

## The counter UAS directory from [www.unmannedairspace.info](http://www.unmannedairspace.info)

The following directory is a listing of available counter-UAS systems, networks and components and is supplied free of charge to [unmannedairspace.info](http://www.unmannedairspace.info) website visitors for information purposes only. The directory is under constant review and will be updated and enlarged. Information is supplied directly by suppliers, with data edited to remove unverifiable claims. The publisher accepts no responsibility for the information supplied. Website sources for the data plus further contact information are given alongside product and services descriptions.

Company	Product	Description	Country	Website
Aaronia	RR Drone/radar detection system	The RF Drone or Radar Detection System is based on the Aaronia IsoLOG 3D Tracking Array Antenna, a rugged or remote-controllable Spectran V5 Real-time Spectrum Analyzer and a new Software Plugin for the RTSA Suite Software. All parts allow a 24/7 monitoring and recording (full gapless data-streaming with up to 4TB/day). Each Sector/Antenna gets its own real-time view and is based on RF and $\mu$ W detection. All views are combined to a 360° view including a 360° picture or 360° live video of the surrounding area/landscape. This gives full control over any RF emissions happening around. The system can provide an optical or audio alert if critical values are exceeded and can collect data and compare them to find out irregularities. It can be used as a "single-spot" version, which is directly available. Or it is possible to combine several systems to monitor larger areas, governmental offices, military base camps, industrial areas etc.	Germany	<a href="http://www.aaronia.com/products/solutions/Aaronia-Drone-Detection-System/?gclid=Cj0KEQjw7dfKBRCdkKrvmfKtyeoBEiQAch0egblrt30bMy2GKvEK_J5HBtPnIHBcVsyCXI380cPQnlQaAIYl8P8HAQ">http://www.aaronia.com/products/solutions/Aaronia-Drone-Detection-System/?gclid=Cj0KEQjw7dfKBRCdkKrvmfKtyeoBEiQAch0egblrt30bMy2GKvEK_J5HBtPnIHBcVsyCXI380cPQnlQaAIYl8P8HAQ</a>

<b>Accipter</b>	<b>NM1-8A Drone Radar System</b>	<p>The Accipiter® NM1-8A Drone Radar System is a software-definable, 2D surveillance radar designed to detect, track and alert to the presence of drones. The system includes one radar sensor integrated into a NEMA-4 rated environmental enclosure, which houses the radar sensor electronics, digital radar processors, radar remote controller, radar data manager, power management and data communications components. The Radar System includes a high-resolution, X-band transceiver with 8' array antenna with the sensitivity to detect and track drones as small as birds, and capabilities to identify behaviour and issue alerts. It is well suited for use at civil and military airports to alert to the presence of drones in the airspace. It is a software-definable surveillance radar specially designed to detect and track vessels from small pleasure craft to large vessels, as well as low-flying aircraft of all sizes, including small ultralights, drones and general aviation aircraft. The system includes one radar sensor integrated into a NEMA-4 rated environmental enclosure, which houses the radar sensor electronics, digital radar processors, radar remote controller, radar data manager, power management and data communications components. The radar sensor is selectable from leading X-band and S-band manufacturers, with antennas ranging from 4' to 21' in length. The Accipiter® NM1-8A is well suited for use along inland and coastal water borders for both maritime and air domain awareness, and land borders for air domain awareness applications.</p>	Canada	<a href="https://www.accipiterra.com/products/aviation-safety-security-2/drone-uas-detection-tracking-and-alerting/">https://www.accipiterra.com/products/aviation-safety-security-2/drone-uas-detection-tracking-and-alerting/</a>
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<b>Advanced Radar Technologies</b>	<b>Drone Sentinel</b>	ART Drone Sentinel is a high performance anti drone and small unmanned aerial vehicle integrated surveillance system. ART Midrange, a radar sensor, has been optimized for very low radar cross section airborne threat detection and tracking. The early detection, warning and tracking functionality provided by the radar is complemented by an optronic platform that features day and night classification capabilities. Both sensors are integrated in the same physical assembly that can be fast and conveniently deployed using a single mast. ART Drone Sentinel also includes an intuitive GIS-powered multi-sensor command and control software suite that provides a common operative picture for unsurpassed airspace situational awareness. The widespread availability of low cost fully automatic micro drones has redefined the security risks of critical infrastructures, national borders and military bases. ART Drone Sentinel is a single mast solution that provides round the clock, 360 degrees anti-drone surveillance with what the company says is the fastest update rate in the market (1 Hz). ART Drone Sentinel performance has been experimentally validated with representative targets under the supervision of a key European end-user. ART Drone Sentinel detects, tracks and classifies micro quadcopters and micro fixed-wing UAVs with radar cross sections below 0.005 m2 at 2000 meter range. In addition, the system can provide simultaneous ground based target detection & tracking. Designed to improve the efficiency of its end users (Border Guards/CIP Security Services/Public Law Enforcement Services), ART Drone Sentinel features fully automatic operation (suitable for non-trained operators), remote management and is cost effective both for large and small scale deployments.	Spain	<a href="http://www.advancedradartechnologies.com/products-services/art-drone-sentinel">http://www.advancedradartechnologies.com/products-services/art-drone-sentinel</a>
<b>AeroDefense</b>	<b>AirWarden TM</b>	AeroDefense systems' AirWardenTM is a Radio-Frequency-based drone and pilot detection, location and alert system. The system detects, locates, tracks and alerts of both the pilot/controller and the drone location within the detection zone which can be 1-5 kilometers from a sensor. Large properties can be configured with networked sensors to establish extensive perimeters. The solution is passive so no staff or special training is required.	USA	<a href="https://aerodefense.tech/">https://aerodefense.tech/</a>
<b>Ainstein</b>	<b>ULAB-D1/ULGB-D1</b>	In September 2018 Ainstein announced two new products in its Ultra Long Range UAV radar series; the Ultra Long Range Airborne (ULAB-D1) and Ultra Long Range Ground-Based (ULGB-D1) radars, capable of precise detection more than 1,000 meters away. Available for customized integration with aerial vehicle manufacturers, the ULAB-D1 is optimized for air-to-air manned and UAVs beyond visual line of sight (BVLOS) operation. The ULGB-D1 is optimized for ground-to-air drone detection and monitoring and can be integrated and deployed by perimeter security solutions and	USA	<a href="https://ainstein.ai/news/">https://ainstein.ai/news/</a>

		service providers. Both feature Digital Beam Forming for highly precise elevation measurement and real-time processing for 3D detection, with speed measurement for more than 100 targets, bringing enhanced security capabilities to airborne and ground-based radar solutions.		
<b>Airspace Systems Inc</b>	<b>Drone security system</b>	The company uses machine vision and deep learning to detect anomalies in the sky and classify rogue drones. Once engaged, the flight system anticipates and reacts to a drone's every move, in real time. The capture system then safely disables and retrieves drones to limit collateral damage.	USA	<a href="https://airspace.co/#home">https://airspace.co/#home</a>
<b>Allen-Vanguard</b>	<b>ANCILE™</b>	The ANCILE™ is an electronic shield for defeating commercial drones. ANCILE™ prevents the intended drone mission by using an RF inhibition technology to disrupt a wide range of command and control protocols. It assures total enforcement of a no-fly zone, says the company, for example to protect convoys, operating bases, sensitive locations and public events. ANCILE™ is effective against multiple, simultaneous drone threats including swarms. It can be used stand-alone or easily integrated into any suite of electronic assets and tailored to any specific circumstance or requirement.	Canada	<a href="http://www.allenvanguard.com/">http://www.allenvanguard.com/</a>
<b>AMTEC</b>	<b>ALS12SKY-Mi5/Skynet</b>	The ALS12SKY-Mi5 is a 12 gauge anti-drone round designed to be rapidly deployed against commercially available drones being utilized for illegal purposes; i.e. illegal surveillance and contraband delivery. Upon firing through a 12ga rifled choke barrel, the five tethered segments separate with centrifugal force and create a five (5') foot wide 'capture net' to effectively trap the drone's propellers causing it to fail.	USA	<a href="https://www.lesslethal.com/products/12-gauge/als12skymi-5-detail">https://www.lesslethal.com/products/12-gauge/als12skymi-5-detail</a>

<b>AntiDrone/ Prime Consulting &amp; Technologies</b>	<b>Mini, short- range, medium- range and long- range counter UAV systems</b>	<p>Mini-range counter UAV systems can be used for protection of relatively small installations or when the requirements to drone detection are not very demanding. The system includes the minimum set of equipment for detection of UAVs at short distances that do not exceed 200 meters. The mini anti-drone system includes a server, video cameras (the quantity may vary from four cameras for separately situated buildings to up to 32 cameras for large installations, for example, football stadiums) as well as proprietary software. The software is based on special algorithms that help to identify drones and distinguish them from birds to minimize false alarms. The system provides 24/7 perimeter monitoring and whenever a drone is detected it sends an alert by SMS or an application installed on the mobile devices of the security personnel. It is also possible to use the system with a perimeter surveillance radar. The radar provides the coordinates of the target, the camera points at it and the software determines whether it's a drone, a bird or any other object. The mini anti-UAV system can be upgraded and optionally used together with RF detectors (like DroneWatcher) to detect the drone control signals. Small-range anti-UAV systems provide protection from drones in the range from 200 m to 1 km. Small-range anti-drone systems are designed for the protection of facilities of private and business sector and include equipment for drone detection and neutralization at distance and height of up to 1 km. The main components of the small-range counter-drone system include perimeter surveillance radars, acoustic sensors and video cameras for drone detection and identification as well as mobile jamming system for drone neutralization. The small-range counter-UAV system can be customized and upgraded with enhanced features by means of additional equipment, such as RF detectors, jammer pan-tilt mount, portable computer with video analytics system, illuminator, mobile tower (with integrated power system), stationary jamming system, communications system, additional lighting system, drone capture net, anti-drone laser and thermal cameras. Medium-range counter-UAV systems include anti-drone solutions for drone detection and neutralization at distances from 1 km to 4 km. Medium-range anti-UAV systems are used for the protection of medium-size facilities of business or government sector and include solutions for UAV detection and neutralization at distance of up to 4 km and height of up to 1 km (depends of the size of the target). The main equipment used in the medium-range anti-drone system includes drone detection radar, video cameras, long-range video tracking system, visual command centre software, computer with video analytics system for drone detection and identification as well as stationary jamming system for drone counteraction. The medium-range anti-UAV system is highly customizable and can be</p>	Denmark	<a href="https://anti-drone.eu/">https://anti-drone.eu/</a>
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<b>AP Systems</b>	<b>Ctrl+Sky</b>	Ctrl+Sky offers a scalable multi-sensors approach to ensure a complete “dome” of protection from unwanted drone invasion. The combination of proprietary radar, acoustic, vision and RF sensors allows Ctrl+Sky to minimize false alarms and detects even small drones at distances up to 2000 meters. The FMCW radar sensor operates in the X band and uses MIMO technology to locate drones. Ctrl+Sky uses the most advanced radar tracker based on MHT algorithm. The system can distinguish drones from other flying objects, such as birds. The acoustic sensor is based on 8-element microphone array that uses digital beam forming technique in the acoustic domain to accurately localize sound sources in 3D space. Advanced, machine learning based classification algorithms discriminate between drones and other objects. Video cameras register recordings of detected drones, so it is possible to present hard evidence of an intruder in a protected area. An RF Sensor detects radio-link between a drone and remote control-station by identifying radio frequency (RF) signatures of Wi-Fi signals. The RF sensor detects a targeted radio signal, identifies it and the software allows neutralization of the unwanted UAV. By using multiple RF Sensors the drone operator could also be localized. Ctrl+Sky Jammer is an optional element of the system, used to neutralize drones by overpowering the drone’s receivers. Its use is restricted to a group of customers with appropriate permissions.	Poland	<a href="http://apsystems.tech/en/">http://apsystems.tech/en/</a>
<b>ApolloShield</b>	<b>AppolloShield</b>	ApolloShield detects drones using multiple technologies - cameras, audio and radio sensors - so no drone can evade detection. ApolloShield estimates the location of the detected drones and their operators, allowing the security team to assess the risk. It finds the unique identifiers of most drones, allowing law enforcement agencies to hunt irresponsible operators. It then takes control of supported drones and sends them a "go home" command, disconnecting the original operator and forcing them to land safely.	Israel	<a href="https://www.apolloshield.com/">https://www.apolloshield.com/</a>

<b>ArtsSYS360</b>	<b>RS500</b>	<p>ARTSYS360 is developing an innovative radar system to be deployed around compounds such as nuclear and plants, water reservoirs and communication facilities. The RS500 is an early drone notification system. It detects drone presence by analyzing signalling channel and radio transmission from the drone operator and triggers automatically a Jamming system which deactivates the drone by jamming the GPS signal.</p> <p>Early drone Notification fits the following solutions:</p> <ul style="list-style-type: none"> <li>• Geo fence protection area as: airports, prisons, offices, campus, villas, and sensitive facilities.</li> <li>• On the go protection for cars, trucks and VIP transports</li> </ul>	Israel	<a href="http://www.artsys360.com/product/rs500/">http://www.artsys360.com/product/rs500/</a>
<b>Ascent Vision</b>	<b>CM202U</b>	The CM202U is a gyro-stabilized, multi-sensor gimbal. It is specifically designed for counter-UAS operations and has simple plug-and-play hook up. The sensor package includes object tracking capability, low power consumption, and direct drive motors for accurate positioning. The entire system is man-portable and includes a Static Target Detection Algorithm and a Moving Target Detector Algorithm to detect people, vehicles, sUAS, UAVs, and general motion.	USA	<a href="http://www.ascentvision.com/counter-uas.html">http://www.ascentvision.com/counter-uas.html</a>
<b>ASELSAN</b>	<b>IHTAR, GERGEDAN, İHASAVARTM</b>	<p>ASELSAN's IHTAR anti-drone system aims to neutralize mini and micro UAV threats in urban and rural environments. It is available in various configurations (fixed, deployable etc.) and detects and tracks multiple UAVs with high accuracy using portable radar. It applies jamming against at least remote control (RC) Devices, Radios, GPS receivers, Wi-Fi, ISM Bands, GSM900/1800, 3G and 4G. IHTAR uses the GERGEDAN jammer to create protection against all known mini-UAV/model aircraft attacks with its specially designed antenna patterns creating semi-spherical protection umbrella.</p> <p>The GERGEDAN GERGEDANTM Anti-Drone and RCIED Jammer System is designed to protect military bases, facilities, high value assets, ceremonies, meetings, demonstration areas and checkpoints against drone/min iUAV attacks by jamming the RC frequencies, GPS/GLONASS frequencies, data link frequencies, image forwarding frequencies and RCIED triggering frequencies (if any) of drones/mini-UAVs simultaneously. GERGEDANTM also provides protection against RCIEDs and it is used to protect convoys, VIP vehicles in motion. GERGEDANTM covers the whole RF band</p>	Turkey	<p><a href="http://www.aselsan.com.tr/en-us/press-room/Brochures/Air-and-Missile-Defense-Systems/IHTAR_ENG.pdf">http://www.aselsan.com.tr/en-us/press-room/Brochures/Air-and-Missile-Defense-Systems/IHTAR_ENG.pdf</a></p> <p><a href="http://www.aselsan.com.tr/en-us/press-room/Brochures/Electronic-Warfare-Systems/GERGEDAN_IHTA_ENG.pdf">http://www.aselsan.com.tr/en-us/press-room/Brochures/Electronic-Warfare-Systems/GERGEDAN_IHTA_ENG.pdf</a></p> <p><a href="http://www.aselsan.com.tr/en-us/press-room/Brochures/Electro">http://www.aselsan.com.tr/en-us/press-room/Brochures/Electro</a></p>

		<p>and creates protection against all known drone/mini-UAV attacks with its specially designed antenna patterns creating semi-spherical protection umbrella as well as ground threats such as road-side RCIEDs.</p> <p>iHASAVARTM is a handheld-backpack Anti-Drone Jammer System. iHASAVARTM, removes the need for sensor systems to track drones/mini-UAVs and provides a cost-effective solution by giving the ability to security personnel to take down a drone/mini-UAV at the first sight. With its special design high gain directional antenna, iHASAVARTM creates far greater effectiveness range expected from a handheld-backpack jammer. iHASAVARTM's rifle-like design provides the user with highest ergonomics with its compact architecture, light weight and portability. The system is powered by rechargeable Li-Ion batteries at least for 1.5 hours of continuous operation</p>		<a href="#">nic-Warfare-Systems/iHASAVAR_ENG.pdf</a>
<b>AT&amp;T</b>	<b>Teaming with DEDrone</b>	<p>In September 2018 AT&amp;T and DEDrone announced they were teaming up on a drone detection solution that helps protect military bases, venues, cities, and businesses, from malicious drones. The software-centric platform identifies approaching drones by means of radio frequency, visual, radar, and other sensor data. Analysis of sensor data then reliably classifies approaching drones and finds their locations. It then triggers alarms to alert security staff. It can also be integrated with other counter measures to help protect the public, such as building management and alarm systems.</p>	USA	<a href="#">att.com/CommunicationsNews</a>

<b>Avtomatika Concern</b>	<b>Pishal</b>	Avtomatika Concern (a subsidiary of Rostec state corporation) has introduced an anti-UAS gun called “Pishal” for law enforcement and military units. Reportedly, this anti-UAV weapon has been successfully tested in combat. “The representative of Concern Avtomatika said that in July 2018, this weapon was used to successfully prevent more than 20 UAV attacks. Pishal...interrupts the connection between the UAV and control station. It is said to have an effective range of up to 2,000 meters and can work in frequencies from 600 MHz to 6,000 MHz. Pishal weighs three kilograms (about 6 lbs 10 oz) which makes it quite lightweight for use by a single operator. It is also advertised to be harmless for the operator,” say press reports.	Russia	<a href="https://www.thefirearmblog.com/blog/2018/09/10/russian-pishal-anti-drone-gun-to-be-sold-both-in-military-le-and-civilian-markets">https://www.thefirearmblog.com/blog/2018/09/10/russian-pishal-anti-drone-gun-to-be-sold-both-in-military-le-and-civilian-markets</a>
<b>Battelle</b>	<b>Drone Defender</b>	Battelle DroneDefender systems are non-kinetic cUAS solutions developed to instantaneously defend airspace against commercial drones without compromising safety or risking collateral damage. The systems quickly disrupt an adversary's control of a drone, neutralizing it so that no remote action, including detonation, can occur, minimizing drone damage and risk to public safety. The system comprises a: <ul style="list-style-type: none"> <li>• Handheld Unit – The DroneDefender handheld units are portable, intuitive and man-in-the-loop. The system employs two different defences to disrupt unwanted UAS—remote control disruption and GPS disruption. Learn more about the handheld version.</li> <li>• Ground-based Unit – The DroneDefender ground-based system leverages the technology developed for the handheld system for a more capable cUAS solution. The remote control defeat capability can be paired with a detection and tracking system and integrated with almost any 360° positioner. By mounting the disruption capability on a mechanical positioner, the ground-based DroneDefender system utilizes significantly amplified power, increased antenna gains, and the precision aim-point of the positioner to neutralize UAS threats at much greater distances than the handheld version.</li> </ul>	USA	<a href="https://www.battelle.org/government-offerings/national-security/aerospace-systems/counter-UAS-technologies">https://www.battelle.org/government-offerings/national-security/aerospace-systems/counter-UAS-technologies</a>

<b>Belgium Advanced Technology Systems (BATS)</b>	<b>Drone Guard</b>	<p>Drone Guard is a compact light weight scalable drone detection and disruption System. The detection layer is based on compact radar, capable of detecting and tracking the drones. The radar triggers the other layers of the protection suite. As a result of the radar detection an Electro-Optical (EO) system that is cued to the suspected drones for classification and identification. The second layer provides the countermeasures used to disrupt the target flight. These are activated from the command and control centre based on inputs from the radar and EO sensors. Countermeasures include cueing a jammer to the target or a weapon mount to physically destroy the target.</p>	Belgium	<a href="http://www.bats.be/sites/default/files/Drone%20Guard%20BATS%20Brochure.pdf">http://www.bats.be/sites/default/files/Drone%20Guard%20BATS%20Brochure.pdf</a>
<b>Black Sage</b>	<b>UASX counter drone system</b>	<p>Black Sage’s UASX system uses automatic target classification, video tracking and threat prioritization to automate the CUAS detect-identify-defeat process. UASX fits into three ruggedized plastic cases and is lightweight enough to travel as checked luggage. When rapid deployment is necessary, the complete system is unpacked and set up in less than 30 minutes. UASX stations are modular and enable scaled coverage across large geographic areas using existing point-to-point radios, cat5/6 or fiber networks. Radars, cameras and effectors are registered with a central hardware component and positioned according to unique requirements of the site. Multiple range capabilities are available to accommodate the needs of small sites and large campuses. Vamtac and Humvee mounted counter-UAS systems enable extreme long range protection against UAS threats. Cockpit integrated command and control and rapidly deployable carbon-fiber mast and sensor payload make for a timely and rugged solution for forward operating bases and remote VVIP applications.</p> <p>In July 2018 Black Sage announced it was providing stadiums and venues a relatively low-cost solution for specific high-risk events. According to the company, the Black Sage counter drone system provides: early detection to allow law enforcement to take action even before the drone is airborne, AI classification to reduce false alarms, operator location to assist law enforcement in apprehension, and forensic data to ensure prosecution is all provided by the service..”</p>	USA	<a href="https://www.blacksagetech.com/counter-uas">https://www.blacksagetech.com/counter-uas</a>

<b>Blighter</b>	<b>AUDS</b>	AUDS is a smart-sensor and effector package capable of remotely detecting small UAVs and then tracking and classifying them before providing the option to disrupt their activity. The system may be used in remote or urban areas to prevent UAVs being used for terrorist attacks, espionage or other malicious activities against sites with critical infrastructure. The AUDS Team brings together three UK companies, each with the unique capabilities required to create an effective counter UAV system. Blighter's A400 series air security radars are able to detect small UAVs in all weather conditions, 24 hours a day flying in urban areas or near to the horizon. The Chess Dynamics Hawkeye Deployable System (DS) and EO Video Tracker, featuring both a long range colour camera and a high sensitivity Thermal Imager (TI), along with state-of-the-art video tracking technology, is able to track the UAV and, combined with radar target information, classify the target. The operator is then able to make a timely and informed decision to use the Enterprise Control Systems ('ECS'), smart RF inhibitor to selectively interfere with the C2 channels on the UAV allowing the system to disrupt the UAV's mission. The smart RF inhibitor uses directional antennas to achieve maximum range of operation with minimum collateral effect.	UK	<a href="http://www.blighter.com/products/auds-anti-uav-defence-system.html">http://www.blighter.com/products/auds-anti-uav-defence-system.html</a>
<b>Boeing</b>	<b>Counter-electronics High Power Microwave Advanced Missile Project (CHAMPS)</b>	In October 2012 Boeing and the U.S. Air Force Research Laboratory (AFRL) Directed Energy Directorate, Kirtland Air Force Base, N.M., successfully tested the Counter-electronics High-powered Microwave Advanced Missile Project (CHAMP) during a flight over the Utah Test and Training Range. CHAMP, which renders electronic targets useless, is a non-kinetic alternative to traditional explosive weapons that use the energy of motion to defeat a target. During the test, the CHAMP missile navigated a pre-programmed flight plan and emitted bursts of high-powered energy, effectively knocking out the target's data and electronic subsystems. CHAMP allows for selective high-frequency radio wave strikes against numerous targets during a single mission.	USA	<a href="http://www.boeing.com/features/2012/10/bds-champ-10-22-12.page">http://www.boeing.com/features/2012/10/bds-champ-10-22-12.page</a>
<b>Boeing/General Dynamics</b>	<b>MEHEL 2.0</b>	MEHEL is a laser testbed on a Stryker-armored fighting vehicle chassis and serves as a platform for research and development. MEHEL 2.0 is an improved version of the original MEHEL with a laser upgraded from 2kW to 5kW and other added C-UAS capabilities. MEHEL 2.0 also has a number of U.S. Army Aviation and Missile Research, Development, and Engineering Center counter-unmanned aircraft system mobile integrated capability components to increase the robustness of its capabilities.	USA	<a href="https://www.army.mil/article/184353/army_demonstrates_integration_of_laser_weapon_on_combat_vehicle">https://www.army.mil/article/184353/army_demonstrates_integration_of_laser_weapon_on_combat_vehicle</a>
<b>BSS Holland</b>	<b>DroneBlocker</b>	DroneBlocker is a full-stack counter-Wifi-UAV solution, from detection to neutralization. For Wi-Fi drones (Parrot Bebop, ArDrone, 3DR Solo) and hybrid Radiofrequency/Wi-Fi drones (some DJI Phantom, Yuneec Typhon, Blade Q350), DroneBlocker offers capabilities from detection, localization, identification to	Netherlands	<a href="http://www.bssholland.com/product/counter-wifi-uav-solution-drone-blocker/">http://www.bssholland.com/product/counter-wifi-uav-solution-drone-blocker/</a>

		neutralization – connection breaking and in some cases remote control over the drone.		
<b>Byblos/Roboost</b>	<b>SPID</b>	The Systeme de Protection Integre anti-drones (SPID) is a research project of 18 agencies and organisations to develop a C-UAS system based on several sensors for the detection and the localization of drones and countermeasures. The solution – for military, government and civil applications – resulted in a scalable networked system, with a passive 360 degree detection system, with a weight less than 75kg, deployable in under 30 minutes.	France	<a href="http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2016/12/161118_spid_demo_lad_final.pdf">http://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2016/12/161118_spid_demo_lad_final.pdf</a>
<b>CACI/Six3</b>	<b>CORIAN</b>	CORIAN is a configuration of CACI’s SkyTracker™ UAS tracking solution tailored to meet the U.S. Army’s evolving OCONUS mission needs. This system detects, identifies, tracks, and mitigates UAS by exploiting their radio signals. The system not only exploits UAS but also locates their ground operators. CORIAN is configured for the Army to host multiple EW capabilities to non-kinetically defeat UAS at long range. This software-defined system enables rapid integration of capabilities against new and evolving targets.	USA	<a href="https://www.caci.com/west17/pdf/cyber_electronic_warfare_sensor_suite.pdf">https://www.caci.com/west17/pdf/cyber_electronic_warfare_sensor_suite.pdf</a>
<b>CellAntenna</b>	<b>D3T</b>	D3T™’s key features are: <ul style="list-style-type: none"> <li>• Detects Incoming Drones at standoff distance up to 1 Km</li> <li>• Prevents Entry of restricted airspace of Drone up to 1000 feet above facility covered and up to 300 meters from fence line</li> <li>• DSP (Digital Signal Processing) determines type of Flight Control system being used</li> <li>• Deployment of several electronic counter measures (ECM) based on Threat Level</li> <li>• SDR Technology allows for upgrade of system as new drone flight control platforms enter market</li> <li>• Does not interfere radio frequency communication.</li> <li>• Fiber Based system cannot be jammed.</li> <li>• Scalable to cover large secure building campuses.</li> <li>• Can be combined with Guardian Service™ cellphone control to provide both Drone and Phone (cell phone) protection in any secure facility.</li> </ul>	USA	<a href="https://cellantenna.com/solutions/d3t-drone-detection-and-defeat-technology/">https://cellantenna.com/solutions/d3t-drone-detection-and-defeat-technology/</a>

<b>Cerbair</b>	<b>Counter UAS system</b>	The Cerbair system, fixed or mobile, combines several Radio Frequency and Optical sensors in order to adapt the solution to the level of risk, site configuration and budget. Detection characteristics: Sensor frequencies detected - 2,4GHz / 5 GHz; range up to 3km; detection angle: 90°; Ethernet connection / POE. Video sensor: High resolution: 5MP; Range up to 150m; Detection angle: 90°; Near-infrared at night; Ethernet Connection / POE. Visualizing drone intrusions in real time is possible thanks to powerful algorithms: Detection rate: 90%; Optical real-time tracking of the drone flightpath; Evidence collection (HD picture, video recording of the intrusion); Drone model recognition; Simplified integration on existing system via API. Threat resolution: Alerts configured for a rapid and adapted intervention (visual, sound, text message etc...) - Passive actions: evacuate people to a safe place, interrupt a conversation, search the site, block the drone's line of sight etc; Counter-measures to neutralize the drone by forcing its landing: jamming (flight commands and geolocation) or capturing it with a net thrower.	France	<a href="http://www.cerbair.com/2017/solution.php?lang=en&amp;gclid=Cj0KEQjw7dfKBRCdkKrvmfKtyeoBEiQAch0egWgTCwNVDclUrHSmbHVvh1ron9upQ3Ik1HLj3AS8viMaAIWr8P8HAQ">http://www.cerbair.com/2017/solution.php?lang=en&amp;gclid=Cj0KEQjw7dfKBRCdkKrvmfKtyeoBEiQAch0egWgTCwNVDclUrHSmbHVvh1ron9upQ3Ik1HLj3AS8viMaAIWr8P8HAQ</a>
<b>Chenega International</b>	<b>dronesafeguard</b>	dronesafeguard is a mix of layered C-UAV solutions that seek to interdict intruder drones as far out as possible from the facility, asset or person being protected. This is "protection in depth" and it relies on progressively interleaved C-UAV systems and sub systems to: detect, track, respond and then defeat the drone risk threat before physical, asset, cyber or reputational damage is inflicted. Developed with synergy.	Ireland	<a href="https://chenegainternational.com/media/1195/counteruav_cic.pdf">https://chenegainternational.com/media/1195/counteruav_cic.pdf</a>
<b>Chess Dynamics</b>	<b>Hawkeye Deployable System and EO</b>	The Chess Dynamics Hawkeye Deployable System (DS) and EO Video Tracker, featuring both a long range colour camera and a high sensitivity Thermal Imager (TI), along with state-of-the-art video tracking technology, is able to TRACK the UAV and, combined with radar target information, classify the target	UK	<a href="http://www.chess-dynamics.com/hawkeye-deployable-systems/">http://www.chess-dynamics.com/hawkeye-deployable-systems/</a>
<b>Citadel Defense Company</b>	<b>Drone Defense System, Hunter algorithm</b>	Citadel Defense provides a comprehensive, automated system to detect and prevent s-UAS from entering a protected space. The system passively and simultaneously monitors multiple relevant frequency bands within the RF spectrum in search of emissions that correspond to the characteristics of drone control, video and telemetry signals. When a detected signal is determined to be valid, the system will utilizes multiple escalating tactics to prevent the drone/UAS from entering the protected area. Notification of detections, engagements, and system status is displayed via a dedicated tablet computer, providing the operator automatic or manual control of mitigation strategy. The system is rugged, compact, rapidly deployable (less than five minutes to set up), and can be seamlessly transferred between man-portable, vehicle mount, and static configurations. Citadel's system has been fielded overseas, undergone combat evaluations and has third party validation.	USA	<a href="https://www.citadelthreatmanagement.com">https://www.citadelthreatmanagement.com</a>

		<p>Citadel’s technology is derived from expertise spanning several disciplines, beginning with detailed knowledge of the Radio Frequency (RF) control transmission standards used across all commercial (and most military) drones and UAVs. This includes the protocol variants utilized for Radio Control (RC), first-person video (FPV), and Wi-Fi-based control emitted by drones, controllers, and downlink transmitters. A single Citadel system can analyze and transmit signals spanning the RF range from DC to 6 GHz, including the 100 channels at 2.4 GHz and 150 at 5.8 GHz, the most commonly used bands for commercially available drones. The system is able to isolate and identify these signals from in-band RF spectral noise, discriminating a target signal from miles away. Once a potential detection is discovered it enters the machine learning-based signal path and is refined for detailed analysis and identification. Proprietary algorithms then identify the control signal parameters, intelligently predict the rest of the pattern if necessary, and produce a transmitted mitigation solution. It does so via three approaches – Predictive, Targeted, and Smart Jam transmissions - based on control protocol and operator / mission preference. Citadel’s algorithm has demonstrated an ability to detect and engage military and commercial drones not seen previously in multiple live demonstrations, and key to the Hunter Algorithm’s performance is the use of multiple classifiers. This fuses the capabilities of separate discrete machine learning algorithms to provide significant performance improvements and superior false positive rejection. The Citadel system will then either output a mitigation signal for the target drone system or issue a smart jamming signal localized to the control frequency/s identified.</p> <p>Citadel’s technology is designed to comply with 18 USC 2511 (Electronic Communications Privacy Act) in relation to sampling radio frequency spectrum data and does not use packet headers to identify drone signals or any other identifier that could uniquely identify a specific drone or controller. Citadel assists with enforcing Temporary Flight Restrictions (TFRs), used by the FAA to restrict flights in certain areas. Some have become more permanent, like those around Disneyland, or are event based, such as when the President visits a location. The FAA publishes TFRs as necessary, but there are also unpublished TFRs for sporting events, wildfires and emergency situations outside of FAA publishing.</p>		
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<b>Controp</b>	<b>Tornado</b>	The TORNADO air defence electro-optical/infrared system is able to conduct a 360° scan in one to two seconds to produce a panoramic image and is capable of tracking targets in close proximity of 100m, as well as at distances up to tens of kilometres away. It has a continuous zoom to provide a constant surveillance picture, and can automatically detect moving targets and provide a track for each. The payload is man-portable, and can be operated from moving platforms such as vehicles and vessels, or it can be mounted on a mast.	Israel	<a href="https://www.controp.com/news-events/in-the-media/counter-uav-technology-tornado.aspx">https://www.controp.com/news-events/in-the-media/counter-uav-technology-tornado.aspx</a>
<b>Convexum</b>	<b>Perimeter protection system</b>	Convexum provides a solution to the rising threat of uncontrolled or malicious use of commercial drones, by actively taking control over them, preventing entry into protected airspace, and landing them in a safe location designated by the customer. Convexum offers the ability to land the drone at predefined locations and deny takeoff, in order to insure maximum precision and to minimize collateral damage and risk from drone crashes in the perimeter and its surroundings.	Israel	<a href="https://convexum.com/">https://convexum.com/</a>
<b>CS</b>	<b>Boreades</b>	<p>Boreades meets a requirement from the SGDSN in the framework of the project funded by the ANR (French National Research Agency):</p> <ul style="list-style-type: none"> <li>• Detecting drones, identifying and tracking drones</li> <li>• Neutralizing and recovering drones by jamming and spoofing the remote control and navigation systems</li> <li>• Locating remote pilots</li> </ul> <p>The system is able to jam and decoy the drone's navigation system, making it possible to take control, to select the recovery point, and above all to estimate the location of the remote pilot. It is a high-performance scalable multi-sensor and multi-effector system, mainly based on civilian technologies with a very low Total Cost of Ownership. The hardened real-time supervision system is based on an unique command &amp; control system and a crisis management module developed by CS Group.</p>	France	<a href="https://uk.c-s.fr/BOREADES-an-operational-French-system-to-detect-neutralize-malicious-drones-flights_a584.html">https://uk.c-s.fr/BOREADES-an-operational-French-system-to-detect-neutralize-malicious-drones-flights_a584.html</a>

<b>CTS Technologies</b>	<b>Drone jammer gun</b>	Specifications for the 2016 drone jammer gun: <ul style="list-style-type: none"> <li>• Frequency and power: GPS 5W,wifi 2.4G 25W ,5.8G 1.5W</li> <li>• Antenna: yagi antenna for 2.4G and 5.8G,Log antenna for 5.8G(High gain antenna is option)</li> <li>• Each band power can on/off</li> <li>• Built in polymer lithium battery</li> </ul>	China	<a href="http://ctstechnologys.com/3-in-1-drone-jammer-gun-2016-2-4g-5-8g-and-gps.html">http://ctstechnologys.com/3-in-1-drone-jammer-gun-2016-2-4g-5-8g-and-gps.html</a>
<b>D-Fend Solutions</b>	<b>Autonomous counter-drone perimeter security system</b>	D-Fend Solutions provides an autonomous counter-drone perimeter security system that automatically detects, identifies, and intercepts intruding commercial drones. D-Fend provides comprehensive, safe, portable, and scalable solutions for securing a stationary perimeter.The system is based on autonomous cyber software-defined radio technology that combines cyber and wireless signal processing techniques to take control over drones' communication links without causing spectral interference	USA	<a href="https://finder.startupnationcentral.org/company_page/d-fend">https://finder.startupnationcentral.org/company_page/d-fend</a>
<b>Dedrone</b>	<b>Drone Tracker RF100, RF-300, 3.5, Cloud</b>	Dedrone provides an automatic, integrated, and self-contained platform that delivers drone classification and countermeasures to secure against drone threats and their operators 24/7. The company says DroneTracker is the only modular system on the market that can be customized to address site-specific threats, adapted for easy integration to an existing security program, and accommodates building structures, landscapes, and other exterior conditions." Dedrone's DroneTracker platform provides a complete airspace monitoring and management solution through a convenient browser-based interface. DroneTracker allows users to readily configure multiple sensors, active and passive countermeasures, and alerts for automatic, 24/7 operation. The software continuously displays real-time airspace information and classifies drones using Dedrone's DroneDNA advanced analysis and pattern recognition capabilities. Defensive measures against hostile drones can be activated automatically, with security service providers notified as appropriate. Dedrone automatically classifies, issues alerts, and records evidence to identify and assess potential threats, and can automatically trigger offensive or defensive countermeasures if needed.	USA	<a href="https://www.dedrone.com/en/dronetracker/drone-protection-software">https://www.dedrone.com/en/dronetracker/drone-protection-software</a>

		<p>Combined with the broad coverage and early warning capabilities of Dedrone’s RF-100, the new RF-300 adds situational awareness so organizations can determine the nature and severity of threats from unauthorized drones. Dedrone’s RF-100 and RF-300 are both supported by Dedrone Cloud.</p> <p>In March 2018 Dedrone launched a new sensor, the RF-300, which automatically locates drones and their pilots. According to the company “When combined with the broad coverage and early warning capabilities of Dedrone’s RF-100, the new RF-300 adds situational awareness for organizations to determine the nature and severity of threats from unauthorized drones.”</p> <p>Key features of the RF-300 include:</p> <ul style="list-style-type: none"> <li>• Automatically tracks a drone’s flightpath, providing advance opportunity to protect sensitive infrastructure and deploy security measures</li> <li>• Pinpoints the location of a drone pilot, enabling security personnel to either alert law enforcement of an illegal intrusion or confront the pilot at their launch site</li> <li>• Connects to DroneTracker, Dedrone’s software platform, which combines multiple sensors and countermeasures, including RF, cameras, and microphones, for complete airspace security.</li> </ul> <p>In September 2018 Dedrone released DroneTracker 3.5, a drone detection system aimed at defeating drone swarms.</p> <p>In July 2018 Dedrone announced the release of Dedrone Cloud which “streamlines and accelerates drone detection technology installations, without requiring on-site IT infrastructure or maintenance.” According to a company press release additional highlights of Dedrone Cloud include:</p> <ul style="list-style-type: none"> <li>• Accelerates technology deployment: Dedrone Cloud enables easier deployment of the Dedrone system and thus makes it quicker for customers perform a threat analysis of their airspace</li> <li>• Removes the need for on-site infrastructure: Dedrone Cloud does not require additional IT infrastructure, helping security teams avoid additional costs for hardware, and time spent for installation</li> </ul>		
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<b>Deflt Dynamics</b>	<b>DroneCatcher</b>	<p>Project DroneCatcher started in 2015 when Dutch Police, Military Police and others called for solutions for the protection against unmanned mobile systems. DroneCatcher is a compact mechanically-operated net system designed and integrated in small unmanned helicopter. From the flying platform a net is fired on a hostile drone. The net can be equipped with a parachute to avoid endangering people on the ground. The demonstrator is now operational and the project is on-going as a defence customer has awarded a budget for further development. The system is designed to manage potentially hostile drones in a controlled and safe way by capturing them and dropping them to safe location by parachute.</p>	The Netherlands	<a href="http://www.delftdynamics.nl/index.php/en/">http://www.delftdynamics.nl/index.php/en/</a> <a href="http://www.dronecatcher.nl">http://www.dronecatcher.nl</a>
<b>Department 13</b>	<b>MESMER®</b>	<p>D13's MESMER® Counter Drone System is a patented, low power, non-jamming, non-line of sight, non-kinetic drone mitigation solution. MESMER® provides a safe and effective method of protecting personnel and infrastructure from dangerous drones. The key differentiator for MESMER® is its ability to manipulate weaknesses in all digital radio protocols. This allows MESMER® to put into effect sophisticated automated detection and mitigation strategies to stop, redirect, land or take control of drones across a range of national security and defence scenarios. The patented technology is built on open source software architecture, which ensures that MESMER® can be seamlessly integrated into existing security and surveillance systems. The MESMER® v1.0 system has three key components:</p>	USA	<a href="https://department13.com/mesmer/">https://department13.com/mesmer/</a>

		<ul style="list-style-type: none"> <li>• General purpose computer server running Linux OS. Multiple Ethernet ports are utilized for intra-system communication.</li> <li>• Software Defined Radios (SDR). MESMER® utilizes commercially available SDRs for RF signal reception and generation. SDRs can generate arbitrary waveforms which are used for drone detection, identification, and mitigation.</li> <li>• RF Front End. Provides signal conditioning on both receive and transmit channels, and allows MESMER® to perform optimally in a real-world environment.</li> </ul> <p>The system can be operated using a graphical user interface: a tablet with a touch screen, or a standard desktop monitor with a keyboard and mouse. The system can also be operated in auto-mitigation mode that does not require operator intervention to initiate a drone mitigation.</p>		
<b>DeTect</b>	<b>Harrier/Drone Watcher</b>	<p>DeTect is a leader in advanced bird radar technologies for real-time aircraft birdstrike avoidance, wind energy bird mortality risk assessment and mitigation, and industrial bird control with over 140 of its MERLIN bird radars operating in the US, Canada, Europe, Africa and Asia. The radar processing technology in MERLIN, developed specifically for reliable detection and tracking of small, non-cooperative, low radar-cross section, non-linearly moving targets, is also used in DeTect's HARRIER Security and Surveillance Radar for airspace and marine security applications including drone and UAV detection and defence, Ground Based Sense-and-Avoid (GBSAA) and virtual air traffic control. In 2012. In 2016, DeTect has expanded its drone surveillance capabilities with the launch of its DroneWatcher system that includes an Android application, DroneWatcher APP, that makes a smartphone or tablet into a short range drone detector. DroneWatcher also includes an advanced radiofrequency (RF) sensor, DroneWatcher RF, for longer range detection, tracking, identification and interdiction of drones and small UAVs. Combined, the HARRIER Drone Surveillance Radar and DroneWatcher APP and RF provide a high level of multi-layer comprehensive, multi-layer drone defence.</p>	USA/UK	<a href="http://www.detect-inc.com/">http://www.detect-inc.com/</a>
<b>Deutsche Telecom</b>	<b>Magenta</b>	<p>Together with partners from industry, Deutsche Telekom has developed the Magenta cyber-shield – a detection and alert system for drones. It uses technology developed by the leading partner Dedrone based in Kassel as well as frequency scanners from Rhode &amp; Schwarz, microphone arrays from Squarehead and radar devices from Robin Radar Systems.</p>	Germany	<a href="https://www.telekom.com/en/media/media-information/archive/magenta-drone-defense-shield-445192">https://www.telekom.com/en/media/media-information/archive/magenta-drone-defense-shield-445192</a>

<b>DFS</b>	<b>Magenta</b>	See Deutsche Telecom	Germany	<a href="https://www.dfs.de/dfs_homepage/en/Press/Press%20releases/2017/06.07.2017.-%20DFS%20Deutsche%20Flugsicherung%20and%20Deutsche%20Telekom%20cooperate%20on%20drone%20safety/">https://www.dfs.de/dfs_homepage/en/Press/Press%20releases/2017/06.07.2017.-%20DFS%20Deutsche%20Flugsicherung%20and%20Deutsche%20Telekom%20cooperate%20on%20drone%20safety/</a>
<b>Digitech</b>	<b>JAM 100, JAM 200, JAM 300</b>	Qingdao-based Digitech Info Technology (Digitech) in October 2017 launched its JAM family of counter-UAS (C-UAS) systems at the Ocean Sciences and Technology Exhibition in China, according to press reports. The range comprises the vehicle-mounted JAM-1000, the man-portable JAM-2000 and static JAM-3000 devices. According to Digitech, the JAM-1000 system is designed to defeat ‘hobby drones’, commercial multicopters, as well as small fixed-wing UAVs by causing a targeted threat to crash or retreat by activating its return-to-base protocol. The system disrupts radio frequency (RF) communications in the 2.4 and 5.8 GHz spectrums as well as satellite navigation signals including BeiDou, GLONASS, and GPS.” The company is quoting an effective range of 300 m with a full 360° coverage in the azimuth and 0-75° in elevation. The manportable JAM-2000 system offers a similar jamming profile against RF and satellite signals, although it has been specifically designed for dismounted operations with a rifle-type handheld transmitter and the jammer unit and battery packaged in a backpack. The complete system weighs approximately 20 kg, split into 8 kg and 12 kg for the transmitter and backpack respectively	China	
<b>Diehl Defence</b>	<b>Guardion</b>	The GUARDION drone defense system combines the scalable solutions customized to very specific customer requirements to reliably detect and defend against threats posed by the unauthorized use of drones. GUARDION is offered as an integrated product. It has a proven track record of reliable protection in various applications. GUARDION focuses on integrating electronic detection, verification and countermeasures and connecting them to a position mapping and command and control tool. The HPEMcounterUAS effectors from Diehl Defence, R&S®ARDRONIS from Rohde & Schwarz and the TARANIS® command and control and position mapping system developed by ESG have proven their capabilities in operational use.	Germany	<a href="http://www.diehl.com/en/nc/diehl-defence/press/reliable-protection-against-drones-esg-diehl-defence-and-rohde-schwarz-cooperate.html">http://www.diehl.com/en/nc/diehl-defence/press/reliable-protection-against-drones-esg-diehl-defence-and-rohde-schwarz-cooperate.html</a>

<b>Digital Global Systems</b>	CLEARSKY™	<p>CLEARSKY™ combines automated RF spectrum analysis and drone threat management to provide stadiums with interference-free communications and a barrier against unauthorized drones. CLEARSKY™ uses patented technology to automatically capture, interpret, locate, and alert on rogue wireless signals, ensuring that stadium and field communications are available. The signal classification engine uses Artificial Intelligence to detect known and unknown drones in record times, and the drone defence mechanism keeps unauthorized drones out of restricted airspace while also disabling the drone’s video feed.</p> <p>Stadium RF Operations</p> <ul style="list-style-type: none"> <li>• Identifies and locates interference and performance issues for wireless camera systems, on-field radio, in-house audio-visual, TV broadcast, and staff radio.</li> <li>• Assists with frequency coordination.</li> <li>• Constantly learns the environment, identifying emerging issues and enhancements.</li> <li>• Provides optimum performance models for different events – concerts, sports, etc., while fine tuning during the event.</li> <li>• Mobile surveys/monitoring available for areas not covered by fixed nodes</li> </ul> <p>Drone Threat Management Zone</p> <ul style="list-style-type: none"> <li>• Push a button to engage drone detection and defence. No operator training required.</li> <li>• Protection against single or multiple drones.</li> <li>• Provides line of bearing to both drone and controller.*</li> <li>• Stops unauthorized drone incursion without affecting other wireless communications.</li> <li>• Disables video feed of unauthorized drone.</li> <li>• Mobile and/or fixed-node deployments.</li> <li>• Passively monitors wideband radio frequencies.</li> <li>• AI learning engine can detect previously-unseen drone protocols and publish this new pattern to other DGS nodes in near-real time.</li> </ul>	USA	<a href="https://www.digitalglobalsystems.com/clearsky-stadiums/">https://www.digitalglobalsystems.com/clearsky-stadiums/</a>
<b>Drone Defence</b>	<b>NetGun X1</b>	The Net Gun X1 is a simple to use, cost effective active deterrent that allows law enforcement officers to capture unwanted drones up to 15m. It can be specified with two different types of capture net allowing the user the choice depending on the situation they face. It is small, lightweight and compact meaning that more units can be deployed to tackle unwanted drones. Capturing the drone allows the security	UK	<a href="http://www.dronedefence.co.uk/net-gun-x1">http://www.dronedefence.co.uk/net-gun-x1</a>

		operative to regain control of the situation and ensures that it can be handed over to forensic experts who may be able to ascertain the identity of the operator.		
<b>Dronefence</b>	<b>Dronefence</b>	The detection system consists of modules that can be adapted and distributed over a wide range of territories. Ground-based and modular, it covers long-range areas such as airports or industrial plants. The Tracking Units can be also customized to narrow streets and obstructed alleys. The UAV Tracker is a multi-sensor system (Radio Frequency, Camera, Acoustic Technologies). It ensures a high certainty of detection by fusing multiple sensor information. This makes false-alarms by flying birds or aircrafts impossible. Each Unit has a high Range of up to 600m with a predominant directional angle of 120 Degree. This allows to detect small drones from a far distance, even at a point when they cannot be seen or taken notice by security personnel yet. The multi-sensor information enable the distinct identification of each UAV by a unique sensor footprint. This makes it possible, to separate your own drones from potential harmful rogue ones. It also shows multiple intrusions about the same or even similar drones completing your forensic information about the intruder. Among others the unique footprint can help identify the vendor and type of the drone to support security personnel in their daily work. The system collects forensic information about the trajectory and flight of the drone. Video Tracking of the UAV by an industrial-grade and high-resolution camera system ensures safety and security of our customers. 2D and 3D information of UAV and pilot help law-enforcement in apprehending the intruder. The gathering of various forensics about the UAV enables to analyze its potential intention (hobby pilot or actual threat).	Germany	<a href="http://www.dronefence.de/Solution.php">http://www.dronefence.de/Solution.php</a>
<b>Drone Labs</b>	<b>Drone Detector</b>	With a 360 degree detection radius of up to 1 kilometre (2km diameter), Drone Detector can provide ample early warning. It does not require Line-of-Sight to work properly and can detect drones behind trees, buildings, or other obstacles. The technology can even detect many drones when they are turned on. The Detector Stationary Units are meant to be deployed to a fixed location, such as a rooftop, to provide the maximum amount of threat protection up to 1 kilometre. The portable units, currently available as a beta product, can detect threats up to 500 meters and come in a convenient briefcase size form factor. For locations that don't have access to wired or WiFi connections there is an optional 3G cell phone or satellite uplink module to provide communication in remote locations for most countries.	USA	<a href="http://dronedetector.com/">http://dronedetector.com/</a>

<b>Drone Security Defence</b>	<b>Counter UAS System</b>	<p>The Drone Security Defence counter-UAS system offers a 360 degree detection for small UAS up to 15km distance, using a wide range of sensors. Once the drone is detected the system identifies the operator’s profile, tracks the flight, gathers identification information for possible prosecution and then returns the drone to the take-off point. At the heart of the system, say the developers, is “search/identify/react” software which can be tailored to different organisational needs, including integration with other existing systems. The system is available as an automatic or semi automatic network which allows the operator to have as much or as little input as required.</p>	UK	www.dronesecuritydefence.com
<b>DroneShield</b>	<b>DroneGun, DroneSentry, Drone Sentinel, DroneCannon, Radar Zero, DroneNode</b>	<p>DroneSentinel provides the fully integrated sensor suite of DroneSentry without the DroneCannon RF countermeasure capability. With integrated data from all available sensors, users can rapidly detect and assess potential threats. An intuitive user interface provides live and historical data from all sensors, and broadcasts configurable alerts based on user-defined criteria. DroneSentry integrates DroneShield’s suite of sensors and countermeasures in a unified platform deployable in permanent or temporary installations. Incorporating RadarOne radar, WideAlert acoustic sensors, RFOne RF detectors, and DroneHeat and DroneOpt cameras (with integrated DroneBeam), Sentry correlates available data for users and provides maximum situational awareness and the quickest response to airborne threats. DroneSentry also includes the DroneCannon RF countermeasure, providing an end-to-end detection and response capability.</p> <p>In February 2018 DroneShield announced the launch of RadarZero, a compact drone detection radar product. According to the company: “At roughly the size of a paperback book, the product can detect drones up to 750m away and sells for a fraction of the cost of the larger longer-range more conventional radars. Because of its small formfactor, RadarZero is portable and mobile. RadarZero complements DroneShield’s existing longer-range (larger formfactor) RadarOne product and is offered both as a standalone product and as part of the company’s DroneSentinel drone detection and DroneSentry drone detection and mitigation platforms. RadarZero does not replace DroneShield’s existing RadarOne module / product. Rather, it is offered as an alternative for relevant users and environments.”</p> <p>In July 2018 DroneShield Ltd (“DroneShield”) and Intelligent Security Integration Aust. Pty Ltd (“ISI”) partnered on creating the next version of Rapid Scout® HQ, a vehicle with an integrated counter drone detect and defeat solution. The prior version of</p>	Australia	<a href="https://www.droneshield.com/">https://www.droneshield.com/</a>

		<p>Rapid Scout® HQ incorporated a vehicle with an advanced surveillance capability, through a combination of a sophisticated mast-mounted CCTV platform on a vehicle. Going forward, Rapid Scout® will incorporate a counter drone module containing DroneShield’s RadarZero™ (portable drone detection radar), RfOne™ (drone detection via an RF direction finder) and/or DroneCannon™ (counterdrone jammer) modules into the Rapid Scout® platform. The resulting product is believed to be a first of its kind, a non-military vehicle with a suite of counter drone multi-sensor detect and defeat solutions.</p> <p>In October 2018 DroneShield released DroneShield Complete™ v2.0, a software update for the DroneSentry &amp; DroneSentinel products – drone detection and mitigation interfaces with enhancements to tracking, navigation, functionality and usability. DroneShield Complete™ includes a graphic user interface (GUI) that compiles and analyses environmental data to display to the user seamlessly and effectively. This dramatically reduces reaction and response times.</p> <p>The DroneShield Complete™ GUI harnesses the advantages of each detection technology, providing the user with an early warning system and growing detection threat level as more data is gathered and processed. Remote access to DroneShield products allows the customer to check status, configure system settings, monitor threat levels and respond in real-time. The browser-based monitoring application lets the customer view and control DroneShield detection and response activity from anywhere.</p> <p>In October 2018 DroneShield announced the launch of DroneNode™, a portable, compact and inconspicuous counterdrone jamming device which can be utilised at large outdoor events by law enforcement “without raising public concern”, according to the company. DroneNode™ is an evolution of the company’s existing DroneCannon™ product. The DroneNode™ product is contained in a portable case sized at approximately 50x50cm: Oleg Vornik, DroneShield’s CEO commented: “DroneShield’s recent credentials in the area include the 2018 Olympics, the 2018 Commonwealth Games, 2018 ASEAN-Australia Special Summit, the 2017 Hawaii IRONMAN World Championship, and the 2015 – 2017 Boston Marathons.”</p>		
<b>Droptec</b>	<b>Dropster</b>	The Dropster is a non-lethal counter-UAV system. Due to its high mobility and quick preparedness it is recommended for various tasks, such as personal and property	Switzerland	<a href="http://www.droptec.ch/product">http://www.droptec.ch/product</a>

		protection. The red-dot sight combined with the high speed of the net also allows the operator to neutralize moving targets. The Dropster counter-UAV system uses gas pressure to shoot off a cut-resistant net onto civilian drones. At contact, the net entangles itself with the rotors of the aircraft and blocks its thrust. As a consequence, the target falls to the ground. It is also possible, to shoot the Dropster out of buildings and/or from rooftops.		
<b>DSNA Services</b>	<b>UWAS</b>	See JCPX	France	<a href="http://dsnaservices.com/">http://dsnaservices.com/</a>
<b>DSNA Services</b>	<b>Hologarde</b>	Hologarde comprises: <ul style="list-style-type: none"> <li>• A pioneering 3D innovative radar, that has already proven its ability to detect and track small (0.01m2) drones up to 5 km. The software developed for this radar analyses the movement signature of the target, in order to differentiate it against other objects in its range (like planes, helicopters, drones, and even birds).</li> <li>• Radio frequency sensor able to detect the protocol of data exchange between the drone and the remote-pilot. Combined with the radar, RF technology allows confirmation that the target is a drone and not a bird.</li> <li>• Long-range HD infrared cameras (full HD with thermal for night vision) use the geographical coordinates directly fed from the radar to target the mobile, and zoom at long distance in order to identify and provide visual confirmation of drones. These three accurate and proven technologies are connected to a Command Control Center (CCC).</li> </ul>	France	<a href="http://hologarde.com/">http://hologarde.com/</a>
<b>Dynetics</b>	GroundAware® GA9000	GroundAware® is a radar-based ground-based perimeter surveillance system. The GA 9000 series offers 3D radar capabilities for detecting, tracking, classifying, and responding to security threats posed by class 1 and 2 drones and other aircraft in low-altitude airspace, along with humans, animals, and vehicles on the ground. The GroundAware family of surveillance sensors can be integrated with a range of security systems, offers a layered security approach for deterrence and response, and monitors critical areas 24/7, in real-time, and in all-weather. It builds on the technology of the GA1360 and GA4120 models.	USA	<a href="https://www.dynetics.com/newsroom/news/2018/top-security-magazine-names-groundaware-ga9000-a-top-30-technology-innovations">https://www.dynetics.com/newsroom/news/2018/top-security-magazine-names-groundaware-ga9000-a-top-30-technology-innovations</a>
<b>ECA Group</b>	<b>IT180 drone detection system</b>	ECA Group and Groupe Gorgé subsidiary have developed a drone able to locate, identify and track offending operators and aircraft. It is based on the use of ECA Group's IT180 drone, including several transponders. After detecting the offending drone through land-based resources, the strategy consists of activating the IT180 drone: first, it will locate the operator using its on-board technology; second, it will approach and identify the operator using its cameras.	France	<a href="https://www.ecagroup.com/en/event/neutralization-malicious-drones-eca-group-innovating-">https://www.ecagroup.com/en/event/neutralization-malicious-drones-eca-group-innovating-</a>

				and-validates-unique-technology-locate
<b>Echodyne</b>	<b>MESA radar</b>	<p>Echodyne’s Metamaterial Electronically Scanning Array (MESA) radar operates just like a high-end phased array radar, instantly steering a high-resolution beam around a 3D field of view. MESA enables smaller, lighter, less expensive, higher performing imaging radars at commercial price points for industry and government.</p> <p>Features of EchoFlight’s high performance radar include:</p> <ul style="list-style-type: none"> <li>• Precision beam-steering radar that minimizes collision risk by tracking aircraft locations at all times across a broad field-of-view, even in dense airspace or over cluttered environments;</li> <li>• Best-in-class, search while track radar that scans just like a phased array but at commercial pricing;</li> <li>• Compact design with low weight and low power for integration into a wide-variety of UAS platforms; and,</li> <li>• Long-range, all-weather detection and tracking for Beyond Visual Line Of Sight (BVLOS) missions.</li> </ul>	USA	<a href="https://www.echodyne.com/news/echodyne-announces-fcc-certification-of-echoflight-radar/">https://www.echodyne.com/news/echodyne-announces-fcc-certification-of-echoflight-radar/</a>
<b>ELTA</b>  <b>(See also IAI/ELTA)</b>	<b>Drone Guard</b>	<p>ELTA Systems, a division and subsidiary of Israel Aerospace Industries (IAI), in November 2018 unveiled a new and enhanced configuration of its Drone Guard system which detects, identifies and disrupts the operation of UAS and small drones. The new modular configuration has added a Communication Intelligence (COMINT) system for more precise detection, classification and identification based on broadcast frequency and unique communication protocol analysis and verification for neutralizing threats, says the company. Furthermore, the Drone Guard’s 3D Radars, Electro-Optical (EO), and Jammer systems have all been upgraded with bolstered capabilities. The enhanced COMINT system “can effectively jam or disrupt the drone’s control channel and navigation, by supporting an array of communication protocols that can ‘fend off’ a single drone or even a swarm of drones from the guarded premises,” says ELTA.</p>	Israel	<a href="http://www.iai.co.il/17887-en/Groups_ELTA.aspx">http://www.iai.co.il/17887-en/Groups_ELTA.aspx</a>

<b>Embry-Riddle Aeronautical University</b>	<b>Drone Net</b>	<p>Embry-Riddle Aeronautical University is developing a drone detection network of passive rooftop sensors that capture electro-optical and infrared data (EO/IR) called “drone net”, which will be a cost effective alternative to radar, says the university. The system is aimed at small airports, university and corporate campuses, farms or other operations. “In the future, if the Drone Net’s all-sky camera and connected acoustic network detect a small unmanned aerial system (sUAS) without a flight plan, or off its flight plan, the technology will kick into gear,” says Embry-Riddle.</p> <p>“Specifically, the all-sky camera will cue an EO/IR camera to slew and track the sUAS with high-resolution visible and infrared imaging until the non-compliant sUAS leaves the area monitored by Drone Net – encompassing about 1 square kilometer.”</p> <p>“When the all-sky and acoustic system detects something moving,” said Samuel Siewert, an assistant professor of electrical, computer and software engineering, “it activates automatically, sort of like lizard-brain intelligence. It sends a message to begin electro-optical and infrared sensing by tilting and panning the camera to re-detect the sUAS in a narrow field of view. The EO/IR sensing is controlled by machine intelligence, so that it will re-detect and track, supporting the identification of drones by ground-based computing systems.”</p> <p>Ultimately, the goal of the research is to help law enforcement distinguish between responsible drone operators and possibly hostile ones by creating a database of drone “fingerprints.” The researchers, working on Embry-Riddle’s Prescott, Ariz., campus, will compare and validate data captured by the Drone Net with information from many other types of passive and active sensors</p>	USA	<a href="https://erau.edu/">https://erau.edu/</a>
<b>Elbit Systems</b>	<b>ReDrone</b>	<p>ReDrone is an advanced anti-drone protection system designed to detect, identify, track and neutralize different types of drones at a designated airspace. The system is capable of pinpointing both the drone and its operator’s directions. The advanced detection system provides 360-degree perimeter protection and complete, up-to-the-minute situational awareness. It can also deal with several drones simultaneously. After detecting a target, the ReDrone system disrupts the drone’s communication with its operator, blocks its radio and video signals and GPS positioning data, and sends it off track, preventing it from carrying out an attack.</p>	Israel	<a href="http://elbitsystems.com/pr-new/elbit-systems-reveals-redrone-advanced-anti-drone-protection-neutralization-system/">http://elbitsystems.com/pr-new/elbit-systems-reveals-redrone-advanced-anti-drone-protection-neutralization-system/</a>
<b>ELT Roma</b>	<b>ADRIAN</b>	<p>ADRIAN (Anti-Drone Interception Acquisition Neutralization) is a Counter-UAV solution designed to Intercept and Neutralize LSS (Low-Small-Slow) UAV in multiple scenarios and environments, including urban and dense-urban environment. ADRIAN is based on multispectral sensors (Radar, EO/IR, acoustic and radio link interceptor) performing data fusion for detection and identification. ADRIAN architecture is modular and can be tailored depending on operational, environmental and</p>	Italy	<a href="http://www.elt-roma.com/product/adrian">http://www.elt-roma.com/product/adrian</a>

		cost/effectiveness requirements. ADRIAN reactive and smart jammer is capable to deny the remote control link of the platform and the navigation aids signals used to follow the programmed route through proper waypoints. Jamming techniques enhancing the effectiveness of soft kill disruption of hostile platforms maintaining full operational services of active friendly platforms.		
<b>ELTA North America</b>	<b>Counter-unmanned aerial systems</b>	N/a	USA	<a href="http://eltanorthamerica.com/">http://eltanorthamerica.com/</a>
<b>Ericco</b>	<b>Low slow moving targets defence system, low altitude and slow speed small targets defence system - fixed, low altitude and slow speed small targets defence system - vehicular, ER-1000 hand-held unmanned aerial vehicles to drive traps, anti-UAV electromagnetic interference gun</b>	China's Ericco makes numerous counter-UAS systems. The ER-Low Slow Small Targets Defence System AUAV - Portable is a small hand held jammer, supporting multiple frequency interferences and covering the mainstream unmanned aerial vehicle (UAV) spectrum. It is powered by lithium batteries. Transmitted power is adjustable with interference range between 800 ~ 1200 meters. The ER-Low-altitude And Slow-speed Small Targets Defence System AUAV-Fixed deals with security threats and unexpected small UAV incursions. The product can be deployed fixed site, unattended with auto-detection, auto-tracing, and auto-attack features. It detects sUAS by radio or radar automatic detection, with tracking and locking, then jamming the data-link or GPS positioning signal. The Interference distance is between 1000 ~ 1200 meters. The ER-Low Altitude Slow Small Target Defense System AUAV—Vehicular is a vehicle mounted version of the ER-Low-altitude And Slow-speed Small Targets Defence System AUAV-Fixed unit. The ER-1000 hand-held unmanned aerial vehicles to drive traps device consists of a hand-held host and a battery pack. The hand-held host for the three-band transmitter antenna comprises an integrated design and can simultaneously generate 2.4GHz / 5.8GHz band UAV flight control interference and satellite positioning interference signals. The ER-Anti-UAV Electromagnetic Interference Gun is a rifle equipped with UAV interference capabilities for GPS satellite positioning signals, remote control signals, image data link. It has a range of 1,500 metres	China	<a href="http://www.ericcointernational.com/anti-uav-defence-system/low-altitude-slow-small-target-defence-system.html">http://www.ericcointernational.com/anti-uav-defence-system/low-altitude-slow-small-target-defence-system.html</a>

<b>Esc Aerospace</b>	-	A vendor independent system house	Germany	<a href="http://www.esc-aerospace.com/?page_id=3620">http://www.esc-aerospace.com/?page_id=3620</a>
<b>ESG</b>	<b>Guardion</b>	The GUARDION drone defence system combines the scalable solutions customized to very specific customer requirements to reliably detect and defend against threats posed by the unauthorized use of drones. GUARDION is offered as an integrated product. It has a proven track record of reliable protection in various applications. GUARDION focuses on integrating electronic detection, verification and countermeasures and connecting them to a position mapping and command and control tool. The HPEM counterUAS effectors from Diehl Defence, R&S® ARDRONIS from Rohde & Schwarz and the TARANIS® command and control and position mapping system developed by ESG have proven their capabilities in operational use.	Germany	<a href="https://www.esg.de/en/division/defence-public-security/drone-defence-and-unmanned-aircraft-systems-uas/">https://www.esg.de/en/division/defence-public-security/drone-defence-and-unmanned-aircraft-systems-uas/</a>
<b>Exponent</b>	<b>Drone Hunter</b>	A UAV programmed to intercept rogue drones	Dubai	<a href="http://exponent-ts.com/drone-hunter/">http://exponent-ts.com/drone-hunter/</a>
<b>Fortem</b>	<b>Drone Hunter</b>	<p>Fortem DroneHunter™ is an unmanned counter-UAS aircraft engineered to autonomously fly toward unwanted drones in the sky—without a human pilot on the ground—and detect, track, classify, monitor via video stream, inspect, and safely capture the intruder drone. Fortem’s DroneHunter™ is claimed to be the world’s first counter-drone system that operates beyond line of sight (BLOS) using radar to protect a perimeter day and night from unwanted air threats. According to the company “Some of the technology was developed and hardened over several years on US Department of Defense applications and is now available for commercial use. Core technologies include TrueView Radar, machine learning, specialized guidance, secure data collection and services, robotics and aerospace design, and open command and control platforms for customers to detect, track, classify and mitigate unwanted drones. The open, secure ground station offers operational flexibility of multiple DroneHunters™.”</p> <p>In September 2018 Fortem Technologies announced the launch of Fortem Portable SkyDome, a counter-UAS technology that establishes a 360-degree view of a designated airspace and enables Fortem’s autonomous DroneHunter, to investigate specific areas and provide ground and airspace security with the ability to mitigate</p>	USA	<a href="http://www.fortemtech.com/dronehunter.html">http://www.fortemtech.com/dronehunter.html</a>

		<p>drone intrusions safely. “Portable SkyDome acts as a powerful force multiplier for keeping a designated perimeter and airspace secure,” said a company press release. “,</p> <p>Key benefits of Portable SkyDome are:</p> <ul style="list-style-type: none"> <li>• The system can be set up and torn down quickly at an event or venue and requires no radar or sensor expertise</li> <li>• Boundaries and zones can be created to send automated alerts, texts and emails when intruders enter a zone</li> <li>• Rules can be applied to automatically launch a DroneHunter for additional observation, surveillance, pursuit and capture</li> <li>• When a careless or clueless drone is identified by Portable SkyDome then DroneHunter can be activated to pursue and capture it and tow it away from populated and sensitive areas for safe disposal, regardless of their navigation capabilities</li> <li>• The stand-alone system can be installed and taken down in a few minutes.</li> </ul>		
<b>General Atomics</b>	<b>Fencepost</b>	<p>The General Atomics Electromagnetic Systems (GA-EMS) Fencepost acoustic detection system is a covert, lightweight acoustic surveillance system for CUAS, port security, and high value asset, facility and base protection applications. Fencepost provides a range of tracking and data collection capabilities and visualizations, including early warning alerts with target bearings, multiple simultaneous threat detection and tracking, and 3D-track of targets. The system can be configured with multiple networked sensors to support a wide area of coverage, from remote field operations to congested urban environments. Captured data can be integrated into existing command and control software programs to support Intelligence, surveillance and reconnaissance, operations, and decision-support applications, according to the company.</p>	USA	<a href="http://www.ga.com/general-atomics-acoustic-detection-system-successfully-performs-at-us-army-event">http://www.ga.com/general-atomics-acoustic-detection-system-successfully-performs-at-us-army-event</a>
<b>GEW Technologies</b>	<b>SkyScan2</b>	<p>The SkyScan2 is meant to be used by front-line security forces to detect threat emitters and provide real-time information to control centre commanders. This information can be critical in assessing the security scenario and gaining tactical advantage. While locating emitters, concurrent monitoring is also provided. The SkyScan2 can also be used for communication surveillance and information gathering during high risk events.</p>	South Africa	<a href="http://www.gew.co.za/spectrum-monitoring/products/sky-scan-2/">http://www.gew.co.za/spectrum-monitoring/products/sky-scan-2/</a>

<b>Gradiant</b>	<b>Counter UAS system</b>	<p>Gradiant's technology aims to address traditional surveillance limitations using a solution based on the fusion of different sensors. At this moment, the system is working with two complementary technologies: radio frequency (RF) detection and video processing; but the system has been designed to have the opportunity to include new sensors in the fusion layer to increase the probability of detection (radar, acoustic, etc). This system is not only capable of detect, identify and locate the drone attacks but also neutralize it. The RF detection module is based on smart spectrum analysis using signal intelligence (SIGINT) techniques, which allow the detection and identification of the signals exchanged by the UAV and the ground station. This solution does not only locate the UAV but it also locates the ground station. The video processing module is based on commercial-of-the-self (COTS) both visible and infrared cameras and a video processing smart software tool for UAV detection and location. It is important to highlight that both systems are passive, this feature has some advantages as: it cannot be detected by the attacker, it does not generate electromagnetic pollution, and the power consumption is low compared with active solutions like radar, so it is feasible to board it into mobile units and powered with battery.</p>	Spain	<a href="https://www.gradiant.org/">https://www.gradiant.org/</a>
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<b>Gryphon Sensors</b>	<b>Skylight, Mobile Skylight, R1400 3-D Active Electronically Scanned Array (AESA) air surveillance radar, S1200 2-D Active Electronically Scanned Array (AESA) direction finder, Skylight Airspace Monitor Interface</b>	<p>Gryphon Sensors Skylight system uses multiple ground-based sensors to detect cooperative and non-cooperative targets in the airspace, providing intelligent situational awareness for integration and security. Skylight combines multiple technologies to provide the most comprehensive, clear airspace picture. Featuring an array of self-contained sensors, it serves as a complete mobile command center for many applications. Contained in a van, Mobile Skylight features 4x4 off-road capability and can be taken anywhere without a commercial driver’s license. Gryphon Sensors R1400 is a 3-D Active Electronically Scanned Array (AESA) air surveillance radar designed specifically for the detection of small, low-flying targets. The R1400 provides rapid, precise detection and tracking of airborne targets, including small unmanned aircraft systems (UAS), general aviation, birds and other cooperative or non-cooperative targets of interest. It provides accurate target position and velocity in a configurable hemispherical volume of coverage: 360 degrees in azimuth and 90 degrees in elevation. The S1200 is a 2-D Active Electronically Scanned Array (AESA) direction finder that monitors the signals in the relevant frequency bands for the rapid and precise detection and tracking of small unmanned aircraft systems (sUAS). It uses an extensive library of drone control signal profiles in order to detect and classify these types of signals. This passive sensor reliably and automatically detects the remote control of a commercial microdrone within a 5 km radius. The company also offers a variety of high-resolution, slew-to-cue, optical tracking cameras used to get eyes on the target. Used for visual identification and optical tracking, this sensor is especially useful in the classification of non-cooperative targets like birds, general aviation, etc. It uses both thermal and EO lenses to view airborne targets up to 3km in range — with 360° pan and 180° tilt rotations. The SAMI (Skylight Airspace Monitor Interface) is the glue that brings the sensors together to give a complete airspace picture.</p> <p>In February 2018 Gryphon Sensors agreed a partnership with WhiteFox Defense Technologies, so WhiteFox’s non-jamming, non-kinetic mitigation and analysis capabilities is now integrated within Gryphon’s Skylight system. The resulting RF-based sensor-driven system provides an unclassified and exportable counter-UAS system.</p>	USA	<a href="http://gryphonsensors.com/">http://gryphonsensors.com/</a>
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<b>Henan Zhaonan Information Technology</b>	<b>UAV radio detection system, jamming gun, early warning and control system</b>	<p>The radio detection system rapidly scans and searches UAV remote control signals and undertakes parameter measurement and decoding analysis for these target signals. It can achieve real-time detection and early warning of UAVs and after detecting the invasive UAV, it can send out alarm signals to guide the UAV interference equipment and achieve the interference or interception of the invasive UAV, forcing the UAV to land or return.</p>	China	<a href="http://www.szrayopt.com/UAV-defense--system">http://www.szrayopt.com/UAV-defense--system</a>
<b>Hensoldt</b>	<b>Xpeller, TRML-4D</b>	<p>Xpeller is able to protect sensitive areas against illicit intrusions of small drones, ranging from individual buildings through big events to airports and military camps. Xpeller uses radars, optical, RF and other sensors to detect and identify the drone and assess its threat potential at ranges from a few hundred meters up to several kilometers. Once the threat has been identified, a jammer interrupts the link between drone and pilot and/or its navigation. The modular system concept relies on the selection of individual devices from the Xpeller tool kit depending on customer requirements and local conditions, thus offering best value for money.</p> <p>At Eurosatory 2018 the company showed its newly developed TRML-4D radar system for ground-based air defence. The 3D multifunctional radar ensures rapid response detection and tracking of approximately 1,500 targets in a radius of up to 250 km and at an altitude of up to 30 km. TRML-4D uses AESA radar technology (AESA = Active Electronically Scanned Array), which enables the acquisition of targets after just one rotation of the antenna, thus improving the response time and hit probability even in a complex environment with a high target density and involving highly agile and asymmetric threats. Thanks to the precise coordination of all the antenna elements in the C band (NATO G band) and special signal processing modes, the radar can provide extremely exact information on the targets. An integrated secondary radar system for identifying friend or foe (IFF) prevents friendly fire. The high performance of the radar is largely due to the great number of transmit / receive (T/R) modules in the antenna, which are made from special RF-capable materials.</p>	Germany	<a href="https://www.hensoldt.net/solutions/air/electronic-warfare/xpeller-counter-uav-system/">https://www.hensoldt.net/solutions/air/electronic-warfare/xpeller-counter-uav-system/</a>

<b>Hensoldt</b>	<b>PrecISTRM</b>	<p>Hensoldt is developing an airborne multi-mission surveillance radar which will provide armed forces and border protection authorities with new levels of situational awareness and extremely short reaction times. The software-defined radar named PrecISR (derived from 'precise', pronunciation: 'pri'saiser') incorporates active array and digital receiver technology into a scaleable high-performance sensor which can be installed aboard helicopters, UAVs and fixed-wing mission aircraft carrying out surveillance of large sea and coastal areas against piracy, trafficking or illicit intrusion. Due to its software-defined radar modes and electronic beam steering, PrecISR can fulfil different tasks virtually at the same time. It is able to detect, track and classify thousands of objects and thus literally find the 'needle in a haystack'. Because of its compact design and the fact that all power consuming parts are located outside of the airframe, the airborne platform integration of PrecISR is simplified significantly compared to other radars, according to the company. PrecISR is in the full-scale development phase. A fully functional flying demonstrator is expected to exist in about one year's time and a series product in 2020.</p> <p>Hensoldt launched its Xpeller counter-UAV system in April for the first time in a compact and deployable version called "Xpeller Rapid. According to the company, the new configuration combines a radar system, a camera, radio detectors and jammers. The system can either be integrated into a vehicle or can be used in a transport container for rapid deployment.</p>	Germany	<a href="https://www.hensoldt.net/press/press-release/news/detail/News/hensoldt-brings-new-airborne-surveillance-radar-onto-market/">https://www.hensoldt.net/press/press-release/news/detail/News/hensoldt-brings-new-airborne-surveillance-radar-onto-market/</a>
<b>Herz</b>	<b>Hawk</b>	<p>Hawk is an advanced security system designed to protect sensitive infrastructure areas and people. It combines detection, alerting, monitoring and neutralization of unmanned aerial vehicles (UAVs). The system ensures undisputed security. The system comprises a number of elements – fixed and mobile radars, cameras, control station and "drone" neutraliser.</p>	Poland	<a href="http://thehawksystem.com/">http://thehawksystem.com/</a>
<b>Hex Horus</b>	<b>C-UAS operations and consultancy</b>	<p>The company operates C-UAS equipment and portable systems, maintain persistent detection, provide early warning, and conduct demonstrations during CUAS training exercises. It serve in the form of dedicated air guards or air sentries utilizing an array of CUAS equipment including but not limited to: CORIAN, SKY-VIEW, MADS-K, LIDS, DRAKE and DRONE DEFENDER.</p>	UK	<a href="http://hexhorus.com/">http://hexhorus.com/</a>

<b>HGH Infrared Systems</b>	<b>Spynel</b>	HGH Infrared Systems has developed an improved version of the Spynel-S and Spynel-X long-range detection systems to meet the high demand for drone and micro-drone detection. The units can now be equipped with a Visible Channel, a Laser Range Finder, or both. This option is called V-LRF and aims to facilitate the recognition phase of the threat detected by the sensor's panoramic detection system. The user will be able to use a x30 continuous optical zoom thanks to the full HD Visible Channel to detect very small flying objects. The other option is an eyesafe Laser Range Finder, which provides the user with accurate data regarding the distance of the detected threat, on land, sea or in the air.	France	<a href="https://www.hgh-infrared.com/News/News/HGH-Infrared-Systems-to-launch-Spynel-s-Visible-Channel-and-Laser-Range-Finder-at-DSEI-2017-in-London">https://www.hgh-infrared.com/News/News/HGH-Infrared-Systems-to-launch-Spynel-s-Visible-Channel-and-Laser-Range-Finder-at-DSEI-2017-in-London</a>
<b>H.P. Marketing &amp; Consulting Wüst GmbH</b>	<b>HP47 and HP 3962H</b>	The HP47 "Dronegun" offers a fast and mobile solution against incoming UAVs by stopping the drones in the approach and controlled to land, or by GPS back to the starting point and thus to locate the dronspilot. The HP 47 interferes with the familiar remote control as well as satellite-controlled frequencies. A selection of the frequencies to be interfered with is necessary. LEDs provide information about the active channels as well as the battery status. The system has already been successfully deployed several times and has been able to support many critical deployment structures. The HP 3962 H provides flexible solution against commercial UAVs. A kind of disturbance bell around the jammer prevents the UAVs from entering the affected area; Configurations by directional antennas are readily possible. Through the network integration, a stationary, alarm-based safety lattice can be provided for airports, prisons and government facilities.	Germany	<a href="https://www.hp-jammer.de/jamming-products_e.php">https://www.hp-jammer.de/jamming-products_e.php</a>
<b>IAI/ELTA</b>	<b>Drone Guard</b>	To detect low signature, low-level and low-speed airborne targets, ELTA has adapted to this specific mission its 3D radars, which include the ELM-2026D, ELM-2026B and ELM-2026BF for short (10km), medium (15km) and long (20 km) ranges, respectively, with special drone detection and tracking algorithms, as well as adapting them with EO sensors for visual identification of the target. In order to disrupt the hostile UAV, ELTA has developed advanced adaptive jamming systems which can be used in concert with its detection and identification sensors, or as a continuously operated stand-alone system. The jamming disrupts the drone's flight and can either cause it to return to its point-of-origin ('Return Home' function) or to shut down and make a crash landing. Drone Guard systems have been extensively and successfully tested against a variety of different drones and scenarios, including simultaneous multiple drone penetrations or attacks.	Israel	<a href="http://www.iai.co.il/2013/32981-46509-en/MediaRoom.aspx">http://www.iai.co.il/2013/32981-46509-en/MediaRoom.aspx</a>

<b>IMI</b>	<b>Red Sky 2</b>	The system is designed to detect, disrupt and neutralize UAVs engaged in potentially malicious activity or hostile airborne surveillance missions, stopping them from infiltrating sensitive location such as stadiums, airports, secured compounds, military bases and etc., or in order to protect a V.I.P against armful attack carried out by those systems. It combines aerial radar detection, electro optical thermal acquisition and a high powered directional RF neutralization abilities with supreme range of 3-5km of detection and neutralization. The system can be supplied either as an active system or reactive system that operates only after triggering an alarm when unfamiliar object reaches to the aerial security zone	Israel	<a href="http://www.imisystems.com/whatwedocat/firepower-precision/land-firepower-precision/air-defense/#main-form">http://www.imisystems.com/whatwedocat/firepower-precision/land-firepower-precision/air-defense/#main-form</a>
<b>Indra Sistemas</b>	<b>ARMS (Anti RPAS Multisensor System) family</b>	The ARMS family from Indra is a field proven solution for the protection of any kind of infrastructures from the threats posed by drones. The system has been designed to cope with the smallest targets (<0,01 sqm RCS) and is able to detect single intruders or swarm strategies. Its multi-sensor technology (radar, EOS, RF analysis, RDF, Jamming/Spoofing) combined with an easy-to-use, rule-engine based C4ISR core, provides a modular, scalable solution that can be tailored to the particular needs of any infrastructure. ARMS entry level is “an affordable, self-packaged solution suitable for small areas or single buildings. The family grows up to multi-site deployments where multi-sensor data fusion provides a unique situational awareness picture that can be integrated into existing C4I systems. Drone neutralization is done through time, frequency, space, and power selective Jamming/Spoofing, to defeat the threat with minimum interference in the surrounding RF systems.	Spain	<a href="https://www.indracompany.com/en/security">https://www.indracompany.com/en/security</a>
<b>Invisible Interdiction</b>	<b>Ghoul Tool</b>	Invisible Interdiction has launched the second of the Ghoul Tool line of drone countermeasures for military, law enforcement, and counter-terror forces. The GTFSS works by breaking the command and control or navigation radio links between the drone pilot and the aircraft. Key differentiators quoted by the company include: <ul style="list-style-type: none"> <li>• Power: One MBITR Li-ion battery provides 2+ hours of continuous operation</li> <li>• Very easy, one-hand operation, can still operate primary weapon with other hand</li> <li>• Optional field programmable bands</li> <li>• HERO, HERP, HERF certified</li> <li>• Size: 20”L x 7.5”H x 5”W</li> <li>• Weight: 5 pounds</li> </ul>	USA	<a href="https://invisidiction.com/">https://invisidiction.com/</a>

<b>Involi</b>	<b>Involi.live</b>	involi.live collects real time LAATD (Low Altitude Air Traffic Data) from ADS-B (Automatic Dependent Surveillance & Broadcast) and aircraft transponders, processes it and transmits it to the UTM system so anyone flying and connected to the system can have that information on-board in real time. The solution is to scale-down and adapt the concept of the control tower to the use case of drones, by creating unmanned micro control towers to detect the position of aircraft. This has the advantage of enabling integration of all latest technologies in such devices, while taking out from the loop the weakest element of the equation: the human. The data gathered from a network of micro control towers will be made available in real-time on a platform. In this way, the information on surrounding air traffic could be used by any air traffic connected to it, to automatically and efficiently.	Switzerland	<a href="http://www.involi.com/how-it-works.html">http://www.involi.com/how-it-works.html</a>
<b>IXI Technology</b>	<b>Drone Killer</b>	According to IXI: "Current counter-UAS system technology includes radio frequency (RF) command and control (C2) disruption systems...and directed energy weapons. These systems protect forward operating bases, airports, and other strategic high-asset facilities. These systems are large and stationary; they cannot be used by a mobile user. In addition, UAS threats are more prevalent at the front lines, at small checkpoints and outposts, and remote areas where convoys, dismounted warfighters, and security personnel on missions away from well-established air control assets....The Drone Killer adds counter-UAS capabilities to mobile forces that cannot use large systems that add weight and require added power sources. The Drone Killer is compact and light-weight, able to be deployed from inside light vehicles or by dismounted warfighters in mobile units, strike teams, checkpoints."	USA	<a href="http://ixitech.com/products/drone-killer/">http://ixitech.com/products/drone-killer/</a>

<b>JCPX</b>	<b>UWAS</b>	UWAS is a complete solution designed to detect, identify, track, and neutralize drones. Developed in collaboration with DSNA Services, the system comprises a radar, night and day cameras and a counters measures. The system provides a solution for defence of strategic targets covering a radius of up to 5 km. The UWAS System is an end-to-end system designed to provide effective airspace defence against hostile drones (Micro and Nano UAVs) used by terrorists to perform aerial attacks, collect intelligence, and other intimidating activities. First, the threat is detected and identified. The data is combined and correlated and alerts the operator of the hostile UAV. When the threat reaches the neutralization area, the hostile drone is neutralized by activation of several counter measures. The system is coming with an easy user friendly interface, no specific training required, no specialised operators needed. UWAS has 360° circular coverage and is designed to detect, track, and neutralize drones classified as threats flying in No-Fly zones. UWAS has a very fast response time, it causes minimal collateral interruptions to the surrounding urban environment, with maximum safety to friendly aircraft. The UWAS System is operational under all weather conditions, 24 hours a day.	Monaco	<a href="http://jcp-development.com/">http://jcp-development.com/</a>
<b>Jiun An Technology</b>	<b>Raysun MD1</b>	The Raysun MD1 Multicopter Defender is a shoulder rifle that disrupts a drone's radio frequency within three seconds, giving its operator the impression that it is out of range. The drone is then programmed to return to its owner, make a controlled descent, or fall out of the sky. The device facilitates control of ISM or GPS signals individually, so the user can cut down an ISM signal while keeping the GPS working to track the owner's position and respond. There is a night vision device and thermal scope for night-time operation within 1,100m. The system has been used by the Iraqi military.	Taiwan	<a href="http://www.jiunan.com.tw/en/defense/MulticopterDefender.html">http://www.jiunan.com.tw/en/defense/MulticopterDefender.html</a>

<b>K9</b>	<b>Covert, portable DJ500C drone jammer, portable Terminator 3000 jammer, fixed DJ500F jammer</b>	<p>K9 Electronics provides a range of drone jamming systems. Its covert portable drone jamming system (DJ500C) is fully enclosed and operational from its waterproof, shockproof enclosure. The DJ500C designed for covert use against commercial and domestic UAV drones used to spy on or take illegal images and videos. By simply pointing the DV500C towards the drone, the drone will be immediately disconnected from its users control transmitter forcing it to land. The portable Terminator 3000 drone jammer gun is a high power, full frequency jamming system designed to jam all remote control frequencies used by modern drones and UAV's. The system also has the capability to disrupt satellite navigation frequencies used by drones and UAV's in flight. The fixed site drone jamming system DJ500F can be used to protect areas from commercial spy drones and UAV's snooping, taking pictures and streaming video. The DJ500F can disable the communications link between the drone operators transmitter and receiver thus forcing the drone to land or return to it origin, dependent on how its programmed. Using the GPS option on the DJ500P the drone will become lost and therefore forced to land. The DJ500F can be installed on top of most buildings including factories, warehouses, apartment blocks, and houses. With special fixtures the system can be installed on yachts.</p>	Belarus	<a href="http://www.drone-jammer.co.uk">http://www.drone-jammer.co.uk</a>
<b>KB Radar Design</b>	<b>Groza-R/ Groza-S/ Groza-Z</b>	<p>The Groza range of radio communications jammers for military use are designed for search, detection and jamming of VHF/UHF fixed-frequency, adaptive and programmable frequency-hopping radio communication links. Groza-R is a counter multicopter electronic gun designed for prevention of small-sized UAVs within visibility range trespassing the territory of protected facilities. It jams UAV control channels and on-board hardware of GPS, GLONASS, Galileo and BeiDou satellite systems. The gun is equipped with a collimator sight. Groza-S is a counter-UAV electronic warfare station mounted to an all-terrain Ford Transit vehicle comprising two masts for SIGINT and jamming hardware, life support system and autonomous power supply. Designed for detection, direction-finding of UAV and UAV ground control post; downlink and uplink jamming of GPS, GLONASS, GALILEO, BeiDou on-board satellite navigation system equipment; and spoofing GPS on-board satellite navigation system equipment.</p> <p>Groza—Z: This complex offers facility protection against mass-production civilian multicopters of DJI Phantom 2, 3, 4; Inspire; Mavic; Matrice; Walkera Voyager 3, etc. type. KB Radar says it ensures detection zone with radius not less than 500-1000 m from the centre of the protected facility, multicopter flight blocking zone with radius</p>	Belarus	<a href="http://www.kbradar.by/en/products/radiolokatsiya/">http://www.kbradar.by/en/products/radiolokatsiya/</a>

		not less than 300-500 m; detection and direction-finding of radiated Ground Control Post (operator's location).		
<b>Kelvin Hughes</b>	<b>SharpEye</b>	<p>Kelvin Hughes SharpEye™ SxV radar is highly sensitive and has been optimised for the detection of drones, quadcopters, UASs and UAVs. The company provides complete radar based solutions for border and perimeter security and SharpEye™ with its ability to detect small low aerial targets even in clutter conditions makes it the ideal sensor to detect and provide early warning of the operation of drones. Systems can be a single SharpEye™ SxV mobile radar or part of a multi radar and electro optic camera system deployed via the company's Single Mast Solution (SMS) for mobile and semi-permanent requirements. With a SharpEye™ radar as the primary detection sensor, security agencies are able to monitor and intercept threats from drones in remote and difficult to access locations and also easily move locations. Complete single or multi node situational awareness can be developed through a Detect, Recognise, Identify and Classify methodology and the evolving picture controlled using the Kelvin Hughes control and interface software CxEye™. At DSEI 2017 Kelvin Hughes demonstrated the next evolution of its drone detection and tracking technology. The SMS-D ('D' meaning drone) is a dedicated drone detection and tracking system now featuring a thermal camera and video tracker that acquires the drone target using the initial radar detection information. The benefit of this is once the thermal camera and video tracker has acquired the target it will enable a visual identification and track. Further benefit comes from the combination of the camera mounted on a pan and tilt system that provides a means to precisely calculate the altitude of the UAV. The SMS-D therefore is able to operate as a 2D sensor system providing 3D target information whereby the radar provides the range and bearing. This data can be outputted to a third party counter measure system.</p>	UK	<a href="https://www.kelvinhughes.com/security/uav-drone-detection">https://www.kelvinhughes.com/security/uav-drone-detection</a>
<b>Kirintec</b>	Sky Net Longbow/Recurve	<p>The Sky Net Longbow and Recurve suite of products allow users to respond to and counter specific terror threats. The technology targets the control and video feed from target drones (offering a physically smaller and tactical solution to threats) and counters their use for intelligence gathering, target acquisition and direct target effect. Applications include military operations, national and border security, prisons and airlines. The systems cover the same frequency bands as a vehicle-installed system and can operate with omni-directional as standard, or directional low-, mid- and high-band antenna if required. Sky Net Longbow, Recurve and Recurve Max are also available with CTI (Communications Through Inhibition) technology.</p>	UK	<a href="https://www.kirintec.com/sky-net-defeating-uas-uav-drones/">https://www.kirintec.com/sky-net-defeating-uas-uav-drones/</a>

<b>Korea Advanced Institute of Science and Technology</b>	<b>Drone detection radar</b>	South Korea's Korea Advanced Institute of Science & Technology (KAIST) has developed and deployed a new drone detection radar system which has been deployed around the stadium and athlete village of the 2018 Winter Olympic Games.	South Korea	<a href="http://www.kaist.edu/html/en/index.html">http://www.kaist.edu/html/en/index.html</a>
<b>KRET</b>	<b>R-330KMK Zhitel/"Resident"</b>	The electronic warfare (EW) unit of the Western Military District (ZVO) is now in place around the city of Kursk, equipped with R-330KMK Zhitel or "Resident" automated radio interference systems. These systems are understood to be able to detect and jam radio signals and interfere with UAV mission systems up to a radius of 30km.. According to Defence 24 ( <a href="http://www.defence24.com/639005,electronic-warfare-russian-response-to-the-natos-advantage-analysis">http://www.defence24.com/639005,electronic-warfare-russian-response-to-the-natos-advantage-analysis</a> ): "'Zhital" (R-330Zh) system consists of two elements: a wheeled platform with an operator station for the reconnaissance system (0.1-2GHz frequency range) and a trailer with emitters and antennas of the active jamming system. According to the official information, the system's purpose is to detect, track and jam the Inmarsat and Iridium satellite communications and GSM 1900 cellphones, and also to act against GSM navigation system utilizing the NAVSTAR satellites. "Zhital" may be operated autonomously or it may, alternatively, be remotely controlled by the R-330KMK station. Its range has been defined as 15 kilometres in case of the ground-system jamming and 200 kilometres, with regards to the airborne platforms.	Russia	
<b>L3</b>	<b>Drone Guardian</b>	Drone Guardian is hardware-agnostic and scalable. The base system sensors include radar, camera and RF detection, but existing sensors and effectors, or more appropriate alternatives, can readily be integrated to suit specific threat profile.	USA/UK	<a href="https://l3-droneguardian.com/">https://l3-droneguardian.com/</a>
<b>Leonardo</b>	<b>Falcon Shield</b>	At DSEi 2015, Finmeccanica – Selex ES unveiled its Counter-Unmanned Air Vehicle (C-UAV) system, named Falcon Shield. Falcon Shield provides users with a multi-spectral threat sensing capability and, through the integration of an electronic attack capability, a multi-layered threat response. This response introduces a capability to take control of a remotely-piloted drone and land it safely (a command-link control intervention capability) prior to the need to defeat the threat by simple jamming or kinetic solutions. Consequently, the potential for undesired collateral effects is greatly minimised. Falcon Shield is derived from Selex ES's heritage associated with the provision of short-range defence solutions against a variety of airborne threats.	Italy	<a href="http://www.leonardocompany.com/en">http://www.leonardocompany.com/en</a>

		<p>Falcon Shield makes use of Selex ES's high-performance, passive electro-optical and electronic surveillance sensors, combined with scenario specific radar. These provide a fully integrated threat detection, identification and tracking capability which enables Falcon Shield to operate in environments that range from wide area through to high-clutter, 'urban canyons'. Incorporated within the Falcon Shield system is Selex ES's electronic attack capability that provides users with the ability to disrupt or take control of the threat. Because Falcon Shield is inherently flexible, this electronic attack capability can be complemented by the integration of additional, optional kinetic effectors. Ease of use is provided through use of the Selex ES Vantage Command, Control &amp; Situation Awareness (C2SA) framework. This delivers an intuitive user interface and automated threat detection &amp; tracking functions, including automated handover between detection and identification sensors.</p>		
<b>Leonardo DRS</b>	<b>MLIDS</b>	<p>Mobile Low, Slow Unmanned Aerial Vehicle Integrated Defense Systems, or MLIDS is a collection of different sensors and weapon systems that have been integrated by DRS to fill the counter-UAS mission, and mounted on top of two separate all-terrain mine resistant ambush-protected vehicles, or MATV.</p> <p>In July 2018 the U.S. Army has selected Leonardo DRS, Inc. to provide the Interim, Mobile Short Air Defense (IM-SHORAD) system Mission Equipment Package (MEP) for installation Stryker A1 vehicles. The package includes Moog's Reconfigurable Integrated-weapons Platform (RIWP), Raytheon's Stinger missiles and Rada's Multi-mission Hemispheric Radar (MHR) to provide a "detect-identify-track-defeat" capability required to defeat UAS, rotary-wing and fixed-wing threats.</p> <p>According to Leonardo DRS the IM-SHORAD solution provides both hard and soft kill capabilities to the warfighter while minimizing impacts on the mobility of the Stryker. The RIWP turret supports multiple weapon configurations to give tactical commanders flexibility in various combat scenarios. The Leonardo DRS solution has the mobility, firepower and soldier protection required to fight forward at the lowest tactical levels. When fielded, this IM-SHORAD capability will provide tactical level commands the precision ground-to-ground and ground-to-air lethality necessary to fight and win across a multi-domain battlefield. This down-select decision is part of the Army's IM-SHORAD effort to deliver prototypes in 2019.</p>	USA	<a href="https://www.c4isrnet.com/digital-show-dailies/ausa/2017/10/09/army-to-test-counter-drone-mat-v-upgrade-in-combat-next-year/">https://www.c4isrnet.com/digital-show-dailies/ausa/2017/10/09/army-to-test-counter-drone-mat-v-upgrade-in-combat-next-year/</a>

<b>Liteye</b>	<b>AUDS</b>	<p>The AUDS Technology Team brings together three UK companies each with the unique capabilities required to create AUDS. The Blighter Surveillance Systems Blighter A400 series Air Security radar is able to detect small UAVs in all weather conditions 24 hours a day. The Chess Dynamics EO/IR camera system, with state-of-the-art video tracking technology, is able to track the UAV and, combined with radar target information, classify the target. The operator is then able to make a timely and informed decision to use the Enterprise Control Systems Ltd, ECS, smart RF inhibitor to selectively interfere with the C2 channels on the UAV allowing the system to disrupt the UAV's mission. AUDS is a second-generation system that detects, tracks, identifies, and defeats UAS threats. The AUDS system utilizes state-of-the-art radar, precision thermal and daylight cameras, advanced video tracking, and non-kinetic defeat capabilities. AUDS is a TRL-9 level system, and is in full production.</p> <p>Liteye is contracted to deliver numerous containerised anti-unmanned aircraft systems (known as C-AUDS) to the US Department of Defense by the end of the fourth quarter of 2018. In September this year Liteye Systems received a USD18 million follow on contract for delivery of numerous containerized anti-unmanned aircraft systems, or C-AUDS for short, from the US Air Force. This is the fifth contract for C-UAS systems and services Liteye has received since the fall of 2016. The US version of the AUDS system first deployed with the US Army in late 2016. Liteye is now deploying and supporting their AUDS, M-AUDS, M-AUDS-KE, and C-AUDS variants of their C-UAS system.</p> <p>In October 2018 OpenWorks Engineering Ltd and Liteye Systems Inc announced they formed an exclusive partnership to support military, law enforcement and security authorities with their counter-UAS missions; The two companies are joining forces to offer an integrated low-collateral-damage C-UAS defeat layer to Liteye's counter unmanned systems offerings.</p>	USA	<a href="http://liteye.com/counter-uas.html">http://liteye.com/counter-uas.html</a>
<b>Lockheed Martin</b>	<b>Icarus</b>	<p>Built from internal investments, the ICARUS™ system can identify and intercept commercially available drones. Its multi-spectral sensor system detects and characterizes incoming drones within seconds, before using cyber electromagnetic activity to disable it or allowing the operator to take control of the drone and move it to a safe area.</p>	USA	<a href="http://lockheedmartin.com/us/innovations/061416-webt-laser-swarm-drones.html">http://lockheedmartin.com/us/innovations/061416-webt-laser-swarm-drones.html</a>

<b>Lockheed Martin/ Procerus</b>	<b>Indago</b>	Lockheed Martin/Sikorsky's Indago quadrotor will be paired with the MyDefence Communication KNOX counter-unmanned aerial system (C-UAS) system under a new development agreement between the companies. Collaborative development will take place at MyDefence in Denmark. The project is part of an industrial cooperation programme in Denmark with Sikorsky, a Lockheed Martin company. Project goals include pairing the Indago with the KNOX system to achieve rapid response aerial surveillance capabilities. This solution will allow users to quickly and effectively detect adversaries and record evidence that could be used for prosecution. The pairing of the KNOX and Indago systems would be especially useful to secure areas such as critical infrastructure, prisons and private property.	USA	<a href="http://www.lockheedmartin.com/us/products/procerus/indago-uas.html">http://www.lockheedmartin.com/us/products/procerus/indago-uas.html</a>
<b>Lockheed Martin</b>	<b>ATHENA</b>	ATHENA is a transportable, ground-based system that serves as a low-cost test bed for demonstrating technologies required for military use of laser weapon systems. Lockheed Martin funded ATHENA's development with research and development investments. It uses the company's 30-kilowatt Accelerated Laser Demonstration Initiative (ALADIN) that provides great efficiency and lethality in a design that scales to higher power levels. ATHENA is powered by a compact Rolls-Royce turbo generator.	USA	<a href="http://news.lockheedmartin.com/2017-09-20-Upgraded-Lockheed-Martin-Laser-Outguns-Threat-in-Half-the-Time">http://news.lockheedmartin.com/2017-09-20-Upgraded-Lockheed-Martin-Laser-Outguns-Threat-in-Half-the-Time</a>
<b>Lockheed Martin</b>	<b>HELIOS</b>	In March 2018 the US Navy awarded Lockheed Martin a USD150 million contract, with options worth up to USD942.8 million, for the development, manufacture and delivery of two high power laser weapon systems, including intelligence, surveillance and reconnaissance (ISR) and counter-Unmanned Aerial System (counter-UAS) capabilities, by fiscal year 2020. The High Energy Laser and Integrated Optical-dazzler with Surveillance (HELIOS) system brings together laser weapon, long-range ISR and counter-UAS capabilities. HELIOS combines three key capabilities, brought together for the first time in one weapon system: <ul style="list-style-type: none"> <li>• A high-energy laser system: The high-energy fiber laser will be designed to counter unmanned aerial systems and small boats.</li> <li>• A long-range ISR capability: HELIOS sensors will be part of an integrated weapon system, designed to provide decision-makers with maximum access to information. HELIOS data will be available on the Lockheed Martin-led Aegis Combat System.</li> <li>• A counter-UAS dazzler capability: The HELIOS dazzler will be designed to obscure adversarial UAS-based ISR capabilities.</li> </ul>	USA	<a href="https://news.lockheedmartin.com/2018-03-01-Lockheed-Martin-Receives-150-Million-Contract-to-Deliver-Integrated-High-Energy-Laser-Weapon-Systems-to-U-S-Navy">https://news.lockheedmartin.com/2018-03-01-Lockheed-Martin-Receives-150-Million-Contract-to-Deliver-Integrated-High-Energy-Laser-Weapon-Systems-to-U-S-Navy</a>
<b>Lockheed Martin</b>	<b>High-powered-microwave (HPM) based</b>	In August 2018 US Army Contracting Command announced a notice of intent to sole-source its requirement for an Airborne High-Powered Microwave (HPM) Counter Unmanned Aircraft System (CUAS) along with Delivery, Development and Support (Solicitation Number: W911QX-18-R-0073) to Lockheed Martin. "The Government	USA	<a href="http://www.lockheedmartin.com">www.lockheedmartin.com</a>

	<b>airborne counter unmanned aircraft systems</b>	<p>intends to solicit and negotiate with Lockheed Martin (CAGE Code 64059), located at 1701 W Marshall Drive, Grand Prairie, TX 75051-2704 for high-powered-microwave (HPM) based airborne counter unmanned aircraft systems (CUAS), including the necessary development, integration and support required to meet the government's performance requirements to field UASs with payloads capable of negating adversary UAS in a timely and efficient manner. Unmanned aircraft system payloads under consideration include explosives, nets, entanglers/streamers, and high-powered-microwave (HPM) sources."</p> <p>In November 2017 the US Air Force Research Lab (AFRL) awarded Lockheed Martin USD26.3 million for the design, development and production of a high power fibre laser. AFRL plans to test the laser on a tactical fighter jet by 2021. The contract is part of AFRL's Self-protect High Energy Laser Demonstrator (SHIELD) program, and is a major step forward in the maturation of protective airborne laser systems. "Lockheed Martin continues to rapidly advance laser weapon systems and the technologies that make them possible," said Dr. Rob Afzal, senior fellow of laser weapon systems at Lockheed Martin. "We have demonstrated our ability to use directed energy to counter threats from the ground, and look forward to future tests from the air as part of the SHIELD system."</p>		
<b>Lokmas</b>	<b>Stupor anti-drone gun</b>	<p>Russia's Lokmas Stupor anti drone gun has a range of 500m and electromagnetic and optical-electronic suppression systems interrupts the operation of control channels, data transmission and navigation. In addition, the gun is equipped with a laser emitter of visible range, which allows the user to partially or completely disorganize the process of video filming, which is conducted from the drone.</p>	Russia	<a href="http://antikopter.ru/perenosnoy-kompleks-elektromagnitnogo-i-optiko-elektronnogo-podavleniya-bespilotnykh-letatelnykh-apparatov-grazhdanskogo-naznacheniya-pkp-bpla">http://antikopter.ru/perenosnoy-kompleks-elektromagnitnogo-i-optiko-elektronnogo-podavleniya-bespilotnykh-letatelnykh-apparatov-grazhdanskogo-naznacheniya-pkp-bpla</a> ).
<b>Marduk</b>	<b>Shark</b>	<p>Shark is currently understood to encompass a network of systems providing a wide-area defensive capability, with an electro-optical system cued to a target following the initial detection by another sensor, following which it is tracked by Shark and ultimately engaged by laser effectors – initially up to 10 kW – to temporarily or permanently 'blind' the optronics payload of a UAV.</p>	Estonia	<a href="http://marduk.ee/">http://marduk.ee/</a>

<b>MBDA</b>	<b>Licorne</b>	At Eurosatory 2018 MBDA demonstrated its Licorne C2 lightweight and mobile air defence command and control system now with integrated anti-drone capabilities. In the concept system on display, MBDA had reportedly integrated HGH's Infrared tracking camera; a Sagem electro-optical camera and a Konsortium Engineering Activities System's (KEAS's) UAS jammer.	International	<a href="http://www.mbda-systems.com">www.mbda-systems.com</a>
<b>MBDA Deutschland</b>	<b>High-Energy Laser Weapon System</b>	Precise and scalable laser weapon systems designed to protect major events and critical infrastructures. Effective against a range of threats, including mini-UAVs proven in a series demonstrations and tests from target acquisition, engagement and destruction at distances of up to 2km. MBDA is examining laser-armament options for naval and air applications as well as ground-based mobile laser effector concepts with capacities in excess of 100kW, 360-degree coverage and open system architecture for close and intermediate-range protection against micro UAVs and RAM (rocket and mortar) targets. MBDA says it can provide full system solutions complementing conventional weapon systems with laser effectors. The company claims: ultra-high-performance density from one effector; precise fine tracking and multi-stage control; proof of system's ability to engage highly agile targets and a future-proof principle. Advantages for military application include avoidance of collateral damage caused by fragmenting ammunition and low logistics overhead and minimum costs per firing.	Germany	<a href="https://www.mbda-systems.com/innovation/preparing-future-products-3/high-energy-laser-weapon-systems/">https://www.mbda-systems.com/innovation/preparing-future-products-3/high-energy-laser-weapon-systems/</a>
<b>MC-CLIC</b>	<b>Anti-UAV Rifle</b>	Developed originally to stop drones approaching the Prince's Palace in Monaco, MC-CLIC's anti-UAV rifle has three antennas and a maximum range of 1km. Batteries allow for 90 minutes' continuous use. Intercepted drones can be forced to land once the radio signal has been interrupted for long enough.	Monaco	<a href="http://www.monacolife.net/more-details-emerge-of-made-in-monaco-anti-drone-rifle/">http://www.monacolife.net/more-details-emerge-of-made-in-monaco-anti-drone-rifle/</a>
<b>Meritis</b>	<b>Integrated drone defence system</b>	Meritis Integrated Drone Defence systems are designed to cover the tactical approach drone detection, identification and disruption sector. All products are designed to be modularly integrated depending on customer requirements. Detection and identification systems are based on the SR-9000S drone detection radar, the ADS-2000 acoustic drone detection system and the SC-1000T/SC-1500T camera systems. The jammer units are the RTX-300P2/P6 portable units, the RTX-2000 M6 mobile units and the RTX-3000X stationary units. Integration products include the SWC2U command and control dashboard, the MC3 mobile command and control Cube unit and the SkyCleaner drone gun	Switzerland	<a href="http://www.meritis.ch/DroneDefEN.html">http://www.meritis.ch/DroneDefEN.html</a>

<b>Microflown AVISA</b>	<b>SKYSENTRY</b>	The AVISA Skysentry acoustic vector sensor array is claimed to be “the only acoustic sensor solution to provide reliable multi-platform drone detection in a single system”. It provides round-the-clock surveillance against aerial threats, and can detect, locate and track a variety of drones from toy-shop multi-copters to larger, fixed-wing propeller UAVs. Detection for small, low-noise drones is 400 m. The system is suited to urban environments characterised by lack of line-of-sight, as it can separate the acoustic signature from a drone from other sound sources. It can be upgraded to monitor gun shots and blasts.	Netherlands	<a href="http://microflown-avisa.com/capabilities/counter-uavs/">http://microflown-avisa.com/capabilities/counter-uavs/</a>
<b>Miltronix</b>	<b>Multi-mode radars</b>	The company’s range of multi-function, multi-mode radars have the capability to effectively and efficiently detect and track all kinds of UAVs, including those with low RCS. They can detect a UAV with an RCS of 0.1 m Sq at 25 Km. These radars are equally capable of detecting and tracking fixed wing and rotary wing aircraft targets with an RCS of 2 m Sq at 50 Km.	UK	<a href="http://miltronix.co.uk/portfolio/4d-multi-function-multi-mode-uav-detection-tracking-air-surveillance-radar-system-2/">http://miltronix.co.uk/portfolio/4d-multi-function-multi-mode-uav-detection-tracking-air-surveillance-radar-system-2/</a>
<b>Mitsubishi Electric Corporation</b>	<b>Drone Deterrence System</b>	Mitsubishi Electric’s Drone Deterrence System is reported to have a one-touch instant jamming mode, is lightweight enough to be moved by one person and has a detection and jamming range of about 1 km, although this could change depending on operational circumstances. The control unit can be incorporated into a laptop computer. The company cited frequency detection specifications of 920MHz, 2.4GHz and 5.7GHz. Current users are said to be governmental.	Japan	<a href="https://www.uasvision.com/2017/03/28/mitsubishi-first-anti-uav-system/">https://www.uasvision.com/2017/03/28/mitsubishi-first-anti-uav-system/</a>

<p><b>My Defence</b></p>	<p><b>Watchdog, Wolfpack, Wingman, Pitbull, KNOX</b></p>	<p>MyDefence products detect and counter commercially available drones (LSS – Low, Slow, Small), by integrating sensors and deterrents. The information is passed through the meshed network and display alerts in any command and control (C2) system (i.e. ATAK) MyDefence “Watchdog” networked sensor offers long range detection for i.e. perimeter protection and the “Wolfpack” is a 360 degree directional detection sensor for point defence and rapid deployment protection. The WINGMAN is a small handheld (wearable) drone detector. The WINGMAN works as a stand-alone product, and can optionally interface with other radios for information relay. The WINGMAN is claimed to be the smallest UAS detector on the market. The PITBULL is the intelligent response to the LSS (Low, Slow, Small) drone as it is an automated response to the threat. Through the intelligent server solution IRIS, the company has developed a system which detect and counter commercially available drones, by integrating sensors and deterrents from MyDefence and others. It display alerts on the graphical user interface and is able to integrate in to any system architecture. The KNOX alarm sounds when an unknown drone is detected in the area of interest. Additionally, KNOX is able to detect and identify drones and protect the area by disturbing the device communication at the precise wireless frequency of the drone without interfering with other mobile signals.</p> <p>In late 2018 MyDefence announced the launch of its drone swarm jamming capability, demonstrated at Electric Storm. During the event, five drone operators attempted to execute a coordinated drone attack. The coordinated attack was effectively neutralized using the MyDefence PITBULL Counter UAS jammer, and all drone operators lost control of their drones, says the company. The device is wearable and weighs only 775 grams. Used in conjunction with the WINGMAN drone detector, the PITBULL can automatically jam drone signals, when a drone is detected, says MyDefence. This reduces the cognitive load of the operator, allowing the soldier to focus on the mission, without worrying about enemy drones.</p> <p>Product features</p> <ul style="list-style-type: none"> <li>• Wearable Counter UAS jammer</li> <li>• Ultra-light form factor with a weight of only 775 grams (w/o battery)</li> <li>• Up to 20 hours standby battery time and 2 hours of continuous jamming</li> <li>• Both automated and manual jamming modes</li> <li>• Jamming range of 1,000 meters<sup>1</sup></li> <li>• Average power output is 2W</li> <li>• Software is programmable</li> </ul>	<p>Denmark</p>	<p><a href="http://www.counter-uav.org/counter-uav-solutions.html">http://www.counter-uav.org/counter-uav-solutions.html</a></p>
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<b>My Sky Technologies</b>	<b>Man-portable counter UAV drone</b>	My Sky Technologies based in Adelaide, South Australia, is developing a man-portable, field-deployable fire-and-forget counter UAV drone. The 600 gram drone is stored in a soldier's pack and launched when an enemy drone is detected. The drone carries a range of sensors including RF, infrared, video and GPS and is equipped with saw-like rotors to bring down the enemy drone. The counter-attack drone reaches speeds of up to 250kmh, can fly to an altitude of 5000m and has a range of about 8km.	Australia	<a href="http://www.mskytech.com.au/">http://www.mskytech.com.au/</a> ),
<b>Nammo</b>	<b>Programmable ammunition</b>	Nammo produces a range of programmable ammunition aimed at addressing the threat of ISIS-controlled weaponised commercial drones. This makes it possible for any larger gun to fire shells that can be programmed to explode with pinpoint accuracy, either before, above or inside a target, says the company. Adaptable to several weapon platforms, including 40 mm grenade launchers, 30 mm guns, 120 mm tank ammunition and M-72 rockets, this makes the technology ideal for dealing with a number of different threats, including drones.	Norway	<a href="https://www.nammo.com/newsroom/#/news/keeping-soldiers-safe-from-drones-how-nammo-can-help-257674">https://www.nammo.com/newsroom/#/news/keeping-soldiers-safe-from-drones-how-nammo-can-help-257674</a>
<b>NASA</b>	<b>Safeguard</b>	The Safeguard system monitors and enforces conformance to a set of rules defined prior to flight (e.g., geospatial stay-out or stay-in regions, speed limits, altitude limits). Safeguard operates independently of the UAS autopilot and is strategically designed in a way that can be realized by a small set of verifiable functions to simplify compliance with regulatory standards for commercial aircraft. A framework is described that decouples the system from any other devices on the UAS as well as introduces complementary positioning source(s) for applications that require integrity and availability beyond what the Global Positioning System (GPS) can provide. Additionally, the high level logic embedded within the software is presented, as well as the steps being taken toward verification and validation (V&V) of proper functionality.	USA	<a href="https://ntrs.nasa.gov/search.jsp?R=20160012239">https://ntrs.nasa.gov/search.jsp?R=20160012239</a>
<b>NNIIRT</b>	<b>1L121-E radar</b>	Air defence radar	Russia	<a href="http://www.nniirt.ru/">http://www.nniirt.ru/</a>

<b>Northrop Grumman</b>	<b>MAUI/DRAKE</b>	Northrop Grumman's Mobile Application for UAS Identification (MAUI) is a mobile acoustic sensor that operates on Android cell phones and uses the phone's microphone to detect Group 1 drones, defined as UASs weighing less than 20 pounds, flying lower than 1,200 feet and flying slower than 100 knots. The MAUI software-based approach leverages commercial off-the-shelf mobile devices to provide beyond-line-of-sight detection and identification of UAS threats in high noise environments. The company's Drone Restricted Access Using Known EW (DRAKE) is a radio-frequency negation system that delivers a nonkinetic, selective electronic attack of Group 1 drones. DRAKE demonstrates the feasibility of repurposing mature counter-improvised explosive device technology for interoperable, counter-UAS missions while protecting friendly force communications.	USA	<a href="http://news.northropgrumman.com/news/releases/northrop-grumman-demonstrates-counter-uas-technologies-at-black-dart-exercise">http://news.northropgrumman.com/news/releases/northrop-grumman-demonstrates-counter-uas-technologies-at-black-dart-exercise</a>
<b>Northrop Grumman</b>	<b>G/ATOR</b>	A highly mobile multi-mission radar system designed to fully support worldwide expeditionary requirements, Northrop Grumman's AN/TPS-80 G/ATOR system provides multi-faceted detection and tracking capabilities to enable engagement of a wide range of hostile threats, and offers robust air traffic control capabilities to ensure the safety of Marines worldwide. Operational capabilities enhanced by Northrop Grumman's proven Active Electronically Scanned Array (AESA) radar technology give the AN/TPS-80 G/ATOR system the ability to perform multi-mission tasks at significantly lower operation and maintenance costs compared to existing radar systems. In addition to providing a broad range of optimized radar capabilities, AN/TPS-80 G/ATOR provides automatic adaptability via a scalable open system architecture. G/ATOR's multi-network capability ensures compatibility with additional U.S. Department of Defense command and control systems.	USA	<a href="http://www.northropgrumman.com/Capabilities/gator/Pages/default.aspx">http://www.northropgrumman.com/Capabilities/gator/Pages/default.aspx</a>
<b>Northrop Grumman</b>	<b>JCREW</b>	The Joint Counter Radio-Controlled Improvised Explosive Device (RCIED) Electronic Warfare (JCREW) system is a software-programmable jammer that provide protection from device-triggered improvised explosive devices (IEDs), such as those carried by UAS. Northrop Grumman developed mounted, dismounted and fixed-site variants to protect vehicles, warfighters, and permanent structures for the Navy and the U.S. Air Force.	USA	<a href="https://news.northropgrumman.com/news/releases/northrop-grumman-awarded-95-million-jcrew-production-contract">https://news.northropgrumman.com/news/releases/northrop-grumman-awarded-95-million-jcrew-production-contract</a>

<b>Numerica</b>	<b>Track Manager, Python Simulator</b>	<p>Numerica Track Manager provides real-time correlation and fusion of measurement and track data for superior situational awareness in benign and electronic attack environments.</p> <ul style="list-style-type: none"> <li>• Integrates all data sources into one track file, minimizing dual tracks, swaps and spurious tracks.</li> <li>• Supports most radars, including primary and secondary surveillance, 3D air defence and approach radars.</li> <li>• Easily scales up from one sensor to many sensors and very large track loads.</li> <li>• High-performance, multi-hypothesis algorithms provide highly accurate, real-time integrated track outputs.</li> <li>• Adaptable architecture can be expanded through add-on modules that provide enhanced capabilities for diverse missions and use cases.</li> </ul> <p>The company's Python simulation infrastructure with high fidelity radar models for rapid performance assessment of complicated network-centric tracking systems is an open architecture, distributed discrete event simulation environment used for conducting Monte Carlo simulations of various multi-component systems. Scalable in that it supports parallel computation across multiple processes, cores, and nodes within a computing framework. Provides the middleware for constructing simulations, including both publish/subscribe and service request/response messaging patterns. Enables simulations to be broken down into the smallest logical components, allowing components can be reused and integrated using minimal interfaces. Supports existing models for DoD radars, tracking components, and truth target generators, to enable various multi-target, multi-sensor, multi-platform tracking studies. Distinguished from other simulators in its lightweight, flexible, interfacing capability. The Python infrastructure allows components in various software languages to be integrated.</p>	USA	<a href="http://www.numerica.us/defense/unmanned-systems/#collision-avoidance-system">http://www.numerica.us/defense/unmanned-systems/#collision-avoidance-system</a>
<b>Orbital ATK</b>	<b>T-REX</b>	<p>Orbital ATK exhibited its Tactical-Robotic Exterminator (T-REX) at DSEI 2017 in London, an integrated version of the Liteye/AUDS UAS detection and identification system mounted on board a Stryker vehicle combined with 30mm cannon.</p> <p>The full suite of systems includes a Blighter A400 Series Air Security Radar; Hawkeye DS and Electro-Optical Video Tracker; Directional RF Inhibitor, giving the T-REX, operator the choice of non-lethal, or lethal UAS disruption capabilities. T-REX also features the Orbital ATK's XM914 Chain Gun with advanced ammunition to defeat Class 1 and 2 UAS.</p>	USA	<a href="https://www.orbitalatk.com/">https://www.orbitalatk.com/</a>

Orelia	Drone Detector	The Drone Detector from the Orelia/Squarehead Technologies consortium uses acoustic detection to detect electrical drones, including those without radio frequency links (when on auto-pilot) and that are invisible to radar. It can create a sensing barrier via a network of sensors to protect perimeters from unwanted drones. All monitors are plug-and-play and are centrally controlled on a single management platform. Detected unwanted drones can then be stopped by firing a jammer, as each sensor can be used as a jammer/spoofing controller. Applications include cyber intrusions, personal property and infrastructure such as prisons.	France	<a href="http://www.drone-detector.com/en/protect-your-business-against-drone-cyber-intrusion/">http://www.drone-detector.com/en/protect-your-business-against-drone-cyber-intrusion/</a>
<b>OpenWorks Engineering</b>	<b>Skywall 100, Skywall 300</b>	<p>SkyWall offers those exposed to the drone threat the ability to physically capture an aircraft and control its descent to the ground. The SkyWall system is a combination of a compressed gas powered smart launcher and an intelligent programmable projectile. The first system being released is SkyWall100; a man-portable handheld launcher that is highly mobile and a cost effective way of dealing with the drone threat. In September 2017 OpenWorks launched SkyWall300, an updated version of the SkyWall100 hand-held drone capturing system, which has been deployed by major government authorities and protected President Barack Obama during his visit to Berlin last year. SkyWall300 is an automatic version with an air powered system that launches the same range of net capture projectiles used with the SkyWall100 handheld system. It integrates with external drone detection and command and control systems to allow for maximum ease of use. It automatically tracks any drone prior to giving the remote operator the ability to command the system to capture the target.</p> <p>In October 2018 OpenWorks Engineering Ltd and Liteye Systems Inc announced they formed an exclusive partnership to support military, law enforcement and security authorities with their counter-UAS missions; The two companies are joining forces to offer an integrated low-collateral-damage C-UAS defeat layer to Liteye's counter unmanned systems offerings.</p>	UK	<a href="https://openworksengineering.com/skywall">https://openworksengineering.com/skywall</a>

<b>Panasonic</b>	<b>Drone Finder</b>	Drone-finding technology developed to mitigate the threats of drone accidents and terrorism. The system uses a 32-microphone array and a Pan Tilt Zoom CCTV camera, with each sensor able to detect distances of up to 300m through a 150-degree field of view. It also analyses benign surrounding noises to eliminate them from detection.	Japan	<a href="http://www.securitynewsdesk.com/panasonic-develops-drone-finder-technology/">http://www.securitynewsdesk.com/panasonic-develops-drone-finder-technology/</a>
<b>Patria</b>	<b>MUSCL</b>	At Eurosatory 2018 Patria launched its MUSCL (Multi-Static Coherent Location) passive sensor drone detection system. According to the company: "Passive sensor systems do not transmit signals themselves, but use radio signals transmitted or reflected by the targets. Because passive systems are extremely difficult to detect and small in size, they actually perform better than active radars in various surveillance tasks... MUSCL offers a modular and highly mobile passive air surveillance system. Its range extends to several hundreds of kilometers with a 360-degree directional coverage, and it can track more than 100 objects simultaneously. MUSCL's operating principle allows it to detect small and low flying targets, and to pick up stealth targets even better than active radar systems. The MUSCL system is mainly designed for air surveillance by governmental authorities, but it can also be used to protect critical infrastructure, such as nuclear power plants, and major sporting events."	Finland	<a href="http://www.patria.fi/en">www.patria.fi/en</a>
<b>Pierce Aerospace</b>	<b>Flight Portal ID</b>	A remote ID system	USA	<a href="http://www.pierceaerospace.net/">http://www.pierceaerospace.net/</a>
<b>Prime Consulting &amp; Technologies</b>	<b>GROK Jammer/ GROK Mobile Gun/ Mini-range Counter UAV System/ Small-range Counter-UAV System</b>	Prime Technologies' counter-UAV products can be used separately or as part of complex integrated anti-UAV defence systems. The <b>Grok Mobile Gun</b> is an easily transportable anti-drone rifle that is easy to set up and it helps to neutralise threats within seconds. Drones can be tracked at up to several kilometres' distances. When the UAV is located, the rifle and its mounted directional antennas with horizontal and vertical polarisation are pointed towards the approaching drone and immediately block it. The gun provides autonomous operation for up to 1 hour of continuous jamming. It jams all standard drone remote control frequencies and GSNS signals applied by UAVs. Applications include infrastructure security as well as military security and homeland protection.	Denmark	<a href="https://dronemajor.net/about-us">https://dronemajor.net/about-us</a>

		<p>For continuous jamming at long distances, the company offers the <b>GROK Drone Jammer (GROK J)</b>. UAVs including micro-drones can be detected and defeated at distances from 100m to several kilometres. The system blocks remote control radio frequencies and frequency bands of GSNS. Radio frequency jamming can be activated automatically upon UAV detection or manually. Frequency band coverage and output power can be adapted on customer request. Additional Pan-Tilt platform with antennas (interfaced with the camera or radar) available. Applications include government installations, industrial plants, airports, military bases, prisons, and protection against espionage attack.</p> <p>The company also offers mini- and small-range counter UAV solutions. <b>Mini-range systems</b> provide drone detection at distances of up to 200 m and are used for security of small installations or when drones have to be detected at relatively short distances. System components: Infrared and Video Surveillance Systems, Grok Visual Command Center.</p> <p><b>Small-range systems</b> give protection from 200 m to 1 kilometre and are used for protection of private and business facilities. Small-range components: Perimeter Surveillance Radars, Infrared and Video Surveillance Systems, Acoustic Sensors, Grok Mobile Gun. Optional: GROK Drone Detection Radar, RF Detectors, Video Acquisition and Distribution.</p>		
<b>Quantum Aviation</b>	<b>Drone Protect</b>	<p>DroneProtect® offers clients a tailored and scalable capability to enhance situational awareness using technology specifically targeting the unique signature of drones and delivered at price points to suit all budgets. Using a combination of radio and wi-fi signal detection with electro-optical cameras and if required, bespoke radar, DroneProtect® provides detection, alerting and when suitably specified, tracking of threats using a simple and intuitive operating system, pushing alerts to any remote smart device, laptop or PC. DroneProtect® detects analogue and digital control signals including encrypted systems such as DJI Lightbridge. The system blends RF, optical and radar data to offer a holistic threat picture.</p>	UK	<a href="http://quantumaviation.co.uk/drone-protect/">http://quantumaviation.co.uk/drone-protect/</a>

<b>QinetiQ</b>	<b>Obsidian</b>	The Obsidian radar system detects, identifies and tracks small/micro UAVs that could pose a threat to operational security. By combining staring antenna array technology and QinetiQ's Pallisade™ surveillance management system, complete information on UAS threats can be collected, analysed quickly and then distributed to key personnel through secure wifi distributed channels. The antenna array detects potential threats instantly, without having to scan, while also being able to distinguish very slow moving objects and filter out objects such as bird, ensuring information is unequivocal.	UK	<a href="https://www.qinetiq.com/en-gb/what-we-do/land-and-critical-infrastructure">https://www.qinetiq.com/en-gb/what-we-do/land-and-critical-infrastructure</a>
<b>Rada Electronic Industries</b>	<b>Multi-mission hemispheric radars</b>	RADA's Compact and Multi-Mission Hemispheric Radars are software-defined, AESA, configurable radar platforms which offer a wide range of operational missions at a very high performance-to-price ratio. Among the missions are Active Protection, Hostile Fire Detection, Counter-UAV, all-threat air surveillance, 3D perimeter surveillance, and more. RADA offers a family of tactical multi-mission radar system platforms that primarily differs in antenna sizes, resulting in maximal detection ranges. By combining those radar platforms with a mission application, RADA provides tailor made operational solutions for a wide range of detection distances and targets.	Israel	<a href="http://www.rada.com/capabilities-3/land-radars-2.html">http://www.rada.com/capabilities-3/land-radars-2.html</a>
<b>Radio Hill Technologies</b>	<b>Dronebuster</b>	The Dronebuster is an RF jamming device. This means the device is designed to interrupt the control of the drone by overwhelming the control frequency. This causes the drone to stop and hover, or return to the operator, depending upon the model of the drone. The drone operator has no control while the frequency is being overwhelmed with RF energy. The Dronebuster can take this one step further and also overwhelm the GPS signal, which will cause the drone to land or fall out of the sky. The Dronebuster™ is a cost effective tool for security teams and first responders to use during fluid, ambiguous, fast-paced encounters. The system allows security teams and law enforcement to efficiently deal with a drone approaching a Forward Operating Base, hovering over a large crowd, snooping into secure/private areas, or flying in restricted airspace. With the Dronebuster™, the operator has the tools to intercept the drone command link and command the drone to descend or go home. All the operator must do is aim the Dronebuster™ at the drone and toggle the switch. The LE, or law enforcement model of the Dronebuster allows State and local law enforcement and first responders to clear nuisance drones without forcing them to land. This model will interfere with both communications and video downlinking protocols. It will not however, interfere with GPS navigation signals. In many cases, the drone will simply 'go home.' For all non US Government entities: This device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or	USA	<a href="http://www.radiohilltech.com/">http://www.radiohilltech.com/</a>

		leased, until authorization is obtained. The sale of the Dronebuster LE model is awaiting rules changes at the FCC that will allow for its use by State and local law enforcement.		
<b>Rafael Advanced Defense Systems</b>	<b>Drone Dome, I-Dome</b>	Drone Dome is an interception system that uses a laser beam to locate and destroy hostile drones.  At the 2018 Eurostaory event Rafael launched its I-Dome – a mobile all-weather air defence system designed to intercept and destroy short-range rockets, drones and artillery shells. All components are installed on a single truck and the integrated system is reported to be effective in all weather conditions and function as a stand-alone system or as part of a wider network.	Israel	<a href="http://www.rafael.co.il/4312-en/Marketing.aspx">http://www.rafael.co.il/4312-en/Marketing.aspx</a> <a href="http://www.globes.co.il/en/article-rafael-unveils-laser-based-drone-interception-system-1001193645">http://www.globes.co.il/en/article-rafael-unveils-laser-based-drone-interception-system-1001193645</a>
<b>Rajant</b>	<b>Swarming counter-UAS</b>	According to press reports from the October 2017 AUSA event Rajant Corporation is one of the companies developing a Mobile Ad Hoc Networking (MANET) counter-UAS system under evaluation with the US Army's Program Manager for Counter-Rockets, Artillery and Mortars (PM CRAM). Rajant's concept is for a swarm of approximately 20 vertical take off/landing UAVs which are launched when RAM and UAS targets are detected. The platforms are networked by secure broadband communications via the company's Kinetic Mesh radio system.	USA	
<b>Raytheon</b>	<b>Phalanx</b>	A self-contained package, the Phalanx weapon system automatically carries out functions usually performed by multiple systems: search, detection, threat evaluation, tracking, engagement and kill assessment. The Block 1B version of the system adds control stations that allow operators to visually track and identify targets before engagement. The 1B variant's configuration augments the Phalanx system's proven anti-air warfare capability by adding a forward looking infrared sensor. It allows the system to be used against helicopters and high-speed surface craft at sea while the land-based version helps identify and confirm incoming dangers	USA	<a href="http://www.raytheon.co.uk/capabilities/products/phalanx/">http://www.raytheon.co.uk/capabilities/products/phalanx/</a>
<b>Raytheon</b>	<b>High-Power Microwave weapon</b>	Demonstrated in 2013. Raytheon is one of several defence contractors chosen by the Office of Naval Research to develop a high-powered laser weapon capable of hitting fast-moving targets at a distance under the Ground Based Air Defense Directed Energy On the Move programme	USA	<a href="http://www.raytheon.co.uk/news/feature/laser_tech.html">http://www.raytheon.co.uk/news/feature/laser_tech.html</a>

<b>Raytheon</b>	<b>GBDAA</b>	<p>In October 2018 Raytheon reported it was close to completing the safety case for the company's Ground Based Detect And Avoid (GBDAA) system, used by the US Air Force and also demonstrated at Springfield-Beckley Municipal Airport in Ohio. The ground-based detect and avoid (GBDAA) capability uses existing air traffic data from multiple sources to provide Unmanned Aerial System (UAS) operators with a real-time display of aircraft in the surrounding airspace. GBDAA alerts operators to potential conflicts with neighbouring aircraft and recommends avoidance manoeuvres for UAS in the event that a conflict does occur. The US Air Force uses GBDAA in place of ground observers or chase aircraft at Cannon Air Force Base in New Mexico to allow safe passage of UAS to a military operations area via civil airspace since 2014. Raytheon is currently installing the equipment at Beal Air Force base in California to eliminate a temporary flight restriction area, followed by Grand Forks base in North Dakota. A mobile version of the equipment was recently deployed in Ohio to help accelerate the safe integration of drones into the national airspace: Here, GBDAA supports small UAS operating beyond visual line of site (BVLOS) in an area that extends some 200 square miles. The Volpe Centre is supporting deployment of the mobile version of GBDAA for the joint project between US Air Force Research Labs and the State of Ohio. The programme is building a safety case for the Federal Aviation Administration (FAA), and providing a mobile common centre able to respond in the case of a natural disaster.</p> <p>The main component of GBDAA is a modified FAA terminal automation system equipped with Raytheon's Standard Terminal Automation Replacement System (STARS) that ingests and displays surrounding aircraft to a UAS operator. GBDAA leverages existing NAS radar equipment and infrastructure to locate surrounding aircraft, and can also take feeds from in-fill radar designed to track small UAS. Conflicts are brought to the attention of the controller using three levels of alert with visual and audio alarms. The mobile unit features also a data link capability that enables position data based on GPS information to be sent by UAS operators to the command unit.</p>	USA	www.raytheon.com
<b>Raytheon</b>	<b>MRZR</b>	Raytheon has combined a high-energy laser with a variant of its Multi-spectral Targeting System – a sophisticated package of electro-optical and infrared sensors – and installed it on a Polaris MRZR, a small, all-terrain vehicle. This makes the system particularly suited to expeditionary missions, the company says. The system is standalone, with a footprint of roughly 30 square feet. On a single charge from a standard 220v outlet, the HEL system on board the MRZR delivers four hours of	USA	<a href="https://www.raytheon.com/news/feature/laser_dune_buggy">https://www.raytheon.com/news/feature/laser_dune_buggy</a>

		intelligence, surveillance and reconnaissance capability and 20 to 30 laser shots. The system can also be coupled with a generator to provide virtually infinite magazine depth. The weaponised MTS sensor package that is the core of the system. In this configuration, the MTS provides its standard setting ISR and tracking capabilities while also serving as a beam director.		
<b>Raytheon</b>	<b>Stinger</b>	The Cruise Missile Defense Systems Project Office, in conjunction with the Armament Research and Development Engineering Center, has completed testing on a new Proximity Fuze warhead for the Stinger missile aimed at improving Stinger performance against unmanned air system (UAS) targets. The approval will lead to fielding under an urgent materiel release.	USA	<a href="http://www.raytheon.com">www.raytheon.com</a>
<b>Raytheon</b>	<b>Coyote, KRFS radars</b>	The U.S. Army will use Raytheon Company's Coyote® unmanned aircraft system and the KRFS radar (Ku band radio frequency system) to counter the escalating threat of enemy unmanned aerial vehicles in the skies above the battlefield. Equipped with an advanced seeker and warhead, the Coyote-enabled system can successfully identify and eliminate threat UAVs when paired with an advanced electronically scanned array KRFS radar, which acquires and accurately tracks all sizes of UAS threats. Coyote is small, expendable and tube-launched. It can be deployed from the ground, air or a ship. Coyotes can be flown individually or netted together in swarms, and they are adaptable for a variety of missions including surveillance, electronic warfare and strike. "Enemy unmanned aircraft are among the biggest threats facing our ground troops today," said Dr. Thomas Bussing, Raytheon Advanced Missile Systems vice president. "Our small, expendable Coyote provides the Army with an affordable and highly effective solution for countering the growing UAS threat." In addition to Department of Defense missions, Coyote is also used by the National Oceanic and Atmospheric Administration for hurricane tracking and modelling.	USA	<a href="http://www.raytheon.com">www.raytheon.com</a>
<b>Repulse</b>	<b>Repulse 24/ Repulse 2458E/ Repulse 2458H Handheld/ Repulse360</b>	Repulse drone protection systems do not rely on detection, as they are light weight standalone units that can be left switched on 24 hours a day. The systems produce an electronic shield/no fly zone above 1km vertically and horizontally impenetrable by any commercially available drone using 2.4GHz or 5.8GHz for control. Units available are:  <b>Repulse 24:</b> Can be installed internally to an aircraft to provide protection by beaming in front of the aircraft for 1km. It can also be used as a mobile unit fitted in a	UK	<a href="https://www.repulsedrones.com/products.php">https://www.repulsedrones.com/products.php</a>

		<p>security vest as it is very lightweight. The unit only utilises the 2.4GHz frequency as that will give users the greater distance for drone flight which is where the problem seems to be around aircraft and airports or other applications.</p> <p><b>2458E</b> which is ruggedised or enclosed to keep it weatherproof, portable and can be used as permanent mounting; can be supplied with tripod mount and can run off 12v 6800ah battery enclosed in the unit or be plugged into 12v DC mains supply. Weighs 2.5kg including battery.</p> <p><b>2458H Handheld</b> – a handheld unit, weighing just 1.5kg, with a tripod mount in the handle. Normally runs off 12v 6800ah battery but can be plugged into 12v DC mains supply;</p> <p><b>Repulse 360/20</b> - ruggedised/enclosed unit which provides a more permanent/weatherproof solution but can at the same time be used as a quick mobile deployment system. Units can protect an area with at least a 2km diameter for a full 360° which is useful for buildings and large areas. The domes have been specifically designed to combat the harsh environmental conditions such as found in the Middle East.</p>		
<b>Rheinmetall Air Defence</b>	<b>Radshield, FIRST, MSP600, UMIT, MEES, Skymaster, C2 software, remote tower, RF-Jammer, HPEM, HEL, Skyranger Boxer</b>	<p>Rheinmetall Air Defence offers a modular toolbox which contains a possible solution for all budget sizes to counter this rising threat. In the “sense” domain the company offers:</p> <ul style="list-style-type: none"> <li>• The Oerlikon Radshield® Drone Detection System for multi sensor air space control. The system is optimized to reliably detect low, slow and small objects (multicopters, RC aircraft, balls, balloons, model air ships) and to discriminate them from false targets such as birds. Even a person attempting to trespass a fence can be detected by the system. Objects that are thrown over the fence of a protected asset are also detected, the flight path calculated and shown in the command and control center by triggering an alarm.</li> <li>• The FIRST, an infra-red search and track sensor which ensures permanent reconnaissance of the surrounding area.</li> <li>• The MSP600, a stabilized platform with thermal- and TV cameras, laser range finder and video tracking.</li> </ul>	Germany	<a href="https://www.rheinmetall-defence.com/en/rheinmetall_defence/systems_and_products/air_defence_systems/drohnenabwehr_toolbox/index.php">https://www.rheinmetall-defence.com/en/rheinmetall_defence/systems_and_products/air_defence_systems/drohnenabwehr_toolbox/index.php</a>

		<ul style="list-style-type: none"> <li>• The Universal Multispectral Information and Tracking (UMIT), a mission approved system for air space surveillance. It utilizes different sensors and can detect small drones.</li> <li>• The Mobile Eagle Eye System (MEES), a mission approved air space and ground surveillance system. It combines the two operational components FIRST and MSP 600 and features its own mobile command post.</li> </ul> <p>In the “decide” domain the company offers:</p> <ul style="list-style-type: none"> <li>• The Oerlikon Skymaster® Command &amp; Control System</li> <li>• Rheinmetall C2 Software which enhances the decision making process by filtering, correlating and processing data from all sensors, providing the operator with one comprehensive and common operating picture. Features such as automatic threat detection, sensor slewing and target tracking have also proven to be key enablers for quick reactions and optimum decision making to counter the threat.</li> <li>• The Remote Tower, an air traffic control centre for airfields in remote locations.</li> </ul> <p>In the “act” domain the company offers:</p> <ul style="list-style-type: none"> <li>• The RF-Jammer, a multichannel, programmable high frequency emitter. The frequencies, antennas and performance can be adjusted to the specific threat environment in order to suppress all common communication frequencies used by drones or even mobile communications. The signal strength of the emitter allows interoperability with existing transmission systems and is therefore ideal for public and governmental frequency regulation.</li> <li>• The High Power Electromagnetics (HPEM) is based on a highly repetitive, semiconductor based impulse generator with a transmitting power in the GW-band. The extremely short pulse durations are emitted through a broad band antenna. This impulse causes drones to abruptly lose control and crash.</li> <li>• The High Energy Laser (HEL) is able to focus the power output of one or several laser modules on one spot on the target, burning its way through the electronic parts and other components and causes the drone to lose control and crash.</li> </ul> <p>At 2018 Eurosatory Rheinmetall presented its new Oerlikon Skyranger Boxer air defence system. “It can shoot down incoming rockets as well as mortar rounds – but also unmanned aerial systems, including the low, slow and small kind, e.g. quadcopter drones; it is also highly effective against low-flying aircraft,” according to the company. “The heart of the new Oerlikon Skyranger Boxer is the air defence</p>		
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		module, equipped with an Oerlikon Revolver Gun Mk3 turret. The system features an integrated sensor unit with X-band tracking radar and electro-optical sensors as well as electronic warfare components. This enables swift, autonomous engagement of externally assigned targets. The Skyranger can receive and process target data from both 2D and 3D search radars. Furthermore, the integrated search sensor technology and Oerlikon Skymaster battle management system give the Skyranger an autonomous sector-monitoring and target engagement capability.”		
<b>Robin Radar Systems</b>	<b>Elvira</b>	Elvira offers 360-degree coverage which combines “smart software with affordable radar” for fast tracking and detection. The system works in low visibility conditions, and in urban environments full of obstacles, moving objects, and wireless radio devices. It can detect swarms of drones. Elvira’s map-based interface is comprised of colour coded tracks which can be toggled on and off, and the track visualisations and colours are all user configurable. Elvira’s tracks and alarms can be integrated as a layer in existing security systems and Command and Control (C2) systems. A simple XML broadcast-based interface is included as standard. Other protocols, e.g. ASTERIX, are available on request. The system is camera ready. It can be equipped with a high-resolution pan-tilt-zoom (PTZ) camera for visual confirmation of the target. Elvira is designed to be ready for integration with other detection systems, existing command centres and new forms of intervention.	Netherlands	<a href="https://www.robinradar.com/products/all-systems/elvira/">https://www.robinradar.com/products/all-systems/elvira/</a>
<b>Robodub</b>	<b>N/A</b>	Robodub’s patented technology allows multi-rotor drones to morph their shapes in mid-air. This provides a significant increase in manoeuvrability to the drones making them faster and more agile than conventional multi-rotors. It also enables the drone to balance lopsided or dynamically shifting/swinging loads. Applications include military applications, counter-drone operations and parcel delivery.	USA	<a href="https://www.robodub.com/">https://www.robodub.com/</a>
<b>Rohde &amp; Schwarz</b>	<b>Guardion</b>	The GUARDION drone defence system combines the scalable solutions customized to very specific customer requirements to reliably detect and defend against threats posed by the unauthorized use of drones. GUARDION is offered as an integrated product. It has a proven track record of reliable protection in various applications. GUARDION focuses on integrating electronic detection, verification and countermeasures and connecting them to a position mapping and command and control tool. The HPEMcounterUAS effectors from Diehl Defence, R&S®ARDRONIS	Germany	<a href="https://www.rohde-schwarz.com/uk/home_48230.html">https://www.rohde-schwarz.com/uk/home_48230.html</a>

		from Rohde & Schwarz and the TARANIS® command and control and position mapping system developed by ESG have proven their capabilities in operational use.		
<b>Saab</b>	<b>Giraffe radars</b>	Saab's Enhanced Low, Slow and Small (ELSS) system is a capability that enables the company's Giraffe range of air surveillance and air defence systems to distinguish between UAVs and birds with accuracy. Its Giraffe portfolio now includes the ground based long-range Giraffe 8A, as well as sea and land versions of the Giraffe 4A, the short-range Giraffe 1X and medium-range Giraffe AMB. Giraffe radars are equipped to detect stealth-cloaked aircraft, and that they also feature industry-leading jamming resistance measures.	Sweden	<a href="http://saabgroup.com/Media/news-press/news/2015-09/giraffe-radar-shows-enhanced-anti-uas-skills/">http://saabgroup.com/Media/news-press/news/2015-09/giraffe-radar-shows-enhanced-anti-uas-skills/</a>
<b>SafeSky</b>	<b>Counter UAV system</b>	The company develops and builds field-deployed mobile counter-drone systems aimed at detecting, identifying, tracking and intercepting commercial drones outfitted to attack military personnel. In July 2017 the US Navy Special Warfare Command signed a \$1.5 million deal for a CUAV from the company.	USA	<a href="https://www.skysafe.io/">https://www.skysafe.io/</a>
<b>SCG</b>	<b>DroneRIFLE, DroneRanger, DroneJammer</b>	SCG's Drone-Defense Jammer is a high performance application specific jammer, automatically controlled and managed by ART HMI software. The company also manufactures a complete range of counter-UAS products.	Switzerland	<a href="https://scgroup-ltd.com">https://scgroup-ltd.com</a>
<b>Search Systems</b>	<b>SparrowHawk</b>	SparrowHawk is a Counter UAV (C-UAV) system designed to capture and recover intact a rogue UAV and its payload safely. SparrowHawk will stop fully autonomous UAVs and glide attack UAVs up to 20kg, both rotary and fixed wing, and can be re-armed in just a few seconds for repeat sorties. Batteries can also be swapped in seconds, minimising downtime. The SparrowHawk system is portable, reliable, quick to deploy and easy to operate. It comprises a SparrowHawk multi-copter UAV, weighted entanglement system, parachute, compressed air firing system complete with inbuilt safety mechanisms, EO and IR camera aiming and target selection system. Fast computerised battery charging is included in each system.	UK	<a href="http://searchsystems.eu/sparrowhawk/">http://searchsystems.eu/sparrowhawk/</a>
<b>Securus Technologies</b>	<b>Drone detector</b>	Securus Technologies has spent over 18 months evaluating the technology and potential partners dedicated to detecting drones and stopping them from reaching correctional facilities. Drone detection uses a digital antennae structure (DAS) infrastructure similar to that of Securus' Wireless Containment Solution.	USA	<a href="https://www.securustechhnologies.com">https://www.securustechhnologies.com</a>

<b>Sensofusion</b>	<b>AIRFENCE</b>	<p>AIRFENCE has been designed with over three years of military testing with real world tactical scenarios. At its core, it can automatically detect, locate, track and take over UAV controls all on full auto. In addition, AIRFENCE can locate the operator with pin point accuracy in real time. How it works:</p> <ul style="list-style-type: none"> <li>• RF Detection - Software defined radios that can detect UAVs</li> <li>• High Range of Detection - 6 mile (10km) range with a single AIRFENCE unit</li> <li>• Alarm System - Custom configuration to enable early warning and critical warning notifications in real time</li> <li>• Easy to Scale - Scale horizontally by simply adding more units</li> <li>• Triangulation - AIRFENCE uses triangulation as an additional method to detect UAVs</li> <li>• Manual or Automated Response - AIRFENCE can be preprogrammed to run on full auto, or can be configured to “take action” manually</li> <li>• Mobile Notifications - Configure AIRFENCE to send mobile push notifications when UAVs are detected</li> <li>• Over-the-Air Updates - Real time software updates allow the system to continuously adapt to evolving threats</li> <li>• MAPS-AIRFENCE is capable of showing the real time location of the detected UAV’s on a map. Sensofusion maps can be configured for offline access.</li> </ul> <p>In September 2018 Sensofusion launched AIRFENCE 6.0, which can now target individual UAS’, regardless of what frequency band they hop to when counter-attacking.</p>	Finland	<a href="https://www.sensofusion.com/">https://www.sensofusion.com/</a>
<b>SESP</b>	<b>Drone Defeater</b>	<p>SESP Group's Drone Defeater depowers Unmanned Aerial Vehicles and Secures the perimeter, transforming any field base into a protected fortress. The Drone Defeater severs the connection between drone and pilot. SESP's UAV jamming solution packs intense reservoirs of power to establish the strongest and broadest possible perimeter of security. Seamlessly integrated into any SUV, or as standalone equipment, the Drone Defeater floods the skies with blocking waves, rejecting the penetration of any enemy drone</p>	UK	<a href="http://sesp.com/dronedefeater/">http://sesp.com/dronedefeater/</a>
<b>Sierra Nevada Corporation</b>	<b>SkyCAP</b>	<p>SkyCap counter UAS is described as a viable and effective solution for lightweight dismounted on-the-move tactical vehicle platforms and fixed-site infrastructure protection. Skycap is a multifunction variant of SNC’s operationally deployed Modular Advanced Electric Warfare system (AEWS-M). SkyCap is said to provide superior UAS identification and radio frequency defeat performance. “Performance of the SkyCAP dismounted system has demonstrated its immediate readiness and relevance to the</p>	USA	<a href="https://www.sncorp.com/press-releases/snc-counter-uas-showcased/">https://www.sncorp.com/press-releases/snc-counter-uas-showcased/</a>

		Joint Force for dismounted and expeditionary CUAS protection,” the company says. Integrated with “industry-leading” tactical radar detection and electro-optical infrared (EO/IR) sensors.		
<b>Silent Sentinel</b>	<b>Oculus</b>	High resolution cameras such as the OCULUS HERITAGE are Silent Sentinel’s contribution to the joint development of a counter drone detection capability with Kelvin Hughes. The cameras can detect and identify a PHANTOM-sized drone well beyond 750-1,000m and slave high resolution cameras to the appropriate vector for detailed observation.	UK/USA	<a href="http://silentsentinel.com/oculus-heritage.html">http://silentsentinel.com/oculus-heritage.html</a>
<b>Six3 Advanced Systems</b>	<b>See comment</b>	Six3 Advanced Systems Inc., Dulles, Virginia, has been awarded a USD48.6 million indefinite-delivery/indefinite-quantity contract that provides integration, installation, sustainment, and engineering services to the AIRWorks Rapid Development Capabilities Integrated Product Team in support of the deployment of new and existing counter unmanned aerial systems capabilities and hardware “to high priority and sensitive government sites that protect assets vital to national security.” According to the US Department of Defense: “This contract provides technical, engineering and project management support services to include modeling and simulation, hardware integration, software integration, and command and control integration. Materials and equipment to be integrated may be procured under this contract or provided as government furnished equipment. Work will be performed in San Diego, California (19 percent); Washington, District of Columbia (9.5 percent); Norfolk, Virginia (9.5 percent); Sterling, Virginia (9.5 percent); Seattle, Washington 9.5 percent); Jacksonville, Florida (9.5 percent); China Lake, California (6.3 percent); Leonardtown, Maryland (4.8 percent); Yuma, Arizona (3.2 percent); Dugway Proving Ground, Utah (3.2 percent); and various locations outside the continental U.S. (16 percent), and is expected to be completed in May 2019. This contract was not competitively procured. Six3 is part of the CACI International Group of Companies	USA	<a href="http://www.caci.com">www.caci.com</a>

<b>Skydroner</b>	<b>Skydroner 500, 1000</b>	<p>SkyDroner 500 is designed for urban installation with a detection range of up to 500m. It is ideal in providing total building surveillance in a city environment. SkyDroner 500 can be deployed at the rooftop to provide 24 hours monitoring of surrounding drone activities. SkyDroner 1000 has an effective detection range up to 1000m. It is designed to perform long range surveillance of drone activities in a desert environment. The system is built to meet IP65 standard and operated up to 60 degrees with minimum maintenance. The SkyDroner Central Control Unit has been designed: to alert officer of approaching drone; to indicate progressive distance of the anonymous drone; to provide video footage for easy verification; to identify and indicate type of drone; to record date/time of an event; to generate incident reports</p>	Singapore	<a href="http://www.skydroner.com/product">http://www.skydroner.com/product</a>
<b>Skylock</b>	<b>Anti-drone active and passive systems</b>	<p>SKYLOCK provides early detection, long range protection of up to 20km of large objects or 3.5km and neutralization of unauthorized drones up to 2.5km. The company's integrated systems provide the option of passive, selective and active solutions for multiple applications and have already been deployed in several countries. The suite of systems comprise:</p> <ul style="list-style-type: none"> <li>• A radar system. The outer layer of protection is provided by a rotating radar that detects all drones flying in proximity to the defined no-flight zone. The lightweight, portable radar system defines the range, azimuth, elevation and velocity measurements for up to 200 targets simultaneously, including miniature UAV's characterized by a small signature with a low speed and altitude.</li> <li>• EO/IR tracker. The electromechanical modular electro-optical system provides day and night observation, detection, recognition and identification of the drone up to 2.5km depending on the weather conditions and target. The system's EO/IR trackers thermal imaging and daytime camera provides the control room with a precise location and clear images of the drone.</li> <li>• The RF jammer. This comprises of several jamming antennas- a standard configuration of 3-5 antennas and 2-4 antennas are used to jam the frequency range of the RC and video links which are mounted on the EO system gimbal and aligned with the EO sensors line of sight. The operator is able to neutralize the drone, forcing it away, or grounding the drone at its current location. It is especially useful for urban surroundings, where radar line of sight may be blocked by obstacles. The RF jammer has "on the move" mode.</li> <li>• The D360 reactive detection system This is triggered by the RF's continuous aerial scanning of most common civilian drone's remote controls. Effective coverage of detection up to 2km, 360°</li> </ul>	Israel	<a href="https://www.skylock1.com/">https://www.skylock1.com/</a>

		<ul style="list-style-type: none"> <li>• Laser burner. The operator has the ability to destroy the drone using the systems high powered, accurate laser beam that activates a burner system, effectively destroying the drone within a matter of seconds at range of up to 800m.</li> <li>• Optical tracking. The drone tracker system is based on high end image processing algorithm, the tracker is combined with long range camera systems. The tracker is also used as video encoder with embedded video stabilization capabilities.</li> <li>• Drone gun. A heavy jammer gun for security teams and first responders to use during fluid, ambiguous, fast- paced encounters. The system allows security teams and law enforcement to efficiently deal with a drone approaching a Forward Operating Base, hovering over a large crowd, snooping into secure/private areas, or flying in restricted airspace. With the Drone Gun the operator has the tools to intercept the drone command link and command the drone to descend or go home.</li> </ul> <p>At the 2018 Eurosatory event Skylock launched its three-in-one anti-drone system that can neutralize a drone from 800m. The first layer is a radar which has a reported detection range of up to 20km for large objects, 10km for medium-sized drones and 5.3 km for small UASs. The second layer includes a thermal camera and tracker. The third layer is a suite of anti-drone systems including a radio frequency jamming system or, for close-in operations, a laser with a 800m range.</p>		
<b>SkySafe</b>	<b>Skysafe</b>	<p>The company develops and builds field-deployed mobile counter-drone systems aimed at detecting, identifying, tracking and intercepting commercial drones outfitted to attack military personnel. SkySafe provides military, public safety, and commercial customers with comprehensive airspace awareness and control. Offering fixed, mobile, and temporary drone defence solutions, the company provides the tools to safely and effectively operate authorised drones while protecting against threats. Rogue drones are disabled using radio frequency technology. In some cases, it can force the drone to automatically return to its take-off point, by reverse- engineering the communications and telemetry links that are unique to each model of drone, according to <i>CNN Business</i>.</p>	USA	<a href="https://www.skysafe.io/">https://www.skysafe.io/</a>

<b>Skysec</b>	<b>Sentinel Catch/ Sentinel Catch &amp; Carry</b>	Sentinel's Catch CUAS intercepts and captures intruding drones using a net. It comes in two versions: Sentinel Catch which is launched from a mobile control vehicle and has a single propeller and 5km range, and Catch & Carry which is larger, has four propellers and which also captures unwanted drones in a net, but can stay in the air to carry what it has caught to a safe location. The Sentinel Catch uses a parachute to ground the intercepted drone. Both variants have a modular design allowing for upgrades to laser or tv-guided mode; multiple flight modes such as take-off, cruise and interception; missions can be aborted at any time. Applications include urban defence and airport defence.	Switzerland	<a href="https://www.skysec.ch/">https://www.skysec.ch/</a>
<b>Smart Shooter</b>	<b>SMASH</b>	Smart Shooter has demonstrated its new count-UAS capability within the SMASH family of small arms fire control systems at the annual Association of the United States Army event. The C-UAS range of fire control systems made its international debut at the 2018 Eurosatory exhibition in Paris. The SMASH 2000 Plus is reported by the company to add a drone mode to its targeting systems which allows the shooter to lock onto a target and will only allow a round to be discharged when it can be guaranteed to hit the target. "The SMASH fire control system puts a precision anti-drone capability at the fingertips of its users, featuring built-in targeting algorithms that can track and hit even very small drones skimming along at high speed, at ranges of up to 120 metres, with the first shot," says the company. The SMASH 2000 Plus has a built-in storage so video or images can be recorded for training or after-action reviews.	Israel	<a href="https://www.smart-shooter.com/products/">https://www.smart-shooter.com/products/</a>
<b>Spotter RF</b>	<b>UAVX</b>	UAVX helps commercial facilities and large-scale venues actively monitor and secure their premises, protecting them from unwelcome drones and UAVs. The UAVX precisely detects, tracks and classifies small drones, such as the DJI Phantom, using SpotterRF's compact surveillance radar (CSR), artificial intelligence, and long-range video tracking. UAVX offers comprehensive protection from terrorists, vandals and disruptors. Key features <ul style="list-style-type: none"> <li>• Permanent or temporary installation</li> <li>• Spotter RF radar</li> <li>• Day and thermal cameras</li> <li>• Automatic target classification (Artificial Intelligence)</li> <li>• Optional RF Jammer</li> <li>• 350m quadcopter detection range</li> </ul>	USA	<a href="https://spotterrf.com/uavx-counter-uav-drone-system/">https://spotterrf.com/uavx-counter-uav-drone-system/</a>

		<ul style="list-style-type: none"> <li>• Up to 750m optical video tracking range</li> <li>• 1/6 the price of competitive radar counter UAV system</li> </ul> <p>In August 2018 the company launched the first 3D drone detection radar “that creates a full dome drone detection area from 0 to 90 degrees in the vertical and 360 degrees in the horizontal with a single radar that weighs 12 pounds.”</p> <p>“The 3D-500 radar measures latitude, longitude and altitude of all aerial targets in a 1 km wide hemisphere dome, even directly above the radar with no gaps in coverage. Rapid threat assessment is simple with the automatic detection and 3D tracking of sUAS combined with fully automated camera cueing on the target. Manpower and cost are both reduced with this system while mitigating the threat of undesired aerial presence.”</p>		
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<b>Squarehead</b>	<b>Discovair</b>	The Discovair system is a fully automated passive, acoustic drone detection system for close proximity air marshalling. The system utilizes our acoustic array sensors, allowing for both detection and tracking of drones. The system detects audio anomalies within field of view and runs a discrimination algorithm on the anomaly. Discrimination is immediate, and tracking is provided in real time.	Noway	<a href="http://www.sqhead.com">http://www.sqhead.com</a>
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<b>SRC</b>	<b>Silent Archer</b>	<p>SRC's Silent Archer counter-unmanned aircraft system (UAS) technology is comprised of TRL 8/9 radar and electronic warfare (EW) systems, camera and a 3-D user display to defeat hostile drones, whether a lone target or a UAS swarm. Combined, these systems provide spatial, frequency and optical surveillance capabilities to detect, track, classify and identify the airborne threat. Once the UAS threat is identified, various low-cost, low-risk electronic methods are utilized to disrupt the UAS, such as jamming the communications links between the operator and the aircraft. The Silent Archer technologies work together to provide a complete, end-to-end counter-UAS solution for applications such as:</p> <ul style="list-style-type: none"> <li>• Force protection in contested environments</li> <li>• Critical infrastructure protection</li> <li>• Security for VIPs and high profile events</li> <li>• Urban environment surveillance</li> </ul> <p>SRC has successfully demonstrated the ability for Silent Archer anti-drone technology to detect, track, identify and defeat UAS at U.S. government-sponsored counter-UAS test events like JIAMDO's Black Dart, the Army Warfighting Assessment (AWA), Network Integration Evaluation (NIE), and Maneuvers and Fires Integrated Exercise (MFIEX).</p> <p>An open architecture and sensor-agnostic design of Silent Archer technologies support a variety of optional systems and functionality, such as:</p> <ul style="list-style-type: none"> <li>• Direction finding unit (Provides line-of-bearing information to the UAS and their operators)</li> <li>• Wireless networking (For communicating between systems and command and control (C2) centres)</li> </ul>	USA	<a href="https://www.srcinc.com/what-we-do/counter-uas/">https://www.srcinc.com/what-we-do/counter-uas/</a>
<b>ST Kinetics</b>	C-UAS Grenade	<p>ST Kinetics' CUAS grenade has been designed to defeat small, commercially available, multirotor UAVs. The 40mm grenade disperses streamers delivered to the flightpath of a UAV disabling its propellers, forcing it to crash. It is compatible with a wide range of grenade launchers on the market including the STK 40GL, HK69A1, M203, M79, AG36, MK13, M32A1, Milkor and Rippl Effect MGL. The round has a stated maximum range of 600 m, but the typical engagement range is around 200-300 m when targeting small UAVs.</p>	Singapore	<a href="https://www.janes.com/article/77676/singapore-airshow-2018-st-kinetics-unveils-speciality-40-mm-ammunition">https://www.janes.com/article/77676/singapore-airshow-2018-st-kinetics-unveils-speciality-40-mm-ammunition</a>
<b>Steel Rock</b>	<b>NightFighter</b>	<p>The company makes digital a long range counter UAV system and an analogue long-range portable rifle system. Three-band and five-band variants are available.</p>	UK	<a href="https://www.sruav.co.uk/counter-uav-solutions">https://www.sruav.co.uk/counter-uav-solutions</a>

<b>Synergia</b>	<b>dronesafeguard</b>	dronesafeguard is a mix of layered C-UAV solutions that seek to interdict intruder drones as far out as possible from the caility, asset or person being protected. This is "protection in depth" and it relies on progressively interleaved C-UAV systems and sub systems to: detect, track, respond and then defeat the drone risk threat before physical, asset. syber or reputational damage is inflicted. Developed with Chenega International.	UK	<a href="http://synergia.biz/">http://synergia.biz/</a>
<b>TCI</b>	<b>Blackbird</b>	TCI's Drone Detection technology provides field-proven, fully automated detection and geolocation of drones and their radio controllers. It can be deployed interactively by an operator, or automatically for unattended operation (providing low cost of ownership). The system scans the RF spectrum looking for the RF signature of drones and radio controllers. When a drone or controller is detected, the system geolocates the target and provides a notification. Local operators receive notifications by visual and audible alarm. Remote personnel can be notified by other mechanisms, including email and instant text message. Security personnel can then observe the location of both the drone and the controller on the integrated map and track the target's movements. Knowing the location of the drone's controller helps authorities pinpoint the operator for a safe and effective intervention.	USA	<a href="https://www.tcibr.com/tci-blackbird-integrated-drone-detection-and-geolocation-system-counter-uas-system/">https://www.tcibr.com/tci-blackbird-integrated-drone-detection-and-geolocation-system-counter-uas-system/</a>
<b>Telaforce</b>	<b>Drone detection and protection system</b>	The technology, according to TelaForce, can identify and locate unmanned aircraft flying in restricted or protected airspace, with the added benefit of being able to track back to their operators on the ground. TelaForce also claims it can operate in any weather condition, through continuous, automated monitoring.	USA	<a href="http://telaforce.com/">http://telaforce.com/</a>
<b>TeleRadio Engineering</b>	<b>SkyDroner 1000/ SkyDroner 500</b>	SkyDroner is an anti-drone surveillance system designed to detect, distract and disable any anonymous drone from flying into a protected area. It consists of multiple sensors to monitor the range of radio signals and identify the different characteristics of a drone's signature, distracts the drone by taking over the command and control frequencies and can immobilise it in an emergency. The variants are: SkyDroner 500, designed for urban installation with a detection range of up to 500m. Applications include building surveillance in a city environment. SkyDroner 500 can be deployed at the rooftop to provide 24 hours monitoring of surrounding drone activities; and SkyDroner 1000 which has a detection range up to 1000m. It is designed to perform long-range surveillance of drone activities in a desert environment. The system is built to meet IP65 standard and operated up to 60 degrees with minimum maintenance.	Singapore	<a href="http://www.skydroner.com/product">http://www.skydroner.com/product</a>

<b>Terra Hexen</b>	Droneblocker System Omnidirectional / SAFESKY/ Unidirectional Neutraliser	Terra Hexen is a Business Partner of the manufacturer of the CTRL+SKY system, the Advanced Protection Systems company, and represents it on numerous markets around the world.	Poland	<a href="http://terrahexen.com/en/home/">http://terrahexen.com/en/home/</a>
<b>Thales</b>	<b>ECOsystem</b>	Joining forces to satisfy the growing need for UTM, Thales and Unifly will leverage Thales's expertise in air traffic management, system integration and cyber security as well as Unifly's dedicated focus on drone management to provide the premier UTM application. The solution will incorporate Unifly's Validation Engine, a sophisticated software application that conducts real-time validation of drone flight plans, into Thales ECOsystem, a decision support platform for improved aviation operations.	France	<a href="https://www.thalesgroup.com/en/ecosystem">https://www.thalesgroup.com/en/ecosystem</a>
<b>Thales</b>	<b>SQUIRE</b>	SQUIRE is a man-portable medium-range ground surveillance radar that can detect and classify moving targets on, or close to, the ground at ranges up to 48 km. It consists of compact components to be carried in two backpacks. Each weighs less than 23 kg, including batteries, and can therefore be easily carried by two persons.	France	<a href="http://www.thalesgroup.com">www.thalesgroup.com</a>
<b>ThalesRaytheon Systems</b>	<b>AN/MPQ-64F1 Improved Sentinel</b>	The AN/MPQ-64F1 Improved Sentinel is a three-dimensional, phased-array system that operates in the X-band frequency range. Its primary mission is to automatically detect, track, identify, and report airborne threats, including helicopters, high speed attack aircraft, cruise missiles and unmanned aerial vehicles (UAVs). The Improved Sentinel is the standard for the alerting and cueing of targets to support a variety of weapons, including Stinger missile based SHORAD weapon systems, VSHORAD missile systems and air defense guns. This advanced tactical radar detects and tracks threat aircraft at several times the range of short-range weapons, providing early warning to ground crews and supporting maximum-range engagement of threats	France/USA	<a href="http://www.thalesraytheon.com/fileadmin/tmpl/Products/pdf/Improved_Sentinel_Radar_Data_Sheet_-_April_2011.pdf">http://www.thalesraytheon.com/fileadmin/tmpl/Products/pdf/Improved_Sentinel_Radar_Data_Sheet_-_April_2011.pdf</a>

<b>Theiss UAV Solutions</b>	<b>EXCIPIO</b>	Theiss UAV Solutions, LLC has released the EXCIPIO, a patent pending non-electronic, non-destructive Anti-Drone system. The EXCIPIO (Latin for “I Capture”) is an interception and neutralizing system that allows for surgical removal of a potential threat. Though the initial system concept was focused on intercepting and neutralizing an airborne UAS (or “Drone”), the conceptual applications have expanded to include manned aircraft, ground vehicles, people, and animals (whether airborne or on the ground).The EXCIPIO Aerial Netting System can be mounted to a variety of fixed wing or rotorcraft platforms for use. The EXCIPIO is launched when a threat target has been identified and then flies to intercept the target. When the EXCIPIO has reached the threat target, it fires a net upon the target when commanded by the EXCIPIO System operator. Once the target has been “netted,” the EXCIPIO can either release the net with the neutralized target ensnared (utilizing a small drag chute to slow the fall of the neutralized target) or keep the net tethered to the System for the purpose of relocating the net and neutralized target to a desired location before releasing them to the ground.	USA	<a href="http://www.theissuav.com/researchanddevelopment/">http://www.theissuav.com/researchanddevelopment/</a>
<b>ThirdEye Systems</b>	<b>Meduza, aEye</b>	ThirdEye Systems presented its passive drone detection platform Meduza at Eurostaory 2018. Based on on-the-fly, real-time thermal computer vision algorithms, Meduza can be installed as a stand-alone unit or as a complementary system to long-range detection systems. Unlike radar, it can detect drones low on the horizon, even against a complex background, according to the company. The man-portable platform is already integrated with hard-kill systems, so it can shoot down any drone it detects. “Meduza offers high scanning abilities over vast areas and can detect objects over different types of terrain, including urban areas and more,” says Lior Segal, CEO of ThirdEye Systems. ThirdEye Systems also presented aEye, a fully autonomous, on-the-fly, AI-based, neural-network thermal analytics and classification system, with day and night capabilities. aEye’s on-board analytics enable threat detection while the drone is in flight. The management software of this cost-effective system facilitates enhanced situational awareness, while reducing operators’ cognitive stress levels. aEye can be installed on any third party drone, from DJI M200 to high-duration drone platforms and MIL-STD drones, and is already operational on an advanced long-range VTOL platform.	Israel	<a href="http://thirdeye-systems.com/about-us/">http://thirdeye-systems.com/about-us/</a>
<b>TRD Consultancy</b>	<b>Orion-7 MP Drone Slayer/ Orion D/ Orion H Drone Slayer</b>	Orion produces the Orion -D Manpack portable drone detection system which can detect and identify single or multiple drones at ranges of between 200 to 500m. The drones can then either be sent away or jammed and brought down using the Orion H handheld anti-drone system or the Orion-7 MP ‘Drone Slayer’ with a range of up to	Singapore	<a href="https://gbp.com.sg/drone-jammer-makes-debut-at-dsa-2018/">https://gbp.com.sg/drone-jammer-makes-debut-at-dsa-2018/</a>

		1,500m. The system is capable of jamming a swarm of drones. Orion units provides anti-drone solutions to governments, security firms and private companies.		
<b>Trustcomes</b>	<b>DroneBlocker</b>	N/a	France	<a href="https://www.trustcoms.com/en/droneblocker">https://www.trustcoms.com/en/droneblocker</a>
<b>T-Worx</b>	<b>I-Rail/IXI Drone Killer integration</b>	In May 2018 T-Worx reported that IXI EW had entered into a Product Development and a Licensing Agreement with T-Worx Holdings to provide for the integration of the IXI Drone Killer handheld counter UAS technology onto the T-Worx Intelligent Rail® (“I-Rail®”) system with its Rifle Operating System™. According to T-Worx: “Developed under the US Army Small Business Innovative Research (SBIR) Programme, the I-Rail provides both power and intelligent control of electronic devices when attached to an I-Rail integrated Picatinny Rail. Following an extensive competition, the I-Rail also became the NATO Powered Rail standard in 2015...The current IXI Drone Killer is the only standalone handheld counter UAS device that employs software-defined radio technology to detect and affect class 1 and class 2 UAS (sUAS) devices without the use of broadband jamming. Because the Drone Killer does not employ broadband jamming, once a sUAS is detected by the Drone Killer, it can affect the sUAS with low power signal transmissions. All Drone Killer signals are pre-programmed and can be updated in the field by the user....The Development Agreement encompasses the redesign of the IXI Drone Killer into a small, lightweight, and low power consumption assembly that attaches to the I-Rail. This integration reduces the Size, Weight, and Power (SWaP Reduction) of the current system by more than 50% – to just over two pounds. Integrating the Drone Killer onto the I-Rail gives soldiers counter sUAS capabilities without the burden of carrying a separate, heavier device.”	USA	<a href="http://www.tworx.com/#">http://www.tworx.com/#</a>
<b>UAV Vision</b>	<b>CM202U</b>	The company designs and manufactures high performance, lightweight, gyro stabilized camera payloads for ISR applications. The advanced CM202 gyro-stabilised, multi-sensor camera ISR payload is engineered to offer customisation and the low SWaP gimbal is suitable for integration on a UAV, manned aircraft, fixed land system or mobile land vehicle. The CM202U is a multi-sensor, gyro-stabilised gimbal for counter UAS operations. The entire system is man-portable and robust, and includes object tracking capability, low power consumption, direct drive motors for accurate positioning, Static Target Detection Algorithm, and Moving Target Detector Algorithm.	Australia	<a href="http://www.uavvision.com/mission/counter-uas">http://www.uavvision.com/mission/counter-uas</a>

<b>University of Luxembourg</b>	<b>Anti-swarm system</b>	<p>Press reports says researchers at the University of Luxembourg have developed a new counter-UAS system which comprises a swarm of self-organizing drones which surround and escort the intruder away from the protected airspace. “Over the next years, thousands of drones will hit the skies to fulfill all kind of services such as food and package delivery, surveillance and maintenance,” Matthias Brust, one of the researchers who carried out the study, was reported as saying. “Now, many cities are working on establishing designated drone flight zones. However, the deployment of a large number of drones comes with risks and security issues, in particular because of the speed, flexibility and autonomy of drones. Our research focuses on the question of how a drone defence system can act quickly and autonomously against rough or malicious drones entering the flight zone, and take appropriate counter-measures...We developed a modular and local algorithm, which runs on each drone to enable it to make the right decision autonomously based on the state of its neighbouring drones—forming a so-called ‘intelligent swarm’ of drones,” Brust explained. “After initial deployment and detection of an intruder, the defense drones form a self-organized network and intercept the intruder by isolating it through a local encapsulation algorithm from its environment to escort it out of the flight zone.”</p> <p>According to the reports, the researchers developed a new auto-balanced clustering process, which ensures that the UAV swarm arranges itself in an effective formation to intercept and capture rogue drones. Once captured, the swarm can then safely escort the malicious vehicle outside of the flight zone. “The most challenging task was to develop a local algorithm that doesn’t require a system-wide consensus to function,” Brust said. “Additionally, we needed to make sure that each drone is able to switch into the correct phase of the defence manoeuvres in the right moment. We approached this problem with a modular design which creates balanced swarm-wide interception structures for the capture and escorting formation.”</p>	Luxembourg	<a href="http://arxiv.org/abs/1808.06900">arxiv.org/abs/1808.06900</a>
<b>Vector Solutions</b>	<b>Artemis</b>	<p>The ARTEMIS Drone Defense Solution is a fully autonomous, portable device designed to detect and defeat the majority of commonly proliferated group 1 and 2 commercial drone systems. Through passive interrogation of known drone control frequencies utilizing an automated spectrum analyzer and proprietary HUNTER algorithm, the ARTEMIS identifies potential targets; implements control measures and forces the drone into its pre-programmed loss-of-link profile. The ARTEMIS targets only the drone control frequency and does not interfere with any other frequency in the spectrum. By precisely isolating the drone controller and cross-referencing a known control database, the system yields maximum effectiveness with no false positives.</p>	USA	<a href="http://vectorsolutions.us/counter-drone/">http://vectorsolutions.us/counter-drone/</a>

		While the majority of current drone systems operate via remote control and generally in the same spectrum, next generation threats become much more robust. In order to combat autonomous drones operating solely on GPS signals or outside of the normal operating spectrum, the company relies on a portable threat defence tool capable of defeating autonomous drones.		
Veth Systems	Drone Hunter	The Drone Hunter System (DHS) is an RF jamming device which can block the communication of public drones or can realise a field protection. It can locate a drone more than 1 km away and send it back to its point of location or can land it. DHS1 AirWault is suitable for large coverage areas such as airports, public buildings and prisons. DHS AirWault Mini, which is mobile, is designed for protection of smaller units such as vehicles, private buildings, boats and events.	Hungary	<a href="https://cee-aviation.com/doc/Presentation_Dron%20Hunter.pdf">https://cee-aviation.com/doc/Presentation_Dron%20Hunter.pdf</a>
Vaereos	Counter drone methodology	Vaeros implements a methodology for counter-drone operations that focuses on four key areas: technology foraging, situational awareness, active detection and response, and training and education.	USA	<a href="http://vaeros.org/capabilities/uas-counter-uas-testbed/">http://vaeros.org/capabilities/uas-counter-uas-testbed/</a>
Van Cleve	DroneRanger	DroneRANGER's key components are a 360° scanning radar and a positioning system on which images (visual and thermal) and radio frequency (RF) jammers are integrated. The radar detects the drones and the RF jammers block radio frequencies, thus neutralizing the drones. Components comprise: <ul style="list-style-type: none"> <li>• Co-Aligned Radar, Thermal, Near-IR, &amp; Visible Cameras</li> <li>• Safety &amp; Security for Valuable Properties &amp; Remote Assets</li> <li>• Photonic Deterrence Bore Sighted to Cameras</li> <li>• Automatic Wide Area Protection</li> <li>• 24 Hour All Weather Operation – Day or Night</li> <li>• Low Power for Remote Installations</li> <li>• Interfaces to Central Station Monitor</li> <li>• iPad / iPhone View, Command, &amp; Control</li> <li>• Elegant Installation &amp; Operation</li> </ul> Features: <ul style="list-style-type: none"> <li>• 1.7 Mile Line-of-Sight Operation</li> <li>• Radar &amp; Camera Detection</li> <li>• Authoritative Photonic Deterrence</li> <li>• Embedded Processor &amp; DVR</li> <li>• 20 foot Mast, Integrated Lowering System</li> <li>• IP Ethernet Communication</li> </ul>	USA	<a href="https://www.vcasecurity.com/">https://www.vcasecurity.com/</a>

<b>Vigilant Drone Defense</b>	<b>Advanced Counter UAV Defense System/Vigilant Drone Denial System</b>	<p>Vigilant Drone Defense products create a secure and impenetrable zone of protected airspace, protecting people and assets from invasive drones. The Vigilant Drone Denial Systems comes in several configurations to meet any deployment and operational requirement: Handheld Units, Vehicle &amp; Vessel Mounted, Man-Packable, Temporary Fixed and Permanent Mounted units. Products are enclosed in IP66 certified cases that ensure the system can be used in harsh environments. Products are suitable for military defense purposes, as well as other government, commercial industry and private sector purposes that requires protection from invasive and malicious drone activity. Vigilant Drone Defense products establish an invisible and completely secure no fly zone of airspace with an effective protective radius of 500 meters – to over 8 Km, with over 1 Km in altitude protection. This invisible no fly zone is quickly and easily deployed to protect sensitive and secure locations, as well as property and personnel. The company states:</p> <ul style="list-style-type: none"> <li>• VDD systems work 100% of the time</li> <li>• VDD systems create a secure airspace and is effective against all commercially available drones</li> <li>• VDD systems DOES NOT affect GPS, or communications of other aircraft</li> <li>• VDD systems do not rely on detection</li> <li>• VDD systems has many different configurations</li> <li>• VDD systems are a HIGH STRENGTH/LOW POWER REQUIREMENT units</li> <li>• VDD systems can be manufactured to end user requirements</li> </ul>	USA	<a href="http://www.vigilantdronedefense.com">http://www.vigilantdronedefense.com</a>
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<p><b>Vodafone</b></p>	<p><b>Internet of Things</b></p>	<p>In February 2018 UK mobile telephone network provider Vodafone has announced the start of drone tracking and safety technology trials. Vodafone’s approach uses 4G Internet of Things (IoT) technology to protect aircraft from catastrophic accidents as well as prevent inadvertent or criminal drone incursions at sensitive locations such as airports, prisons and hospitals. The Vodafone IoT drone tracking and safety technology trials support the objectives of the European Aviation Safety Agency (EASA). Vodafone has developed one of the world’s first Radio Positioning Systems (RPS) for drones. This uses a 4G modem and SIM embedded within each drone to enable:</p> <ul style="list-style-type: none"> <li>• real-time tracking of each drone (with up to 50 metre accuracy) by drone operators and authorised bodies such as air traffic control;</li> <li>• over-the-horizon/beyond line-of-sight control by the operator, greatly reducing the risk of accidental incursions when operators lose sight of their drones;</li> <li>• protective geofencing, with drones pre-programmed to land automatically or return to the operator when approaching predetermined exclusion zones (such as airports and prisons);</li> <li>• emergency remote control intervention to provide the authorities with the means of overriding a drone operator’s control to alter a drone’s flight path or force it to land;</li> <li>• SIM-based e-identification and owner registration.</li> </ul> <p>In a preliminary trial in late 2017 Vodafone used its 4G network to control a 1.3 metre wingspan, 2 kilogram X-UAV drone. Throughout the preliminary trial – which took place over a 32-kilometre course around the town of Isla Mayor, near Sevilla in Spain – the drone transmitted a real-time HD video feed and flight data including speed, RPS location and GPS coordinates. Further trials, which will be coordinated with the relevant authorities, are now scheduled in Spain and Germany through 2018 with the intention of making the Vodafone drone tracking and safety technology available for commercial use from 2019.</p>	<p>UK</p>	<p><a href="http://www.vodafone.co.uk">www.vodafone.co.uk</a></p>
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<b>Vorpal</b>	<b>VigilAir</b>	<p>VigilAir, Vorpal’s flagship product, is an RF-based drone situational awareness solution. VigilAir detects, geolocates and tracks drones with sensitivity and accuracy to provide high clarity drone situational awareness. VigilAir is comprised of several RF sensors (four as a minimum) deployed in the Area of Interest, and a clouded server acting as a command and control centre. Distances of few kilometers between sensors and unlimited system scalability provide wide coverage, in both urban and rural areas. The solution enables the accurate detection, geolocation and tracking of both drone and operator, providing users with actionable intelligence and zero false alarms. VigilAir is a fully passive system (RF reception only) and can be operated from fixed installations or deployed ad-hoc in its ruggedized version. Founded in 2009, Vorpal Ltd. has accumulated experience in realizing advanced signal processing and analysis solutions, with in-house proprietary knowledge and algorithms. Aided by experience in military-grade Signal Intelligence (SIGINT), Vorpal designs and deploys advanced, highly accurate geolocation solutions.</p>	Israel	<a href="http://www.vorpal-corp.com">www.vorpal-corp.com</a>
<b>WhiteFox Defence</b>	<b>DroneFox Tactical, DroneFox Fortify</b>	<p>WhiteFox Defense Technologies (WhiteFox) has developed a comprehensive, intuitive, man-portable, readily integrated, high-performance, low-impact, small footprint, personnel efficient, and cost-effective drone threat detection, identification, and mitigation device called the DroneFox. As a single integrated system, the DroneFox detects, tracks, identifies and defeats (DTID) sUAS. The DroneFox detects drones in an airspace, with a range extending even kilometers beyond visual line of sight. A forensic threat analysis is executed on target drones based on variables including its payload capacity, model, location, pilot’s location, and live video feed, thereby extending operator’s ability to protect others from the ground into the airspace above. DroneFox operators are able to safely mitigate the threat by taking complete control of the drone and rerouting to any desired location. According to the company: “The DroneFox, as a defensive counter-sUAS solution, is produced in a form factor that is man-portable and easily fixed to a secure location. The WhiteFox team has developed a C-sUAS protocol library that encompasses virtually 100% of the currently identified critical threat drones, and ~90% of the worldwide commercial drone market. This library includes the encrypted Lightbridge 2: the most popular drone communication protocol in the world, by both consumers and terrorists. WhiteFox has been confirmed by top government officials within the U.S. Department of Defense and intelligence community to be the only entity who can accurately claim and defend the ability to safely mitigate Lightbridge 2 drones.”</p>	USA	<a href="https://www.whitefoxdefense.com/">https://www.whitefoxdefense.com/</a>

		In February 2018 Gryphon Sensors agreed a partnership with WhiteFox Defense Technologies, so WhiteFox's non-jamming, non-kinetic mitigation and analysis capabilities is now integrated within Gryphon's Skylight system. The resulting RF-based sensor-driven system provides an unclassified and exportable counter-UAS system.		
<b>Zala Aero Group</b>	<b>REX 1 counter UAS gun, Zont</b>	<p>Zala Aero Group, a Kalashnikov company, has presented its REX 1 counter-UAS gun at the Army 2017 forum in Russia. According to the company: "The weapon is equipped with a block of suppression, which drowns in the radius of five kilometers signals of the US satellite navigation system GPS, Russia's GLONASS, China's BeiDou and Europe's Galileo. Also, the device is capable of blocking GSM, 3G, LTE signals at a kilometer distance and interfering with frequencies of 900 Mhz, 2.4 GHz, 5.2 – 5.8 GHz. The REX 1 disables the drone but does not damage it physically – the aircraft loses its connection with the control panel and smoothly lands...To put the device in combat readiness, just press one button. The weapon is equipped with a fastening system, so that it can additionally be equipped with sights, lights, designators, as well as objective control devices....The weight of REX 1 is 4.2 kg, while the model has a built-in battery that provides continuous operation of the device for three hours."</p> <p>Russian news agency TASS reported in October that Zala had demonstrated a new device of satellite navigation signal suppression for unmanned aerial vehicles (UAVs) at the Interpolytex-2018 security exhibition. "The compact module is placed under an unmanned aerial vehicle's wing and suppresses the signal of satellite navigation systems within a radius of up to 5km, and also blocks the operation of all devices that use satellite navigational systems for navigation," the Kalashnikov press office said. The satellite navigation signal suppressing system has been developed for Special Operations forces. The system can be used to neutralize an enemy's equipment that may pose a threat to defended facilities. The new system will expand the range of electronic warfare devices developed by Zala. It comprises the REX-1 anti-drone rifle and the ZONT man-portable device. The new satellite navigation signal suppressing system has undergone successful trials and proven its efficiency.</p>	Russia	<a href="http://zala.aero/rex-1/">http://zala.aero/rex-1/</a>