

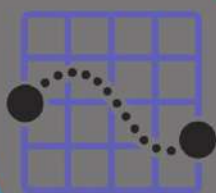


DRONEDEFENCE

Securing Your Airspace



Detect



Locate



Identify



Defeat

SCALABLE, SAFE & SIMPLE DRONE SECURITY SOLUTIONS

Prevent unwanted drones entering your airspace. Robust, safe and economical system to create a permanent no-drone-zone.

Simple to use and integrated into existing security systems, SkyFence is the proven technology solution to protect your airspace.



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Please Note: Drone mitigation may be subject to local legislation. Get in touch to find out more.



Richard Gill - Founder & CEO

I believe that drone technology is going to change the way we view, interact with and eventually move around our planet.

*Everything we do at Drone Defence is about **enabling** drone technology and demonstrating its potential.*

However, we recognize that some people would wish to subvert drones for their own gain.

*It is our **mission** to protect people and organizations from the harmful use of commercial drone technology.*

Scalable, Safe, Simple

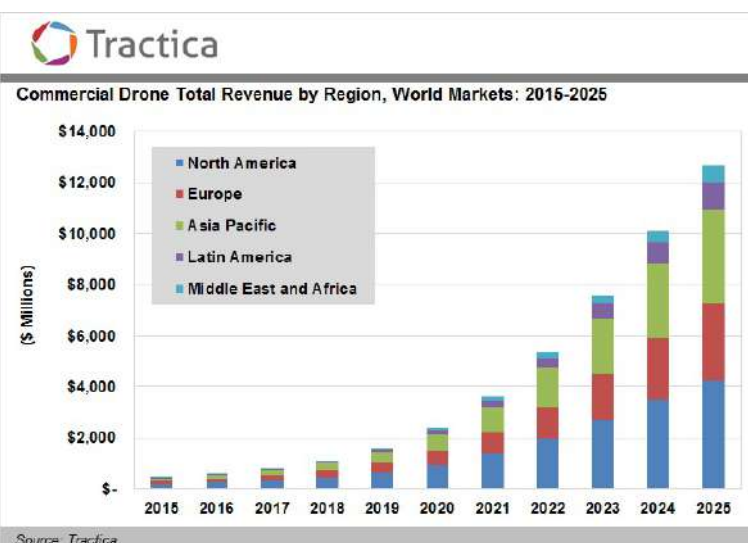
Drones are a growing risk for critical infrastructure sites such as prisons, utilities, airports and ports. Decision makers and operators are needing to consider and address this emerging threat from commercial drones, sales of which are estimated to reach over \$12bn by 2025.

Drones are fantastic tools but in the wrong hands they can be a nuisance, or they could cause a serious security breach. The use of drones to smuggle contraband, monitor activity or carry out hostile surveillance has been increasing in line with the adoption of drone technology.

Recent years have seen a significant advance in drone endurance, range and payload capacity whilst the price has also plummeted, leading to a proliferation of drone use. Drones are being used by criminals because of these reasons as well as being quick, easy to fly and they generate imagery in real time.

The drone's manoeuvrability allows it to gain access to places, overcoming traditional physical security. Then the drone can deliver illicit substances, or record footage or take photographs as part of planning surveillance prior to the actual operation.

In prisons we've seen drones involved in this activity. Organised gangs have been developing more sophisticated procedures with drones providing situational awareness in 'overwatch', whilst 'runner' drones deliver the contraband.



As access to technology becomes more widespread and technologies converge, new threats are created. Drones can be used as the delivery mechanism to transport illicit substances, carry electronics to gain illegitimate access to sensitive systems and information, or invade privacy.

DRONEDEFENCE

Drone Defence are here to help protect you from this emerging threat. We focus our developments based on end user requirements to ensure they are safe, simple to use, and effective.

We can provide your site and security personnel with the latest scalable, easy to use counter drone technology which will ensure that your daily business activities are protected from unwanted drones.

Potential Threats:

Smuggling

Surveillance

Safety Risks



How do I defend against Drones?

Drones do not conform to a common set of standards. As the demand and use of Commercial Off The Shelf (COTS) Drones grows, the more they will be used to invade privacy, move items rapidly from point to point, and more sinister activities. There have been countless incidents of drones being used to smuggle contraband into prisons, fly into nuclear power stations, or attack critical infrastructure. And as technology becomes more accessible the threats presented by drones broadens to cover ever more invasive activity such as electronic snooping, system hacking, surveillance etc.

To effectively stop drones they first need to be detected and then a countermeasure system needs to be deployed.

The aim of any drone detection technology is to Detect, Track and Identify the drone. In general, four technology types are used, these are:

Technology	Effectiveness	Range	Pros	Cons
Radar (Detect & Track)	80-90%	750m+	Can detect RF silent drones Established Technology	Struggles with ground clutter High False Alarm Rates, High Costs 'Active Device' Requires Permission
Cameras (Detect & Identify)	30-50%	Up to 1000m (depending on weather)	Captures Image of Drone	Poor Weather Performance High False Alarm Rates Poor against multi targets
Acoustics (Detect)	5-10%	Up to 200m	Can act as last line of detection	Very poor in built up areas Can't identify or locate
Radio Frequency Analysis (Detect, Track & Identify)	70-80%	Up to 5km	Single – Detect & Range plus Bearing Multi – Geo-location	Cannot detect a drone when not transmitting

Our drone detection system is called AeroSentry™ which uses Radio Frequency analysis to indicate if a drone is in the area. Once identified AeroSentry™ can automatically activate our SkyFence™ system which creates an electronic barrier that the drone cannot fly through

How does it work?

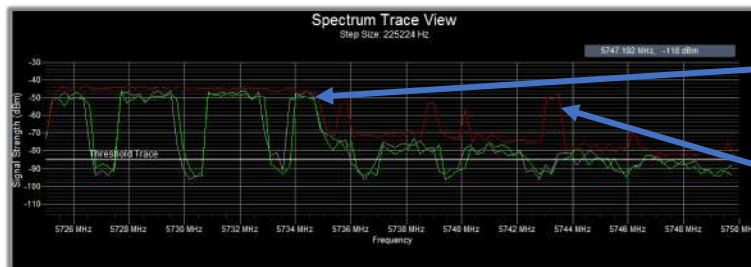
Part 1 – Detection and Identification Utilises our AeroSentry DND 360 RF detection system

1. Detect

The AeroSentry DND360 detects drones up to a 5km range. Early warning is provided through graphical interface, and mobile alerts enables reaction and response times to be maximised.

2. Identify

AeroSentry uses multiple detection algorithms to alert when a drone is within range. Where possible we can also conduct signal analysis to determine the type of drone. Complex algorithms enable the AeroSentry to confirm the identity of drones, avoiding false positives.



Video Signal
(OFDM)

Command
Signal (FHSS)

Part 2 – Countermeasures Utilising SkyFence our integrated fixed system

3. Defeat

Once a real drone threat has been established, the system activates the chosen countermeasure automatically, or alerts the crew. Should the drone approach the site, its control/video signal will be blocked, initiating its fail-safe return to home mode forcing it to return to its take-off point. It does this by blocking the signal between the controller and the drone not unlike when trying to talk to someone in a noisy environment.



If you imagine that you are in a room with loud music and you want to talk to someone else. The loud music will prevent you from speaking to the listener unless you are very close.

Signal jamming works on the same principle, by drowning out the Controller's signal we prevent the message from reaching the drone.

SKYFENCE

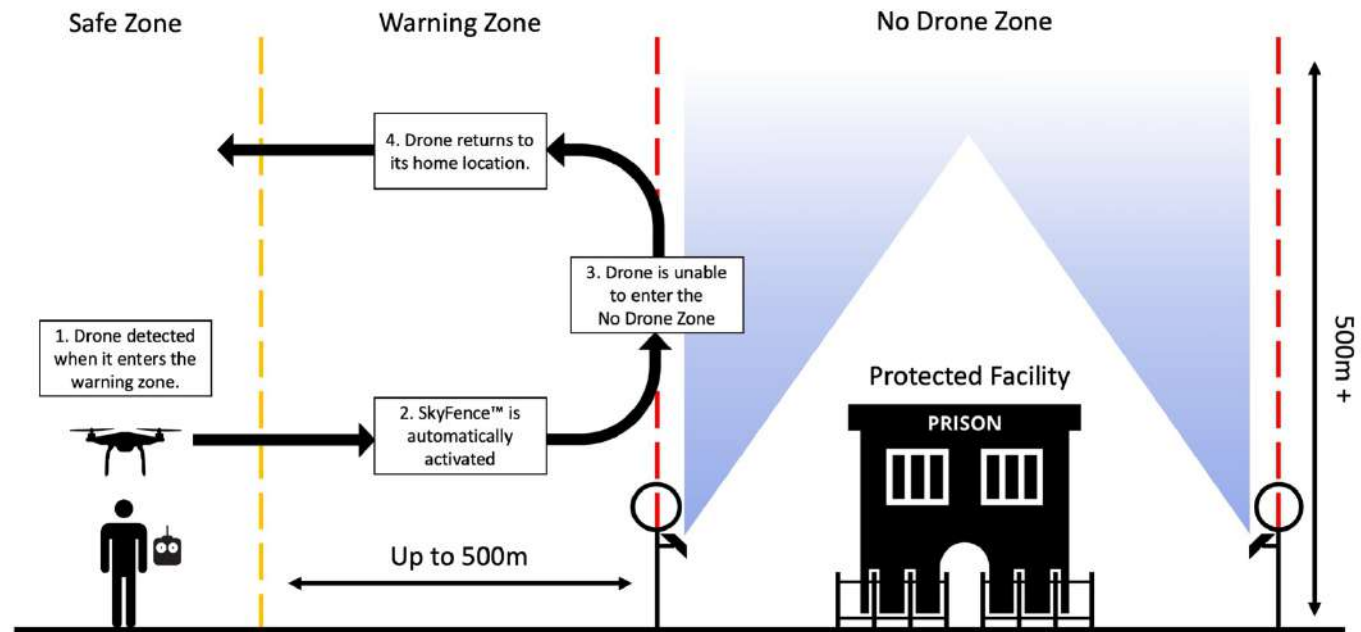
SkyFence™ is an electronic countermeasures system which prevents drones from flying into or close to a protected location by disrupting its command and navigation radio transmissions; in any weather, day or night. It can be configured horizontally or vertically depending on the operational requirements.

As a system it uses multiple low-powered radio transmitters which are strategically placed around the protected site. When activated either automatically or manually, SkyFence™ transmits a signal which is designed to overwhelm the drone's radio transmissions. This breaks the control and video link between the drone and its operator, forcing the drone to return to home. With the optional GPS jammer you also have the option of forcing the drone to undertake a controlled landing, enabling forensic evidence to be obtained.

SkyFence™ is fully programmable and can be activated via a suite of sensors or human input.

Key Features:

- Electronic fence to stop drones
- No impact on other devices
- In excess of 500m in height
- Creates a 'roof' over facility
- Disrupts command and navigation frequencies
- Scalable, to cover any size site
- No damage to the drone
- Defeats drone swarms



Safe and Effective

SkyFence only affects the protected airspace because it employs Precise Antenna Technology (PAT). As a result it is much more effective and avoids the collateral damage associated with omnidirectional jamming technology. SkyFence has undertaken rigorous testing and is fully compliant with EU directives.

"SkyFence has undergone full maintenance and testing procedures during 2018 and passed in all areas. The system was subject to local independent penetration testing and in addition the Prison has also undertaken independent testing of the system without the contractor on site. After extensive drone flights covering all fence areas at various distances, no drone was able to cross the fence, and the system operated as expected on each occasion." Dave Matthews - Guernsey Prison Governor

Fully Supported

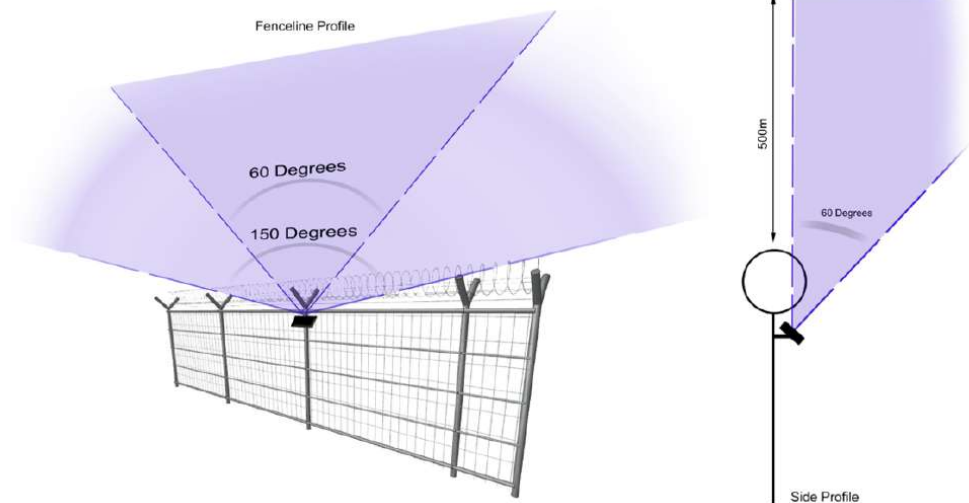
The system is installed by qualified security installation personnel and is fully supported throughout the life of the product with Service, Maintenance and Software Plan options available. Where possible we utilise existing infrastructure (fences, posts, lighting rigs, CCTV locations etc) to mount the SkyFence Panels, minimising additional impact. Once commissioned the SkyFence system creates an electronic fence around the site with each panel creating a 60° projected RF cone to an effective distance of around 500m.

Scalable and Cost Effective

The system is infinitely scalable to match the range of installations and perimeter sizes of any site, and can be integrated into existing Security Management Systems. Its modular design allows for zones to be created, and provides for easy expansion. This proven technology is simple to use, provides a cost effective solution and unrivalled performance against COTS drones.

"SkyFence has caused no undue interference as demonstrated in Guernsey Prison and to date has proven to be 100% safe."

Dave Matthews –
Guernsey Prison
Governor



Case Study – Guernsey Prison

In the summer of 2017 Guernsey Prison in the Channel Islands, UK installed a SkyFence™ system to prevent drones from smuggling drugs, phones and weapons into the prison.

This prison is the first in the world to have an automatic drone defence system. When a drone approaches the prison, it is detected by a radio frequency sensor and then SkyFence™ is automatically activated.

This creates an invisible wall to prevent the drone from crossing the perimeter; an effective No Drone Zone over the prison.

Dave Matthews – Guernsey Prison Governor – said *“We put this up because we saw what was happening in the UK and we knew it was only a matter of time before Guernsey became victim to deliveries by drones. The system has just stopped the problem happening.”*

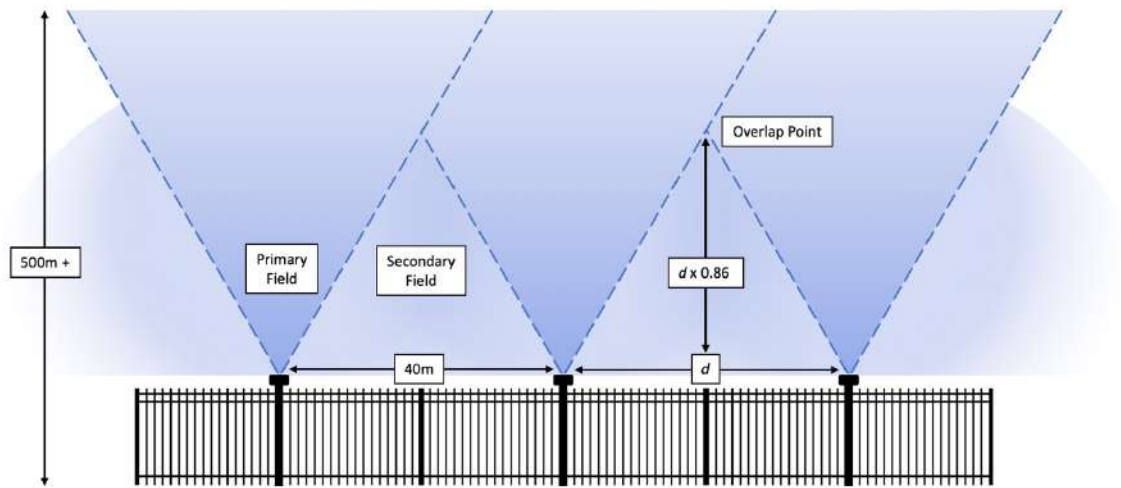
Since the system was commissioned *“we have multiple detections, but no drone has been able to cross the perimeter. SkyFence is seamlessly integrated into existing security systems and causes no more operational impacts on staff than any other alarm system.”*

ITV covered the SkyFence™ project at Guernsey Prison – watch here - <http://www.itv.com/news/channel/2017-05-12/guernsey-prison-testing-pioneering-anti-drone-tech/>

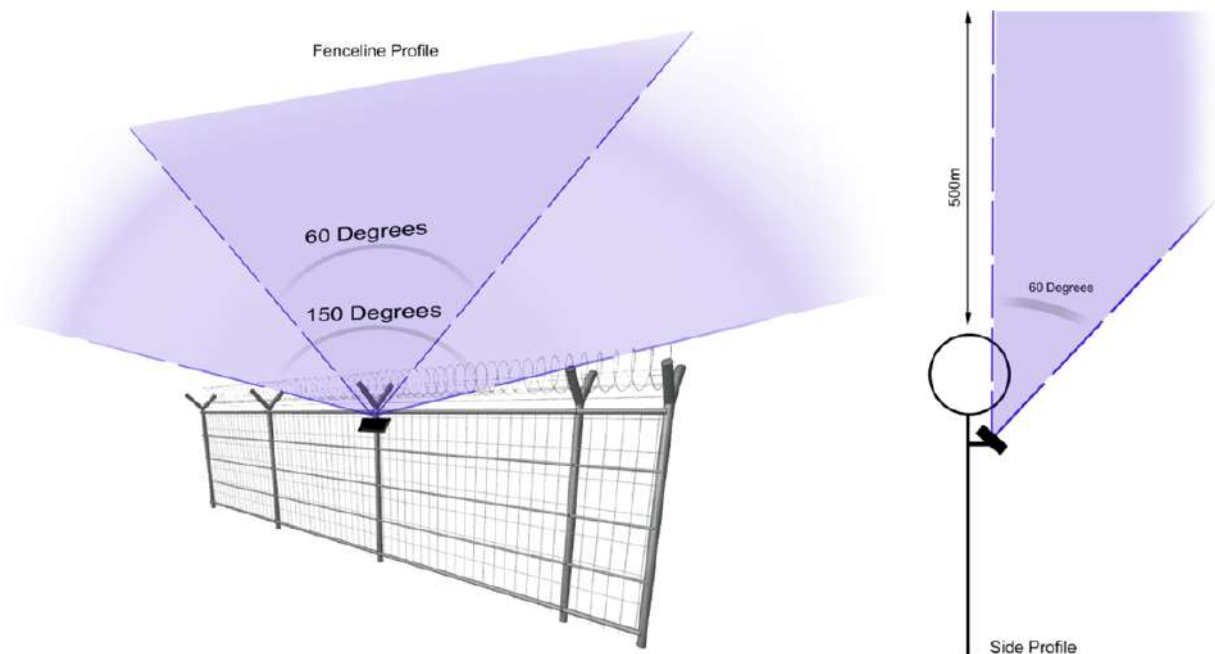


Specification and Technical Summary

SkyFence™ Coverage

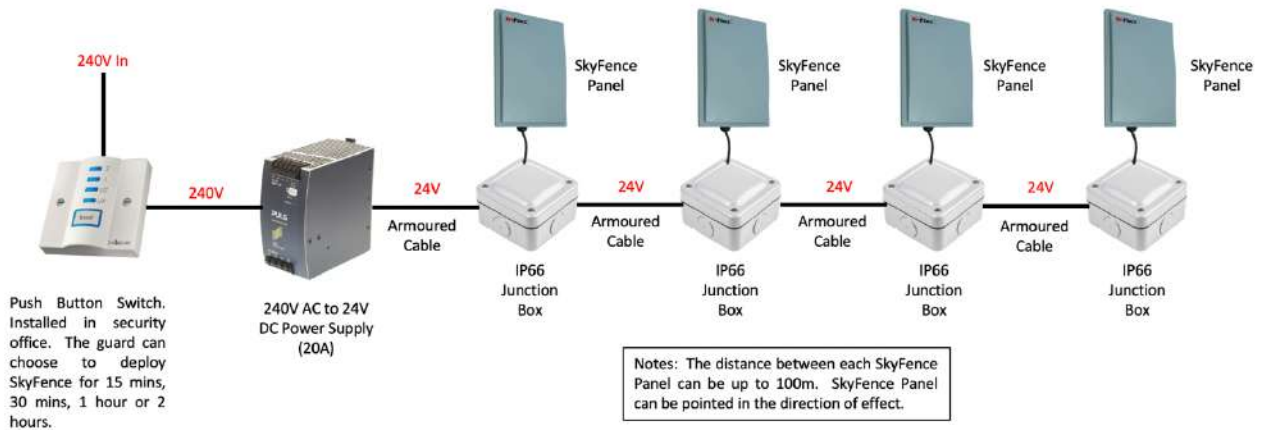


By using Precise Antenna Technology (PAT) SkyFence™ reduces impact on other electronic devices and only effects the drone in the sky. When minimising collateral electronic impacts is essential then SkyFence™ is the solution.

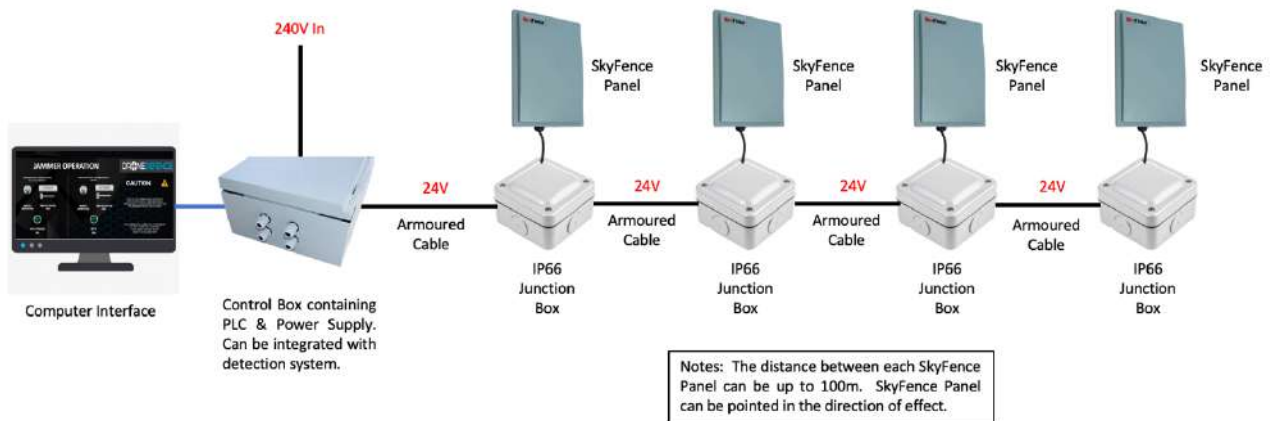


SkyFence's Primary Field extends to over 500m in height above the panel meaning the drone cannot fly over the electronic wall. The Secondary Field ensures that there are no gaps in the system.

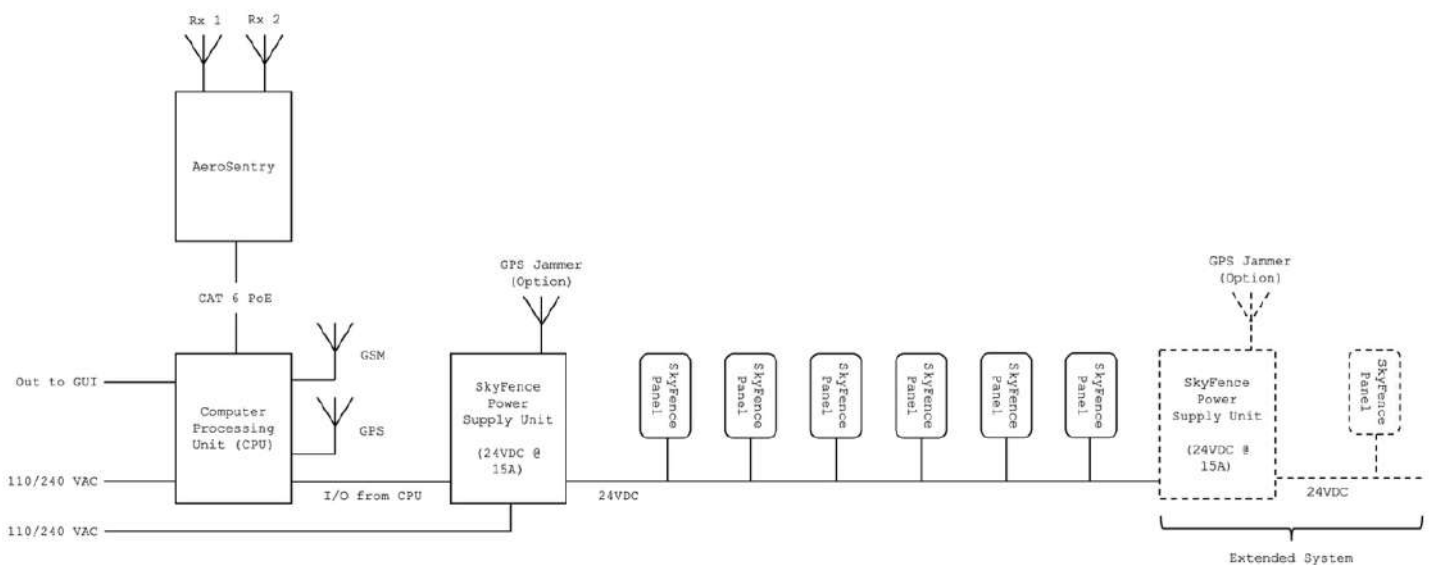
Manual Activation Installation setup



Automated Activation Installation setup



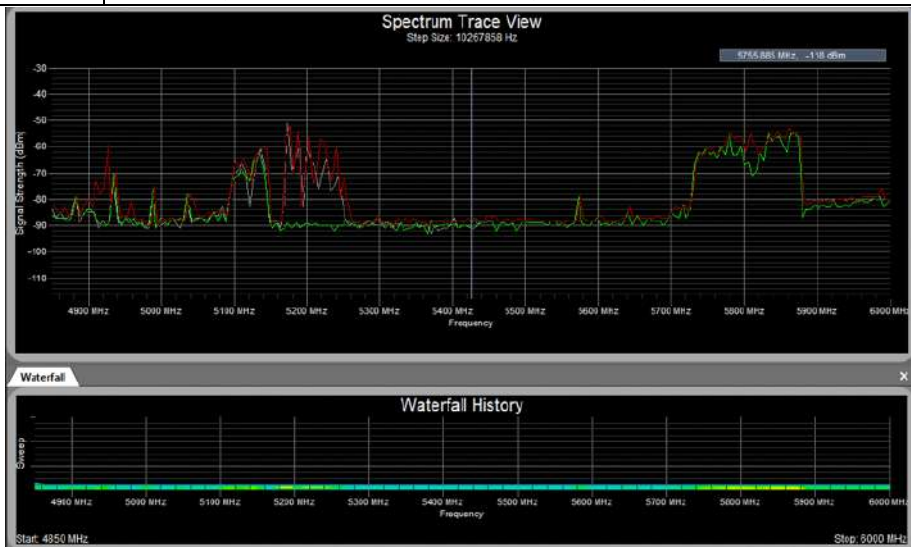
SkyFence & AeroSentry Wiring Diagram



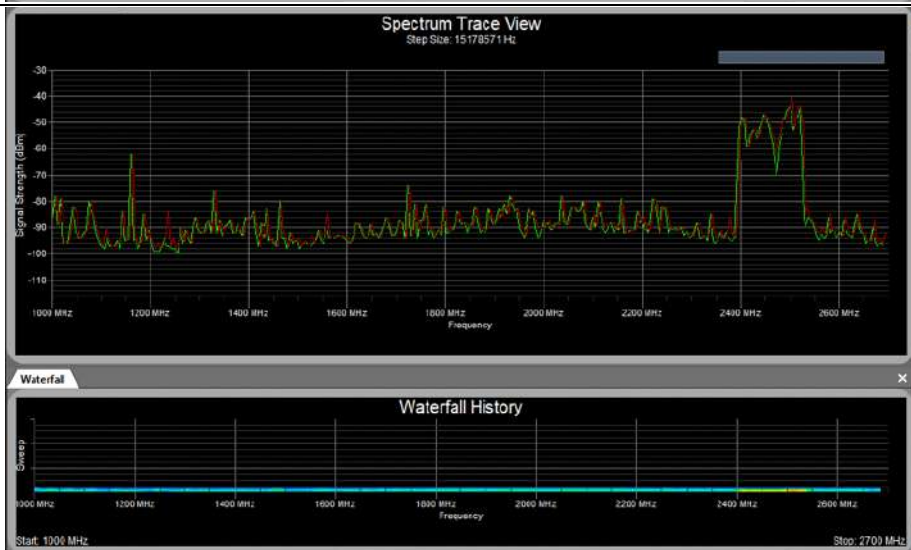
Technical Details

Specifications	Details
Frequencies	2400-2500 MHz 5710-5880 MHz
Details of modulation	PXXXN
Equivalent Isotropic Radiated Power (EIRP) -Watts and dB	2400-2500 MHz – 5W (37dBm) 5710-5880 MHz – 2W (33dBm)
Antenna gain	2.4GHz – 10 dBi 5.8GHz – 14.5 dBi
Spectrum Plot showing suppression of 2nd and 3rd Order Harmonics	The following spectrum plots show the background EM activity within the chosen parameters and the jamming effects and the harmonics: Figure 1 shows the plot when the 5.8GHz jamming signal is activated. Figure 2 shows the plot when the 2.4GHz jamming signal is activated.
Installed antenna height above ground level	In a fixed installation the panel is installed at 3m above the ground.
Radiation Hazard Safety Distance.	In front of panel :- 1m Public Exposure 1m Occupational Exposure

**Figure 1 – SkyFence
5GHz Spectrum Trace**



**Figure 2 – SkyFence
2.4GHz Spectrum Trace**



Why work with Drone Defence?

- We are Drone manufacturer agnostic. As a result we are able to detect 99% of COTS (Commercial Off The Shelf) drones.
- We are industry experts who are at the cutting edge of the conceptual development of not only the drone sector but we are setting the standard in counter drone applications.
- We sit at the top table of UK Governmental Strategy and Policy makers and have strong and established connections into the UK MOD, DSTL, CAST, NOMS, Met Police amongst others.
- We take part in all of the physical and conceptual simulated exercises for UK Government stakeholders meaning we remain market leaders.
- We have built up an extensive knowledge of drones, their capabilities and risks that they pose.
- We have award winning record-breaking security experts on staff who stand ready to support our customers.
- We provide full spectrum support for our products and our customers.
- Our systems are low power emitting - This means we remove any RF leakage and minimize impact on prison or airport systems. Our systems are completely safe.
- We offer regular Demonstrations Days for clients to attend to witness the systems in operation