



TECHNOLOGY

Anti-Drone System Solution



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04 Market Analysis



PART 01

Challenges

- √ Background
- √ Black-flight Issues
- √ Management Difficulties

China consumer-level drone manufacturing enterprises include DJI, Ehang, XAG and ZeroTech, etc.. DJI currently accounts for about 70% of the global consumer-level drone market share. By the end of 2018, the number of drones in China was about 1.8 million, and it is expected to reach more than 3 million in 2020.



The number of registered drone was 285,000, an increase of 120,000, an increase of 73%, of which 83% of light and small drones under 7kg accounted for 83%.



The number of registered drone owners was 268,000, an increase of 100,000 over the same period of last year, an increase of 60%, including 237,000 individual users and 31,000 business users.



44,573 people have drone driver's licenses, an increase of 20166, an increase of 83%, of which multi-rotor driver licenses accounted for 88%

Black fly

- In March 2014, North Korea used a cheap electronic product to transform a drone, and successfully flew into the presidential palace of the South Korean capital, Blue House. The South Korean military air defense fired hundreds of shells and did not damage it. .
- From January to May 2015, the White House was repeatedly invaded by drones. A man was detained for attempting to maneuver drones into the White House.
- In September 2015, a out of control drone crashed into the stands of the US Open, causing the game to be interrupted.
- In December 2018, the British Gatwick Airport and Heathrow Airport were invaded by drones, causing a large number of flight delays.
- On January 22, 2019, the Newark Liberty International Airport in the United States was grounded due to the intrusion of drones;

In recent years, there has been a surge in drone safety incidents worldwide, and nearly 100 drone-related accidents occurred in the UK in 2017.



White House



US Open



Venezuela



India-Pakistan border



Korea Blue House

Time	Exp	Destination	Airline/Flight	Area	Gate	Remarks
15:25		London Gatwick	easyJet EZY8182		B25	Cancelled
19:30		London Gatwick	easyJet EZY8184	6	B25	Operational Reasons
15		Catania	Alitalia AZ 1721	1	A17	Boarding
15		London Gatwick	easyJet EZY8186		B	Cancelled
10		Olbia	AIRITALIA IG 1204	4	A13	Boarding
10		Roma	Alitalia AZ 2059	3	A19	
10		Napoli	Alitalia AZ 1289	3	A04	

Gatwick Airport

Black fly

In China, drones such as "black fly", "scramble" and wounding incidents are not uncommon. Data below:

- In 2015, there were 4 UAVs in China that interfered with civil aviation flights.
- In 2016, there were 23 black-flying incidents of drones in China.
- More than 40 cases occurred in the first half of 2017. Among them, in 2017, airports in Chongqing, Chengdu, Kunming and other places in southwestern China were frequently invaded by aircraft such as drones and model airplanes, causing adverse effects. In addition to disrupting the normal operation order of the airport and aviation safety, the drone "black fly" Hidden dangers in national security and public safety are also prominent.
- On March 21, 2019, an Austrian man was unauthorised for aerial photography of the Three Gorges Dam and was seized by the relevant authorities. There have been many accidents in the country that caused serious injuries and property losses, and there are criminals used to sneak shots or transport prohibited items.



Sanxia sneak shot



Kunming Airport



Chengdu Airport



Military Base



Chongqing Airport



Hangzhou Airport

Difficulties

UAV Event Characteristics



Unpredictable time of occurrence



Unpredictable location



Unpredictable number of drones

UAV Transmit Power

Working Frequency	Transmitter Power Grade	Equivalent Isotropic Radiated Power (EIRP) Limit				
		840.5-845MHz		1430-1444MHz	2408-2440MHz	
		Upstream (dBm/Channel)	Downstream (dBm/Channel)	Downstream (dBm/Channel)	Upstream (dBm/MHz)	Downstream (dBm/MHz)
840-845MHz	1	46	34	42	---	---
		42	30	35	27	27
		20	20	23	23	20

工业和

1430

工业和信息化部
航空器

各省、自治区、直辖市
为满足应急救援、
驾驶航空器系统的
规定》及我国规
1444MHz和2408
具体事宜通知如下
一、使用频率
-2440MHz。
二、840.5-845MHz可用

ined
on





PART 02

Product

- √ Detection Technology
- √ Jamming Technology
- √ Product Introduction

Defense Type

Type	Drone Type	Control Type	Flight Speed & Height	Defense Subject	Defense Rate
Unintentional black fly	Small and medium	RC	Low Speed, Height 0-100m	Police, Enterprise	90%
Black fly	Small and medium	RC	Low Speed, Height 0-100m	Police, Enterprise	90%
Deliberate Invasion	All	No Link, by Waypoints	Low Speed, Height 0-500m	Military, Police	100%

Anti-drone System

Detector

Radar
Detector

Spectrum
Detector

PTZ
Tracker

Acoustic
Detector



Jammer





Physical
Capturing

GPS
Spoofing





Laser
Gun

Acoustic
Gun

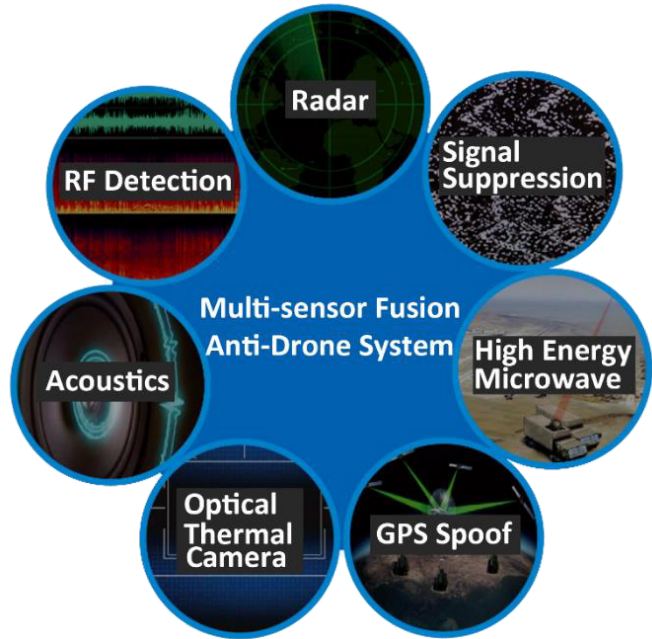
Detection Technology Comparison

Detection Method	Advantage	Disadvantage
Radar 	<ol style="list-style-type: none"> 1 Active detection, able to effectively detect all types of drones, including silent flying drones. 2 Multi-target detection capability, 3 High precision of position detection 4 Environmental adaptability. 	<ol style="list-style-type: none"> 1 It is impossible to distinguish between cooperative and non-cooperative goals. 2 There are requirements for the installation site, and the electromagnetic environment impact needs to be considered. 3 Radar detection requires 24 hours of continuous illumination of electromagnetic waves and cumulative radiation to the plant.
Camera 	<ol style="list-style-type: none"> 1 Does not transmit radio signals 2 Visual detection 3 High Target resolution and detection accuracy 4 Target identification and target collection 	<ol style="list-style-type: none"> 1 Narrow field of view, weak automatic search ability. 2 Performance is susceptible to weather, haze and other environmental factors. 3 Long-distance optoelectronic equipment costs are high.
Spectrum 	<ol style="list-style-type: none"> 1 Does not transmit radio signals 2 Quick response , whitelist 3 Small size and easy to install. 	<ol style="list-style-type: none"> 1 No full-band detection method. 2 Low positioning accuracy. 3 Detecting known models, need to build a library for unknown new models, and have a certain missed detection rate
Acoustics 	<p>No radiation, easy to install, cost-effective</p>	<p>Vulnerable to environmental noise, affecting detection performance and limiting detection distance</p>

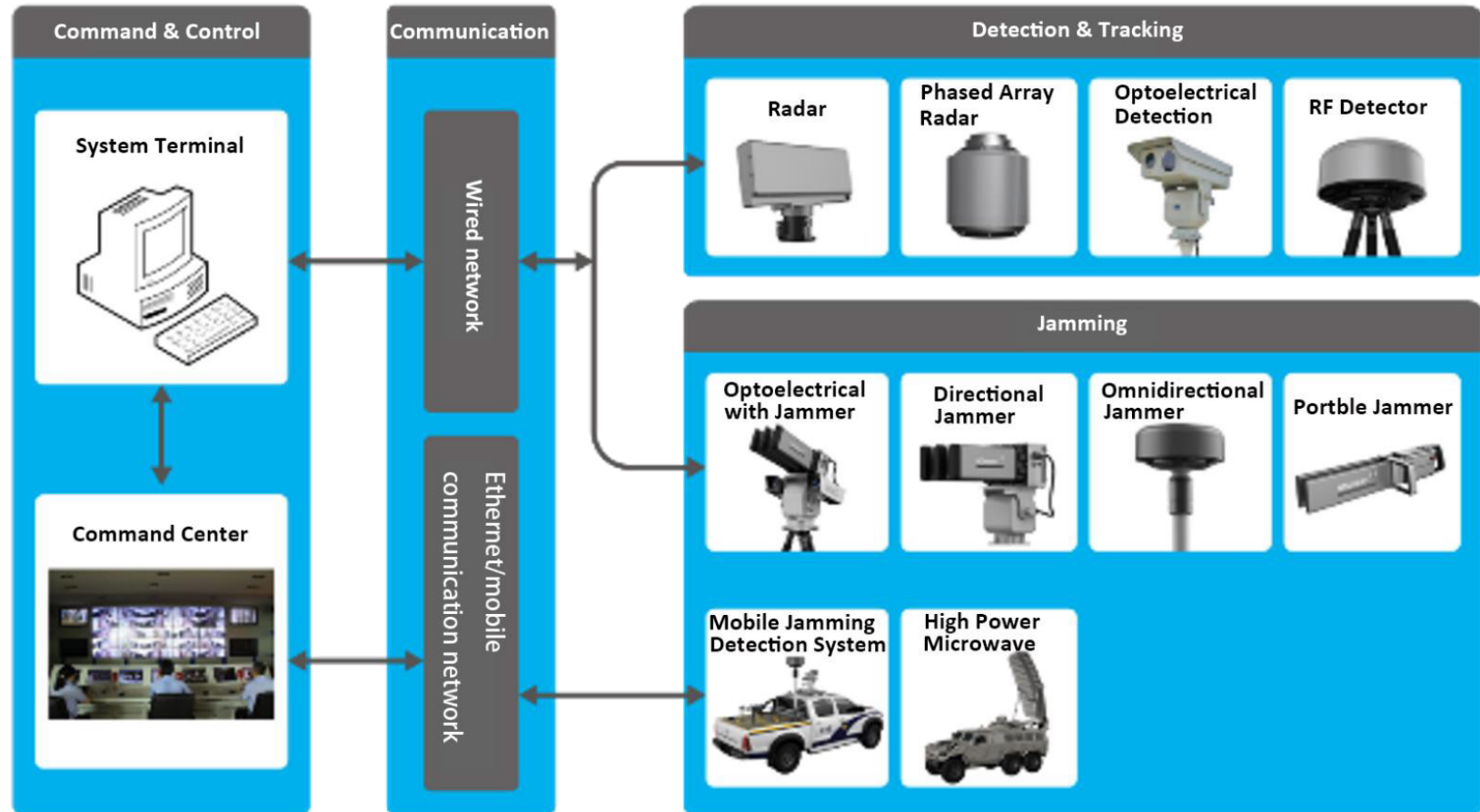
Jamming Technology Comparison

Jamming Method	Advantage	Disadvantage
Laser 	<ol style="list-style-type: none"> 1 Quick response, fast irradiation speed, high hit accuracy. 2 High radiation intensity, high destruction power. 3 Not susceptible to electronic interference. 	<ol style="list-style-type: none"> 1 High cost, easy to bring secondary damages, high threshold for use. 2 Restricted by the means of attack used, it is generally applied to the military field.
GPS Spoofing 	<ol style="list-style-type: none"> 1 Low transmit power, milliwatts-level of transmit power 2 Can achieve the deception of silent flying drone targets. 	<ol style="list-style-type: none"> 1 Affect all electronic navigation devices in the protected area. 2 No interference with the remote control signal aircraft.
RF Jammer 	<ol style="list-style-type: none"> 1 Mature technology 2 Easy to operate 3 Lower cost 4 Easy to upgrade 	No obvious weak points
Physical Capturing 	Direct capture, short disposal time, no secondary damage	Difficult to capture, low automation level

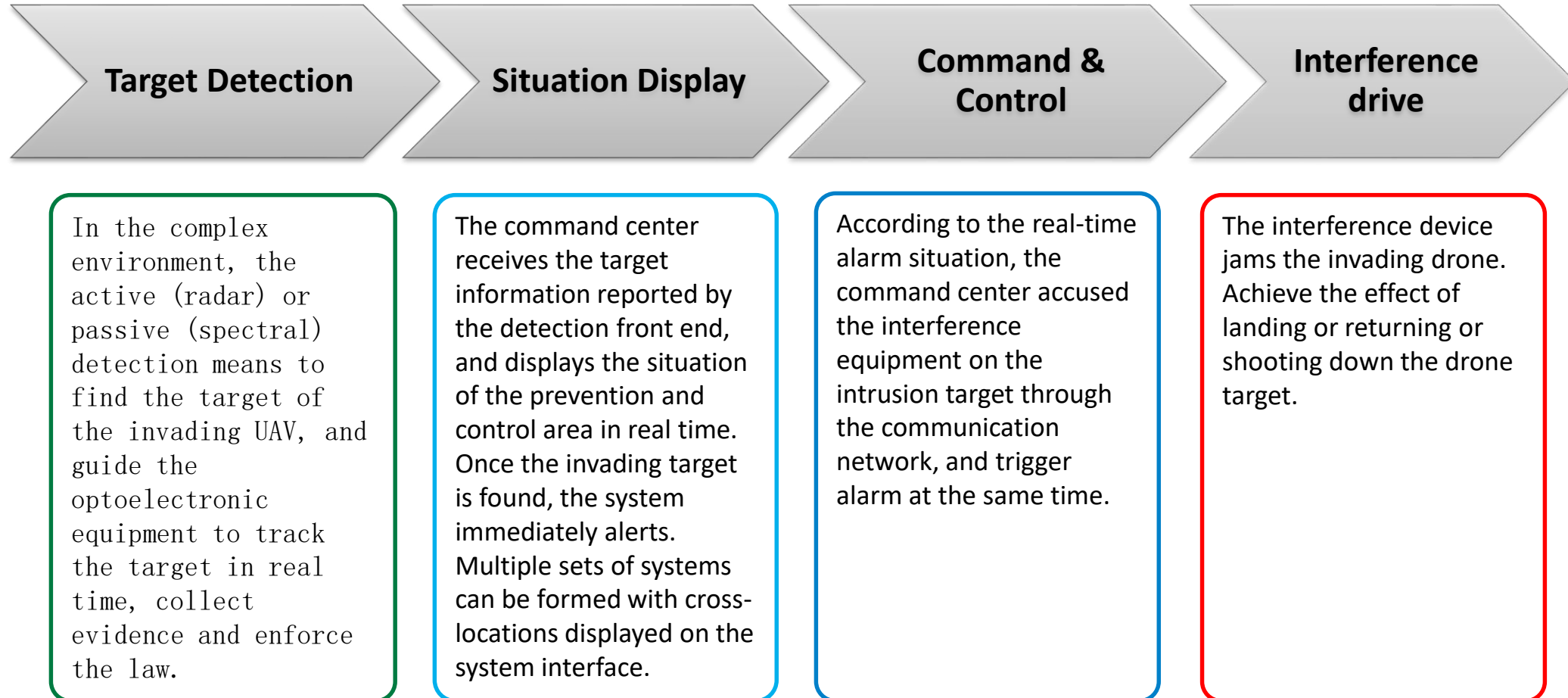
All-in-one Anti-drone System



The complete all-in-one anti-drone system consists of four parts: the detection subsystem, the disposal subsystem, the command subsystem and the communication subsystem. It integrates the functions of target detection, tracking and identification, and command and jamming.



All-in-one Anti-drone System



All-in-one Anti-drone System

★ Multi-sensing, inspection and integration

Based on the actual application scenario, the multi-sensor front-end is integrated, integrating target detection, target recognition, tracking and positioning, command and jamming, and interference handling, with high integration and powerful functions.

★ All day, full frequency band, all direction

It is suitable for complex electromagnetic and climatic environments, and is not affected by lightning, haze weather and night vision. It can realize 7*24 hours 360° omnidirectional detection and counter-production.

★ Intelligent control

The command center adopts an intelligent management platform to identify the enemy and the threat level of the intrusion target, and realize the functions of situation display, target classification early warning, multi-target switching control, and real-time storage.

★ Easy to deploy

The system can be fixed or quickly deployed, with one-click start; open network architecture design, reserved system front-end device expansion interface, enhance the scope of protection area, and adapt to new tasks.

Anti-drone System Parts



UAV detection equipment :

- Radar : SC-R5000
- Spectrum : SC-S3000
SC-S5000
- Audio Detection :
SC-V500
- optoelectrical Search :
SC-C1000
SC-C1000E
SC-C2000
- Protocol Crack :
SC-A5000

Radio blocking device :

- Directional Jammer :
SC-J1000W
SC-J3000
- Omnidirectional Jammer :
SC-JA500
SC-JA1000
- Complementary Blind Jammer :
SC-JD300

Communication Protocol Interference Device :

SC-D1000

Navigation Spoofing Device :

SC-CG3000

Physical Capturing Equipment :

High Energy Microwave :
SC-W3000



✓ Handheld



✓ Portable



✓ Fixed



✓ Vehicular

Product



SC-S3000/S5000/S8000
Spectrum Detection Equipment

★ Main Specifications

Detection Distance	3000m/5000m/8000m
Detection Frequency Range	300MHz~6000MHz
Detection Direction	360 horizontal omnidirectional, -20°~50° pitch
Direction Finding Accuracy	≤3° (RMS)
Frequency Hopping Interception	2000HOP/s
Communication Interface	LAN
Power Supply	DC12V
Operating Temperature	-40°C~65°C
Weight	< 10kg

Product

★ high maturity

All-in-one design, all working modules are integrated in one protective cover, with no attached work unit.

★High real-time, low leakage rate

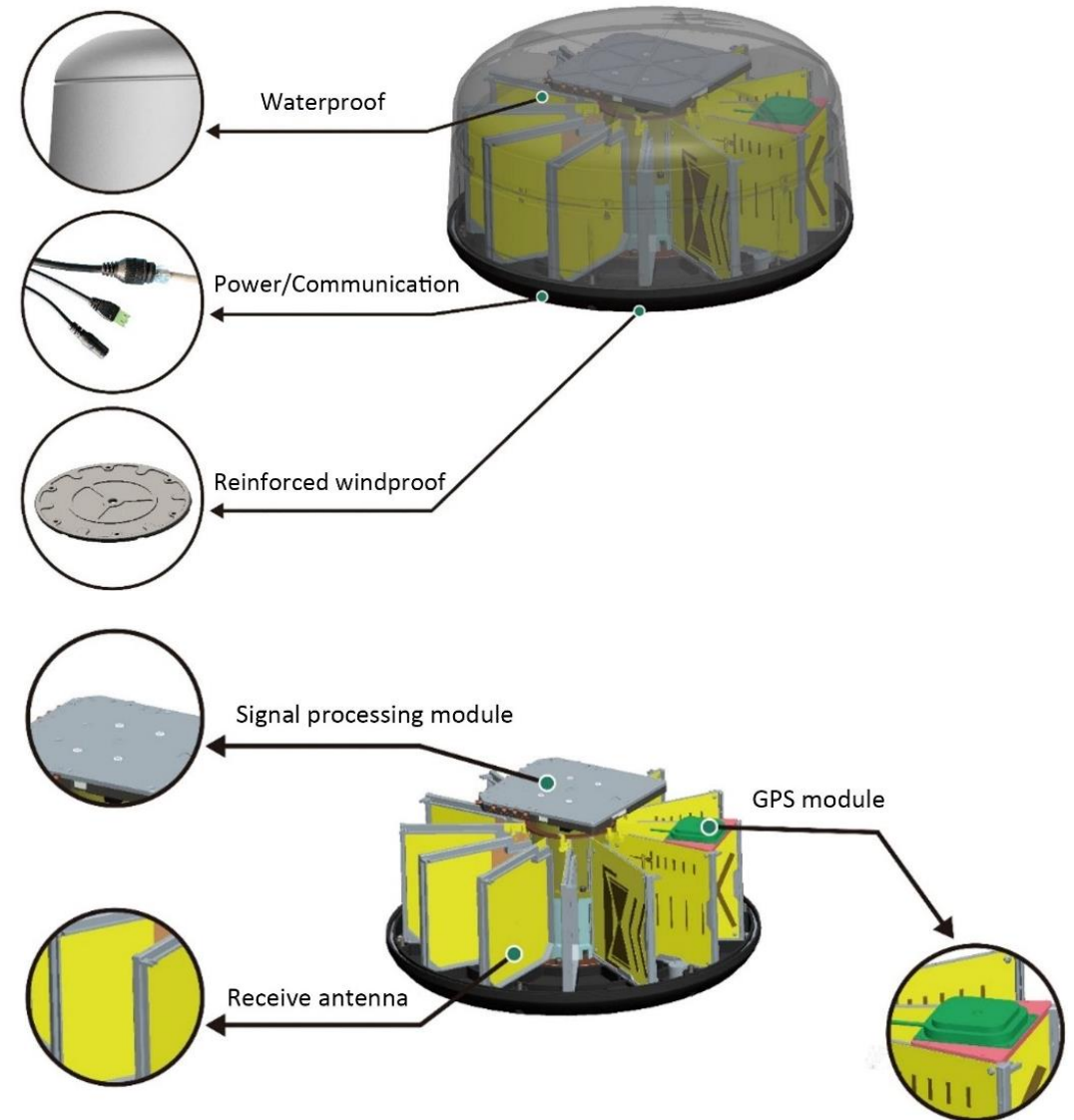
Signal reception and feature analysis are completed at the front end of the probe, greatly improving device performance.

★Probing performance industry leading

360° omnidirectional detection for accurate direction finding and stable detection and tracking of drone targets

★ Passive detection

The spectrum detection device uses only detecting the receiving space electromagnetic waves without any electromagnetic radiation.



Product



SC-JC3000
optoelectrical Interference
Integrated Equipment

★ Main Specifications

Interference Distance	1000m/3000m
Transmit Power	≤10W/30W per frequency band
Working Frequency	Navigation band: L band (GPS, Beidou, GLONASS) Remote frequency band: L band / S band / C band
optoelectrical Tracking Distance	1000m (daytime)
Zoom Factor	30x optical zoom
Resolution	1920X1080 (visible light)
PTZ Tilt Angle	Yaw 0°~360°, pitch -15°~75°
Power Supply	AC220V
Equipment Weight	< 20kg
Operating Temperature	-40°C~65°C
Protection Level	IP65

Feature

- **Integrated Design**

Adopting integrated and modular design, optoelectrical equipment and interference equipment are contained in the same PTZ platform, no external devices, high concealment

- **Directional Antenna Design**

The directional jamming antenna has strong directivity, and the transmission power is much lower than the signal shielding interference device. The disposal is rapid, and low impact on the human body and the surrounding electromagnetic environment.

- **Multi-band Effective Interference**

With 900MHz, 1.5GHz, 2.40GHz, 5.70GHz four-band interference capability, the interference covers more than 95% of the UAV frequency band in the market.



- **Interference Mode is Optional**

Supports two modes of disengagement and forced landing, and switches the interference mode according to the actual application to reduce the secondary damage caused by the drone.

- **The Low-light Camera Ensures Working All Day**

Matching star-light cameras to track and identify targets throughout the day

- **Safe to Use**

Keep the power-on standby state, start the work after the alarm of the detection device, automatically adjust the orientation to dispose of the target, and realize unattended operation.



Product



SC-G3000
Omnidirectional Deception of
Interference Devices

★ Main Specifications

Interference Distance	500m-3000m adjustable
Output Power	1mW~1W adjustable
Working Frequency	Navigation band: (GPS, Beidou, GLONASS)
PTZ Tilt Angle	Orientation 0°~360°, pitch -15°~55°
Power Supply	AC220V
Equipment Size	450X450X260mm
Operating Temperature	-40°C~65°C
Protection Level	IP65

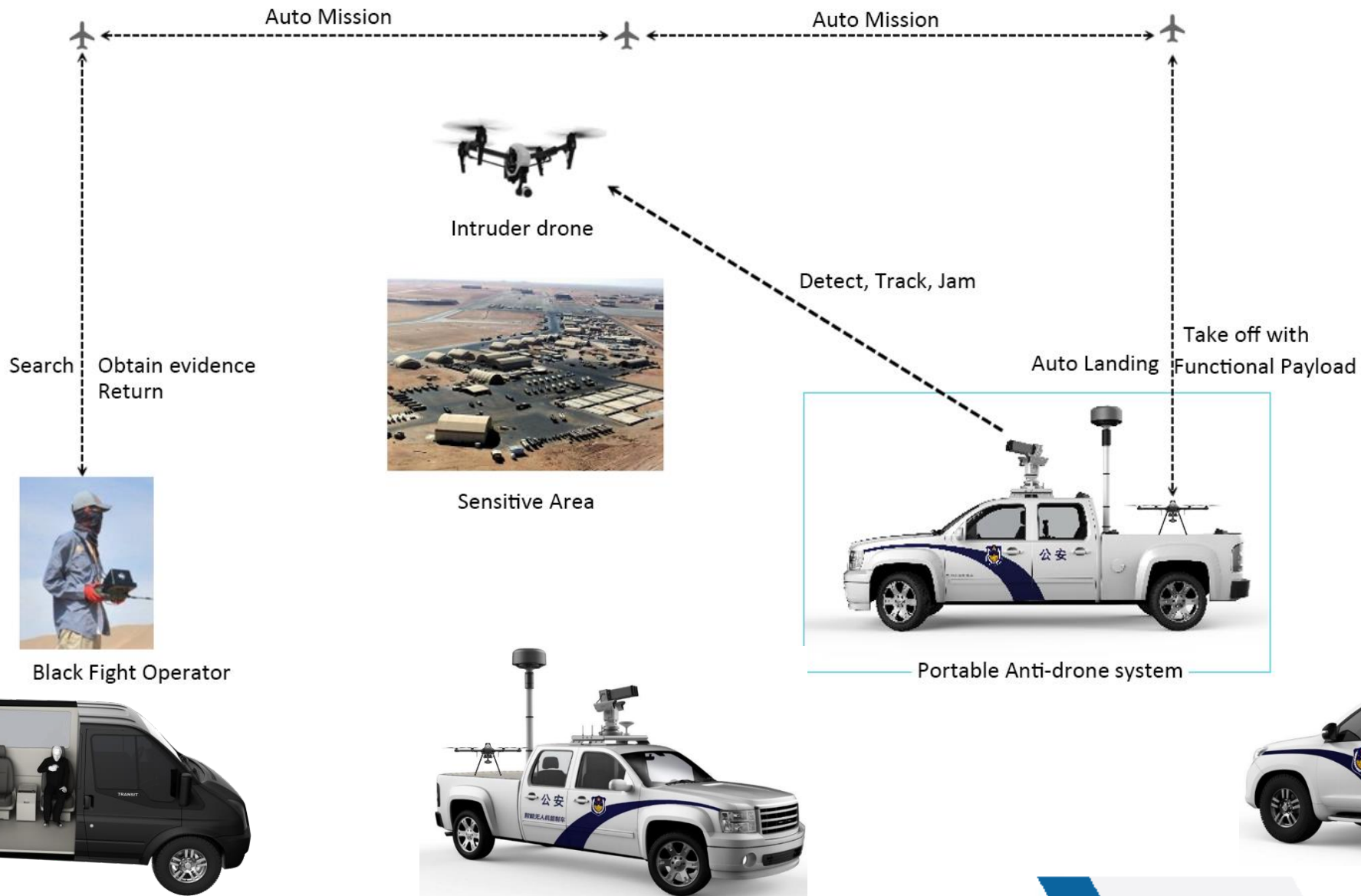
Product



Radar Detection Equipment

Interference Device

Mobile Defense System





PART 4

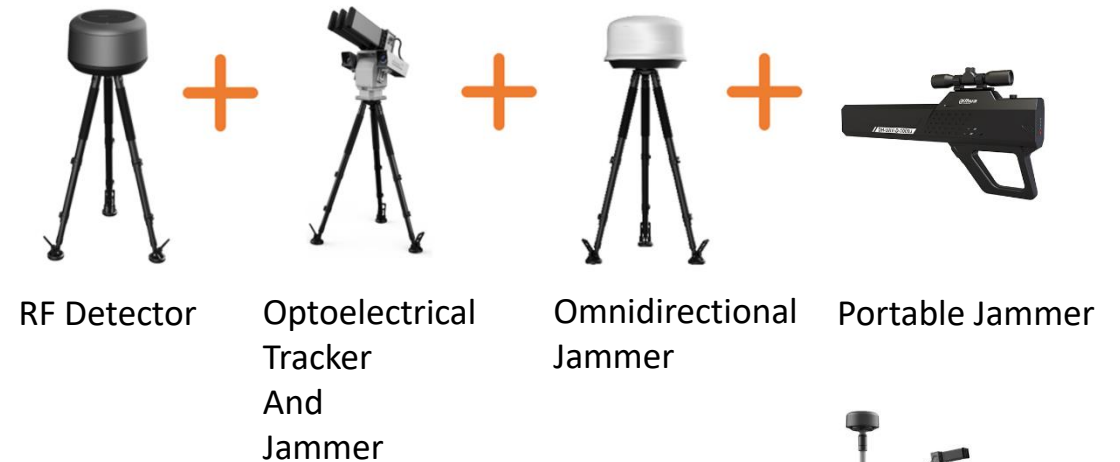
Solution and Case

UAV control mainly includes drone discovery, identification, tracking, and interference counteraction.

The drone threats faced by law enforcement agencies mainly come from major activities such as sports events, important meetings, important gatherings, and political travel. The working environment is complex and the working place is changeable. Therefore, the anti-UAV equipment of law enforcement departments must be deployed quickly, adapt to all kinds of complex environments, have the "all-in-one functions"

In response to the specific application of law enforcement agencies, combined with the current development trend of the anti-UAV industry, it is recommended that the anti-UAV system integrates spectrum detection, optoelectrical tracking, electromagnetic suppression and other technical inspection and integration systems, with portable and vehicle-mounted two types of equipment, of which portable. The equipment adopts integrated design, the total weight of the system is less than 20Kg, the deployment time is less than 1 minute, and the automatic unattended operation is realized; The vehicle-mounted system equips the anti-UAV equipment to various types of police vehicles, which can be deployed not only in a maneuverable manner, but also in the course of travel to ensure the safety of the fleet.

Portable Anti-drone System

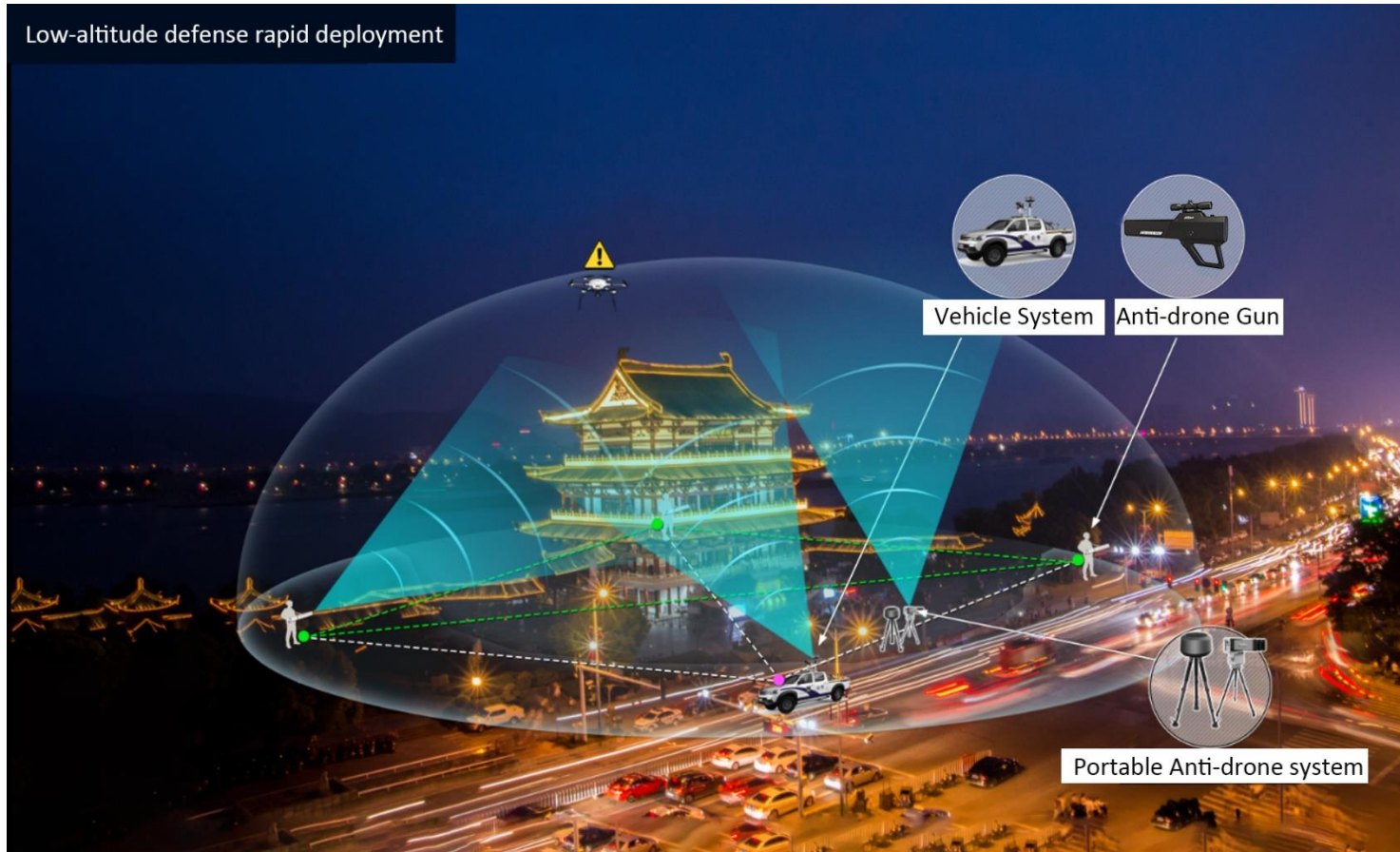


Mobile Defense System



Public Security

Low-altitude defense rapid deployment



Important Building Security

Safeguarding the Environment:

Orange Island Fireworks Protection

Equipment Configuration:

Drone control vehicle,
Portable control system

Staffing:

2 people in the control car,
1-2 people in the portable control system

Protection Plan:

Control vehicle line,
Individual high point + ground combination
Walkie-talkie / instant messaging team

Public Security



Meixi Lake Conference Guarantee

Safeguarding the Environment:

Meixi Lake Conference Guarantee

Equipment Configuration:

Portable Control System

Staffing:

Portable control system 1-2 people

Protection Plan:

Individual high point + ground combination

Walkie-talkie / instant messaging team



"Wisdom Prison"

"Smart Prison" is an indispensable part of the "digital rule of law, smart justice" information system. To improve political position and profoundly understand the importance of accelerating the construction of "smart prison", we must adhere to "Intelligent application" is the goal, and we will fully promote the construction of "smart prison"; finally, we will establish a "smart prison" with standardized scientific and unified data, comprehensive and accurate data information, flexible application of business applications, and research and judgment of intelligent and efficient, in order to continuously improve the level of prison management in China. The quality of criminals is transformed and a solid foundation is laid.

01

On January 01, the Prison Administration of the Ministry of Justice issued the "Technical Standards for Wisdom Prisons"

Accelerate the construction of "smart prisons" in an all-round way, and promote the transformation of prison management from "intelligent" to "smart".

02

On January 14, the Ministry of Justice issued the "Implementation Opinions on Accelerating the Construction of "Smart Prison""

It is necessary to take the construction of "smart prison" as the "number one project". The directors of the prison administrations of various provinces (autonomous regions and municipalities) are the first responsible persons for the construction of "smart prisons".

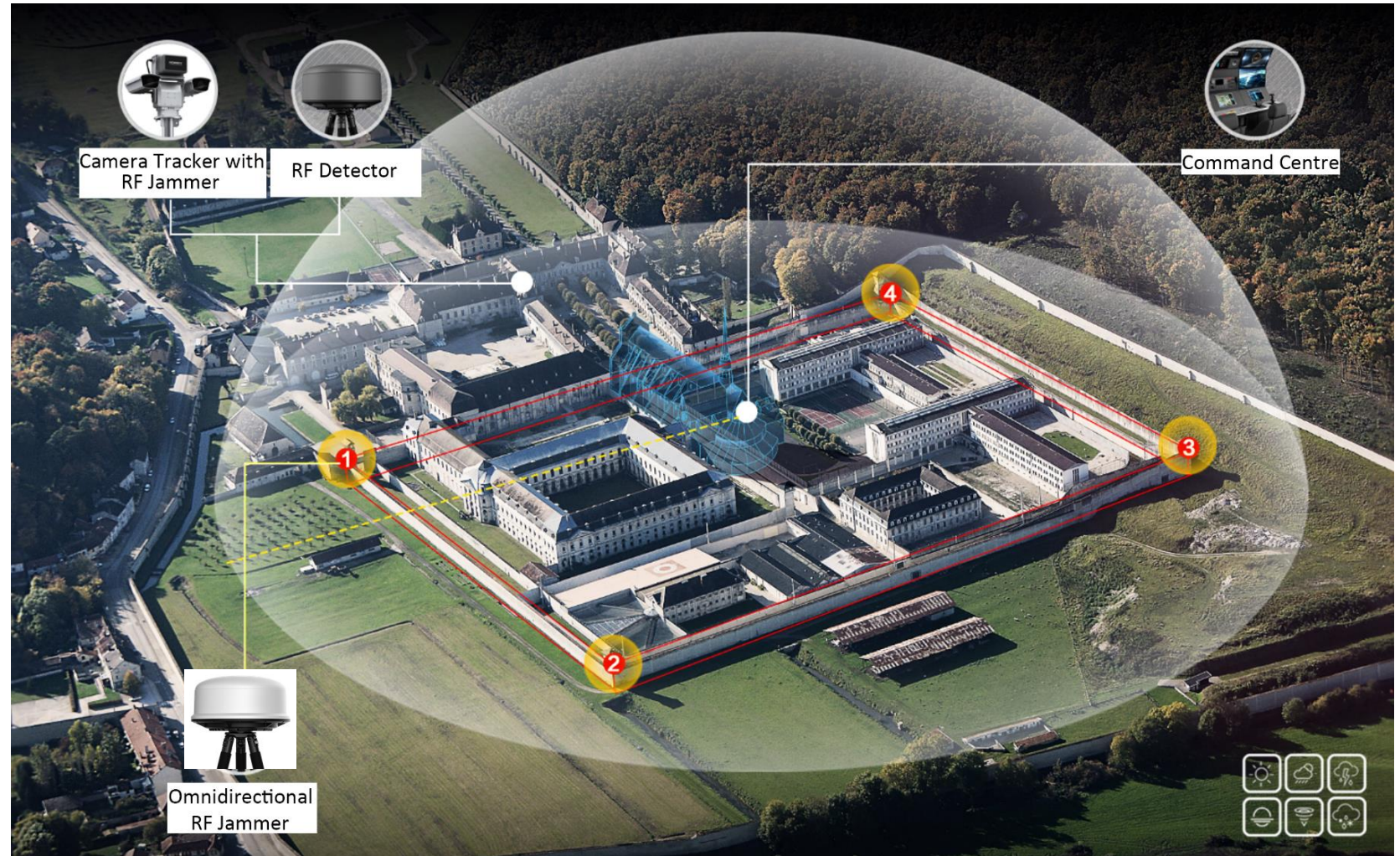
03

In the second half of the 2019, the Ministry of Justice will issue a Technical Guide for the Construction of UAV Control and Control Systems in Regulatory Sites.

In order to effectively improve the ability of surveillance sites to detect and counter illegally invade UAVs, accelerate the development and guidance of the construction of UAV prevention and control systems that meet the characteristics and actual needs of the regulatory sites.

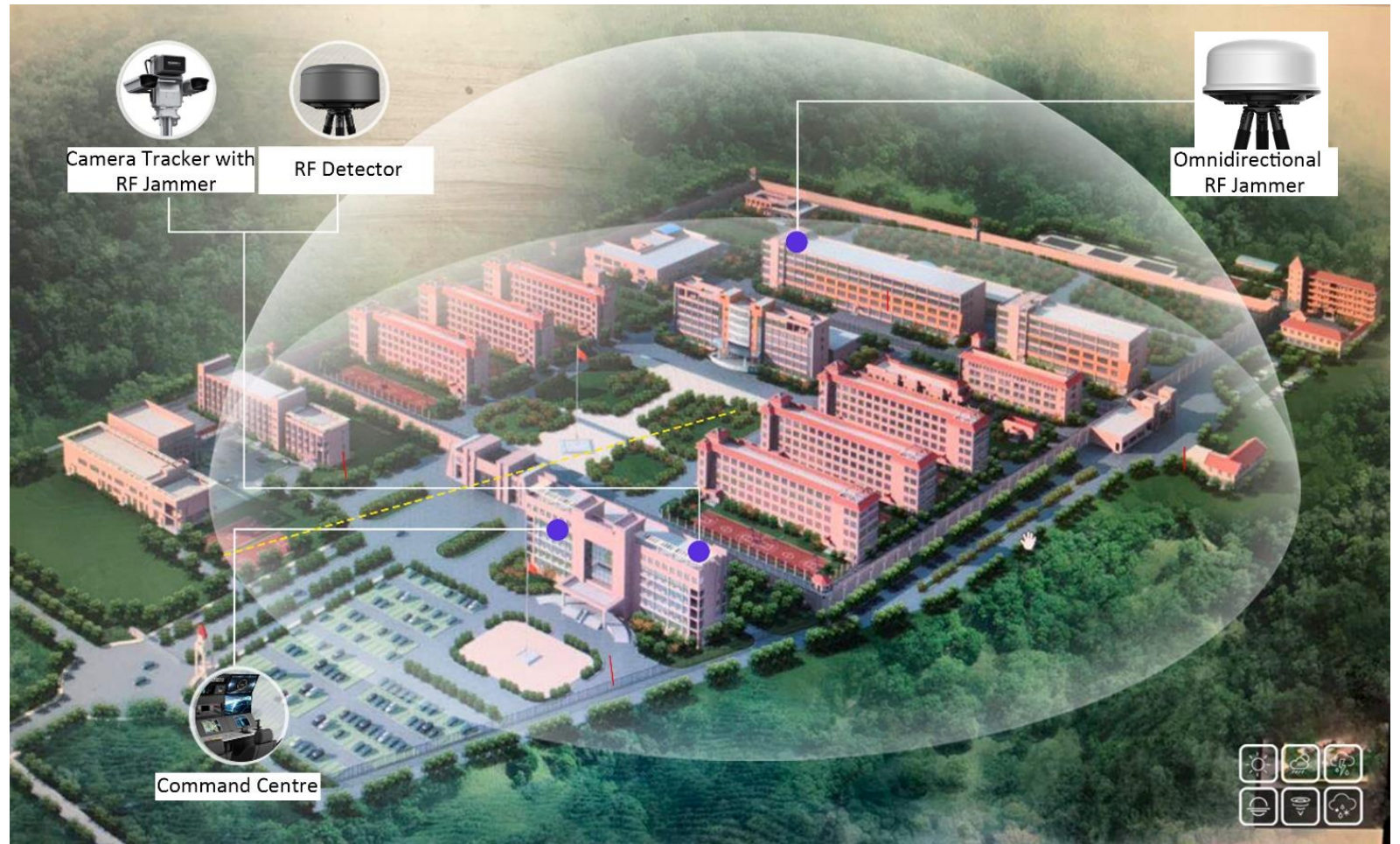
Large Prison

For large-scale surveillance areas, the equipment are deployed one set of spectrum detection equipment and one set of optoelectrical interference integrated equipment on the roof of the prison office building. Four omnidirectional interference devices were deployed to four towers in the prison building (according to the results of the survey). The alleged platform was installed in the existing monitoring room of the prison. The system uses wired LAN to transmit data.



Medium Prison

For medium-sized surveillance areas, the equipment are deployed one set of spectrum detection equipment and one set of optoelectrical interference integrated equipment on the roof of the prison office building. One omnidirectional interference device is deployed to the second highest point to control the ultra-low altitude flight target, and the allegation platform was installed in the existing monitoring room of the prison. The system uses wired LAN to transmit data.



Small Prison

For small surveillance areas, the equipment are deployed one set of spectrum detection equipment and one set of omnidirectional interference equipment on the roof of the prison office building. The accusation platform is installed in the existing monitoring room of the prison, and the system uses wired LAN to transmit data.



Civil Aviation

On May 14th, 2018, Sichuan Airlines flight 3U8633 was in the regional cruise phase of Chengdu. The front windshield of the right cockpit of the cockpit ruptured and fell off. The crew implemented an emergency descent. The aircraft was safely lowered into Chengdu Airport. All passengers landed safely and orderly. setup well. During the standby period, the right side of the co-pilot was scratched at the waist and a flight attendant was slightly injured during the descent.

As of May 19, China's transportation aviation achieved sustained and safe flight for 104 months and 71.4 million hours.



(1) Airborne equipment

(2) Ground equipment

Category		Test Frequency	Working Mode	Test Antenna Polarization
Communication	HF	2.8 MHz ~ 22 MHz	Continuous	Vertical
	VHF	117.975 MHz ~ 137 MHz	Continuous	Vertical
	Satellite Communication	3968–3991Mhz Down 12688–12747MHZ Down		
Navigation	Directionless Beacon	190 kHz ~ 1750 kHz	Continuous	Vertical
	Pointing Beacon	74.8 MHz ~ 75.2 MHz	Continuous	Horizontal
	Heading Beacon	108 MHz ~ 111.975 MHz	Continuous	Horizontal
	Sliding Beacon	328.6 MHz ~ 335.4 MHz	Continuous	Horizontal
	Omnidirectional Beacon	108 MHz ~ 117.975 MHz	Continuous	Horizontal
	GPS	1563.42–1587.42MHz		Circular
	Rangefinder	960 MHz ~ 1 215 MHz	Pulse	Vertical
Monitoring	Secondary Radar	1 029 MHz ~ 1 031 MHz 087 MHz ~ 1 093 MHz	Pulse	Vertical
	Broadcast Automatic Correlation Monitoring System	1 089 MHz ~ 1 091 MHz	Pulse	Vertical

Civil Aviation

Airport Clearance Protected Areas include:
Obstacle restriction surface and area other than the obstacle restriction surface

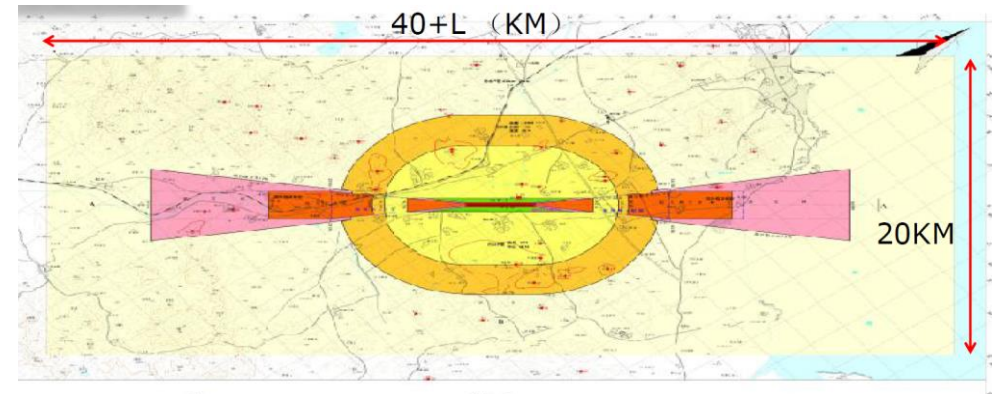
It covers an area of 10 km on both sides of the airport's long-distance runway centerline and 20 km from both ends of the runway.

A $20 \times (40 + L)$ km rectangle centered on the airport (L is the length of the runway)

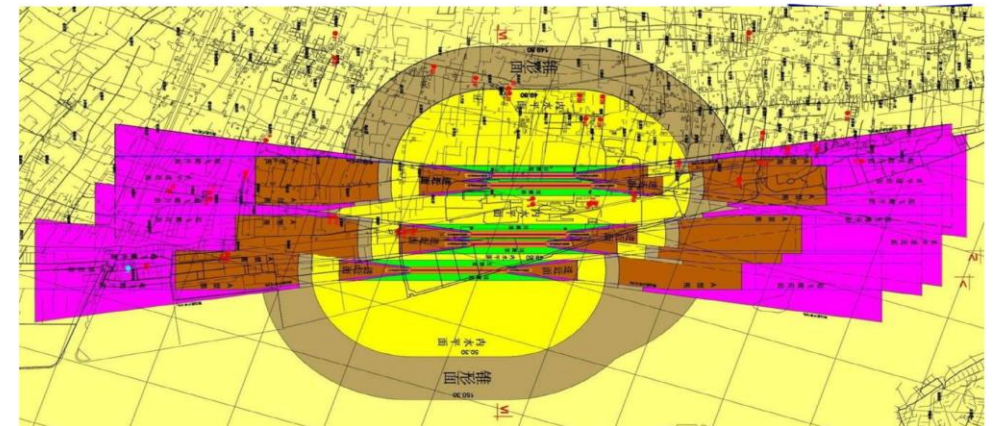
When planning multiple runways, a clearance protection zone shall be designated on the basis of each runway, and the overlapping parts shall be controlled according to stricter requirements, and the clearance area of the airport shall be determined according to the outermost range.

Obstacle restriction surface is to protect aircraft safety
And the airport operates safely to prevent the airport from becoming unusable due to the increase in obstacles around the airport, to limit the number of faces specified by the height of the obstacles in the airport and its surrounding areas.

Airport clearance protection zone refers to the protection of civil aviation
Take off and land safely, in accordance with civil aviation regulations and
Civil aviation technical standards require delineation for airport net
A certain range of air protection.

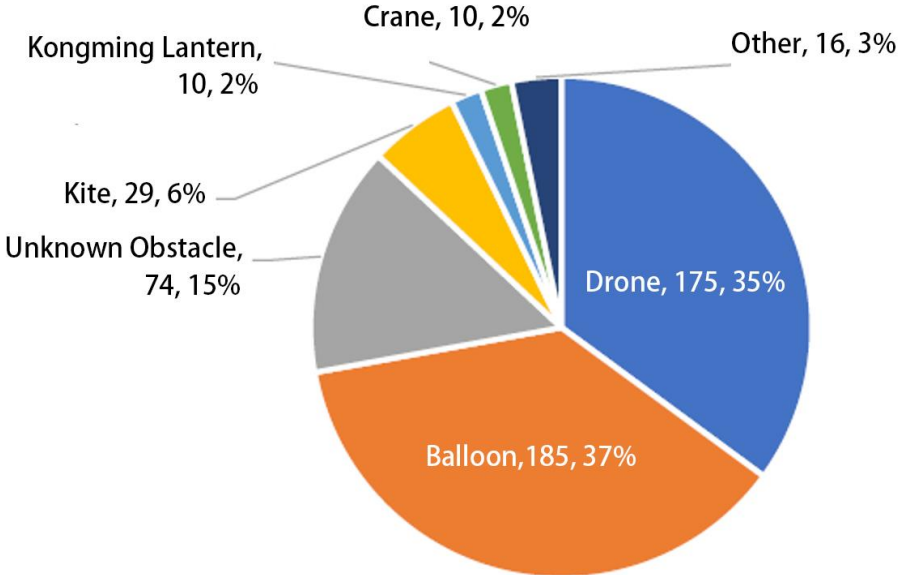


Single Runway

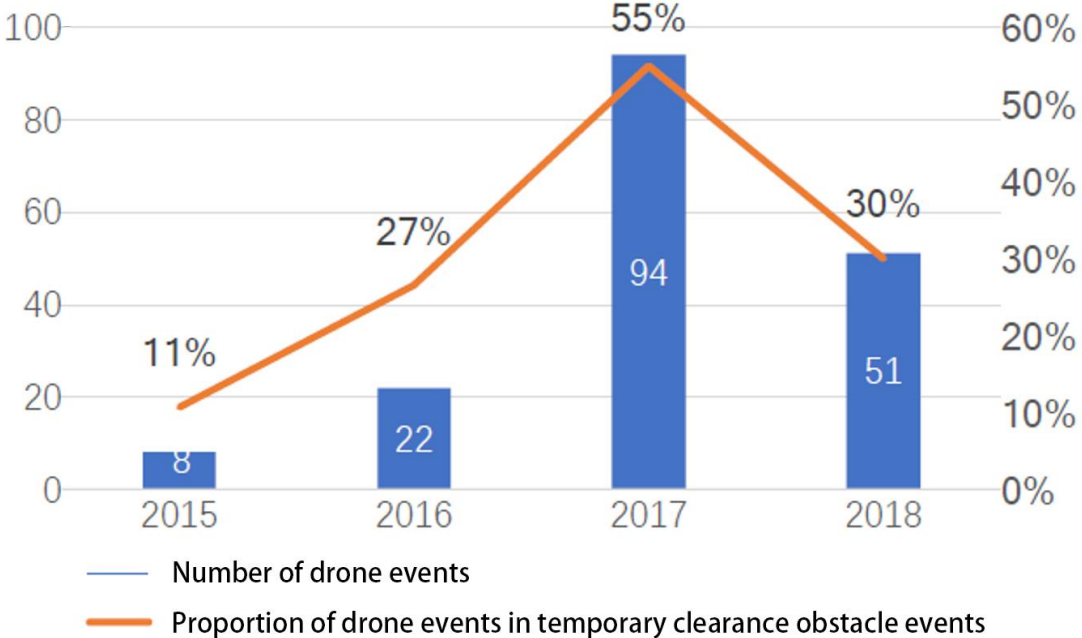


Multiple Runways

From 2015 to 2018, the civil aviation industry reported a total of 527 unsafe incidents of clearance management, including 28 super-high obstacles and 499 temporary clearance obstacles, accounting for 95% of the total number of incidents. The number and proportion of various types of temporary clearance obstacles are shown in the following figure:



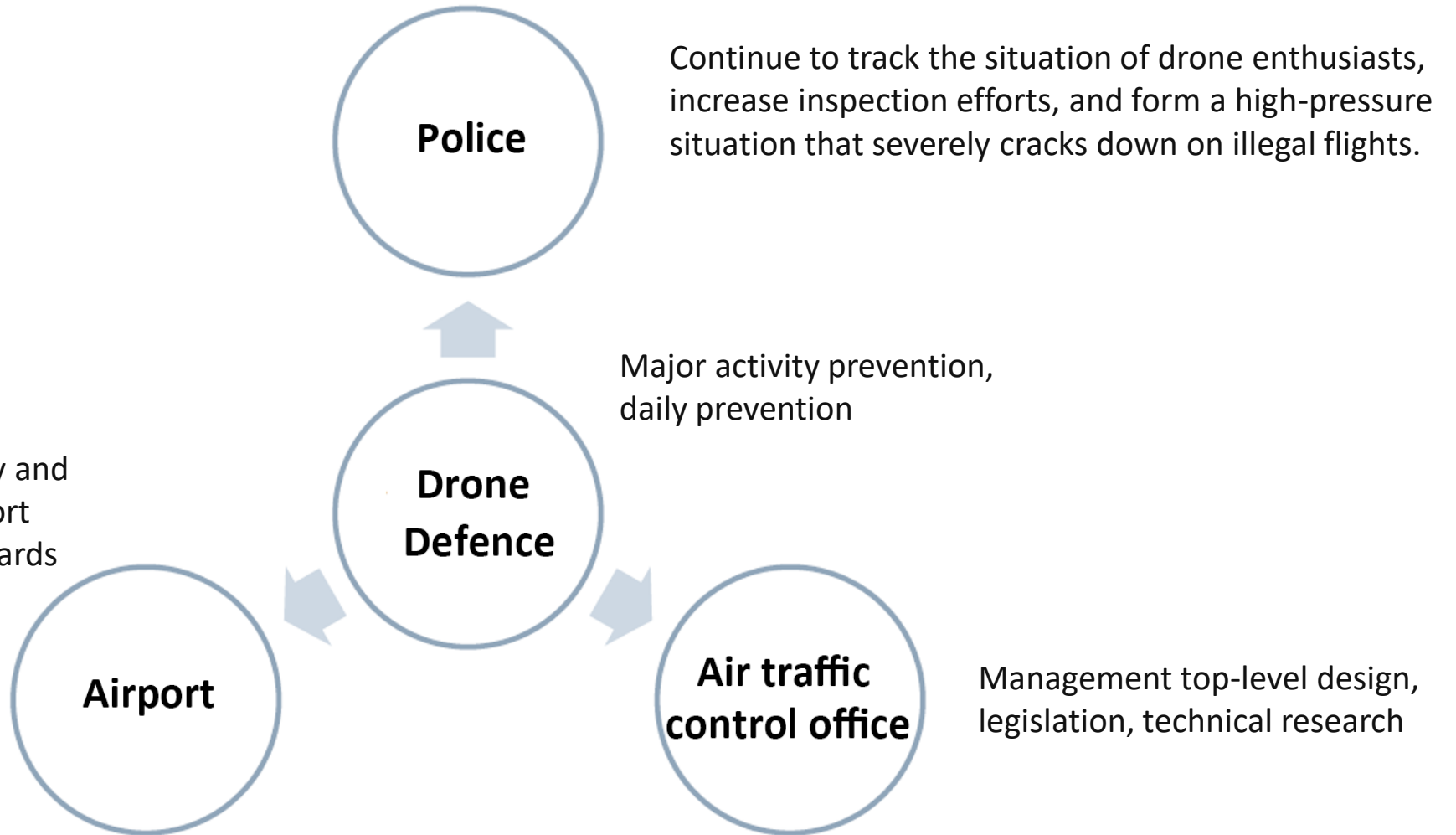
Analysis of temporary clearance obstacles



Number of drone events and their proportion in temporary clearance obstacle events

Relevant Departments

Study airport anti-UAV technology and incorporate it into the "New Airport Technology List" to develop standards for the use of UAV detection and counter-equipment in airports

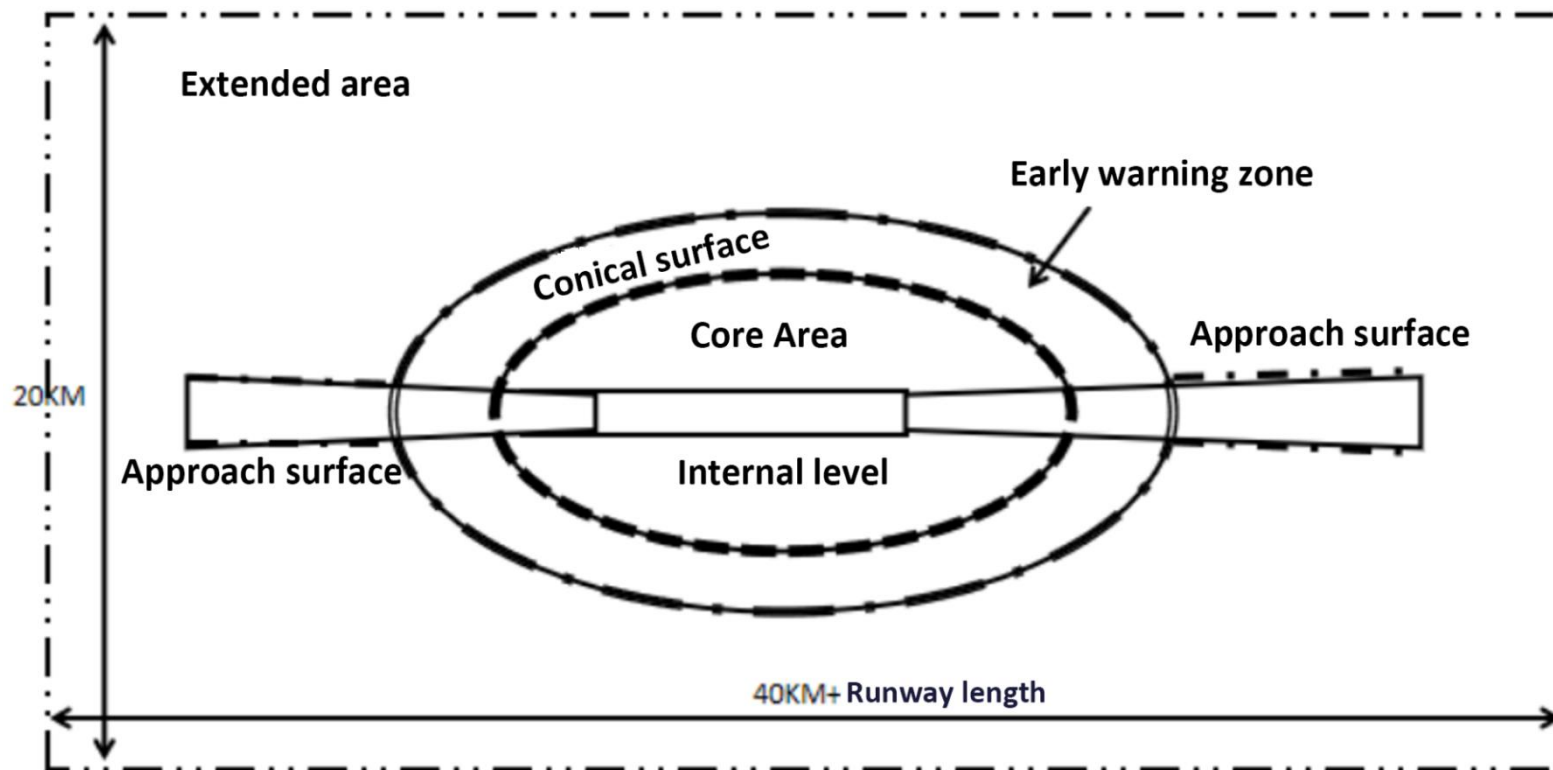


Defense Area

The monitoring area should be determined according to the airport demand. The monitoring area can be set as the core area, the early warning area and the extended area as shown in the following figure:

- The core area should include the horizontal projection of the horizontal plane (4km) within the civil airport;
- The warning zone should include the horizontal projection range (4km) outside the water level, the airport cone surface and the airport approach surface, and the runway reference point is really higher than 45 m;
- The extension zone can be 10 km from both sides of the airport runway centerline and 100 m-1500 m within 20 km of the runway end.

Airspace range.



Technical Standard

Performance	Core area	Early warning zone	Extended area
Positioning accuracy (root mean square value) Not greater than	100 m	200 m	300 m
Pitch accuracy (root mean square value) Not greater than	1.5 °	2 °	2 °
Detection false alarm rate Not greater than	10%	10%	15%
Detection probability	Should be not less than 90%, preferably not less than 95%	Should be not less than 90%	Should be not less than %
Coverage requirement	Should be covered	Preferably be covered	Can be covered
Defence requirement	Perferably be set	Can be set	Can be set
System response time Not greater than	15 s	30 s	60 s

- Research to master the efficiency, performance, safety and reliability of various technologies
- Research equipment layout solutions for different airport environments
Different airport environments
- Research equipment integration solutions for different airport needs
Airport scene broadband mobile communication system
 - 1 Airport cluster communication (interphone) (138\400\800\1.2G, etc.)
 - 2 Airport WIFI
 - 3 Airport FOD detection radar
- Research on networked + counter-integrated management and control solutions for local conditions
- Study local legislation and management procedures
No committee



中华人民共和国公共安全行业标准

GA 1551.3—2019

石油石化系统治安反恐防范要求 第3部分：成品油和天然气销售企业

Requirements for public security and counter-terrorist of petrochemical industry—
Part 3: Sales companies of refined oil and natural gas

2019-03-28 发布

2019-07-01 实施



中华人民共和国公安部 发布

4 重点目标和重点部位

4.1 重点目标

下列目标确定为成品油和天然气销售企业治安反恐防范的重点目标：

- a) 加油(气)站；
- b) 储油(气)库。

4.2 重点部位

4.2.1 加油(气)站治安反恐防范的重点部位包括但不限于以下部位：

- a) 站区出入口；
- b) 油(气)操作区；
- c) 油(气)储罐区；
- d) 监控设备存放区；
- e) 收银处。

4.2.2 储油(气)库治安反恐防范的重点部位包括但不限于以下部位：

- a) 库区周界出入口；
- b) 库区周界；
- c) 油(气)储罐区；
- d) 装卸油(气)作业区；
- e) 油(气)发货作业区；
- f) 监控中心(控制室)。

11.4 反无人机主动防御系统 Anti-drone System

11.4.1 信号发射功率应小于或等于 10 mW。

11.4.2 系统应能自动 24 h 持续工作,无需人员值守。

11.4.3 系统应获得国家认可的防爆合格证。

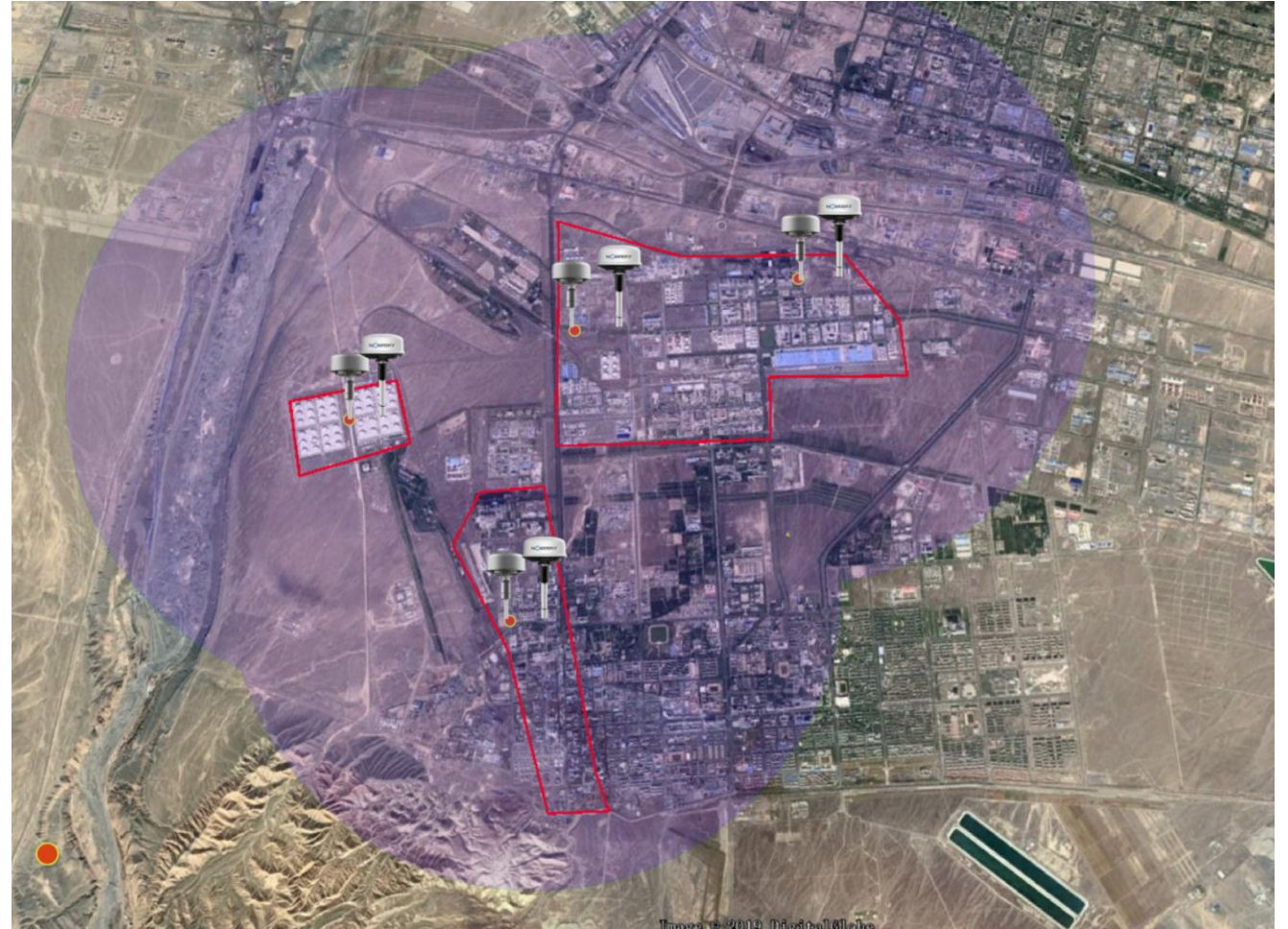
Petroleum and petrochemical system security anti-terrorism requirements in regulations

Spectrum + Spoofing

According to the site survey, 4 sets of spectrum detection equipment + decoy interference equipment are deployed in the development zone, the old factory area and the oil tank area. The detection capability radius is 3km, and the deception radius is 1km.

Advantages of the program: It can protect the waypoints flight and silent drone invasion. Deceptive interference does not need to be turned on 24 hours, and will not affect the normal use of navigation devices in the factory for a long time.

Disadvantages of the program: deception can not prevent the remote drone from flying in; in addition, it can not prevent and control the low flying target



Spectrum device + spoofing interference device deployment diagram

Applications

We have many mature application cases and rich practical support experience in the long-term protection of low-altitude drones and low-altitude security for large-scale activities.

Guarantee Mission Case:



President Xi Visited
Yue Yang

BRICS Conference
Security

Guiyang Digital Expo
Security

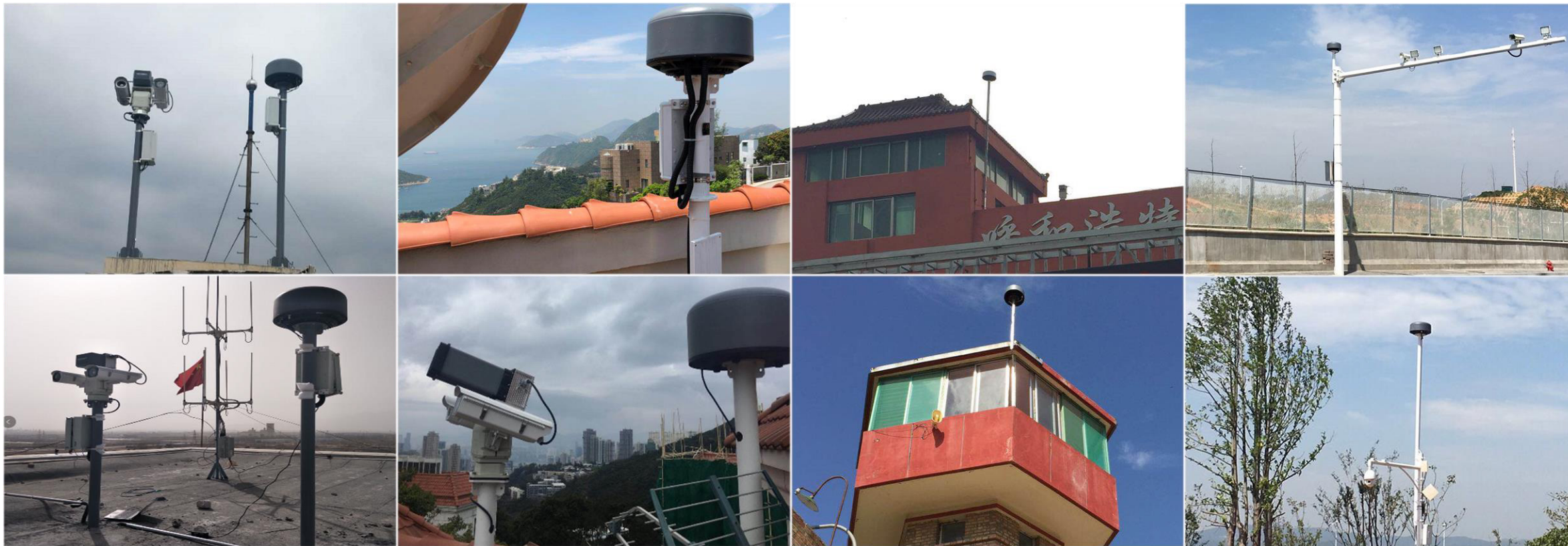
Shanghai OECD
Summit Security

Inner Mongolia 70th
Anniversary

Special Police
Security

Applications

Important Area Defense Cases





THANKS

THE FUTURE OF POSSIBLE