coatings and paints for equipment; emerging technologies such as stick-on nanotech coverings; and advanced adaptive and active camouflage technologies now in development.

The US and European militaries have been purchasing multispectral camouflage and investing in its R&D for years. These expenditures will likely accelerate due to market drivers such as lessons learned from recent conflicts; the growth of C-UAS (Counter-Unmanned Aerial Systems) programs; preparation for potential wars involving China, Russia, North Korea and/or Iran; increasing global defense budgets; and technological innovation in both camouflage and the sensors that it must defeat.



We believe the multispectral camouflage market for the US, NATO and allied nations currently represents about $200 million in yearly spending and will grow to app. $550 million by 2028, representing a 40% CAGR (Compound Annual Growth Rate). These estimates assume demand by multiple militaries for an increasing number and variety of multispectral camouflage solutions, plus the first large US orders of updated MCS (Mobile Camouflage Systems for vehicles) by the end of our forecast period.

Saab Barracuda MCS on Danish Armored Vehicle
(Source: Danish Military)

Emerging technologies could impact this market on the upside. Deployments of updated mobile systems are expanding across fleets of tanks and IFVs (Infantry Fighting Vehicles) to other platforms, such as tactical and special operations vehicles.

Innovative new camouflage solutions are now able to conceal many smaller battlefield assets that have not previously been protected, potentially producing new customer demand to conceal these assets.

Unmanned, networked and increasingly autonomous ground and maritime vehicles will require their own multispectral camo solutions, opening a significant market.

In the medium term, R&D on "active" and "adaptive" multispectral camouflage systems (see descriptions later in the report) may produce systems that augment or, in some cases, displace legacy technologies.

Companies serving the market include the largest pure-play providers, Saab Barracuda and Fibrotex USA; smaller suppliers of legacy and innovative solutions, such as Ametrine, ArmorWorks and DECPT; and major prime contractors such as BAE Systems and Rheinmetall, which have both announced development efforts involving advanced camouflage (See a list of noteworthy companies later in the report.) This mix of current players, plus others likely to join the market as it grows, likely presages increased institutional investment and M&A in the sector. We believe the multispectral camouflage market may mirror historical patterns in the defense industry, echoing the evolution of markets such as those for night vision technologies and UAVs. To be sure, those sectors have been larger than the camouflage market, but their cycle of innovation, investment and consolidation may be replicated in the multispectral camouflage industry.

Armed UAV on Camouflage Net
(Source: Shutterstock)

Brief History of Camouflage

Few military strategies share the primeval provenance of camouflage. From the time animals first evolved to blend into their surroundings, the "hider-versus-finder" competition determined life-or-death. A predator that could sneak up on its quarry ate. A prey animal that could hide from its hunter survived. Evolution continued to hone animal camouflage, culminating with remarkable examples such as the ability of chameleons and octopuses to change appearance to match their backgrounds (which has inspired R&D in the military camouflage industry).

What is Camouflage?

Militaries use camouflage to prevent adversaries from detecting their assets, protecting them in defensive positions and allowing them to get within striking distance of the enemy while on offense. Military camouflage historically centered on preventing visual detection by exploiting the limitations of human biology. Our eyes can only discern the visible portion of the EMS. They send that limited input to our brain, which then uses imperfect cognitive processes to recognize shapes and other features (While smell and sound play

roles in battlefield detection,[1] the focus of this report is human vision and sensors that detect other parts of the EMS.)

Various principles, many first identified in animals, describe how camouflage works. One is *background matching*. Demonstrated in nature by the white coat of an arctic fox during winter (its fur darkens during the summer to match bare ground), the principle is exemplified by the different colors on camo uniforms designed for snowy environments, woodlands or the desert.

Montage of Background-Matching Camo:
US GIs in WW2; Arctic Fox; UKR Soldiers
(Source: UKR & US Sites)

Disruptive coloration refers to patterns that break up the outline of an object, making it harder for the brain to recognize the form as a known object. Think of the spots on a leopard that create "visual noise" amid the shadows and leaves of trees where the cat lurks. Pixelated shapes on modern camo uniforms involve this principle.

Mimicry entails assuming the appearance of something else. The "walking stick" insect looks like a twig. A sniper in a camouflage "ghillie suit" designed to mimic local foliage may appear identical to a nearby bush. In World War I fake trees were built to house observation posts.

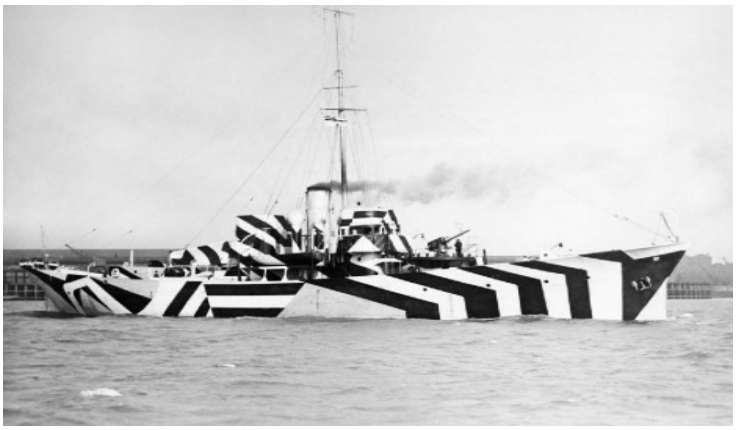
Countershading is when the top of an object is darker and the bottom lighter. Certain sharks display this pattern. When viewed from above, the shark's darker dorsal side melds into the ocean floor. When tracked from below, its lighter ventral surface fades into the glow from the sky.

Countershading on Shark
(Source: US NPS/Bill Fisher)

Countershading has often been employed on military aircraft. When high-flying interceptors look down to spot it, the plane's dark or camouflaged upper fuselage blends into the ground below. Anti-aircraft crews looking skyward for the same plane struggle to distinguish its lighter bottom from clouds or nighttime sky glow (reflected light from the ground).

Countershading on WW2 German Night Fighter
(Source: Max Smith/public domain)

[1] Soldiers operating in close proximity to adversaries have been known to eat only the enemy's food, and avoid deodorants, to prevent smell from betraying them. "Noise discipline" refers to reducing the sounds of military operations, from small unit patrols to submarines.



Dazzle Camouflage on WW1 Ship
(Source: See Footnote Below)

A more dramatic form of camouflage, *motion dazzle,* is based on the fact that humans are extremely adept at detecting movement.[2] Dazzle does not try to hide a moving object but instead attempts to confuse observers about its speed and direction.

Zebra Herd
(Source: Shutterstock)

The pattern works like a zebra's stripes, which can perplex pursuing predators. From World War I to Ukraine, navies have painted warships with dazzle camouflage to disorient enemy gunners.

On the Hunt

Humans at some point in ancient history realized that instead of simply hiding behind the nearest bush to protect themselves from attack or sneak up on prey, they could conceal themselves with what we'd now call camouflage. Ever since, people have camouflaged themselves for the hunt.

Indigenous Hunters Conceal Themselves with Wolf Skins
(Source: *Buffalo Hunters Under the Wolf-skin Mask* by George Catlin)

As with so many of its other innovations, mankind would eventually direct the art of camouflage to war.

Dressing for Battle

While they long understood the value of camouflage for hunting, it took many centuries for humans to adopt it systematically for war. There are scattered historical references to the use of camo by ancient militaries, such as painting warships blue or wearing earth-tone uniforms. But history reveals no methodical employment of camouflage as seen in modern conflicts.

Knights at Battle of Crécy in 1346
(Source: See Footnote 3)

Through the Early Modern Period and even after the first Industrial Revolution, militaries often went to war in the opposite of camouflage.[3]

[2] Dazzle: https://en.wikipedia.org/wiki/Kil-class_sloop#/media/File:HMS_Kildangan_IWM_Q_043387.jpg
[3]Knights: https://tinyurl.com/y7abyhjb

Flamboyant uniforms allowed warriors to "identify friend or foe" in the confusion of close combat and also reflected the concept of chivalric combat between knights.

Unthreatened by precise and devastating long-range attack from rifles, artillery or aircraft, medieval warriors could more easily afford to stand out.

This dynamic continued well into the 19th Century, only beginning to shift when the British Army started to abandon its red coats and other distinctive garb in favor of khaki and olive drab uniforms. But it would take the "Great War," with its accurate long-range weapons and aerial reconnaissance, to launch the modern age of camouflage.

World War I: Birth of Modern Camouflage

World War I not only launched modern camouflage but also provided its name. In 1915 the French Army formed a unit to develop methods for shielding soldiers and equipment from enemy observation. It was called the *camouflage* unit, after the French word *camoufler*, meaning "to disguise" or "to conceal." Artists and engineers – dubbed *camoufleurs* – set to work producing both 2D (e.g., paintings on weapons covers) and 3D (e.g., systems such as camo nets with texture, depth and physical elements to mimic natural textures and blur outlines.)[4]

The *camoufleurs,* as noted earlier, even designed observation posts disguised as trees.

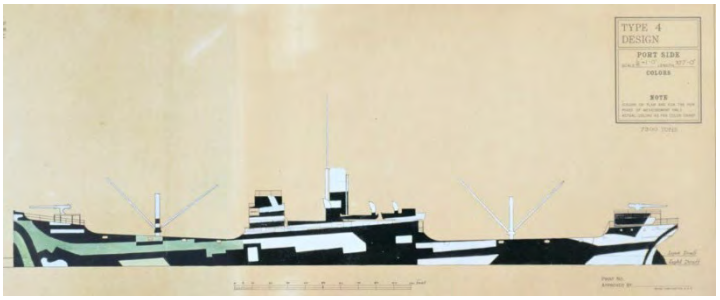
The US and Britain soon established their own camo units, recognizing increased threats from artillery, battlefield optical devices and aerial reconnaissance (which by now included airplanes, balloons and dirigibles).

American and British officers were encouraged by artist Abbott Thayer, author of the book Concealing-Coloration in the Animal Kingdom and often called the father of modern camouflage.

Camouflaged Snake
(Source: Paintings by Abbot Thayer)

Wielding his paintings of concealed animals, Thayer had spent years lobbying the US and Britain to camouflage their military assets before his ideas finally came of age in the Great War.

The "War to End All Wars" prompted innovations still seen today. On the sea, "dazzle" camouflage reduced the accuracy of torpedo and cannon targeting.



Drawing of Ship with Dazzle Camouflage
(Source: US Navy)

The combatants painted camo patterns on their military vehicles and used camouflage nets to conceal positions from ground and aerial observation. Nets were even tested on moving tanks, foreshadowing today's MCS (discussed later in the report.)

World War II: Camouflage at Scale

Military leaders in World War II needed no inspiration from paintings of animals. They understood that advances in weaponry – from accurate tank guns to ground-attack aircraft and

[4] The definitions of 2D versus 3D camouflage vary. We consider camo that covers an asset with layers, such as artificial leaves, 3D.

long-range artillery – meant exposed equipment and troops could attract rapid and accurate strikes.

Most World War II camouflage techniques echoed those from the prior global conflict, just better and more widespread. Camo patterns adorned military vehicles on all sides of the conflict, dazzle patterns were again seen on many ships and camouflage nets sprouted on battlefields around the world.

British Workers Make Camo Nets During WW2
(Source: Imperial War Museum)

The war also stimulated early development of sensor platforms that would one day transform military camouflage. This included night vision technology, field tested by the German military during the war.

But the advancement that most rapidly and fundamentally altered the "hider-versus-finder" contest was RADAR (Radio Detection Ranging), which marked the extension of detection far beyond the visual EMS band.

Radar System in WWII
(Source: US NARA)

Developed shortly before the war, radar technology was enhanced and widely deployed during the fighting (along with its undersea cousin, SONAR, or Sound Navigation and Ranging).

No longer were defenders forced to wait until they could see approaching aircraft or ships. Radar could detect threats at range and, in many cases, help target them with weapons systems.

This new detection measure soon prompted countermeasures, including the development of RAM (Radar-Absorbing Materials) to prevent radars from locking on to targets. By the end of war, some German submarines had RAM on their periscopes, with other anti-radar systems under development.

The imperative to extend camouflage beyond the visual spectrum was now undeniable and poised for rapid innovation in coming years.

Cold War: Beyond Vision

Military competition between the Soviet and US camps during the Cold War propelled innovation in almost every sector of defense technology. Camouflage was no exception.

From 1945 to the late-1990s, military camo grew from painted patterns and fiber nets to early multispectral solutions, driven by the imperative to hide not just from the enemy's eyes, but its sensors.

Advanced reconnaissance and surveillance measures proliferated during the Cold War, including the use of more and increasingly varied sensors on satellites. The improvement and proliferation of sensors capable of detecting emissions along the EMS accelerated the emerging military discipline of signature management.

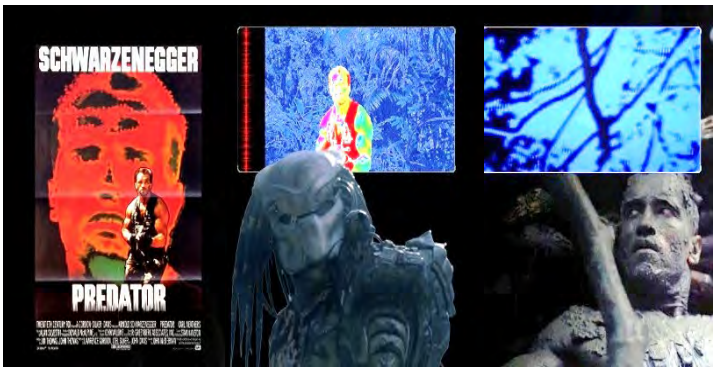
Militaries scrambled to develop countermeasures, especially against radar. Perhaps the most celebrated multispectral camouflage systems

during this period were stealth technologies for advanced aircraft such as the US F-117 "Stealth" fighter.

Ground camouflage also evolved rapidly. In the immediate aftermath of World War II. The US, British and other militaries began refining and expanding the use of camo uniforms, although the focus remained on visual camouflage.

In 1957 a Swedish maker of fishing nets had a brainstorm. He invented and developed the first synthetic camouflage net, designed to replace existing products made of heavier natural fibers. As a nod to its inspiration, the net maker named his new product, and company, "Barracuda." The company would become Saab Barracuda, a major player in today's camouflage market.[5]

Dramatic advances in sensor technologies during the Cold War inspired significant innovation in ground camouflage. New "night-vision" sights detected and visualized EM emissions in the IR (Infrared) range (See more detail on the EMS and sensor technology later in the report.)

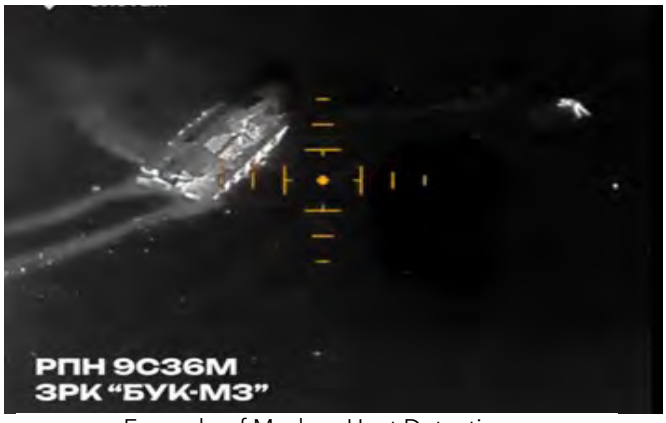


"Thermal Image" Montage from "Predator"
(Source: 20th Century Fox)

Some night vision systems amplified low-level light to reveal targets, sometimes called "image intensification," while others detected heat emitted by objects, in day or night, to generate "thermal images." Warm objects – from people and vehicles to buildings – became observable even in the dark and, with some systems, through fog, smog and dust.

Growing public awareness of emerging sensor measures and the countermeasures to defeat them was reflected in the 1987 movie "Predator." Pursued by a murderous alien using a thermal sensor, the hero realizes he can hide by covering himself with mud to reduce his heat signature.

Once a source of entertainment, today's videos of thermal imagery on the battlefield are all too real, depicting the deadly results of failing to conceal military assets from drones and other weapons targeted by thermal sensors.



Example of Modern Heat Detection
Sensor on UAV Shows Emissions After Attack
(Source: UKR MoD)

With darkness being eliminated as a reliable form of concealment, military technologists began to combine visual camouflage that worked during the day with multispectral camouflage that could protect troops from detection at night.

Soldiers in "BDUs"
(Source: US Army)

An example was the US Army's 1981 roll-out of the Battle Dress Uniform (BDU), a hybrid uniform featuring camouflage patterns made with dyes that also reduced the wearer's NIR (Near Infrared, or reflective IR) signature, making it harder for image intensification technologies to detect. Soldiers were instructed not to starch their BDUs to prevent degradation of the special dyes.

[5] https://www.saab.com/markets/brazil/stories/2018/from-fishing-nets-to-camouflage

BDU-clad soldiers drove military vehicles with their own hybrid camouflage. The Army and other services began using special anti-chemical warfare coatings on vehicles and equipment, coatings that also reduced certain EM emissions.

Among the most significant hybrid camouflage solutions of the Cold War was the multispectral camouflage net. In 1997, the US Army awarded Saab Barracuda a contract worth up to $160 million for its ULCANS (Ultra-Lightweight Camouflage Net System).[6]

Multispectral camouflage nets, stationary and then mobile, would go on to dominate the ground camouflage market, a trend that continues today.

Saab Camouflage Net (current version)
(Copyright Saab AB)

Early 21st Century: Working the Spectrum

The post-Cold War period witnessed a pace of ground camouflage innovation unseen since World War I. The two main drivers: digital technology and multispectral countermeasures.

The US Marines in 2002 introduced their Marine Pattern (MARPAT) camouflage, based on a digital pattern in different colors. MARPAT remains in use more than twenty years later.

The MARPAT was followed by the US Army's Universal Camouflage Pattern (UCP), an attempt to create a single pixelated camo design that would provide effective concealment in multiple environments. What could not be concealed was the fact that the UCP pattern failed to work as promised, leading to the biggest boondoggle in the history of camouflage technology. After an estimated $5 billion spent designing and buying UCP uniforms, the Army eventually switched to a new set of camo patterns and unforms.[7]

Far more effective was the continued development of multispectral camouflage systems, which inspired widespread R&D efforts. The aim was to conceal objects from sensors operating across the EMS, including but not limited to visible, IR and radar bands. A major development was the broad fielding of ULCANS, which gradually replaced less effective camouflage nets.

ULCANS
(Source: USMC)

Widespread production of ULCANS was led by Saab's line of camouflage systems, later joined by products from Fibrotex, an Israeli company, and its Fibrotex USA affiliate. In 2002 Saab announced an order with the American military worth up to $10 billion for its newest ULCANS.[8]

As ULCANS continued to improve, Fibrotex USA won a 2018 American contract for its next-generation nets, a sale worth up to $480 million.[9]

[6] https://www.defenseindustrydaily.com/usas-ulcans-contract-up-to-173b-for-multispectral-camouflage-nets-updated-02357/
[7] https://www.stripes.com/branches/army/army-s-maligned-ucp-uniforms-quietly-retired-years-after-new-camo-design-became-the-norm-1.601442
[8] https://www.saab.com/newsroom/press-releases/2002/saab-barracuda-llc-has-won-an-order-worth-10-billion-dollars-for-its-ulcans-ultra-light-camouflage-netting-system
[9] https://www.militarytimes.com/news/your-military/2018/11/07/more-than-meets-the-eye-army-selects-next-gen-camouflage-system/

The same year Saab announced its own US ULCANS sale, valued at $66 million.[10]

By 2017 the concept behind the ULCANS was on the move – literally. Saab Barracuda began field testing its MSC (Mobile Camouflage System) for US Army armored vehicles. The MCS was designed to be a "second skin" for tanks and infantry fighting vehicles, in effect making the multispectral camouflage net mobile.[11]

As discussed later in the report, Fibrotex soon joined the potentially massive project to equip US and allied vehicles across the world with MCS.

R&D for the next generation of camouflage also accelerated during this era. Major defense contractor BAE Systems announced in 2011 its advanced "ADAPTIV" camouflage system, described as tiles like "a thermal TV screen" that could cover a tank and heat or cool it to match its background (BAE's web site now says the system has additional capabilities and could be ready for production "in two years." See more below.)[12]

The ISTAR Era

The new era of multispectral camouflage centers on the response to the emergence of ISTAR environments, where networks of UAV and other detection and targeting systems place an unprecedented premium on battlefield concealment.

In the years following 9-11, military use of UAVs began attracting public attention, often focused on America's deployment of large drones such as the "Predator" to conduct aerial surveillance and strike enemy positions, and even individuals, seemingly at will. But for years after 2001 only the US and a handful of other nations fielded armed UAVs.

This began to change as countries such as China, Russia and Iran ramped their own UAV programs, producing everything from small drones to long-range platforms. National armies, insurgents and terrorist groups obtained UAVs, from sophisticated military versions to commercial units modified to carry explosives.

Explosive Drone Homes In On Russian Vehicle
(Source UKR MoD)

Still, the broader implications of UAV warfare by nations – especially in conflicts between peer- and near peer-adversaries – received limited consideration. That changed in 2022.

Within months of Russia's invasion of Ukraine, the dramatic impact of UAV warfare between nation states became apparent. "For land forces, the pervasive ISTAR on the modern battlefield and the layering of multiple sensors at the tactical level make concealment exceedingly difficult to sustain," reported the Royal United Services Institute, a leading military think tank, in late 2022.[13]

HOME › LIVE NEWS

Myanmar military adopts anti-junta fighters' drone tactics

Moe Bye (Myanmar) (AFP) – **A Myanmar military drone tracked a car carrying anti-junta forces as it drove through the contested village of Moe Bye. Moments after it parked near a house, the operator dropped an explosive.**

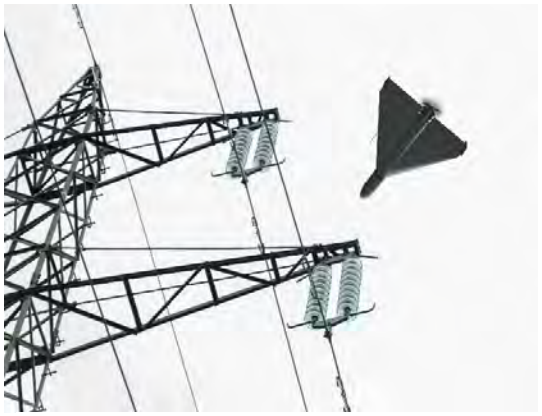
Across the world from Ukraine, the impact of UAV warfare was being demonstrated in Myanmar,

[10] https://www.saab.com/markets/united-states/us-newsroom/news-and-press-releases/2018/saab-to-deliver-camouflage-systems-to-the-u.s.-army
[11] https://www.saab.com/newsroom/press-releases/2017/mobile-camouflage-system-in-use-by-the-US-army-in-europe
[12] https://www.baesystems.com/en-us/feature/adativ-cloak-of-invisibility
[13] https://www.rusi.org/explore-our-research/publications/special-resources/preliminary-lessons-conventional-warfighting-russias-invasion-ukraine-february-july-2022

where drones also created not just a tactical impact, but a strategic one. UAV warfare by insurgents shocked government forces, driving them from "thousands of square kilometers" in 2023.[14]

The same year also saw an upsurge in drone warfare across the Middle East, where the tactical and later strategic utility of UAVs was long recognized.

Houthi insurgents in Yemen, supported by Iran, had employed drones against their regional and domestic enemies, ultimately launching high-profile cross-border attacks on Saudi oil and transportation infrastructure. These attacks helped force Saudia Arabia and the United Arab Emirates into a 2022 cease fire with the Houthis.



Iranian Shahed UAV; Seen from Ukraine to Israel
(Source: Shutterstock)

In the Syrian civil war, years of combat involved at least six combatant countries operating 39 different types of drones, according to one study.[15]

Then came the October 2023 invasion of Israel by Hamas, which took the region's UAV (and missile) warfare to new levels of intensity. Israel deployed drones in operations against Hamas and its Lebanese ally Hezbollah, while Iran provisioned those groups and others with large numbers of UAVs from its increasingly prolific domestic production lines (which also supply drones to Russia).

Iranian-backed forces used their arsenals to expand attacks on targets across the region. Houthi strikes against commercial and military ships in the Red Sea disrupted global trade (and eventually prompted massive Israeli and US retaliation).

On land, Iran and its allies accelerated strikes against US and coalition forces in the area-of-operations overlapping Syria, Iraq and Jordan. One US Army brigade alone sustained more than 170 attacks by drones, rockets and missiles from 2023 to 2024.

The enemy's "weapon of choice" in these engagements was "one-way attack unmanned aircraft system(s)" according to a US Army report. "The brigade's deployment represents the most recent and direct experience of any US Army unit defending against drone attacks and, consequently, an important set of lessons on countering and defending against rockets, missiles, and drones of all sizes," concluded the report.[16]

Tragically, whatever lessons the US Army learned from those attacks were insufficient to prevent a deadly 2024 UAV assault against a US base in Jordan. The January strike killed 3 Americans and wounded many more, leaving the Pentagon in no doubt about the increasing UAV threat.

As the year progressed, Iran and its affiliates turned their UAVs on Israel, launching two massive air attacks and numerous smaller ones. Most Iranian drones, and the missiles launched with them, were

[14] https://www.france24.com/en/live-news/20250109-myanmar-military-adopts-anti-junta-fighters-drone-tactics
[15] https://paxforpeace.nl/news/how-syria-became-a-staging-ground-for-new-drone-wars/
[16] https://mwi.westpoint.edu/understanding-the-counterdrone-fight-insights-from-combat-in-iraq-and-syria/

downed by Israeli and allied aircraft and air defenses, including the "Iron Dome" system.

Then in July a Houthi drone, after traveling an estimated 2,600 kilometers, penetrated Israeli defenses. A few months later, a drone dispatched by Hezbollah, the Iranian-backed militia and terrorist group, struck an Israeli base, killing four servicemen and wounding dozens more.

After that attack, Israeli military officials were forced to admit that even the vaunted Iron Dome could not adequately defend against drones. "This was a difficult event with painful results" said Israeli Defense Minister Yoav Gallant.[17] "We are concentrating significant efforts in developing solutions to address the threat of UAV attacks."

All this likely came as little surprise to Ukraine and Russia, already far along in their responses to the growing UAV and ISTAR challenge. By now massive numbers of armed and sensor-equipped UAVs of all sizes had joined the hostilities in Ukraine.

Both sides increasingly deployed a key countermeasure to the UAV threat: camouflage.

UKR Armored Vehicle with Saab MCS
(Source: UKR MoD)

Solutions started with basic sewn nets and painted camo patterns in the tradition of the WW1 camoufleurs, often combined with traditional methods of concealment such as sheltering in dirt- and vegetation-covered bunkers and behind natural terrain and foliage.

Soon the combatants added stealth paints, equipment cooling systems and other advanced solutions. Ukraine has now demonstrated the value of several current multispectral camouflage solutions, including Saab's MCS.

UKR UAV Image of Warm Truck with *Camofoil* on Left Side of Hood
(Source: DECPT)

The war has also become a proving ground for newer multispectral camouflage systems such as DECPT's *Camofoil*, nanotech-based stick-on multispectral camouflage.

The conflict in Ukraine has proven the critical role of multispectral camouflage in modern warfare, demonstrating that combatants must be prepared for pervasive ISTAR environments in future wars. Combat in the Middle East likely generated similar, if less publicized, lessons, in part relating to multispectral camouflage systems produced by Israeli companies and deployed with the Israel Defense Forces (See information on some of these companies later in the report.)

These lessons are being heeded by defense officials in Europe and the US, who have moved from focusing on anti-terrorism and counter-insurgency operations to conflicts with peer (China), near-peer (Russia) and well-armed (Iran, North Korea) nation states (and potentially combinations of them).

[17] https://www.wsj.com/world/middle-east/hezbollah-drone-strike-kills-4-israeli-soldiers-injures-dozens-911aa861

Such peer- and near-peer conflicts demand paradigm shifts in previous Western defense planning and strategy. Not only are the stakes much higher than in many previous conflicts, but the new scale, strategic tempo and technology cycles will redefine the military landscape.

Beijing has no doubt been incorporating the ISTAR lessons of Ukraine into its own preparations for a potential war with the US and its allies over Taiwan.

The PRC (People's Republic of China) has long focused on UAV technology and its powerful capabilities promise to turn Taiwan's battlefields into an even more challenging ISTAR environment than Ukraine's.

PRC Concept of UAVs as "Blade of Victory"
(Source: Graphic by US Army, See Footnote 20)

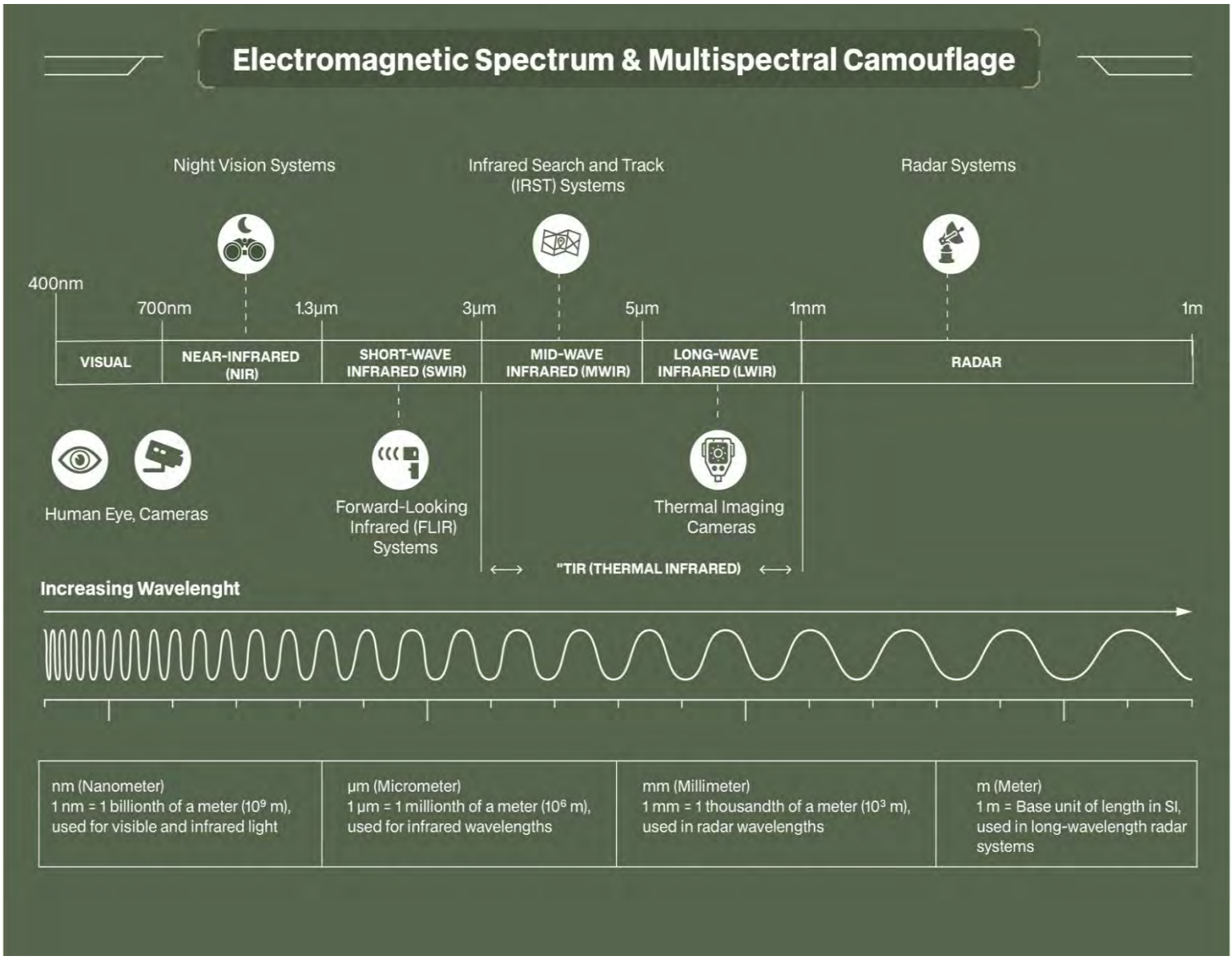
"…PRC developers are demonstrating an interest in additional growth beyond ISR (Intelligence Surveillance & Reconnaissance) and EW into air-to-air and air-to-ground combat, with substantial development efforts to produce swarming (UAV) capability for operational applications," according to a 2024 Pentagon report.[18]

Chinese planners call their drone swarms the "blade of victory," according to PRC strategy quoted by the US Army.[19]

[18] https://media.defense.gov/2024/Dec/18/2003615520/-1/-1/0/MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA-2024.PDF
[19] https://madsciblog.tradoc.army.mil/225-the-pla-close-combat-in-the-information-age-and-the-blade-of-victory/

Electromagnetic Spectrum (EMS), Sensors & Camouflage

The EMS encompasses various types of electromagnetic radiation, or wavelengths. Some of these wavelengths are harnessed by sensor technologies for remote sensing, imaging and detection. Preventing such sensors from detecting military assets is the goal of multispectral camouflage. The graphic below outlines different parts of the EMS, from visual light to infrared and radar, and the sensors that detect them. Note: In signal management, IR portions of the spectrum are sometimes divided into Reflective IR (NIR and SWIR), where camouflage is designed to *match* the reflective spectra of the background (ie, replicate the emissions from surrounding vegetation) and Thermal IR, where camouflage systems *reduce* emitted heat.



The Market

The importance of multispectral camouflage and the forces expanding its market are easier to estimate than its current and future size. Unlike many other defense-related markets, there are few if any detailed and credible reports on this sector's size and growth. Challenges in making such estimates are compounded by the fact that major buyers such as the US government are now evaluating large purchases of current multispectral camouflage, along with R&D investment to develop the next generation.

Methodology and Limitations

For both legacy and emerging camouflage products, current demand is clouded by the lengthy buying cycles of military organizations. Defense customers may see an urgent need to acquire greater capabilities, but it can take years for budgets to reflect that priority. Even when spending decisions are made, their details, such as cost per unit, may not be publicly announced.

Corporate financial disclosures and the revenue reporting found in them provide limited data. Most companies in this market are private and so do not publicly disclose their financials. The public companies that do file earnings reports are so large that sales of camouflage are, relatively speaking, still too small to be broken out in their regulatory reports.

Over recent decades, spending on multispectral camouflage has been lumpy, marked by ongoing smaller orders interspersed with occasional large orders in the hundreds-of-millions or billions of dollars. These large orders have often represented ceilings for multi-year procurements, with actual spending over the contract unclear.

For example, in 2002 Saab Barracuda announced its US subsidiary had "won an order worth 10 billion dollars for its ULCANS ultra-light camouflage netting system."[20] We believe this likely referred to the procurement's total contract value, or ceiling, which can be far greater than the amount ultimately purchased. In this case, Saab Barracuda did see significant orders, but they dropped off sharply as the US reduced operations in Iraq and Afghanistan."[21]

Marines Raise Camouflage Net
(Source: USMC)

The very definition of the market further complicates the task of estimating its size. Multispectral camouflage systems are generally grouped into static, mobile and individual solutions. They include a wide range of products such as camouflage netting systems, both static and mobile; certain components of paints, coatings and dyes used on military vehicles and uniforms; specialized camouflage products, such as camo covers, blankets and "ghillie suits" for snipers; and new categories of multispectral camouflage such as stick-on sheets or emerging "adaptive" camouflage technologies (As noted earlier, the focus of this report is ground combat assets and related systems such as unmanned ground and maritime platforms; we do not include the market for "stealth" materials used on fighter aircraft, submarines and ships, or the overall military uniform or paint/coatings market.)

The emergence, timing and impact of technological innovation complicates market predictions. At least three types of innovation

[20] https://www.saab.com/newsroom/press-releases/2002/saab-barracuda-llc-has-won-an-order-worth-10-billion-dollars-for-its-ulcans-ultra-light-camouflage-netting-system
[21] https://www.fayobserver.com/story/news/military/2014/06/25/business-boom-for-lillington-factory/22189994007/

might have a material effect on this market: improvements in sensors, which could increase and/or change demand for specific camouflage countermeasures; increases in the number and types of military assets that need to be camouflaged; and improvements in camouflage technology itself.

While potential breakthroughs in sensor

Unmanned Vehicles: Air, Land & Sea
(Source: Shutterstock Graphic)

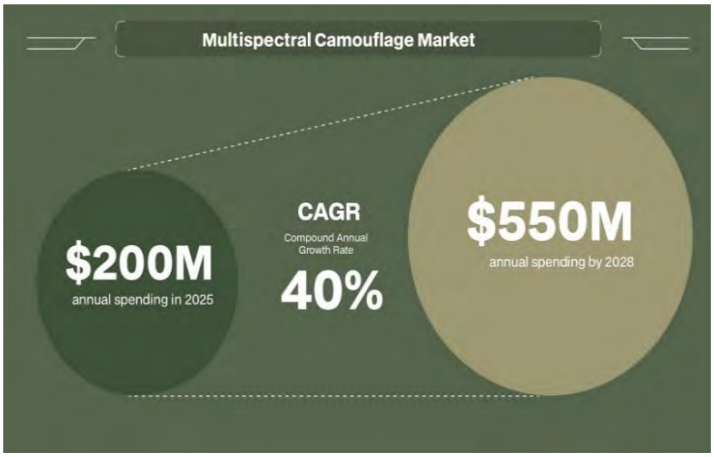
technologies are difficult to predict, an increase in the number and types of military assets that must be camouflaged appears certain. Militaries across the world are increasingly focused on unmanned systems, from UAVs to unmanned ground and maritime systems now proven in Ukraine and the Middle East. The future proliferation of battlefield "robots" and networked autonomous platforms will require more, and more flexible and scalable, multispectral camouflage solutions.

The other type of innovation that impacts market projections involves emerging camouflage technologies. To what extent will they supplement or replace legacy solutions? Recently developed stick-on camo sheets can be shaped and applied by troops in the field, enabling concealment of the large and rapidly growing number of battlefield assets not effectively addressed by legacy camo solutions. The sheets could in theory also replace netting or special paints. Most likely they will be used as the primary camouflage for some assets and a supplement for others. For example, the sheets could fill gaps left by large camo nets or cover higher-temperature surfaces under the nets. The flexibility of these solutions could also help counter AI-powered sensors (See more below.)

Then there are futuristic adaptive camouflage systems heralded for years by large military contractors and research groups (e.g., BAE's "ADAPTIV" system, described elsewhere in this report). If a company offered affordable and scalable camouflage systems that constantly calibrated multispectral protection, matched the visual appearance of vehicles to their backgrounds, or even made armored vehicles look like other objects, the market might well grow even more rapidly.

Size & Growth Summary

For the reasons above, we follow the precept of being approximately right rather than precisely wrong about the size and growth rate of this market. Our estimates should be used for indicative purposes only.



Based on available sales and contract data, input from market participants and the market drivers listed below, we believe the multispectral camouflage market for the US and its allies (not including China and Russia) currently represents about $200 million in yearly spending and will grow to $550 million by 2028, representing a 40% CAGR (Compound Annual Growth Rate). Our estimates assume growing and broad global demand for various multispectral camouflage solutions, plus the first large American orders of updated MCS for US military vehicles beginning by the end of the forecast period.

Emerging camouflage technologies could impact this market on the upside. If a cost-effective capability emerges to camouflage a larger number of military assets, from relatively small objects on the battlefield to unmanned ground and maritime vehicles, demand and spending will probably follow.

Market Drivers

Prior to the 2022 Russian invasion of Ukraine, multispectral camouflage represented a growing market, albeit a modest one compared to large military tech sectors. Two companies, Fibrotex/Fibrotex USA and Saab Barracuda (see company profiles later in this report), dominated the sector with their multispectral camouflage nets, with smaller enterprises supplying everything from nets to "ghillie" camouflage suits for snipers, plus specialized dyes, coatings and paints.

We believe several market drivers will accelerate this market, increasing budgets, generating new business for incumbents large and small, and encouraging new entrants. These drivers include:

Lessons Learned from Recent Conflicts: The urgent requirement for multispectral camouflage has not only impressed senior defense leaders, but the US Congress. The need for better camouflage intersects with broader defense trends such as the development of integrated human, unmanned and robotic warfare. During a speech last year, General James Rainey, Commander of Army Futures Command, reported the US Army has a future warfighting concept with "a very clear theory of victory" but cautioned that "we've got to preserve two things: our people and our ability to do maneuver warfare."[22] This will require battlefield concealment; Rainey's command is among several US military organizations now researching and developing advanced camouflage solutions.

UAV Threats to the US Homeland: Over recent years, unidentified UAVs have been spotted over a number of defense facilities in America, along with many other locations across the country. The Pentagon and civilian agencies have admitted, in effect, that they not only cannot identify the intruders, but lack the policies, permissions and C-UAS technologies to address those drones that pose a threat. Last year the outgoing Secretary of Defense signed the classified "Strategy for Countering Unmanned Systems," which we believe will be adopted in some form by the Trump Administration. The Pentagon announcement of the project was notable for mentioning the UAV threat to the US interior. It highlighted the role of NORTHCOM (US Northern Command; the military's command for homeland defense) as a "lead synchronizer" for the effort. "Unmanned systems pose both an urgent and enduring threat to US personnel, facilities, and assets overseas. Unmanned aerial systems, most commonly known as drones, pose the most significant threat at this time and increasingly in the US homeland. These threats are changing how wars are fought."[23]

"Drones continue to buzz over US bases. The military isn't sure why or how to stop them:" CNN (12/21/24)

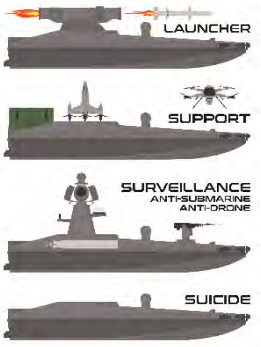
Geopolitical Instability: The Ukraine war and Israeli's fight against Hamas, Hezbollah and Iran have reminded the world that peace is not mankind's default condition. Meantime, the looming prospect of a Chinese attack on Taiwan has galvanized America and its Asian allies.

Massive and Increasing Defense Spending: Global defense expenditures reached $2.46 trillion in 2024, up 7.4% from the year before, according to a leading think tank.[24] US defense spending alone

[22] James Rainey, AUSA Coffee Series, December 13th, 2023. Available at https://www.youtube.com/watch?v=i_6zFKK3LoA&list=PLdbqwk2rR2XKw1mdhodD_bwULVX3dzKIb&index=13
[23]https://www.defense.gov/News/Releases/Release/Article/3986597/dod-announces-strategy-for-countering-unmanned-systems/
[24] https://www.iiss.org/publications/the-military-balance/2025/defence-spending-and-procurement-trends

is expected to reach almost $900 billion in FY2025.

An even larger defense budget for next year is now being considered by Congress. While Trump Administration policies may reduce US defense spending in certain areas such as green energy and the DoD civilian workforce, we believe these cuts may actually free up funding for key technology areas. Military spending by free-world Asian and especially European nations is surging, which will benefit the multispectral camouflage market, especially as a number of companies in the sector are European.



Uses of UMVs
(Source: Shutterstock)

Proliferation of Unmanned Systems: Military leaders and analysts expect future battlefields, including land and sea, to be filled with unmanned vehicles. Many if not most of them will require camouflage.

Technological Innovation: The potential impact of improvements in multispectral camouflage is discussed above. But breakthroughs in sensor technology could also disrupt the market. Imagine the reaction if China were revealed to have new sensors that could defeat current US camouflage and other CCD technologies, exposing American troops to rapid detection and attack. The Pentagon would likely launch major development and procurement programs, as it did when the unexpected and successful use of IEDs by Iraqi insurgents catalyzed the urgent fielding of MRAPs (Mine-Resistant Ambush Protected Vehicles).

Other Market Size Estimates

As part of our analysis we reviewed other market research reports. None of these reports encompasses the entire multispectral camouflage market. They generally cover specific product categories — camouflage nets, textiles & uniforms and dyes/paints/coatings – and vary widely in estimates, detail and quality. However, when combined they do offer a directional perspective on the market.

Textiles & Uniforms

Some military uniforms and specialized apparel, such as ghillie suits, are designed primarily for camouflage and increasingly include multispectral components. General military uniforms must perform a range of functions, but they often incorporate at least limited signature management capabilities, such as anti-IR dyes, along with camo patterns for concealment against human vision.

Sales of "Smart Textiles" for uniforms and other military uses are projected by one market report to increase from over $800 million in 2025 to $1.35 billion by 2028**,** representing a CAGR of 15.37%.[25] More than $1.4 billion in military camouflage uniforms will be sold in 2025 and the market is growing at a CAGR of 3%, according to another report.[26]

Dyes/Paints/Coatings

Since dyes, coatings and paints are often incorporated in the production and pricing of camo nets and uniforms, those analyzing their stand-alone sales volumes must be careful not to "count them twice" by adding their sales to total expenditures on nets and uniforms. And, as noted earlier, true "stealth" coatings for advanced fighters and bombers, ships and submarines are not part of this report. However, growing sales of camouflage dyes, paints and coatings provide context on the broader market.

2025 sales of camouflage coatings could substantially exceed $250 million and grow at a

[25] https://www.mordorintelligence.com/industry-reports/smart-textiles-for-military-market
[26] https://www.researchandmarkets.com/report/military-camouflage-uniform?srsltid=AfmBOopIynkRfh2TDOeYphQOCSKjmWRlYh0FG_D67EFo7jzIGXvhOIlk

11.61% CAGR, according to one report.[27] More than $80 million in stealth coatings will be sold in 2025 and the market is growing at a 4.87% CAGR, according to another study.[28]

An example of the use of coatings, paints and dyes is provided by the US military's Chemical Agent Resistant Coating (CARC), which while developed to provide protection against chemical weapons also conveys multispectral camouflage benefits. The US Army and Marines have painted their combat systems with CARC at a potential total cost of over $40 million, according to budget extrapolations made by The Spectrum Group based on publicly-available data.

Camouflage Netting

The dominant, market pacing product category in this sector is camouflage netting, which has been used for many decades and is now generally made with multispectral shielding for military uses. Estimates of the global size and growth of the multispectral netting market vary widely:

- $640 million this year, growing at a 4.5% CAGR.[29]
- More than $570 million this year, growing to $868 million by 2030, representing a CAGR of 8.6%.[30]
- $134 million by 2033, growing at 8.9% CAGR.[31]

While these reports agree the sector is large and growing, with America as the major market, they not only vary significantly on their top lines but also include spending outside the scope of this report, such as purchases by China and camo nets sold into the commercial outdoors market. On the other hand, these reports appear to rely largely on pre-Ukraine War analysis, which would likely underestimate demand for multispectral camouflage.

The US Netting Market: ULCANS & MCS

As part of our analysis, we reviewed publicly-available data on recent purchases and business activities in the military multispectral camouflage net market.

The US military launched a major new initiative to purchase advanced camouflage in 2018, awarding Fibrotex USA a 10-year, $480 million order for its ULCANS (Ultra-Light Camouflage Netting System), typically a static system placed over command posts, artillery positions, parked vehicles and other stationary assets.[32] The Army and Marine Corps have so far spent around $375 million on procurement task orders for ULCANS, according to government contract databases. Various other US Department of Defense entities have purchased approximately $16 million in additional Fibrotex products.

Soldier Under Camo Net
(Source: US Army)

Saab has also earned US orders for its version of ULCANS, including an app. $66 million order from the US Army in 2018.[33] (Saab also offers a related type of camo net called ULCAS, for Ultra-lightweight Camouflage Screen.)[34]

[27] https://www.zionmarketresearch.com/report/camouflage-coatings-market
[28] https://www.prnewswire.com/news-releases/stealth-coating-market-size-is-set-to-grow-by-usd-76-98-million-from-2022-to-2027--the-rise-in-the-adoption-of-multi-spectral-camouflage-is-an-emerging-market-trend--technavio-301864735.html
[29] https://www.futuremarketinsights.com/reports/camouflage-netting-market#:~:text=The%20global%20camouflage%20(CAMO)%20netting,USD%20951.2%20million%20by%202034.
[30] https://www.openpr.com/news/3742918/multispectral-mobile-camouflage-market-anticipated-to-reach
[31] https://www.datainsightsmarket.com/reports/multispectral-camouflage-nets-50719
[32] https://www.defensedaily.com/army-awards-fibrotex-usa-10-year-480-million-deliver-new-ultra-light-camouflage/army/
[33] https://www.defensedaily.com/press-releases/saab-to-deliver-camouflage-systems-to-the-u-s-army/
[34] https://www.saab.com/products/ulcas

Multispectral nets remain a priority for the US military and Congress. The recently-passed FY2025 NDAA (National Defense Authorization Act) includes a $40 million "Program increase: Ultra-lightweight camouflage net system increment 1."[35] The Army has stated "(Fibrotex's) ULCANS Increment I is a state-of-the-art camouflage system" and has recommended units prioritize using the new ULCANS for their most strategic assets.[36]

"Next generation ULCANS offer unparalleled protection for the warfighter and greatly enhance survivability against the latest sensor threats," the House Appropriations Committee has written, encouraging the Army to accelerate its purchases of the systems.

The American military is also moving to procure MCS nets, installed on military vehicles to protect them both during movement and rest. The Pentagon apparently intends both to purchase existing MCS systems and help develop new ones.

As detailed below, the US Army has been developing MCS solutions from Fibrotex for use on the service's massive fleet of BFVs (Bradley Fighting Vehicles.) Saab Barracuda is now working with Oshkosh Defense to integrate Saab's MCS onto the JLTV (Joint Light Tactical Vehicle), a program representing thousands of US vehicles and trailers.[37] Saab has a relationship with Tulmar Safety Systems, a Canadian company, to produce camouflage systems for the North American market.[38]

International Sales

Saab reports its advanced camouflage systems have been delivered to more than 45 countries (Other references estimate Saab has sold such systems to 60 countries.)[39] France reportedly ordered 3,000 multispectral camouflage nets from Saab last year as part of an ongoing procurement.[40] That same year the company announced a partnership with a British firm to deliver MCS for the British Army's Ajax fighting vehicles, estimated by one source to include almost 600 vehicles.[41]

British Soldiers Push Artillery Piece Under Camo Net
(Source: Shutterstock)

Saab also received orders from the Canadian and Danish militaries in 2019.[42] [43] Denmark in February 2025 announced the completed integration of the SAAB MCS solution on its CV90 IFVs. "The concealment is the first layer of security for the soldiers. If the enemy can see you, he can also hit you in the worst case. Therefore, it is no longer enough to be hidden from the naked eye. You must also be able to operate safely without being seen through sensors and IT systems," explained a representative from the Protection and Concealment Department at Denmark's defense procurement organization.[44]

[35] https://armedservices.house.gov/ndaa/fy25-ndaa-resources.htm
[36] https://www.ascrad.army.mil/News/Article/2461819/camouflage-ulcans-increment-i-debuts/
[37] https://www.saab.com/newsroom/press-releases/2023/saab-showcases-missile-system-on-oshkosh-vehicle-at-dsei
[38] https://www.tulmar.com/news/tulmar-safety-systems-inc-collaborates-with-saab-to-meet-the-rising-demand-for-advanced-camouflage-systems/
[39] https://www.saab.com/newsroom/press-releases/2022/saab-provides-camouflage-systems-to-france
[40] Saab to Provide 3,000 Camouflage Nets to France, The Defense Post, Feb. 29, 2024; https://thedefensepost.com/2024/02/29/france-3000-camouflage-nets-saab/
[41] https://thedefensepost.com/2024/02/23/uk-local-barracuda-camouflage-production/
[42] https://www.saab.com/newsroom/press-releases/2019/saab-receives-order-for-multispectral-camouflage-systems
[43] https://www.saab.com/newsroom/press-releases/2019/royal-danish-army-orders-camouflage-from-saab
[44] https://www.forsvaret.dk/da/nyheder/2025/det-forste-lag-af-sikkerhed-ny-sloring-monteret-pa-infanterikampkoretojer/

R&D Portends Growth in the Market

Military organizations in Europe and America – including the US Army, Navy and Special Operations Command – have been placing increasing emphasis on R&D for multispectral camouflage. For the Army, this involves a greater priority on "sensing/counter-sensing" technologies, including camouflage applications for the service's coming generation of remote-controlled, unmanned and increasingly networked and autonomous weapons systems.

"(W)e are leading several multi-service programs to develop improved camouflage…trying to mitigate the performance of the naked eye as well as emerging sensors threats," noted an official at the Army's Combat Capabilities Development Command (DEVCOM), Disruptive Materials and Fibers Team in the Soldier Protection Directorate, in 2022.[45]

During FY2022-24 the Army initiated an MCS program under Product Manager - Force Sustainment Systems (PM-FSS) to improve the service's multispectral camouflage capabilities. The Army seeks a system that "enables combat vehicle protection and survivability against current peer and near-peer threats; defeats enemy targeting and surveillance systems through multi-spectral concealment (UV, VIS, NIR, SWIR, Thermal, Radar); enables multi-domain operations in A2/AD [anti-access/area denial] environment(s) and provides operational units layered protection and concealment against long-range precision fires, drones, ground, aerial, and satellite threats."[46]

Analysis of contracting databases indicates the Army several years ago awarded OTA (Other Transaction Authority) contracts to least four different organizations for a prototype MCS system. Awardees were the University of Houston; Ametrine, Inc.; Fibrotex USA, Inc.; and ArmorWorks, Inc. This work was completed in support of requirements for the BFV and field command posts.

Public information indicates that Fibrotex USA may have delivered a developmental mobile camouflage system during FY2025, suggesting Milestone-B decisions were confirmed and at least one vendor was selected for prototype testing, Spectrum Group analysts report. To our knowledge, the effort's potential contract value and acquisition strategy have not been publicly revealed, although some industry participants, as discussed earlier in the report, expect MCS solutions for US combat vehicles to represent hundred-of-millions of dollars of spending, or more, over coming years.

Prototype Unmanned Ground Vehicle (UGV)
(Source: US DOD)

Along with procuring multispectral camouflage for existing vehicles, the Army appears interested in camouflage for the coming generation of UGV (Unmanned Ground Vehicle) platforms, including autonomous and robotic systems. "Soldier Protection Technology (Novel Camouflage and Concealment Materials)" was included as a development program in the US Army budget requests for FY2025 with a focus on "autonomous assets in support of small dismounted Soldier (sic) teams and unit formations." Funding for this initiative over coming years may reach $10 million per annum.

[45]https://www.army.mil/article/253962/devcom_soldier_center_continues_longtime_leadership_role_in_camouflage_development
[46] Research by The Spectrum Group.

Multispectral camouflage is a key component of an updated BAA (Broad Agency Announcement) issued in January 2025 by the US Army's ERDC (Engineer Research And Development Center). The BAA will fund camouflage research focused on "fixed-facility survivability incorporating signature management and other technical effects. Fixed facilities include stationary and relocatable high-value targets. The general goal is to directly and indirectly increase the survivability of US and Allied facilities and improve the US and allied counterintelligence, Surveillance, and Reconnaissance (counter-ISR) capability against adversaries."[47]

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SOCOM (the US Special Operations Command) is also evaluating and planning to procure additional signature management solutions and multispectral camouflage for both vehicle and soldier systems. The Command reports the following requirement: "Reduce Signature: Low observability technologies to reduce or confuse detection of SOF manned and unmanned mobility platforms across the full spectrum (visual, acoustic, thermal) are required." Public information on SOCOM budgets for this requirement is limited.

Along with solutions for military vehicles and other platforms, the US military continues to research uniforms with multispectral camouflage. The Army last year released a request "on behalf of the Natick Soldier Systems Center for the Prototype: Reversible Signature Management Overwhite Garments project, which seeks to develop reversible camouflage-printed fabrics with infrared-mitigating properties," reported a defense industry publication last year.[48]

These R&D efforts may prove beneficial for innovative new entrants to the camo market. Senior US defense officials have recently pledged to accelerate the development and fielding of advanced technology to more closely match the rapid technology implementation cycle in the Ukraine conflict.[49] This includes incorporating emerging and non-traditional companies in key procurements, plus purchasing technology in smaller but more frequent tranches to break multiyear "vendor lock" by traditional defense contractors.

Airman Under Camo Nets
(Source: US Air Force)

Expenditures by Market Participants

Supporting estimates of a significant and growing camouflage market is the presence of more than a dozen noteworthy companies in the market (See a list of them below.) These enterprises range from international prime contractors to small, specialized providers. The marketing, product sales and R&D spending of these companies, though not publicly revealed, appears to be significant. This demonstrates, we believe, that well-informed management teams believe this market is poised for growth.

[47] https://www.erdcwerx.org/wp-content/uploads/2025/01/W912HZ25BAA01-January-2025.pdf
[48] https://www.militaryaerospace.com/sensors/article/55042533/camouflage-multispectral-infrared-sensors
[49] General Rames Rainey, Commander of Army Futures Command, has stated that "Ten-Year Programs of Record are not going to cut it," advising that future acquisitions will be capabilities-based and purchased in tranches in order to obtain best-in-class solutions by recompeting acquisitions every 18-24 months.

Noteworthy Companies

The companies below are among the better-known providers of multispectral camouflage products. The overviews that follow and the claims in them are based largely on the companies' own corporate descriptions and other public information. The information has not been independently verified. Contact the company for further information.

Ametrine (US/Israel) focuses on developing high-performance camouflage coatings and materials that enhance survivability by reducing thermal and infrared signatures. Its expertise extends to both static and mobile applications, making the company a critical supplier for military vehicles, shelters and permanent installations requiring multi-domain concealment. https://ametrine.tech/

ArmorWorks (US) develops multispectral camouflage solutions with a focus on tactical effectiveness and durability. Its TactiCam systems provide advanced concealment for personnel, vehicles and infrastructure, incorporating low-observable materials that counter thermal and electromagnetic detection. https://armorworks.com/tacticam/

BAE Systems (US/UK) is pioneering advanced adaptive camouflage technologies such as the ADAPTIV Cloak, a thermal camouflage system that mimics background heat patterns to render vehicles "invisible" to infrared sensors. The company's research into dynamic concealment ensures continued innovation in battlefield stealth capabilities. BAE's undated Web page, as of this writing, claims its technology will be able to superimpose images of other objects on camouflaged vehicles, making "a tank look like…a cow," and could be ready for production in two years.[50]

BAE web sites also mention "Cuttlefish" adaptive camouflage, which appears similar to ADAPTIV.[51] https://www.baesystems.com/en-us/feature/adativ-cloak-of-invisibility

BCB International (UK) provides advanced camouflage and concealment solutions designed for both military and special operations forces. Its portfolio includes thermal and radar-masking textiles, as well as advanced signature reduction solutions for personnel and vehicle concealment. https://www.bcbin.com/Catalogue/Resources/Product-Data-Sheets

DECPT (US/Denmark) offers *Camofoil*, a nanotechnology-based multispectral camouflage solution in the form of cost-effective, field-applicable and adaptable stick-on foil. Supplied at scale, *Camofoil* is a versatile signature management solution applicable across platforms and domains. Its core technology enables rapid updates to keep pace with the high turnover rates of modern conflict. Supports AI spoofing. https://www.decpt.dk

Fibrotex USA (US/Israel) provides the full triad of traditional multispectral camouflage products – static, mobile and individual. Fibrotex USA is a major supplier of full spectrum camouflage solutions to the US military. Its $480 million contract with the US Army for ULCANS cemented Fibrotex' position as one of two leading pure-play providers in the industry. https://fibrotexusa.com/about-us/

HyperStealth Biotechnology Corp. (Canada) reports its HyperStealth® camouflage patterns have been used on large numbers of military uniforms and vehicles. The company is developing advanced solutions such as "Smartcamo," an "intelligent textile which changes its color to match

[50] https://www.baesystems.com/en-us/feature/adativ-cloak-of-invisibility
[51] https://www.baesystems.com/en/product/cuttlefish-adaptive-camouflage

the background of the wearer…" https://www.hyperstealth.com/aboutus.html

Intermat Defence (Greece) specializes in multispectral camouflage coatings and low-observable solutions for military vehicles, aircraft and naval assets. Its proprietary paint technologies significantly reduce detectability in visible, infrared and radar spectra, offering long-term durability and high adaptability to various environments. https://intermatdefense.com/

J and S Franklin Ltd (UK) is a trusted supplier of tactical and static concealment solutions, providing camouflage netting, shelters and defensive structures used by NATO and allied militaries. Its products are designed for rapid deployment and superior concealment, supporting forces in both urban and wilderness operations.
https://www.franklin.co.uk/shelters-and-camps/camouflage-nets.html

Leo Technologies (Finland) specializes in high-performance multispectral camouflage systems tailored for extreme environmental conditions. Its technologies include advanced fiber-based camouflage materials that disrupt detection across optical, infrared and radar wavelengths. http://www.leo-tech.fi/products/camouflage-systems/

Miranda Berberys-R (Poland) is a European leader in multispectral camouflage, developing advanced concealment systems for both personnel and vehicles. Its solutions integrate optical, infrared and radar reduction technologies, making the company a preferred supplier for NATO and allied forces requiring high-performance camouflage. https://mirandamilitary.co.uk/

Noble Biomaterials (US) is a leader in conductive fabric technology and develops multispectral camouflage textiles that integrate low-observable properties. Its materials help reduce radar cross-sections and thermal signatures, making them ideal for military uniforms and equipment. https://noblebiomaterials.com/multi-spectral-camouflage-and-low-observable-and-fabric/

Polaris Solutions (Israel; See Spectral X, below, for US affiliate) provides "advanced survivability solutions" including signature control and management products. Offers "Kit 300" camo sheets that can also be used as stretchers, according to media reports. Founded by Israeli veterans who recognized the need for protection against night vision and thermal imaging during the 2006 war in Lebanon.
https://polarisolutions.com/

ProApto Camouflage (Italy) is a leader in multispectral camouflage, offering over 200 individual concealment solutions for personnel, vehicles and drones. Its patented systems integrate visual, near-infrared, and thermal-infrared technologies, ensuring effectiveness across all biomes.
https://www.proapto-camouflage.com

Ray Service (Czech Republic) is a specialist in electronic camouflage and stealth solutions. It focuses on integrating advanced wiring and low-observable technologies into military vehicles. Its expertise extends to multispectral concealment systems that provide electronic and radar suppression capabilities. https://www.rayservice.com/?s=camouflage

Rheinmetall (US/Germany) integrates multispectral camouflage with its armored-vehicle protection systems, offering advanced solutions for ground forces operating in high-threat environments. Its expertise lies in combining radar and thermal suppression technologies.

https://www.rheinmetall.com/en/microsites/across-project

Saab Barracuda (US/Sweden) Saab Barracuda, along with Fibrotex USA, is a pure-play leader in multispectral camouflage, providing advanced solutions that counter threats across optical, thermal and radar spectrums. It has sold static and mobile nets to dozens of countries. Saab's flagship MCS is widely used on NATO military vehicles, ensuring reduced visibility across various detection methods. The company's partnership with Oshkosh positions it as a contender for wider deployment on the US Army's JLTVs program. https://www.saab.com/products/mcs-mobile-camouflage-system

Spectral X (US; see Polaris Solutions, above, for Israeli affiliate) offers signature management technology, which based on the company's web site appears focused on individual camouflage. https://spectral-x.com

Howitzer with Camo Net Positioned Behind Foliage
(Source: UKR MoD)

Suppliers at a Glance

Note: Information in this matrix is from company web sites and other public information, which may be limited, outdated or inaccurate. See additional information above in the "Noteworthy Companies" section of the report. Contact the company for further information.

Company	Products*	Platforms	Comment
Ametrine https://ametrine.tech	"Flint," a multi-layered composite coating	Focus on solutions for individuals, moving to mobile	Web site & distributors reference thermal/multi-spectral capabilities, but site does not detail exact spectral coverage; special operations focus
ArmorWorks https://armorworks.com/tacticam	"TactiCam™" 3D passive signature management system	Various	Tailored to specific vehicles
BAE Systems https://www.baesystems.com/en-us/feature/adativ-cloak-of-invisibility	"ADAPTIV" "Cloak of Invisibility" camo: Modules to cover flanks of vehicles, starting with CV90 combat vehicles	Vehicles	Available "in two years" https://www.baesystems.com/en/product/cuttlefish-adaptive-camouflage
BCB International https://www.bcbin.com	Nets, panels and suits	Various	Products include lightweight camo "tunnel"
DECPT https://www.decpt.dk	"Camofoil:" Stick-on nanotech-engineered foil	Platform Agnostic; Can be placed on any asset, including in field	Tailored for priority wavelengths & patterns. High-volume, rapid & adaptable deployment. Cut to shape, applied to any surface and object. Stand-alone solution or complement to other systems.
Fibrotex USA https://fibrotexusa.com/about-us	ULCANS, MCS and camo suits	Full triad of static, mobile and individual solutions	Leading provider to US military and other customers; well positioned for large MCS contracts for American military vehicles
Intermat Defence https://intermatdefense.com	Stick on "CHAMELEON SKIN" & Stealth Capability Coating System (SCCS)	Vehicles, weapon systems and infrastructure	Coatings which when applied on any platform suppress drastically its emissions
J & S Franklin Ltd https://www.franklin.co.uk	Camouflage nets and concealment systems for multiple terrains	Various	Also offers ghillie suits with "multi frequency protection"

Leo Technologies http://www.leo-tech.fi/products/camouflage-systems	High-performance multispectral camouflage systems tailored for extreme environmental conditions	Mobile & static platforms; uniforms	Used by Finnish Defense Forces since 2007
Miranda https://mirandamilitary.co.uk	Integrates optical, infrared and radar reduction technologies	Nets, fabrics and uniforms	Tailored to individual vehicles
Noble Biomaterials https://noblebiomaterials.com/multi-spectral-camouflage-and-low-observable-and-fabric	Multi-spectral shielding materials for military uniforms and equipment	Various	"Low observable" materials for everything from uniforms to submarines and jets
ProApto Camouflage https://www.proapto-camouflage.com/about-us	Includes "RECONDOR" anti-drone counter-thermal cloak	Individual	Claims to offer "widest choice" of 3D camo
Ray Service https://www.rayservice.com/?s=camouflage	Stationary camouflage systems	Static assets	Asserts its camo nets can reduce temperature of shielded vehicles by up to 8◦ Celsius
Rheinmetall https://www.rheinmetall.com/en/microsites/across-project	ACROSS project: adaptive camouflage for land systems	For "soldiers and vehicles" (see detail later in report)	"(E)nd date" of development on 5/31/27
Saab Barracuda https://www.saab.com/products/mcs-mobile-camouflage-system	"Barracuda" ULCANS/ULCAS and MCS	Full triad of static, mobile and individual solutions	Used by American and multiple European militaries & being integrated with JLTV; well positioned for large MCS contracts for American military vehicles
Spectral X https://spectral-x.com	"Next-Level Stealth: Thermal Visual Concealment (TVC)"	Web site mentions camo solutions for individuals and various platforms	Offers variety of "survivability solutions" beyond camo; Founded by Israeli veterans (Polaris Solutions is associated company in Israel)

Soldiers Raise Camo Net with Snow Pattern
(Source: US Army)

Investment & M&A Considerations

The multispectral camouflage market appears poised for moderate to rapid growth, fueled by the market drivers discussed earlier in the report.

The fragmented market includes a mix of participants: two leading pure-play incumbent providers of multispectral camouflage solutions; several smaller, agile companies offering both established products and innovative solutions; and large prime contractors that have been developing advanced camouflage solutions, though with unclear market entry and growth plans.

Thus far the sector has seen little funding from institutional investors and limited M&A (one of the last significant, publicly-disclosed transactions was Saab Barracuda's 2002 purchase, for undisclosed terms, of the company that would become its US subsidiary.)

This lack of market activity likely stems from a variety of factors, among them the relatively limited size of the multispectral camouflage market. In the defense market, technology segments with anticipated sales below $200 million a year are small and may fail to attract the corporate development interest of Tier 1 and Tier 2 defense contractors. Such an addressable market size also fails to inspire enthusiasm from many institutional investors seeking to build up smaller companies for eventual sale to prime contractors. Adding to these challenges has been uneven government spending on multispectral camouflage. As described earlier in the report, a tide of spending on legacy camouflage nets during the peak of US military action in Iraq and Afghanistan waned as America reduced its forces there.

We believe these dynamics are changing rapidly. The $480 million order for Fibrotex ULCANS systems in 2018 demonstrated the desire of the Pentagon, and Congress, to update the military's multispectral camouflage. While details have not been publicly released, R&D activities involving MCS systems for the BFV and JLTV fleets appear to foreshadow large orders.

This development activity has likely been accelerated by the lessons of recent combat in Ukraine and the Middle East, which have clearly been heeded by US, NATO and other allied militaries. Pentagon planners, having worked for years to prepare for war with China, have good reason to believe that conflict would involve an even fiercer ISTAR environment than Ukraine's.

As America and its Asian allies, especially Japan, invest more to prepare for conflict with China, Europe is also rearming at a rate unprecedented in recent decades. We anticipate that most future European defense spending will be focused on potential conflict with Russia, where multispectral camouflage will be critical. The end result will be a growing international market for multispectral camouflage solutions.

Airman in Ghillie Suit
(Source: US Air Force)

This growth may encourage greater investment and M&A in the sector. Historical defense industry trends suggest that larger defense contractors may seek to acquire multispectral camouflage producers, both those with proven products and smaller firms developing innovative solutions.

The multispectral camouflage industry may well progress through phases similar to other defense technology markets, such as those for night vision devices and UAVs. We believe the camouflage market will be smaller than those sectors, in part due to the commercial markets for UAVs and, to a

lesser extent, night vision technology. But the evolution of the multispectral camo industry will likely be similar.

Western defense-tech market cycles have reflected a pattern of innovation, growth and consolidation, driven by government R&D, venture capital (which has flooded into the defense industry over recent years), growth equity and M&A.

Government funding often dominates the innovation phase. Both night vision and UAV technologies had been in development for years – a type of UAV was even tested in World War I – before demonstrating their value on the battlefield and attracting wider attention during the Vietnam War. The night vision industry began to scale in the 1980s with the UAV market beginning its rapid ramp not long after. Growth accelerated as VC and private equity entered the sectors. Eventually M&A led to increasing consolidation of the markets.

Troops Seen Through Night-Vision Sensor
(Source: UKR MoD)

The multispectral camouflage market may be poised to follow a similar path. As demand for advanced camouflage increases, investment and M&A activity will follow. Early-stage innovators will drive technological breakthroughs and large defense contractors will seek strategic acquisitions for the lucrative government contracts they will help win.

This dynamic environment may present opportunities for institutional investors and defense companies seeking to establish a strong presence in this high-growth sector.

Vanishing Point: The Future of Camouflage

The market for multispectral camouflage represents a textbook example of the military technology measure/countermeasure cycle.

Current providers continue innovating to make their products more valuable against existing sensors. This can include expanding concealment across a broader range of the EMS; adapting solutions for use on ground, maritime and aerial manned & unmanned systems; and adding operational value, such as new Saab technology to allow radio signals to pass through multispectral camo nets.[52]

Meantime, researchers are exploring next-generation camouflage, including technology capable of defeating advanced sensors (likely to be supercharged by AI pattern recognition.)

As detailed earlier in the report, the US military continues to invest in R&D for advanced camouflage, a trend we expect to accelerate. The European Defence Agency (EDA) announced in 2023 its own program to develop ASCALS (Advanced Solutions for Camouflage of Land Systems) by "finding new materials and their application processes for active and adaptive camouflage in the visible, infrared and radar ranges."[53]

Next-generation camouflage is sometimes divided into "Active" and "Adaptive" systems.

"Active Camouflage" uses technology to manipulate the appearance or thermal signature of an object, such as by using LED (Light-Emitting

[52] https://www.defensenews.com/global/europe/2023/09/08/saab-debuts-camo-net-that-lets-soldiers-radio-signals-pass-through/
[53] https://eda.europa.eu/news-and-events/news/2023/06/22/new-eda-project-to-identify-smart-and-adaptive-materials-to-enhance-camouflage-of-land-systems

Diode) screens mounted on an armored vehicle (see BAE Systems' pending "ADAPTIV" technology.[54]) Active camouflage systems typically require a power source and may soon be enhanced by AI systems that allow the systems to update their patterns continuously to match the surrounding environment.

"Adaptive Camouflage" usually refers to systems that adjust to environmental changes without dedicated energy sources or complex electronics. Adaptive camouflage concepts are often inspired by the specialized skin and muscle cells that allow octopuses and other cephalopods to change color and texture in reaction to their backgrounds. "Smart textiles" that react to environmental stimuli fall in this category.

"Scientists claim breakthrough camouflage material can turn people 'invisible'— New material may enable simpler and less expensive camouflaging technology, researchers say:"
Independent, 12/5/24

Chinese scientists have recently claimed research advances that could allow production of materials that change colors at the molecular level to blend in with their surroundings. "In essence, applying this technology to clothing could make an individual effectively 'invisible,'" one researcher asserted.[55] A related Chinese project focuses on "innovative photonic structures integrated with dynamically reconfigurable materials for adaptive multispectral camouflage."[56]

As camouflage improves, so too will target recognition systems, including those powered by AI and quantum computing. In the future, software will become increasingly important for both concealing and detecting targets. "Right now, we use all this green stuff, we paint our face, we put trees on us and do all this different type (of camouflage) thing(s). But in the future, you're going to have maybe a tank that you want to make look like a bus against an algorithm" powering sensors, US General James McConville told reporters in 2023.[57] In this contest, the quality of software coders will help determine the "hider versus seeker" contest.

Army chief envisions software coders defeating 'camouflage of the future'

The U.S. military should expect adversaries to try to fool its artificial intelligence systems that are used for detection, Gen. James McConville said.

BY JON HARPER • FEBRUARY 23, 2023

Adaptability will be critical for advanced camouflage. Optimal multispectral camo systems will be modular and capable of rapid updates to counter evolving detection technologies.

AI "spoofing" will emerge as a critical countermeasure, enabling rapid pattern or signature changes to confound AI-driven targeting systems. By reducing or changing visual and thermal signatures, spoofing disrupts enemy pattern recognition algorithms, delaying or preventing accurate targeting.

Logo for "ACROSS" Advanced Camouflage Project

BAE's ADAPTIV system (discussed earlier in the report) may address these requirements. So too may camouflage from the "ACROSS" (**Adaptive Camouflage** fo**R** s**O**ldier**S** and vehicle**S**) project, being conducted by a consortium of 19 European organizations, including major defense contractor Rheinmetall (and Saab Barracuda).

"…ACROSS will develop adaptive camouflage techniques and devices capable of adapting their signatures to the background, surveillance sensors (especially when active), different weather and

[54] https://www.baesystems.com/en-us/feature/adativ-cloak-of-invisibility
[55] https://www.independent.co.uk/news/science/invisibility-cloak-breakthrough-camouflague-material-b2659317.html
[56] https://www.sciencedirect.com/science/article/abs/pii/S136970212500063X
[57] https://defensescoop.com/2023/02/23/army-chief-envisions-software-coders-defeating-camouflage-of-the-future/

daytime conditions and the threat level, thus reducing detection, tracking, recognition and identification ranges and increasing the survivability of soldiers and platforms," explains a project web site.[58]

A key question is whether camouflage innovations can be fielded in time to address the rise of AI software-enabled sensors. For example, ADAPTIV has been in development for more than a decade and its web site predicts its release in "two years." The ACROSS system's development "end date" is in mid-2027, according to one of its web sites, and this date may not represent full production readiness. This could place more importance on adapting existing camouflage systems to spoof AI.

For example, DECPT's *Camofoil* is now available and can be produced rapidly to address different EMS spectra and match desired visual appearances; placed on objects in varying shapes to confuse AI targeting systems; and then replaced rapidly if a pattern is compromised.

The exact path of the measure/countermeasure contest between advanced camouflage and emerging sensor technologies remains about as visible as a skilled sniper in a ghillie suit hiding in the jungle.

What can be seen clearly is the growing size and importance of the multispectral camouflage market.

[58] https://www.citeve.pt/technological_intelligence/projects/across-82303f06

Glossary of Camouflage Terms

2D Camouflage: Camouflage on flat surfaces, often using patterns, colors and anti-IR dyes to blend in with backgrounds.

3D Camouflage: Camouflage that incorporates three-dimensional elements to break up the shape and outline of an object, making it more difficult to detect.

Active Camouflage: Camouflage that uses technology to project or mimic the background environment, potentially including visual and thermal signatures. Typically requires a power source and uses screens or electronics.

Adaptive Camouflage: Camouflage that dynamically adjusts its appearance to match the surrounding environment. May be inspired by animals that can "automatically" change their colors and skin textures.

ASCALS (Advanced Solutions for Camouflage of Land Systems): European Defence Agency project to develop advanced camouflage.

AUSVs (Autonomous Undersea & Surface Vehicles): Self-operating marine and underwater systems.

BFV (Bradley Fighting Vehicle): Widely deployed US armored vehicle.

Biomimicry: The design and production of materials and systems that mimic biological processes used by animals such as chameleons and octopuses for camouflage.

Camouflage: Materials or systems used to conceal something by making it harder to detect, typically by blending in with the environment.

Camouflage Triad: Static, mobile and individual solutions.

CCD: Camouflage, Concealment and Deception.

Counter-ISTAR or -ISR: Actions, measures and technologies to counteract enemy intelligence, surveillance, (target acquisition) and reconnaissance efforts.

C-UAS (Counter-Unmanned Aircraft – or Aerial or Aviation – Systems): Can range from camouflage to jamming to laser weapons.

Digital Camouflage: A pattern designed using computer algorithms to break up the outline of an object, making it less recognizable to the human eye.

Electromagnetic (EM) Spectrum: The range and types of electromagnetic radiation.

Electrochromic Camouflage: Uses materials that change color or opacity when an electric current is applied.

FPV (First-Person View) UAV: Drone navigated by remote operator viewing video from the device. Usually armed, often with explosives detonated when the UAV hits a target (aka, "suicide" or "Kamikaze" drone.")

Ghillie Suit: Individual camouflage garb resembling heavy foliage and designed to help its wearer, often a sniper, blend into natural surroundings. These suits and related wearable camo garments or covers are now being produced with multispectral camouflage properties.

Hyperspectral Imaging: A technology used to detect and analyze objects through their spectral signatures across many narrow bands, often used to counter multispectral camouflage.

IFV (Infantry Fighting Vehicle): A type of armored fighting vehicle used to transport and support infantry.

IR, LWIR, MWIR, NIR and SWIR (Infrared; Long-Wave, Medium-Wave, Near and Short-Wave Infrared) Camouflage: Techniques and materials designed to reduce or mask the infrared signature of an object, making it harder to detect. IR portions of the EMS are sometimes divided into Reflective IR (NIR and SWIR), where camouflage is designed to *match* the reflective spectra of the background (ie, replicate the emissions from surrounding vegetation) and Thermal IR (LWIR and MWIR) where camouflage systems *reduce* emitted heat.

JLTV (Joint Light Tactical Vehicle): US light utility/combat multi-role vehicle.

MCS (Mobile Camouflage System): A camouflage system integrated directly onto military vehicles, providing them concealment while moving or at rest.

Multispectral Camouflage: Camouflage designed to be effective across multiple spectra to hide from various types of surveillance equipment.

Near-Peer Adversary: A nation with military capabilities approaching but not necessarily equaling those of the U.S. and its allies (e.g., Russia).

Optical Camouflage: Can refer to a method where the background of an object is projected onto a flexible screen in front of it, concealing the object by matching it to the background environment.

Peer Adversary: A nation with military capabilities roughly equivalent to those of the U.S. and its allies (e.g., China).

Persistent ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance): A battlefield environment where military assets are under near-constant observation and targeting risk, including by sensor-equipped and armed UAVs.

Photonic Crystals: Materials that can control, alter or manipulate light in unique ways, potentially usable for advanced camouflage to reflect or absorb different wavelengths.

RAM (Radar-Absorbing Material): Materials used to absorb and/or deflect radar signals, reducing the radar signature of military platforms.

Reversible Camouflage: Clothing or materials that can be worn inside out to change camouflage patterns depending on the environment.

SAP (Self-Adaptive Photochromism): Basis of technology to develop textiles that change color in response to the environment.

Signature Management: The broader term for reducing all signatures (visual, acoustic, thermal, radar) to minimize detectability. Includes **PSM (Personal Signature Management).**

Smart Textiles: Fabrics integrated with sensors, actuators, or other technologies to provide adaptive camouflage capabilities.

Thermal Camouflage: Techniques to mask or reduce the thermal signature of an object or person, making them less detectable by thermal imaging systems.

UAV (Unmanned Aerial Vehicle): A remotely controlled or autonomous aircraft. May be called **UAS (Unmanned Aerial System).**

UGV (Unmanned Ground Vehicle): A robotic vehicle that operates on land without an onboard human presence.

UKR & UKR MoD: Ukraine & Ukraine Ministry of Defense.

UMS (Unmanned Marine System); UUS/UUV (Unmanned Underwater System, Unmanned Underwater Vehicle); AUSV (Autonomous Undersea & Surface Vehicle): Autonomous or remotely operated vehicles used in maritime environments.

Visible Light: The portion of the EMS that can be detected by human eyesight and regular cameras.

Visual Camouflage: Traditional camouflage designed to conceal objects from human vision and sensors using visible light, such as video cameras.

ULCANS (Ultra-Lightweight Camouflage Netting System): A camouflage net system offering multispectral concealment for stationary assets.

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