

INTEGRATED
RADIO-ELECTRONIC
WARFARE
SYSTEMS

GRIF-1 and CLOUD-3



SPETS TECHNO EXPORT



UKROBORONPROM
Ukrainian Defence Industry

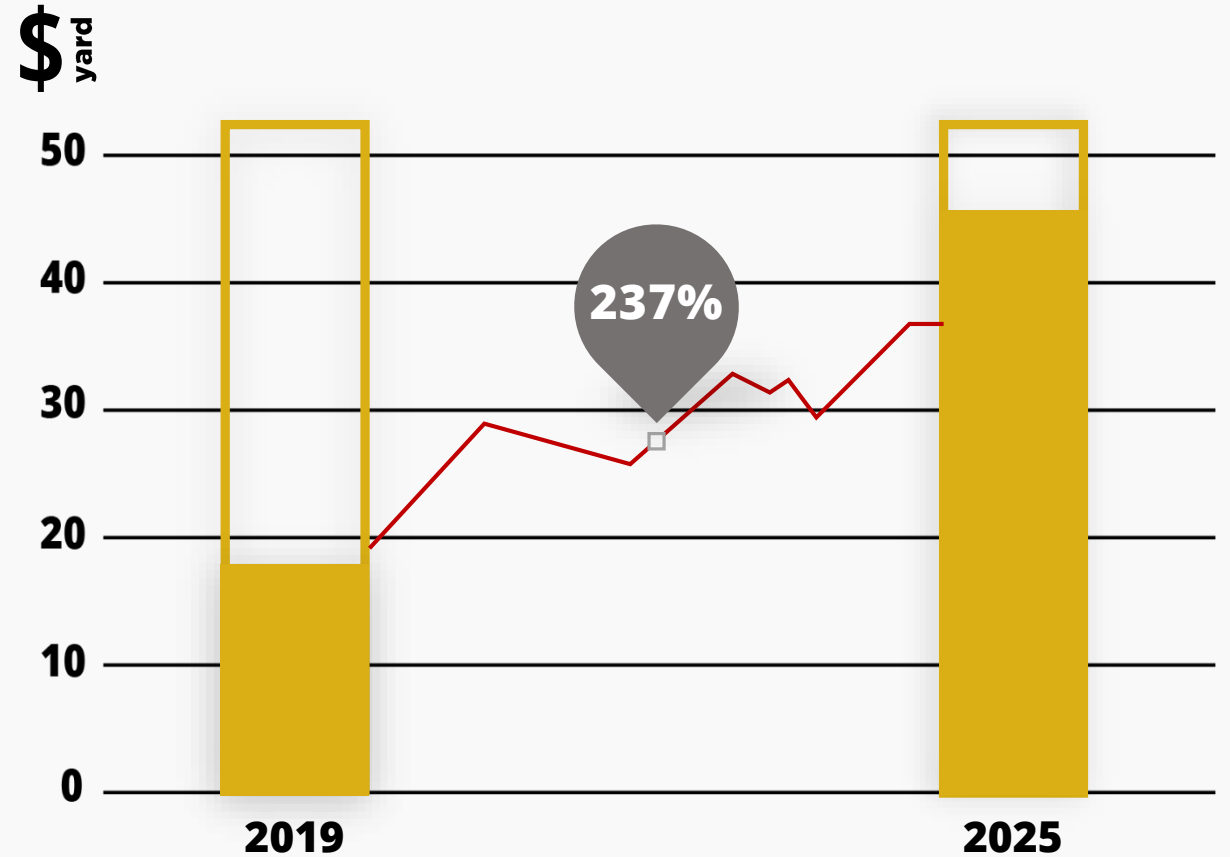
CDET

WORLD UAV sales growth chart



Total volume of the UAVs market will raise from \$19.3 billion in 2019 to \$45.8 billion in 2025, moreover, the average annual increase will be about 15.5%

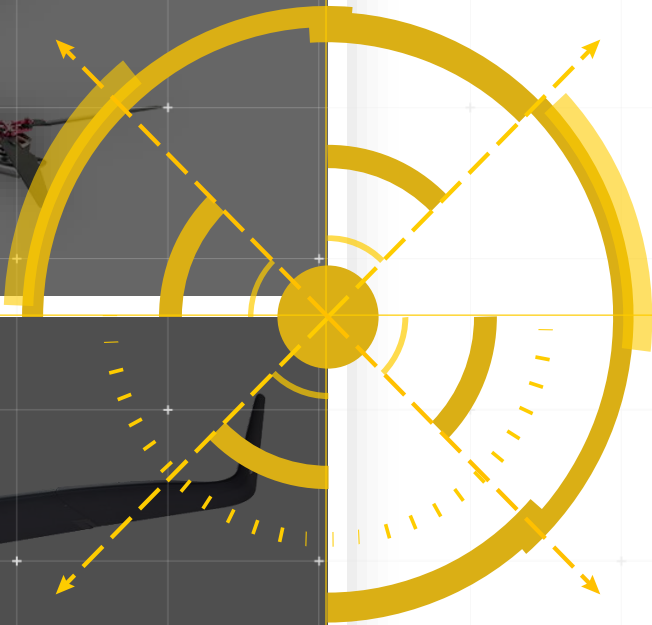
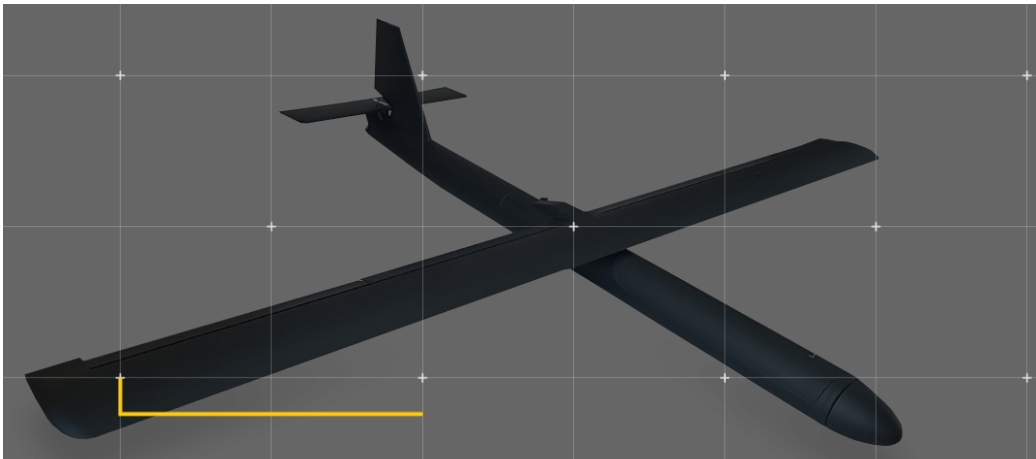
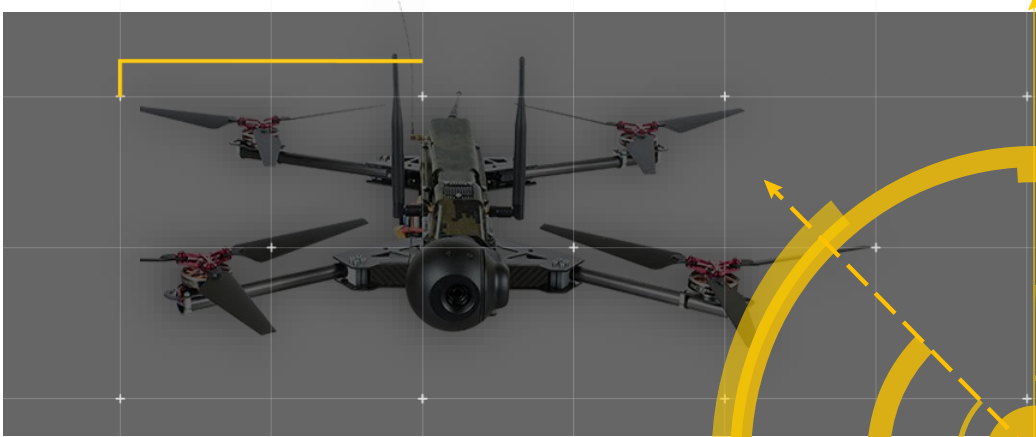
[ResearchAndMarkets.com](https://www.researchandmarkets.com)



THREATS



Along with the increase in the number of UAVs, the threat of terrorist attacks with the use of drones is growing.



MISSION of the EW system

is to prevent the drone from completing
combat mission

THE UAV COUNTERACTION ALGORITHM

DETECTION

Integrated radar detection system
It is effective for detection of big UAVs with inertial navigation system

RF-monitoring and direction finding system
It is effective for detection small drones

IDENTIFICATION

High resolution optical-electronic device "Friend-or-foe"
target verification, target tracking

Automatic comparison of intercepted signal with master data base (RF-monitoring)

JAMMING

"CLOUD-3"
are effective jamming of air and ground targets which use any common frequency ranges

"GRIF-1"
is effective for jamming of any type of radio signals, including control channels of attack drones, remotely controlled bombs, fire control radio channels, trunking communications

TARGET TRACKING

Target designation to air defense system

DESTROYING

It is effective for fully automated UAVs or targets, controlled via satellite communications

THE MAIN DRONES COMBAT APPLICATIONS

during military
conflicts



CLOSE RECONNAISSANCE,

artillery fire adjustment



LONG-RANGE RECONNAISSANCE

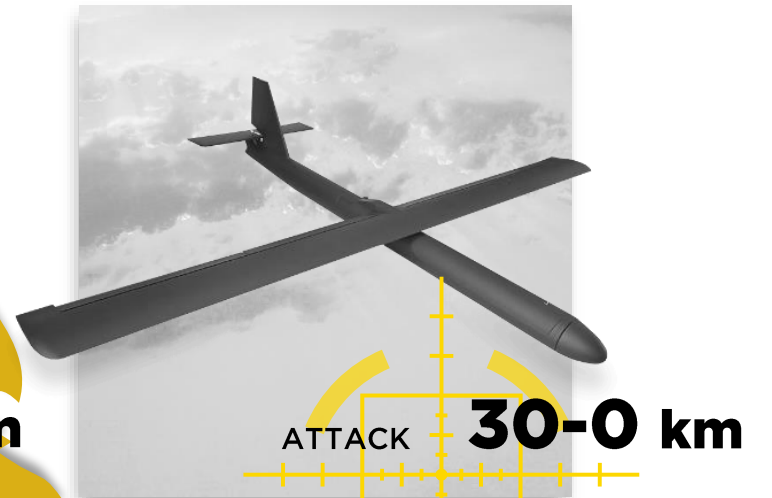
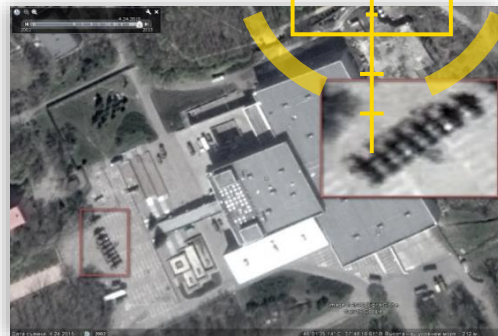
targets detection, targeting



ATTACK DRONES

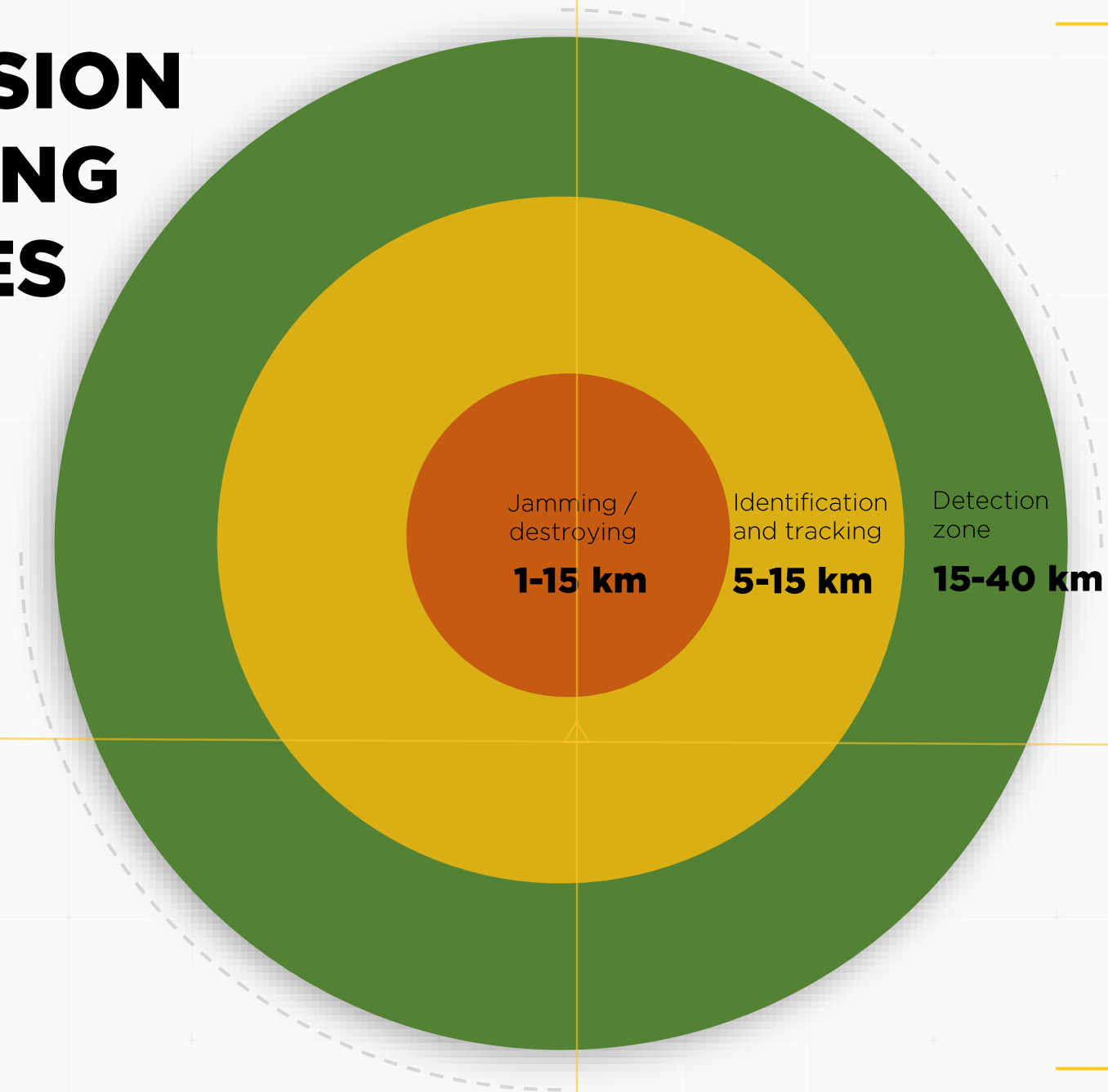
BASIC DISTANCES

for various types of UAVs



DECISION MAKING ZONES

for
effective UAVs
counteraction

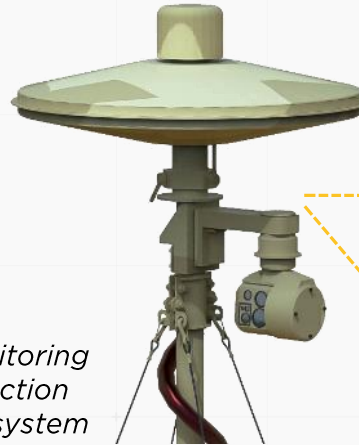


**THE BASIS OF EFFECTIVE
UAVs COUNTERACTION IS**

EARLY DETECTION

*The "GRIF" and "CLOUD"
systems use doubled target
detection systems*

*RF-monitoring
and direction
finding system*



**COPTERS WITH 0,01 M²
OR LESS SPACE AND
SMALL UAVS**



**TACTICAL LEVEL
UAVS, ATTACK
DRONES**



**PRESTRATEGIC UAVS
WITH INERTIAL
NAVIGATION SYSTEM**



Ku-band Radar



**THE MAXIMUM EFFECTIVENESS
OF TARGETS DETECTION IS**

**PROVIDED BY SIMULTANEOUS
ACTIVE AND PASSIVE
RECONNAISSANCE MEANS**

CLOUD-3

Radar "OKO"

Detecting range, km

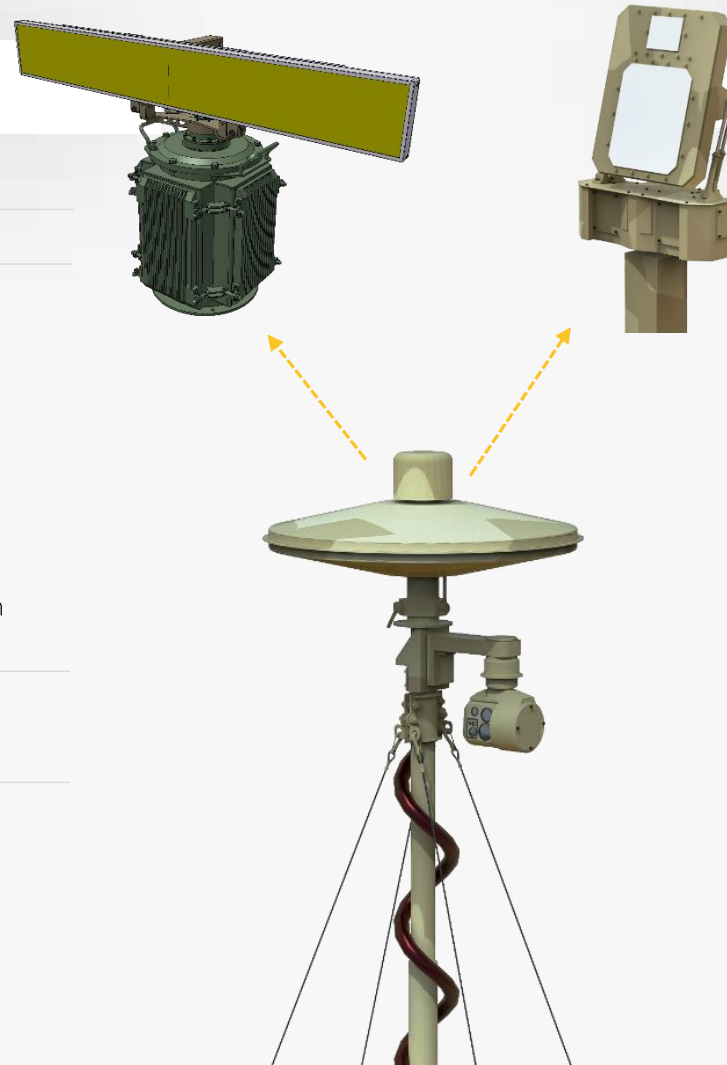
- Target with RCS = 10 m² 28
- Target with RCS = 1 m² 18
- Target with RCS = 0.1 m² 6

Target detection range
(based on RF-monitoring) 15-50 km

Accuracy of target
azimuthal angle
measurement: ±2°

Maximum elevation of
receiving antennas system:

- with tethered UAV 75 m
- with mast 12 m



GRIF-1

PARAMETER

VALUE

Overall dimensions, mm	up to 900 x 900 x 400
Receiving antenna type	Digital antenna array
Simultaneous observation area (degree)	16 x 16
Observation area:	
▪ Azimuth coverage (degree)	360
▪ Elevation coverage (degree)	from -5 to +85
Transmitter type	Solid-state transmitter
Instrumented range, km	35
Detection range, km	
▪ target with a radar cross section = 3m ²	25
▪ target with a radar cross section = 1m ²	20
▪ target with a radar cross section = 0,1m ²	10
Tracking range, km	
▪ target with a radar cross section = 1m ²	15
▪ target with a radar cross section = 0,1m ²	7
Standard deviation in measuring:	
▪ Range, m	5.0
▪ Angular coordinates, degree	0.1
▪ Velocity, m/s	0.1
Consumed power, W	up to 250



THE SYSTEM RANGE ESTIMATION IN UAVs SIGNALS RECONNAISSANCE MODE

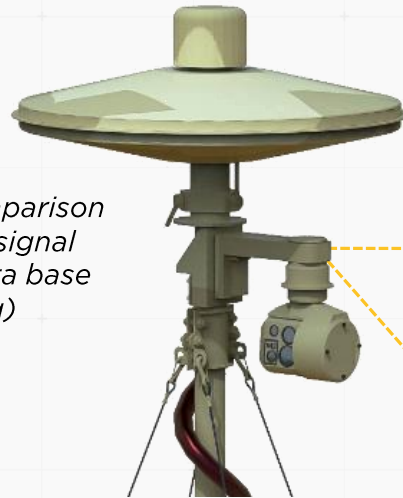
PARAMETER	FREQUENCY							
	400 MHz				3000 MHz			
UAVs flight altitude, m	50	200	50	200	50	200	50	200
Output power of video and telemetry signals transmitter, W	0,1	0,1	1	1	0,1	0,1	1	1
Height of receiving antenna, m	5	5	5	5	5	5	5	5
Line of sight distance, km	33	58	33	58	33	58	33	58
Maximum detection range, km	30	55	30	55	12	15	30	40

**THE BASIS OF CORRECT DECISION
REGARDING DETECTED TARGET IS**

WELL-TIMED IDENTIFICATION

*The "Grif" and "Cloud"
systems use doubled target
detection systems*

*Automatic comparison
of intercepted signal
with master data base
(RF-monitoring)*



*Optical -
electronic device*



**COPTERS WITH 0,01 M²
OR LESS SPACE AND
SMALL UAVS**



**TACTICAL LEVEL
UAVS, ATTACK
DRONES**

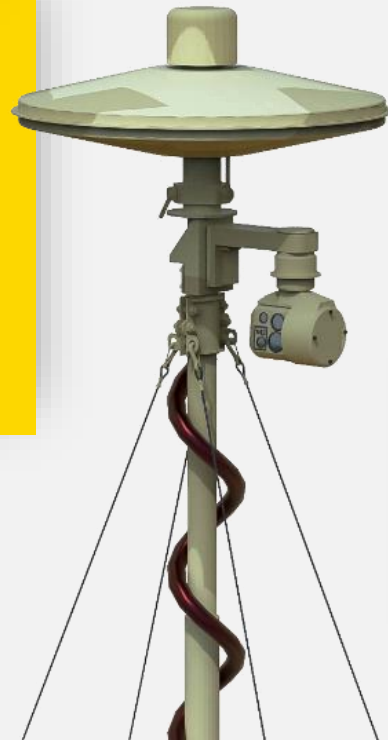


**PRESTRATEGIC UAVS
WITH INERTIAL
NAVIGATION SYSTEM**



THE MAXIMUM EFFECTIVENESS OF TARGETS IDENTIFICATION IS

PROVIDED BY SIMULTANEOUS USE OF OPTICAL OBSERVATION AND PASSIVE RECONNAISSANCE



TARGET TYPE	THERMO IMAGER		TELEVISION CHANNEL	
	Detection km	Identification km	Detection km	Identification km
UAV	6,0	2.4	7,0	2.4
Hanging helicopter (flight altitude 5-4000 m)	12,0	5,0	15,0	9,0
Ground target with front space 2,5x2,5m	4,0	2,0	6,0	4,0

The system continuously supports data base storage

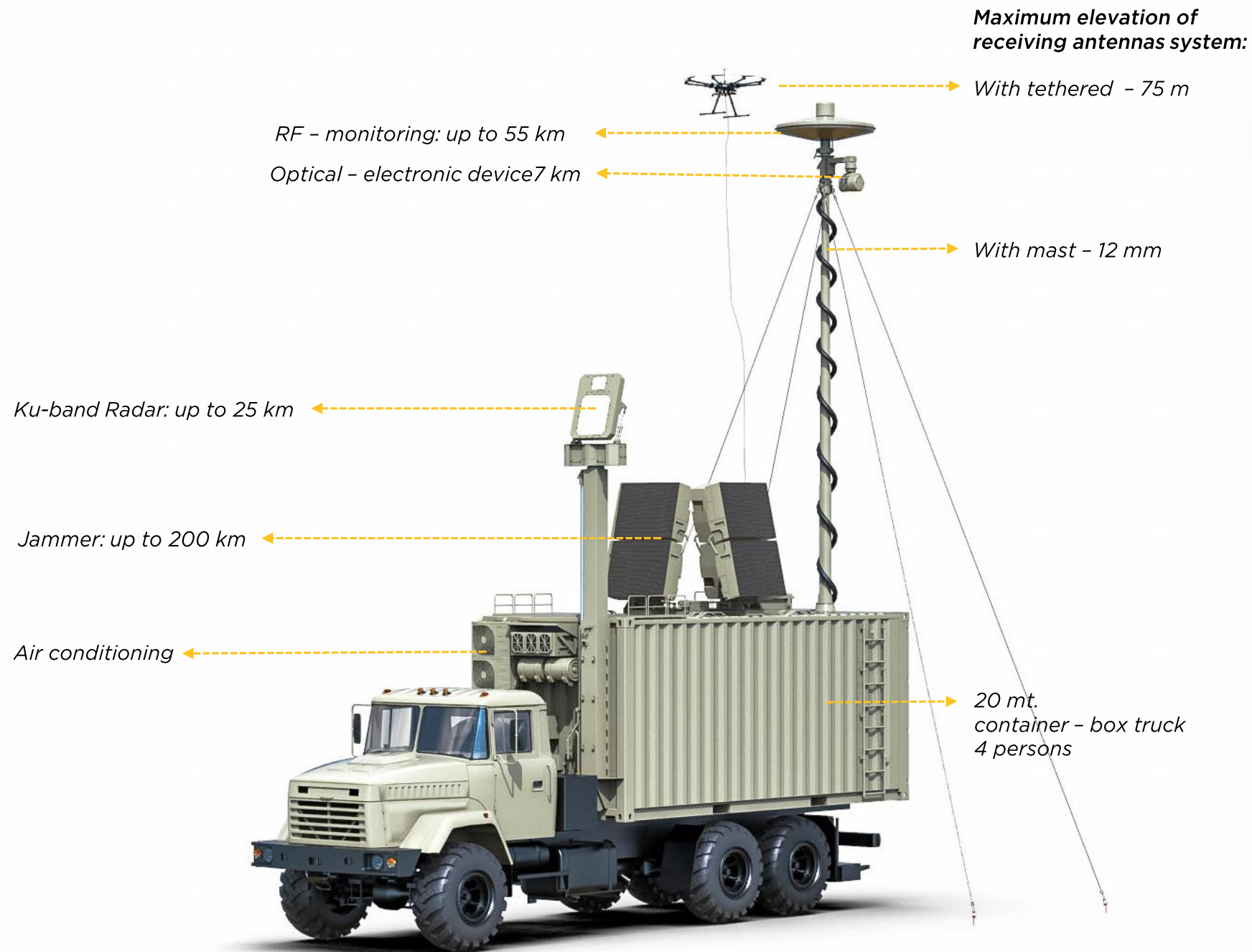
Target verification range (based on RF-monitoring)	15-50 km
Identification of targets by the images of signals entered into the database: <ul style="list-style-type: none"> ▪ by waveform ▪ the signal structure in the time domain 	

EW SYSTEM
CLOUD-3



EW SYSTEM

GRIF-1



EW SYSTEM

GRIF-1

The GRIF system in
transport position



CLASSIFIER OF FREQUENCIES USED IN UAV CONTROL

COPTERS AND SMALL UAVS



94 %

General range:

433 MHz,
935-960 MHz,
1200 -1300 MHz,
2400 MHz,
5200-5800 MHz

PRESTRATEGIC UAVs



5 %

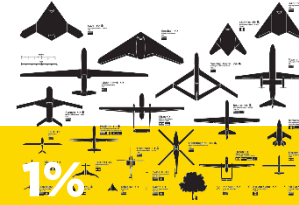
General range:

433 MHz,
935-9260 MHz,
1200 -1300 MHz,
2400 MHz,
5200-5800 MHz,

Special ranges:

1350-1390,
1350-1440,
1452-1492,
1810-1850,
2300-2400;
320-470,
1200-1700,
1650-2400,
1980-2550,
3000-3700,
4400-5001

OTHER VERSIONS



1%

General range:

433 MHz,
935-9260 MHz,
1200 -1300 MHz,
2400 MHz,
5200-5800 MHz,

Special ranges:

1350-1390,
1350-1440,
1452-1492,
1810-1850,
2300-2400;
320-470,
1200-1700,
1650-2400,
1980-2550,
3000-3700,
4400-5001

Additional ranges:

1350-1390,
2025-2150,
2200-2507,
4435-4980,
5100-5800

ATTACK, TERRORIST DRONES-KAMIKAZE



0,001%

The most dangerous group

Any frequencies
300 - 6000 MHz
with homemade receiving-
transmitting devices

EFFECTIVENESS OF VARIOUS SYSTEMS IN UAVs JAMMING

	CDET LLC		COMPETITORS			
	“CLOUD-3” Modular anti-UAV jammer	“GRIF-EWF” electronic warfare system	Many of the world analogs	AUDS, Great Britain	Shipovnik-Aero, Russia	
GNSS SIGNALS RF-JAMMING						
GPS L1 (Galileo E1)	+	+	+	+	+	
GPS L2	+	+	+	+	+	
GLONASS L1	+	+	+	+	+	
GLONASS L2	+	+	+	+	+	
Beidou (all bands)	+	+	-	-	-	
GPS L5	+	+	-	-	-	
Galileo E6	+	+	-	-	-	
Galileo E5	+	+	-	-	-	
Galileo E5a	+	+	-	-	-	
Galileo E5b	+	+	-	-	-	
RF-JAMMING OF DATA TRANSFER CHANNELS						
Frequencies under 433 MHz	-	Continuous frequency band from 300 to 6000 MHz, divided to 7 sub-bands: 300-500 MHz, 500-800 MHz, 800-1300 MHz, 1300-2000 MHz, 2000-3000 MHz 3000-4200 MHz 4200-6000 MHz	-	-	25-100 MHz	
ISM 433 MHz (433-435 MHz)	+		+	+	400-500 MHz	
CDMA 450 (420-490 MHz)	+		-	-	-	
gap 490-824 MHz*	-		-	-	-	
CDMA 800 (824-894 MHz)	+		-	-	800-925 MHz	
gap 894-902 MHz*	-		-	-		
ISM 915 MHz (902-928 MHz)	+		-	+	-	
gap 928-935 MHz*	-		-	-	-	
GSM-900 (935-960 MHz)	+		-	-	-	
gap 960-1805 MHz	-		-	-	-	
GSM-1800-downlink (1805-1880 MHz)	+		-	-	-	
gap 1880-2110 MHz*	-		-	-	-	
3G-downlink (2110-2175 MHz)	+		-	-	-	
gap (2175-2400 MHz)*	-		-	-	-	
WI-FI 2.4, ISM 2.4 (2,4-2,5 GHz)	+		+	+	+	2400-2485 MHz
gap (2500-3000 MHz)	-		-	-	-	-
gap (3000-5150 MHz)	-		-	-	-	-
WI-FI 5.5 (5150-5825 MHz)	+		+	+	+	-



PARAMETER	FREQUENCY							
	400 MHz				3000 MHz			
UAVs flight altitude, m	50	200	50	200	50	200	50	200
Output power of video and telemetry signals transmitter, W	0,1	0,1	1	1	0,1	0,1	1	1
Height of receiving antenna, m	10	10	10	10	10	10	10	10
Power of interference transmitter, W	200	200	200	200	200	200	200	200
Line of sight distance, km	33	58	33	58	33	58	33	58
Maximum detection range, km	30	55	30	55	30	58	30	58

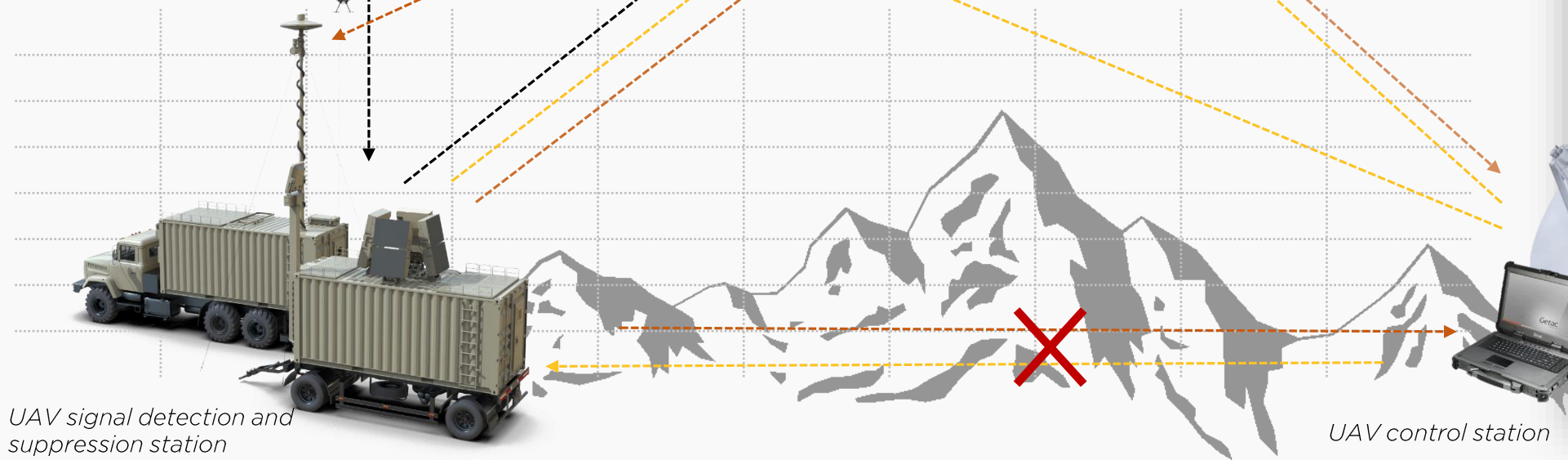
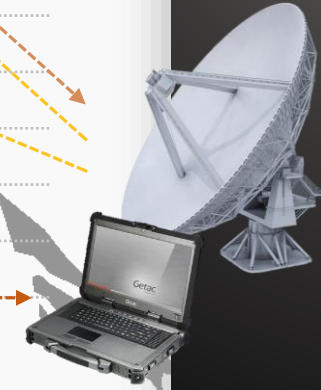
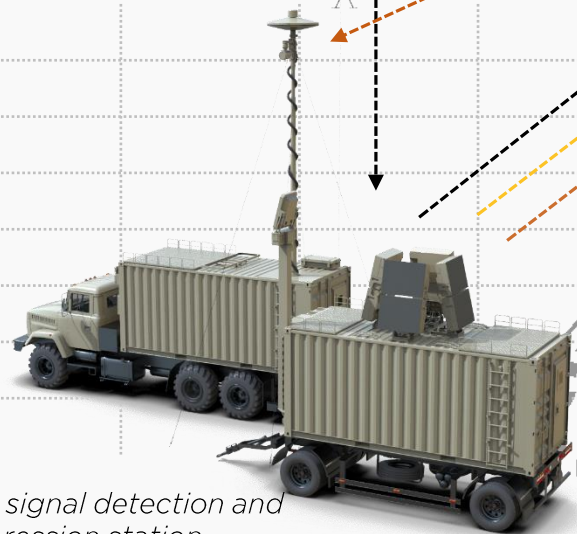
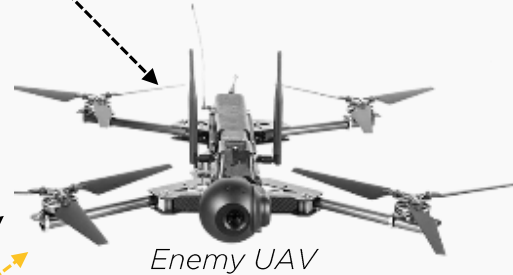
ESTIMATION OF STATION RANGE IN UAVS SIGNALS SUPPRESSION MODE

GRIF-1

CLOUD-3

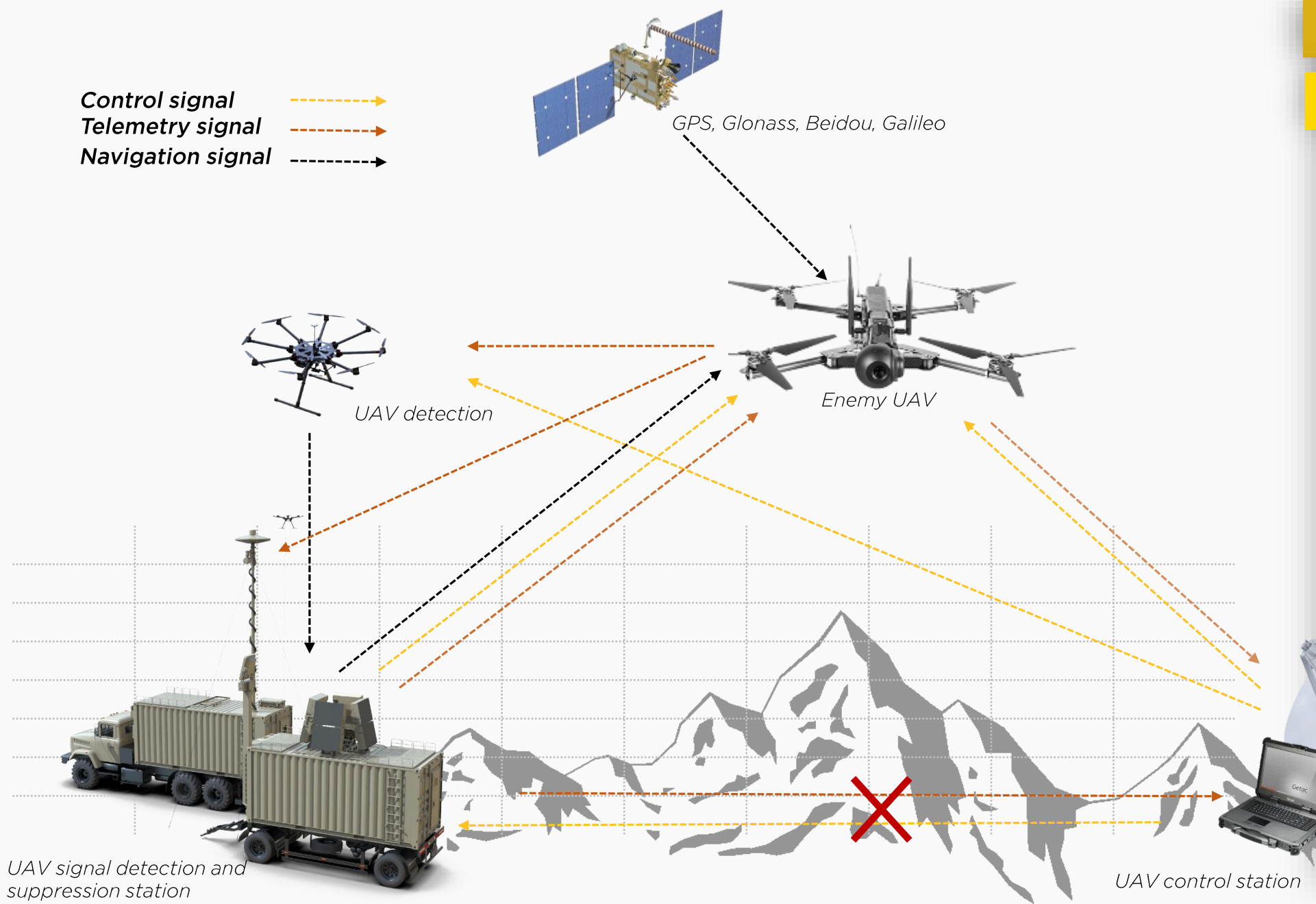
ALGORITHM OF THE SYSTEMS FOR INTERCEPTION AND JAMMING OF UAVS CONTROL, TELEMETRY AND NAVIGATION SIGNALS

Control signal
Telemetry signal
Navigation signal



UAV signal detection and suppression station

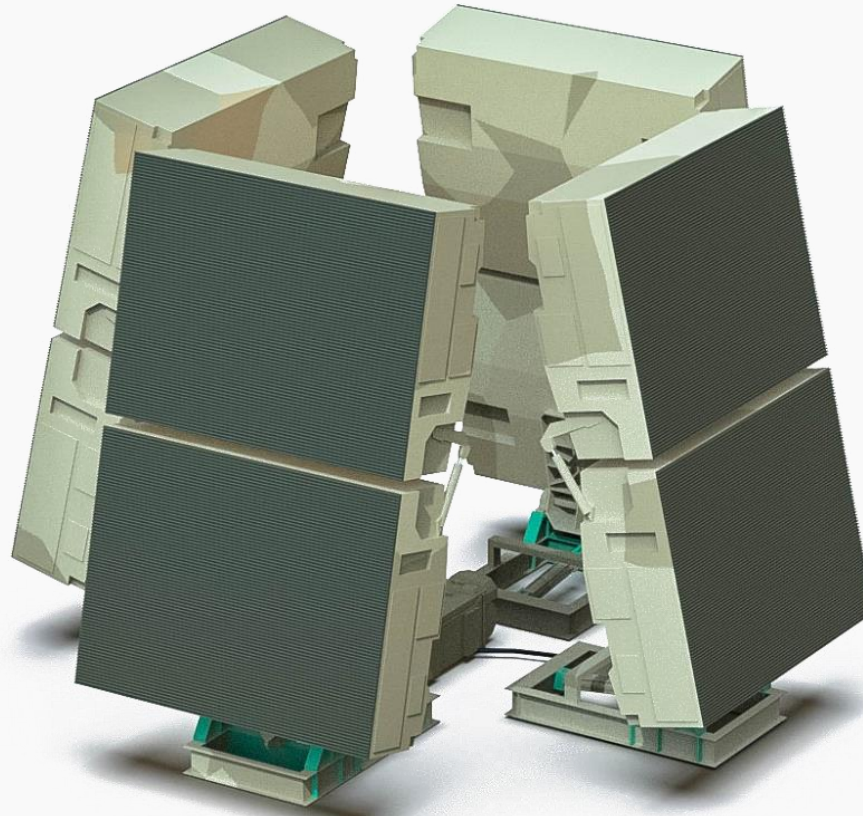
UAV control station



GRIF-1

CLOUD-3

TYPES OF INTERFERENCES, GENERATED BY THE SYSTEMS



- Emission of a narrowband signal at a defined frequency
- Emission of a wideband noise signal
- Simultaneous emission of multiple narrowband signals on different frequencies (multicarrier signal)
- Sweeping of an unmodulated carrier signal through a defined frequency range
- Sequential emission of narrowband signals at different frequencies defined in a list with selectable transmission durations according to frequency priority
- Reactive, parallel emission of one or more narrowband signals prioritized on a list in response to detected signal activity
- Detection, tracking and transmission of selected frequency-hopping signals

GRIF-1

INTERNAL DESIGN OF THE SYSTEM

Frequency coverage

300 MHz ... 6000 MHz,
in 7 diapasons:

300 MHz - 500 MHz

500 MHz - 800 MHz

800 MHz - 1300 MHz

1300 MHz - 2000 MHz

2000 MHz - 3000 MHz

3000 MHz - 4200 MHz

4200 MHz - 6000 MHz



TARGET ACQUISITION

Radar detects new target and provide Human-operator with it's azimuth angle, distance and racial speed

OR

RF-Monitoring and direction - finding system detect new source of radio emission and provide Human-operator with it's azimuth angle and emission frequency band

Camera scans elevation angle on the known azimuth to automatically focus on the target and give to Human-operator the target`s moving picture in maximum possible quality. Camera locates the target and track it with precision, enough to give target designation to external fire control system

Human-operator makes decision about classification of target as 'friend' or 'enemy' based on information from all three sources: optical, radio frequency, radar wit support of built-in pattern database

TARGET IDENTIFIED AS 'FRIEND'

Mark target as 'not interest, stop inform human-operator

?

TARGET IDENTIFIED AS 'ENEMY'

Human-operator turns on GNSS inhibition

Human-operator, using RF-Monitoring system, identifies the frequency band of control and data transfer channels between target and it's operator and turns on RF-Jammer to disrupt these channels

Human-operator gives command to start target designation

TARGET DEFATING

GRIF-1

CLOUD-3

**ALGORITHM FOR
THE SYSTEMS
OPERATORS
DURING
INTERCEPTION
AND JAMMING
OF ENEMY'S UAVs**



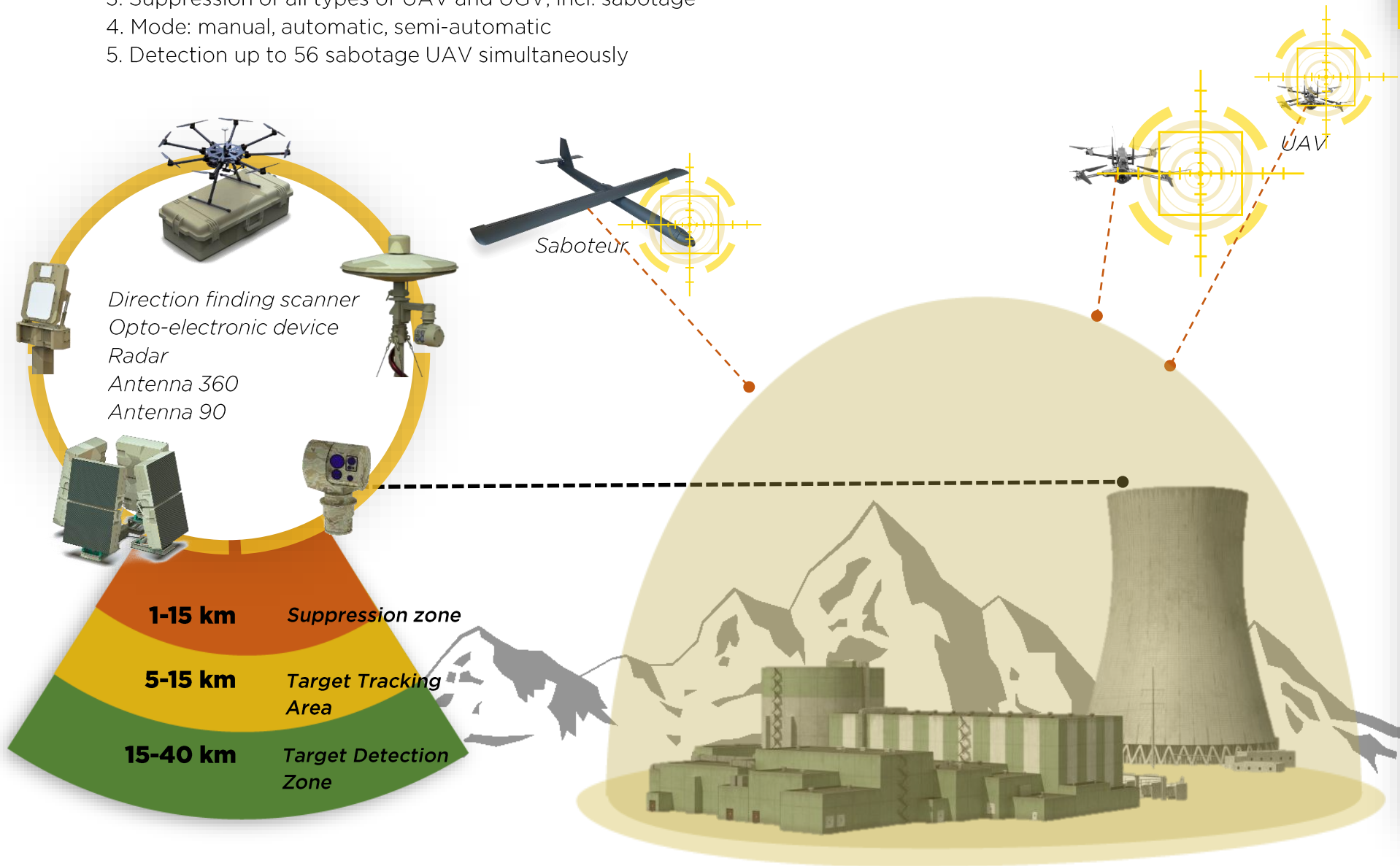
CLOUD-3

INTERNAL DESIGN OF THE SYSTEM

- GPS L1; GPS L2
- GPS L5
- GLONASS L1
- GLONASS L2
- Galileo E1
- Galileo E6
- Galileo E5
- Galileo E5a; Galileo E5b
- Beidou
- GSM-900-downlink
- GSM-1800-downlink
- 3G-downlink
- CDMA 450
- CDMA 800
- WI-FI 2,4
- WI-FI 5,5

Dome protection of stationary facilities

1. Round-the-clock tracking 360° and 24/7
2. Suppression of any kind of communication
3. Suppression of all types of UAV and UGV, incl. sabotage
4. Mode: manual, automatic, semi-automatic
5. Detection up to 56 sabotage UAV simultaneously



GRIF-1

CLOUD-3

APPLICATIONS OF THE SYSTEMS

Set
STATIONARY

It is intended for protection of critical infrastructure objects: oil industry, airports, nuclear objects, military storages



- up to 56 targeted on frequency interferences simultaneously
- adjustable output signal power- up to 3kW
- adjustable interference width from 1KHz to 200MHz
- setting of necessary emission sector from 90° to 360°

GRIF-1

CLOUD-3

APPLICATIONS OF THE SYSTEMS

Set **BORDER GUARD**

It is intended for near-border areas in places of sluggish conflicts with a low probability of heavy artillery or missile strikes use



CLOUD-3

APPLICATIONS OF THE SYSTEMS

Set NATIONAL GUARD

It is intended for support of special forces, military and police missions for prevention of terrorist threats, convoys protection, VIP-persons protection

- jamming up to 20 fixed frequencies simultaneously
- adjustable interference width from 1MHz to 100MHz
- power of transmitted interference 200W - 3000W

Antennas radiation pattern:

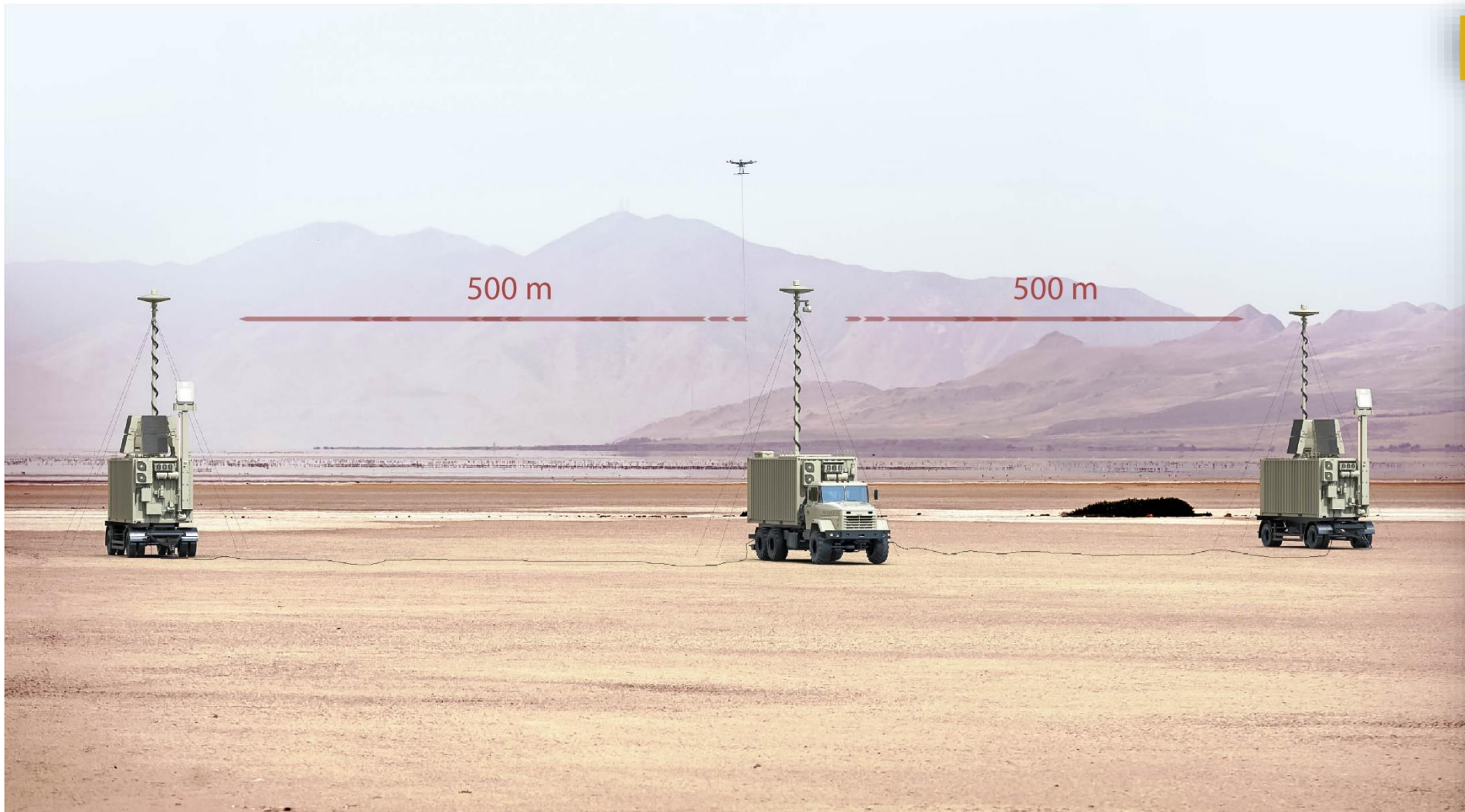
- horizontal: 60-90° (motor driven rotation $\pm 180^\circ$)
- vertical: 40-60°

GRIF-1

APPLICATIONS OF THE SYSTEMS

Set MILITARY

It is intended for protection of troops and equipments locations in areas of active hostilities with a high probability of heavy artillery or missile strikes use



- up to 56 targeted on frequency interferences simultaneously
- adjustable output signal power- up to 3kW
- adjustable interference width from 1KHz to 200MHz
- setting of necessary emission sector from 90° to 360°
- adaptive interference parameters setting



GRIF-1

CLOUD-3

MAIN ADVANTAGES OF THE SYSTEMS IN COMPARISON WITH COMPETITORS

Module structure:

it allows to increase
functionality and frequency
ranges

Self-learning system:

it allows to support and to
process databases of
radioelectric signals and
counteract them in
automatic mode

Tested in combat areas



GRIF-1

CLOUD-3

**MAIN ADVANTAGES
OF THE SYSTEMS IN
COMPARISON WITH
COMPETITORS**

Fully autonomous system with all the support subsystems: it allows to provide long missions

Automatic, semi-automatic and manual operational models

Various sets allow to meet various Customers requirements



ANTI-UAV VEHICLE

CLOUD-3

MAIN ADVANTAGES OF THE SYSTEMS IN COMPARISON WITH COMPETITORS

- Jammer & RF-Inhibitor 300 MHz ... 6000 MHz – supplier CDET LLC
- Radio frequency monitoring unit 300 MHz ... 6000 MHz installed on mast (6 m) and
- tethered drone (up to 75 m) – supplier CDET LLC
- Ku-band Radar PROGRESS (Ukraine)
- Optical - electronic device PROGRESS (Ukraine)
- Armored truck (vehicle) – defined by Customer
- Internal design – supplier CDET LLC
- Software - supplier CDET LLC

ANTI-UAV VEHICLE

GRIF-1

MAIN ADVANTAGES OF THE SYSTEMS IN COMPARISON WITH COMPETITORS

- Jammer & RF-Inhibitor 300 MHz ... 6000 MHz – supplier CDET LLC
- Radio frequency monitoring unit 300 MHz ... 6000 MHz installed on mast (12 m) and
- tethered drone (up to 75 m) – supplier CDET LLC
- Ku-band Radar ARSENAL (Ukraine)
- Optical - electronic device KVANT (Ukraine)
- Armored truck (vehicle) – defined by Customer
- Internal design - 20 mt. container – box truck - supplier CDET LLC
- Software - supplier CDET LLC
- Automatic, semi-automatic and manual operational modes



CONTACT US



STATE FOREIGN TRADE ENTERPRISE «SpetsTechnoExport»

- 🏠 7, Stepana Bandery Avenue,
Kyiv, 04073, UKRAINE
- ☎ +038 044 568 50 70
+038 044 568 53 48
- ✉ office@ste.kiev.ua
- 🌐 www.spetstechnoexport.com



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