WaveFeng Shenzhen WaveFeng Technology Co.

CD30 Program for Construction of Anti-drone Systems in Critical Areas

CONTENTS

Contents

01. Program background and needs analysis

01

Program background

The rapid development and popularization of drone technology has accelerated the emergence of low-altitude drones and drone swarms. The rapid development of micro and small drones, which can carry out mission planning, autonomous navigation, precise positioning and hovering, and which are inexpensive and cheap, has provided new means for terrorist activities and military operations.

01 demand analysis

There have been a number of international incidents of peacetime drone incursions into core locations

- There have been many incidents of trespassing by small drones at core locations and important sites of national importance, such as the Pentagon and the White House in the United States, the nuclear power plant in France, the official residence of the Prime Minister of Japan and Cheong Wa Dae in South Korea, etc.; small drones carrying improvised explosive devices and detection devices have already been pushed by terrorists into the front line of terrorist activities.

There are already operational examples of drone clusters attacking key locations in the international theater of operations

- On January 6, 2018, a Russian base in Syria was attacked by a cluster of drones, demonstrating the immense operational power of drone swarm technology, which was a wake-up call for low-altitude defenses in key locations.
- On January 10, 2019, Yemen's Houthis used drones to attack the government forces' Anad airbase in the country's southern Lahj province.

Difficulty in countering clusters of small drones

- Drones similar to those used to attack Russian bases in Syria are inexpensive, require low technical thresholds, can be purchased in large quantities on the open market, and can be simply modified to carry small explosive devices to carry out fire or suicide attacks against targets, are easy to use on a large scale, and are difficult to detect and intercept.

02. Overview of Anti-drone Technologies

03 Overview of Anti-drone Technologies

Anti-drone technology is divided into three parts: drone detection and detection, identification, and drone countermeasures.

When someone violates the relevant regulations by controlling a drone to enter a no-fly zone, the drone countermeasures system can intervene through a variety of technical means to ensure that the drone is unable to enter or escape from the no-fly zone.

03

Detection Comparison

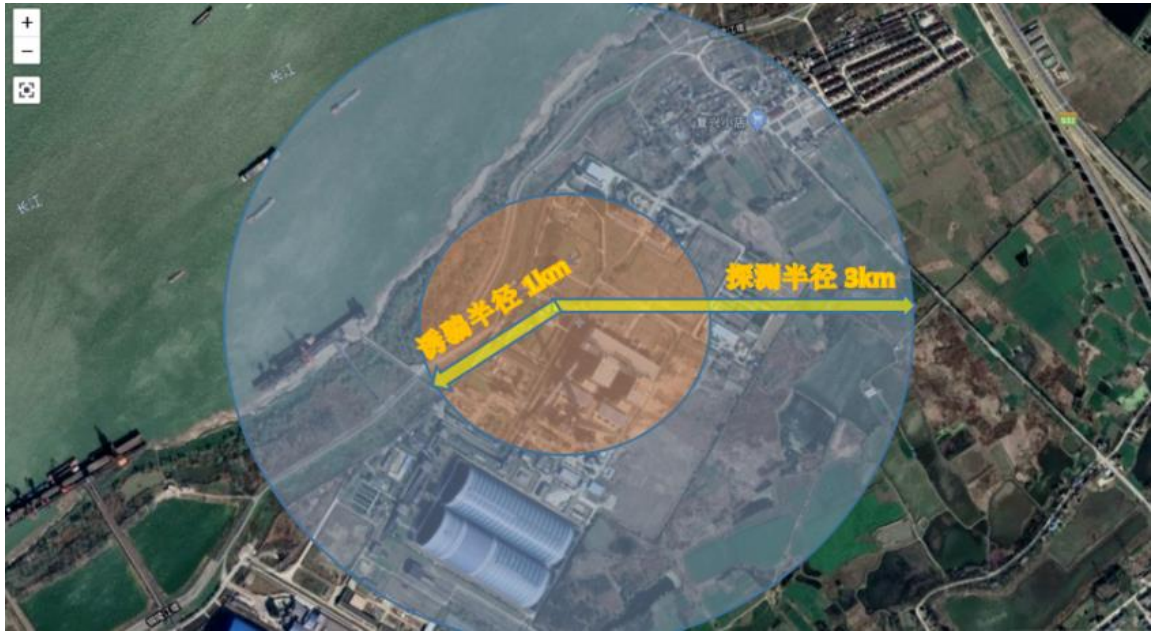
serial number	technical means		vantages	drawbacks
1	radar detection		Real-time monitoring of the location and flight trajectory of the drone, to provide accurate data support for the subsequent response measures, the radio silence of the drone can be detected.	It is easy to be interfered by ground targets, not easy to be distinguished from ground clutter, the target echo is weak, there are false alarms, and the target will be lost if the target is hovering.
2	radio-frequency detection	AOA	A detection unit that is easy to deploy, integrated and capable of identifying unknown drones.	Not as accurate as radar detection, not as accurate as detection models
3		TDOA	Multiple detection units to accurately locate drones and sense movement trajectories	Relatively complex and expensive to deploy
4		radio protocol cracking	Through in-depth spectral analysis and feature recognition of UAV signals, real-time monitoring of multi-dimensional information such as serial number, model, location, speed, altitude, trajectory, and flyer's position of UAVs within the detection range can be realized by a single machine.	Can only crack some of DJI's drones
5	photoelectric detection		Real-time images of drones can be obtained, making it easier for staff to identify and dispose of them.	Highly affected by weather, poor results in foggy and sheltered conditions

03 Countermeasures Comparison

serial number	technical means	vantages	drawbacks
1	soft-kill net interdiction	Minimal secondary disasters	Not easy to operate, limited net bomb capacity, limited distance of action, low success rate.
2	Laser cannon destroyed	physical burnout	Expensive, large, heavy, not easily deployable, high energy required to burn the entire unmanned aircraft, and the target can still fly if it doesn't hit the vitals.
3	GPS decoys	Precise entrapment, broad compatibility, covert operation	Effective on normal navigation signals, not effective on non-GPS navigated drones
4	radio interference	Effective against the vast majority of drones, while countermeasures long range, can be simultaneously countermeasures against multiple targets, reusable, low cost of use.	Impact on the surrounding electromagnetic environment

03. Anti-drone program for critical sites

03 Anti-drone program for critical sites



▶ Based on the demand analysis, the solution is to use Spectrum Reconnaissance and Strike Integration passive detection (message parsing and localization), radar active detection, optoelectronic tracking, detection and Strike Integration full-frequency band detection, full-frequency band directional jamming countermeasures, navigation deception equipment, a variety of means of detection, a variety of countermeasures multi-modal fusion, to give full play to their respective strengths, and to establish a set of scientifically effective unmanned aircraft countermeasures system.

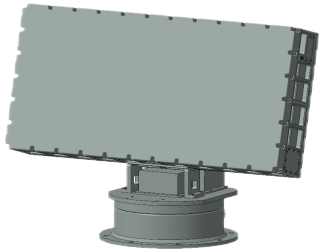
▶The solution consists of front-end radar detection, optoelectronic tracking and radio spectrum detectors (for detection, identification and localization of early warning), linked intelligent signal countermeasures or signal deception (forcing away and forced landing), and a back-end control platform (for monitoring and control of the whole process).

▶ It can realize location detection and warning for UAV targets within 5000m radius of the periphery, and directional forced landing as well as strike for UAV targets within 1000m radius of the core area.

Diagram of Anti-drone Program Components

Equipment detected

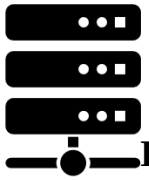
Spectrum detection and message parsing for localization



radar detection

optical tracking

network manipulation



Data Fusion Processor

Intelligent System Large Screen

Countermeasure equipment

Radio Directional Suppression One Band Three Omnidirectional Chassis Suppression

Navigational lures

03 Equipment Function Introduction

Radio spectrum detection captures, **recognizes and locates the signals of illegally intruding drones in the target area by automatically receiving the radio signals between the drones and the remote control device, and it can recognize unknown drones, especially assembled drones.**

Radio decoding detection **can realize real-time monitoring of multi-dimensional information such as serial number, model, position, speed, altitude, trajectory and flyer position of the UAV within the detection range on a stand-alone basis through in-depth spectral analysis of the UAV signals and feature recognition.**

The radar detection **has the ability to detect a variety of aircraft such as quadcopter drones, fixed-wing drones, aeromodels, homemade assemblers and so on. This product has the ability to detect multiple targets and complex urban environments.**

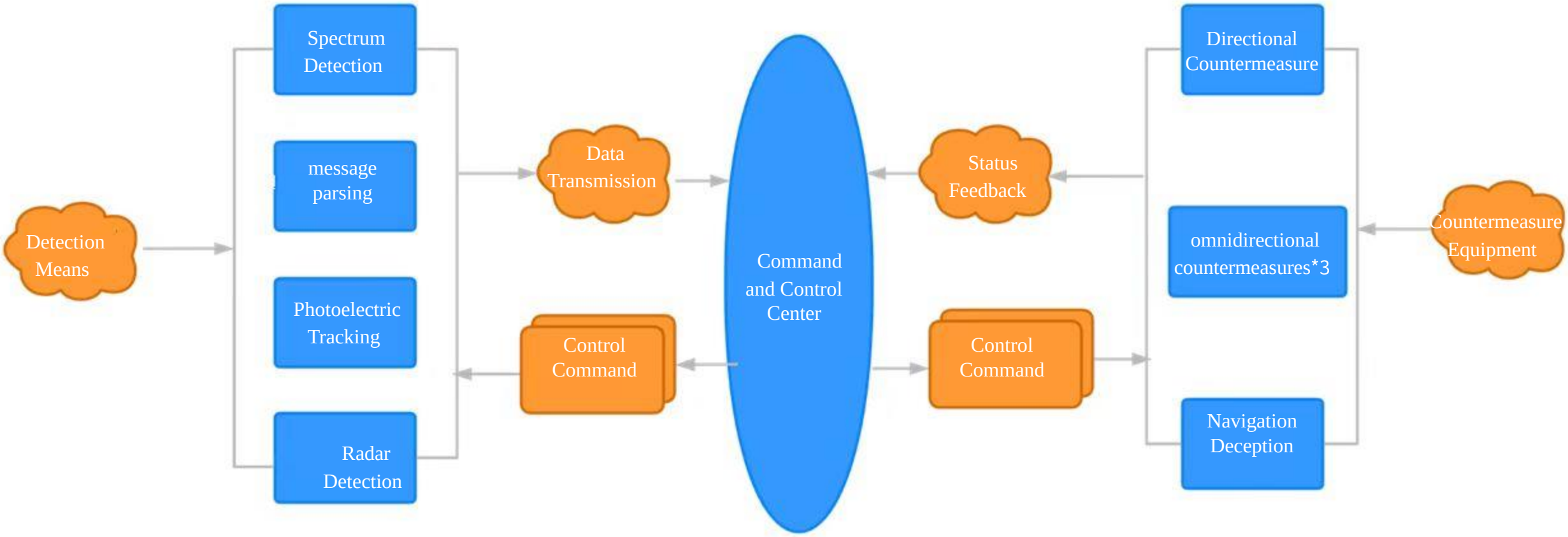
The photoelectric tracking **realizes the functions of confirming, identifying, locking and tracking the target, and at the same time in linkage with other equipment.**

UAV navigation deception function **by interfering or deceiving the UAV's navigation system to make it deviate from the scheduled route.**

Radio Interference Countermeasure **conducts electromagnetic interference strikes against illegally invading UAV targets, forcing the UAV to return to its original route or hover and land in place.**

03

反无人机方案组成图

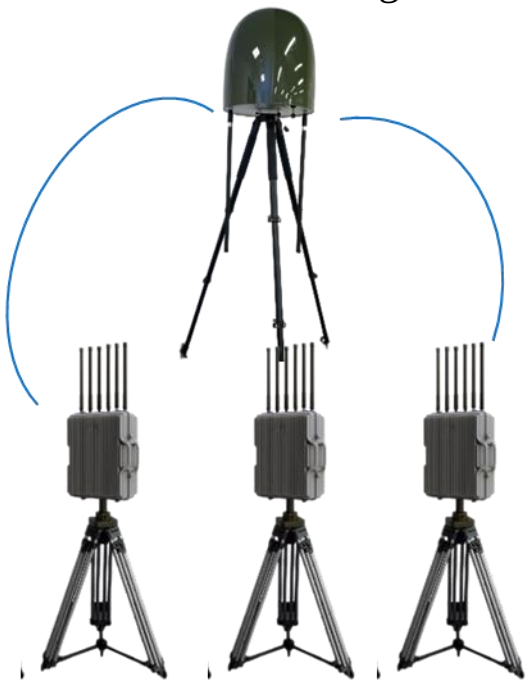


04. Advantages of Spectrum Reconnaissance and Strike Integration Equipment

03 Technological Advantages

The CD30 system is a smart spectrum system incorporating message parsing protocols. Through in-depth spectrum analysis and feature recognition of UAV signals, the CD30 system not only supports full-band detection, identification of unknown UAVs, signal recording, but also provides real-time monitoring of multi-dimensional information such as serial number, model, location, speed, altitude, trajectory, and flyer's position of UAVs of the OcuSync mapping mode model within the detection range.

- Capable of detecting most drones such as DJI, DaoTong, FPV, assembly drones, some military drones and so on;
- Detection and fight in one, integrated protocol parsing module;
- Passive detection, 360° omni-directional, 50MHz-6GHz ultra-wide spectrum detection range;
- With the ability of autonomous learning to recognize unknown UAVs, can record the signal characteristics of UAVs in flight.
- Including standardized broadband mapping and frequency hopping mapping industrial drones, consumer drones, patented design.
- AOA single station identification and localization drone;
- Dual-module countermeasure design, countermeasure band covers part or all of 300MHz-6.35GHz band;



Product Advantages

Loyalty, Innovation, Openness and Efficiency

Full Band Detection **50MHz-6GHz**	**Full-band countermeasures** **One Band N's form of countermeasures covers full-band strikes**
Autonomous Learning Drone Signal Characterization **recognizes unknown drones without relying on model libraries**	**Intelligent Electromagnetic Situational Awareness** **unique patented design of smart gain and reference level**
Whitelist function **does not counteract whitelisted drones in unmanned**	**Airborne drone signal characterization** **unknown UAV models added directly to database in detection**

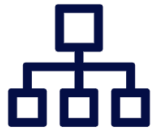
Additional Highlights

Loyalty, Innovation, Openness and Efficiency

early warning

accurate identification

unattended



Multi-unit Networking

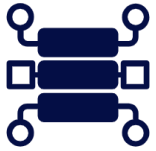
single-site localization

Spectrum Reconnaissance and Strike Integration

passive detection

Flyer Drone Dual Positioning

Simultaneous processing of multiple targets



compatibility and empowerment

05. Introduction to Anti-drone Program System Components

System Components

Loyalty, Innovation, Openness and Efficiency

CD30

Fixed Type Spectrum Reconnaissance and Strike Integration

Model Support

DJI Xiaomi full series
Various modified drones
All kinds of racing drones

Product Features

- Full band coverage
- whitelisting
- Positioning of drones and flyers
- compatibility and empowerment
- independent study

Product Parameters

Feature	Description
Detection Frequency Range	50MHz-6GHz
Jamming Frequency Bands	900M, 1.5G, 2.4G, 5.8G, 1.2G, 5.2G
Model Coverage	DJI full series, various RC models, racing drones, and over a hundred types
Simultaneous Detection Targets	More than 10
Detection Range	5KM
Jamming Range	1KM
Whitelist Support	Supported
Positioning Range	1-2KM
Pilot and Model Positioning	Phantom, Mavic series, 2S, M300, and other DJI products

F60 one-strip-two countermeasure

Targeted countermeasures equipment

Product Features

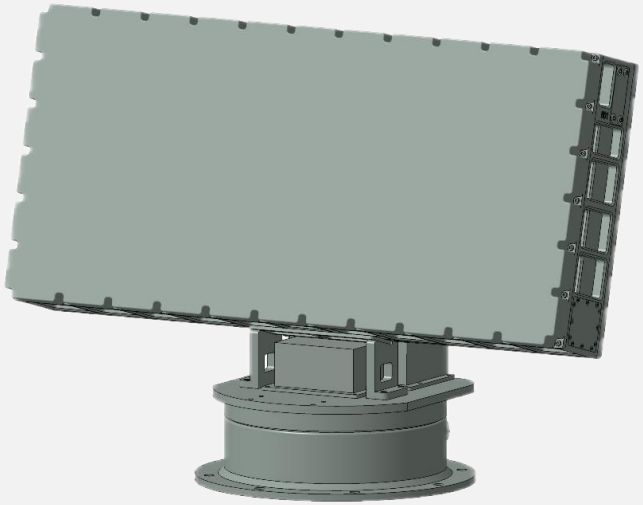
- Long range countermeasures
- Full-band countermeasures
- The suppression effect is obvious

Product Parameters

Frequency Ranges for Devices	Description
Device A	310-340MHz, 410-465MHz, 465-550MHz, 600-700MHz
Device B	700-850MHz, 850-950MHz, 950-1050MHz, 1396-1454MHz
Device C	4620-4850MHz, 5890-6100MHz, 6100-6300MHz
Transmission Power	100W

LD120

Radar detection equipment



Product Features

- multi-target detection
- High accuracy and detection probability
- high data rate

Product Parameters

Parameter	Description
Operating Band	X-band
Detection Range	5 KM
Range Precision	10 M
Azimuth Precision	0.5°
Elevation Precision	0.5°
Velocity Precision	0.5 m/s
Simultaneous Detection Quantity	≥100

System Components

GD500

Optical tracking equipment

Product Features

- multi-target detection
- High accuracy and detection probability
- high data rate

Product Parameters

Parameter	Description
Maximum Tracking Distance	Visible Light: ≥3 km; Infrared: ≥1 km
Support for Automatic Tracking	Radar or spectral distance information driven auto-tracking and zoom
Control Precision	±0.05°
Horizontal Tracking Range	360° continuous rotation without limit
Vertical Tracking Range	+90°
Operating Temperature	-40°C to +55°C

System Components

YP1000

Navigational deception devices

Product Features

- low power
- The suppression effect is obvious
- empowerment through compatibility

Product Parameters

Specification	Details
Supported Bands	GPS L1, GLONASS L1
Signal Transmission Power	≤10 dBm
Defense Distance	500m ≤ R ≤ 1000m
Continuous Autonomous Operation	24 hours autonomous operation
Strategy Support	Defense mode, No-fly mode, Directional drive (optional)
Signal Intrusion Time	≤10s
Total Power Consumption	≤70W
Operating Temperature	-40℃ to +70℃
Product Weight	≤10kg (excluding cables)
Explosion-proof Level	Ex nA IIC T6
Protection Level	IP65
Product Dimensions	355mm × 351mm × 185mm

The results show

Spectrum results display area

Frequency of use, model number、 level、 strength,、 direction, approximate distance and other data

Radar results display area

Moving target speed, latitude and longitude, heading angle, distance, etc.

Optical tracking display area

Flight video, identification of the type of operation flown, or comprehensive judgment of flight intent, etc.

Message parsing display area

Decoded serial number, model, UAV latitude, longitude, altitude, identification status, compliance broadcast information, etc.

Directional and omnidirectional countermeasures display control area

Forced landing, removal and outcome, etc.

Navigation decoy display control area

Hazard rating, forced landing, removal and outcome, etc.

06. Application Cases

Application Cases

A naval base

electric power plant

Application Cases

private business

Special police, troops

factory

Application Cases

penitentiary

Along the High Speed Rail

public security

Thanks!