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TERRITORIAL WATERS SURVEILLANCE COMPLEX

Main challenges in sea border protection

Detection of slow targets of small size.

Small slow boats are the main mode of transport in the coastal zone:

- Smuggling of goods
- Illegal migration
- Intrusion of terrorists and foreign military groups

Harsh weather conditions

- Waving. During a storm, waves create significant interference with classic radars and make it impossible to detect targets against the background of these disturbances.
- Precipitation. Rain and snow reduces the effectiveness of any sensors. In the case of conventional video cameras and thermal imagers with low sensitivity, rain or snow makes them practically useless.
- Fog. Reduces the detection range of video cameras and thermal imagers, but does not affect the performance of the radar.

Coastal infrastructure for installation

- Placing energy-intensive observational systems in places with no infrastructure is impossible.
- High requirements for communication channels. Traditional systems require a high-bandwidth communication channel to transmit “raw” radar data and video.
- Large size and high weight of the radar with mechanical scanning requires the construction of expensive towers for installation

Territorial waters surveillance complex

Purpose

Providing the operational center of the sea border protection with information on the surface situation in territorial waters:

- The presence of surface objects;
- Determination of surface objects parameters - coordinates, speed, direction of movement;
- Identification of surface objects
- Maintenance of surface objects;
- Detection of threats of violation of the state border;
- Prevention of hidden border crossing.

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The main tactical and technical characteristics of the complex

The width of the observation zone on the front	Scalable, depends on the number of tracking stations
Maximum number of tracking stations	Unlimited
The width of the observation zone of one station on the front	22-32 km
Observation depth	32 km
Minimum detection rate of surface objects	0 km
Surface Object Detector	Doppler electronic scanning radar
Controlled parameters:	Coordinates, speed, direction of movement of the EAD
Additional equipment for the identification of objects	Optoelectronic system, AIS
Object detection distance under ideal conditions:	Small wooden boat (EAD 1m.kv) - 11 km Inflatable landing boat (EAD 5 sq.m) – 16 km Small coaster (EAD 30 sq.m) – 20 km Large coaster (EAD 100 sq.m) - 25 km Container ship (EAD 1000 sq.m.) - 32 km
Number of operational centers	Unlimited

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The composition of the complex

- Container type autonomous multispectral monitoring station
- Communication system
- Automated operator workstation
- Command center displaying operational and tactical situation

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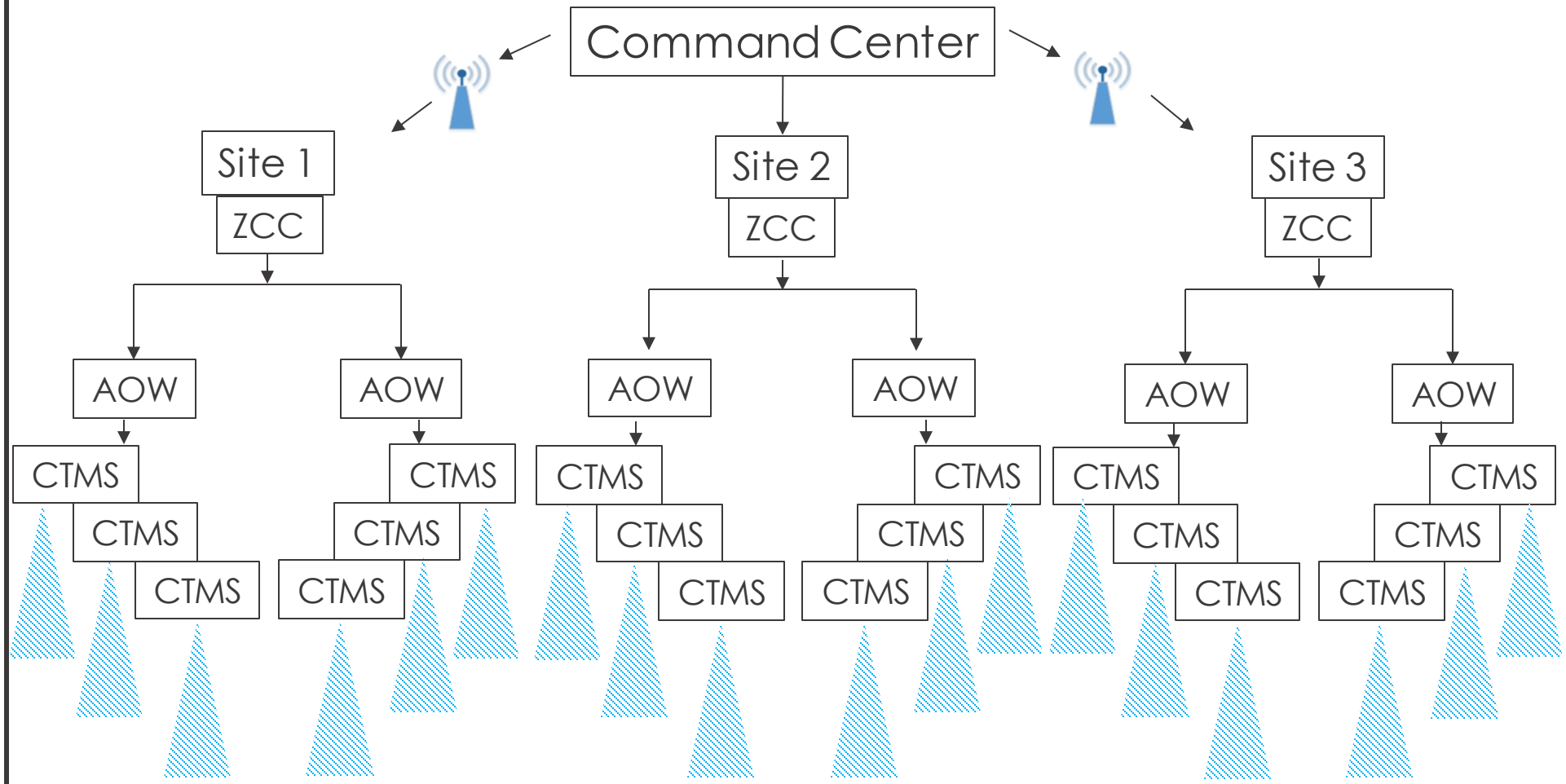
Structural scheme of the complex

ZCC — Zonal control center

AOW — Automated operator workstation

CTMS — Container type multispectral stations

Communication



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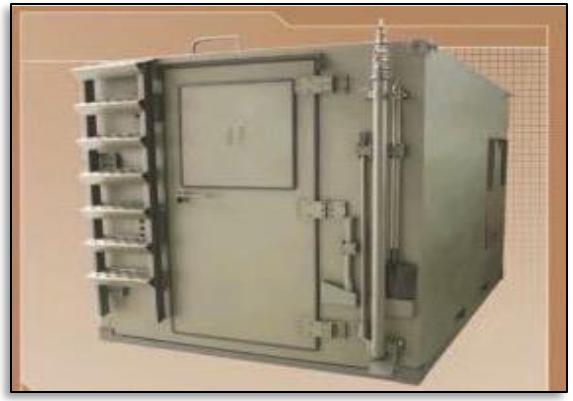
MAIN COMPONENTS OF THE COMPLEX

Container type autonomous multispectral monitoring station



Purpose

- Operation as part of a distributed complex of monitoring of surface objects in a certain sector of territorial waters;
- Ensuring the identification and recognition of various surface objects;
- Exact determination of the coordinates of detected objects;
- Maintenance of the detected objects;
- Transmission of information about the situation in a particular sector to command center;
- Transmission of transit information from adjacent stations.

Container type autonomous multispectral monitoring station

Composition

- Marine radar C-400 series, manufactured by Blighter;
- Optoelectronic surveillance system ATRI PTZ XXX;
- AIS receiver;
- Power supply system;
- System of self security and life support;
- The main channel of communication
- Backup communication channel
- Switch;
- The automated workplace of the operator, service personnel

Container type autonomous multispectral monitoring station

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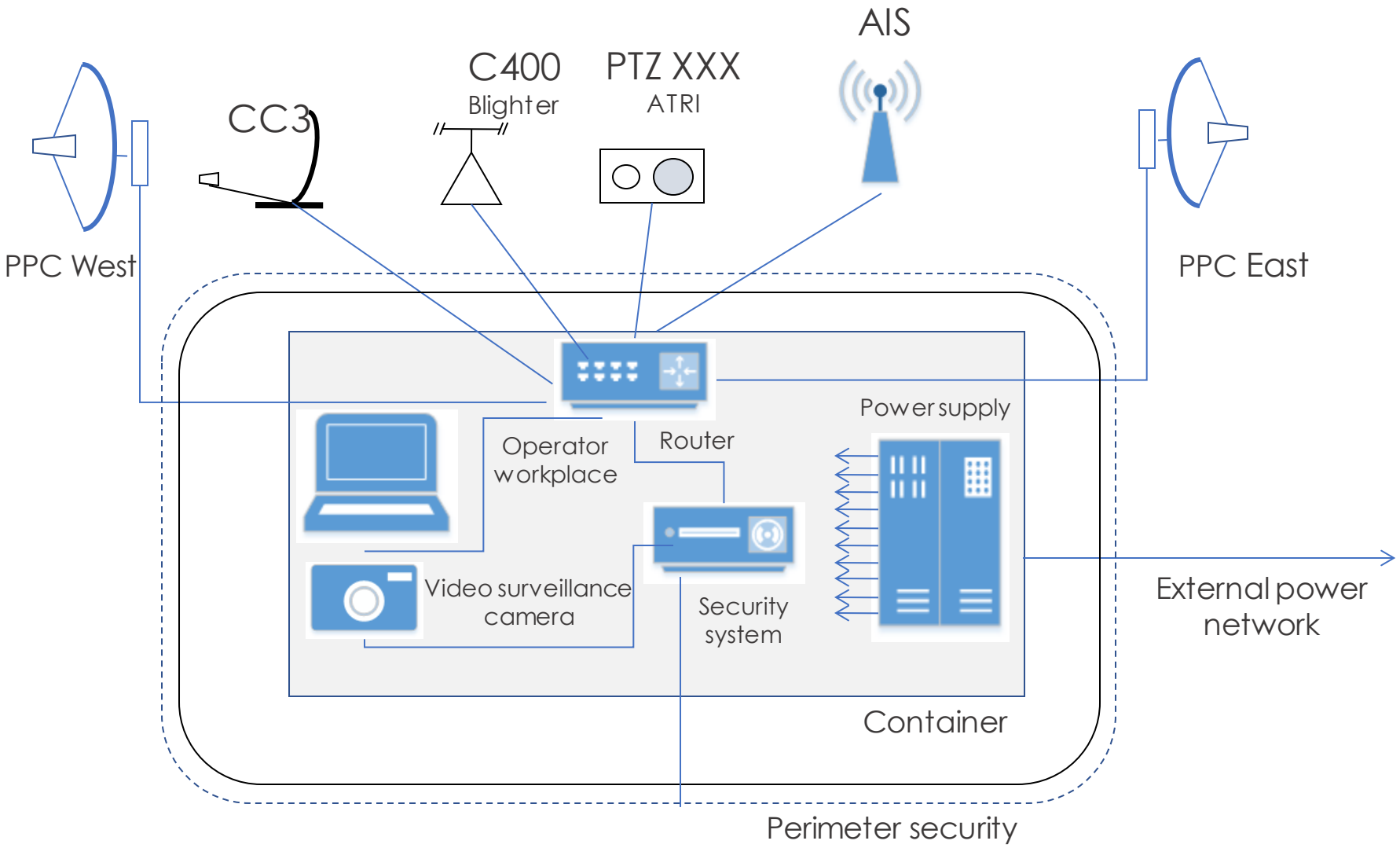
Structure scheme



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Marine radar Blighter C-400 series

Purpose

- Detection of objects on the surface of water and land at a distance of up to 32 km (including in difficult weather conditions and in storm conditions).
- Determining the parameters of detected targets:
  - exact coordinates speed,
  - course,
  - distance,
  - effective area of dispersion (EAD), etc.
- Tracking of detected objects
- Control of the multispectral camera system for visual identification of the target by the operator in all weather conditions, day and night.

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Technical characteristics

Radar type	Doppler electronic scanning radar, frequency-modulated continuous radiation (FMCW) for coastal monitoring
Frequency range	Ku (15,7 GHz – 17,2 GHz)
Scan type	electronic azimuth scanning using passive phased array antenna (PPAA)
Emitted power	• 1 W (Standard version) • 4 W (high power version)
Adjustable operation range	2, 5, 8, 16 or 32 km
Detection range (ideal conditions):	Small wooden boat (EAD 1sq.m) - 11 km* Inflatable landing boat (EAD 5 sq.m) – 16 km* Small coaster (EAD 30 sq.m) – 20 km* Large coaster (EAD 100 sq.m) - 25 km* Container ship (EAD 1000 sq.m.) - 32 km* * High Power Version (HP) with M10S antennas

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Technical characteristics

Minimal operational range	10 m
Azimuth Scan	90°, 180°, 270° or 360°
Elevation	10° or 20°
Azimuth Scan Speed for 90 °	1 sec
Dimensions	666 mm x 503 mm x 128 mm
Weight of one block	27 kg maximum
Operational temperatures	-32°C to +65°C
Level of protection	IP66
Operational time	> 65 000 hours (regular maintenance is not required)
Certification	MIL-STD-810F

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Main features and advantages of Blighter radars for sea border security

Detection of small and slow objects	• Minimum detectable speed of 0 km / h - boats standing on the roadstead • Minimum EAD 0.01 m2
Detection of static ships at anchorage	Detected target is not lost when stopped
Unique built-in marine filter for eliminating interference from waves	Allows to detect a wooden boat with a height of waves up to 2.5 meters
Integration with surveillance cameras	Detection and tracking of targets according to radar data in automatic mode
Integration with AIS and other ship identification systems	Additional information for operators
Easy integration into existing security system	SDK and API are supplied along with the radar
Target classification via Doppler audio captions	Yes
Low requirements for communication channels	The transfer of radar data requires only 20 kbps.

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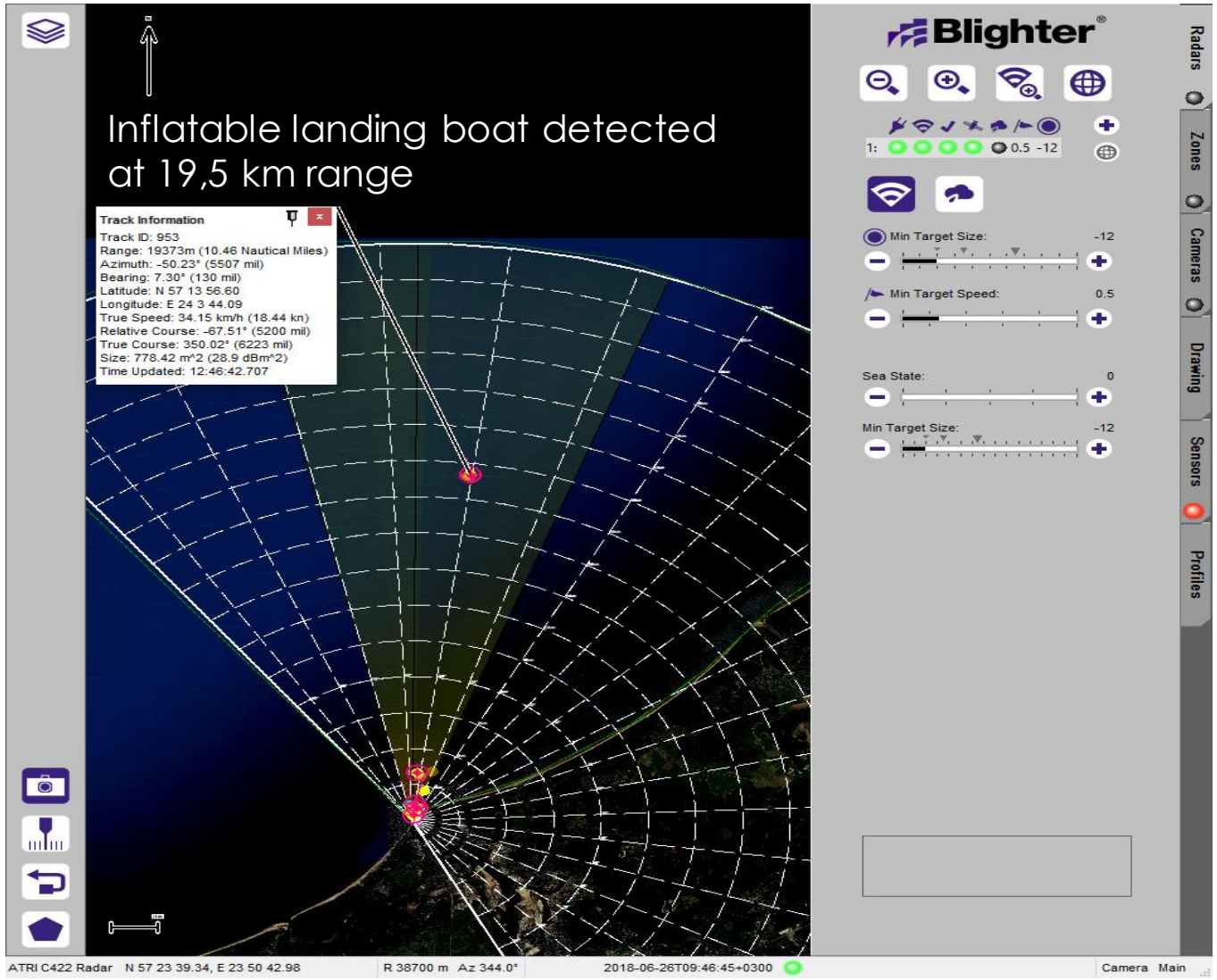
Main features and advantages of Blighter radars for sea border security

Does not require regular maintenance (no moving parts)	Minimum cost of ownership No idle waiting for repair. Operational time more than 65000 hours (about 7.5 years)
24 h operation in all weather conditions	Salt fog, precipitation, strong wind, sudden temperature changes, high humidity, etc.
Simple, cheap and quick installation on existing infrastructure	Significant reduction in installation and infrastructure costs
Low power consumption:	• Reduces the cost of operation. • Can work in remote areas without infrastructure (solar panels, fuel cells, windmills, etc.) • Reduces logistics costs when replenishing fuel supplies or recharging fuel cells
Ku-band	• More compact antenna and permissible mounting height lower than that of X-band radars • Minimizes weather and atmospheric loss and distortion
Electronic disguise	Reduces the probability of detection and suppression by means of EW

Tests of the complex at the lighthouse in Riga on June 26, 2018



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Optoelectronic system

Purpose

The optoelectronic system is designed for continuous monitoring of the territory at short and long distances, regardless of weather conditions, day and night.

Operational features:

- possibility of simultaneous preview of the day / night camera and thermal imager;
- powerful optical zoom on both payloads;
- automatic targeting and target tracking for commands from the radar;
- auto / manual / remote focus on both payloads;
- reliable system design that allows you to work without damage in a strong gale;
- TCP / IP interface;
- gyro stabilized high-precision pan-tilt platform;

Optional:

- optical capture and target tracking in automatic or manual mode;
- electronic image stabilization on both payloads.

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Composition of optoelectronic system

Video processing unit

Thermal imager
- ATRI UTI 640/40-300 HS
- ATRI CTI 640/40-825 HS
- ATRI CTI 1280/54-1200 HD

Day / night camera
- ATRI HSVC 1000
- ATRI HSVC 2200

Gyro stabilized pan-tilt platform

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Un-cooled thermal imager
ATRI UTI 640/40-300 HS

Technical characteristics

Based on a highly reliable long-wave uncooled detector, which provides good detection at a long distance in all weather conditions.

Detector type	Un-cooled VOx 640 x 480 mm
Detector pixel range	17 um
Spectral range	7,5 to 14 um
Image frequency	25 Hz
Focus	Manual (remote) / automatic
Continuous digital zoom	Yes, up to 16x
Consumption	15 W / < 65 W maximum
Operational temperatures	-40°C to +55°C
Focal length	40 to 300 mm
Field of view range	16,6° to 2,1°
Dimensions	500 x 240 x 240 mm
Weight	21 kg

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Cooled thermal imager
ATRI CTI 640/40-825 HS

Technical characteristics

Based on a highly reliable, mid-wave cooled detector that provides excellent long-range detection in all weather conditions.

Detector type	Cooled 640 x 512 XBn FPA
Detector pixel range	15 um
Spectral range	3,4 до 5,1 um
Image frequency	25 Hz
Focus	• Automatic • Manual (remote)
MTBF	20 200 hours, (> 2 years of continuous work)
Continuous digital zoom	Yes, up to 16x
Consumption	35 W / < 120 W maximum
Operational temperatures	-32°C to +55°C
Focal length	40 to 825 mm
Field of view range	0,66° x 0,53° до 13,7° x 11,0°
Dimensions	511 x 241 x 240 mm
Weight	15,1 kg

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Cooled thermal imager ATRI CTI 1280/54-1200 HD

Technical characteristics

Based on a highly reliable, mid-wave cooled HD quality detector that provides excellent long-range detection in all weather conditions.

Detector type	Cooled,1280 x 1024 XBn FPA
Detector pixel range	10 um
Spectral range	3,4 to 5,1 um
Image frequency	25 Hz
Focus	• Automatic • Manual (remote)
MTBF	20 200 hours, (> 2 years of continuous work)
Continuous digital zoom	Yes, up to 16x
Consumption	35 W / < 120 W maximum
Operational temperatures	-32°C to +55°C
Focal length	54 to 1200 mm
Field of view range	0,61° x 0,34° to 13,51° x 10,83°
Field of view range HD	0,61° x 0,41° to 13,51° x 7,62°
Dimensions	559 x 260 x 260 mm
Weight	17 kg

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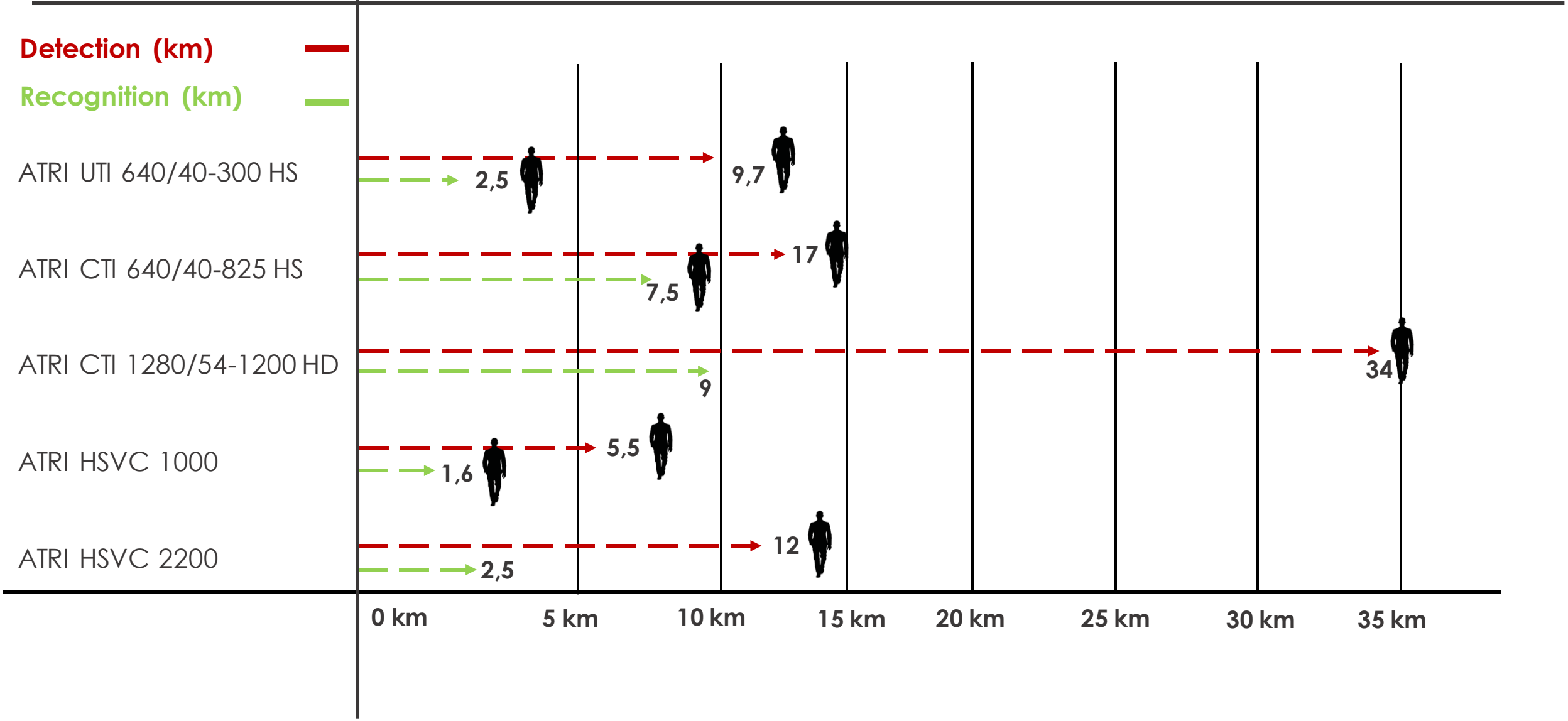
Day / night camera

Technical characteristics

Highly sensitive two megapixel video camera with powerful optical zoom 1000 and 2200 mm. Ideal for day / night surveillance in all weather conditions.

Designation	ATRI HSVC 1000	ATRI HSVC 2200
Focal length	20 – 1000 mm zoom 50x	20 – 2200 mm zoom 110x
Field of view	Narrow 0,5° / Wide 24,8°	Narrow 0,23° / Wide 24,8°
Digital output	JPEG, RTSP, ONVIF, HD-SDI, analog	H.264 (MPEG-4)
Sensor	Ultra high sensitivity 2/3“	
Resolution	1920 x 1080 HDTV - 1080p	
Sensitivity	Color 0,005 lux	
Scanning system	Up to 30 fps @1920 x 1080	
Digital zoom	16x	16x
Dimensions	777 x 216 x 206 mm	777 x 216 x 206 mm
Weight	18 kg	18,5 kg

Range of detection and recognition of human target 0.5m x 1.75m



Range of detection and recognition of NATO target 2.3m x 2.3m

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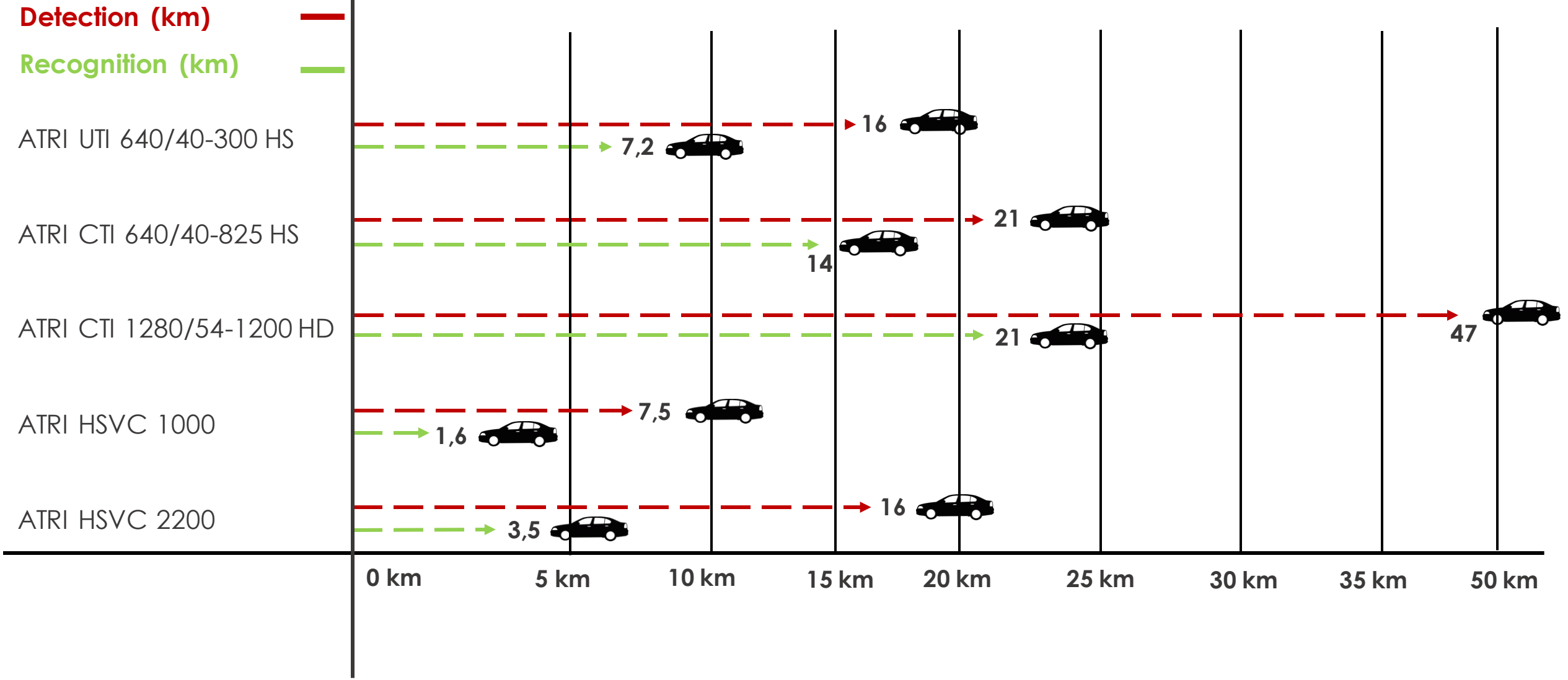


Lens cleaning system

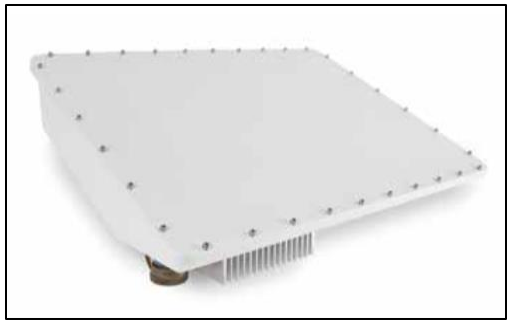
Effective on systems that are subjected to salt water, mist or sand since traditional wiper cleaning process scratches the surface of these highly priced sensitive lenses.

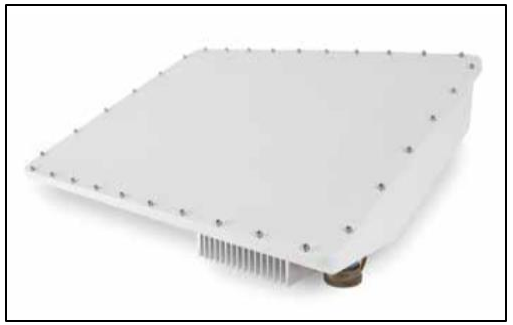
The key advantage of this system is that there is no mechanical contact with the lens that could potentially damage it or its anti-reflective coating.

With its three-stage procedure, the LCS gently and effectively removes all of the dirt and any deposits from camera lenses.

1. Applying distilled water to the lens.
2. Removing dirt and deposits from the lens with a mixture of high-pressure air and distilled water
3. Air drying the lens.

Video processing unit



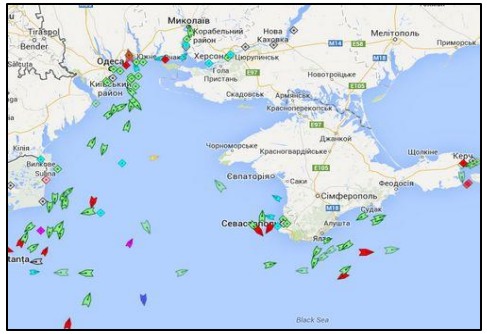


Hardware processing unit is the "brains" of the multi sensor system.
It combines all the payloads and pan-tilt unit into a single unit for the external observer and enable a single Ethernet connection to the whole unit including access to video streams and control of the entire system.

Characteristics

- Video stabilization with roll correction
  - Accurate frame to frame change detection
  - Remove high frequency jitter
  - Correction of platform roll motion
- Motion detection
  - Detects very small moving objects
  - Simple track selection method
  - Three different MTI modes support
  - Uses color based (histogram) difference algorithms
- Video tracking (optional)
  - Robust tracking – automatic track re-initialization
  - Low latency

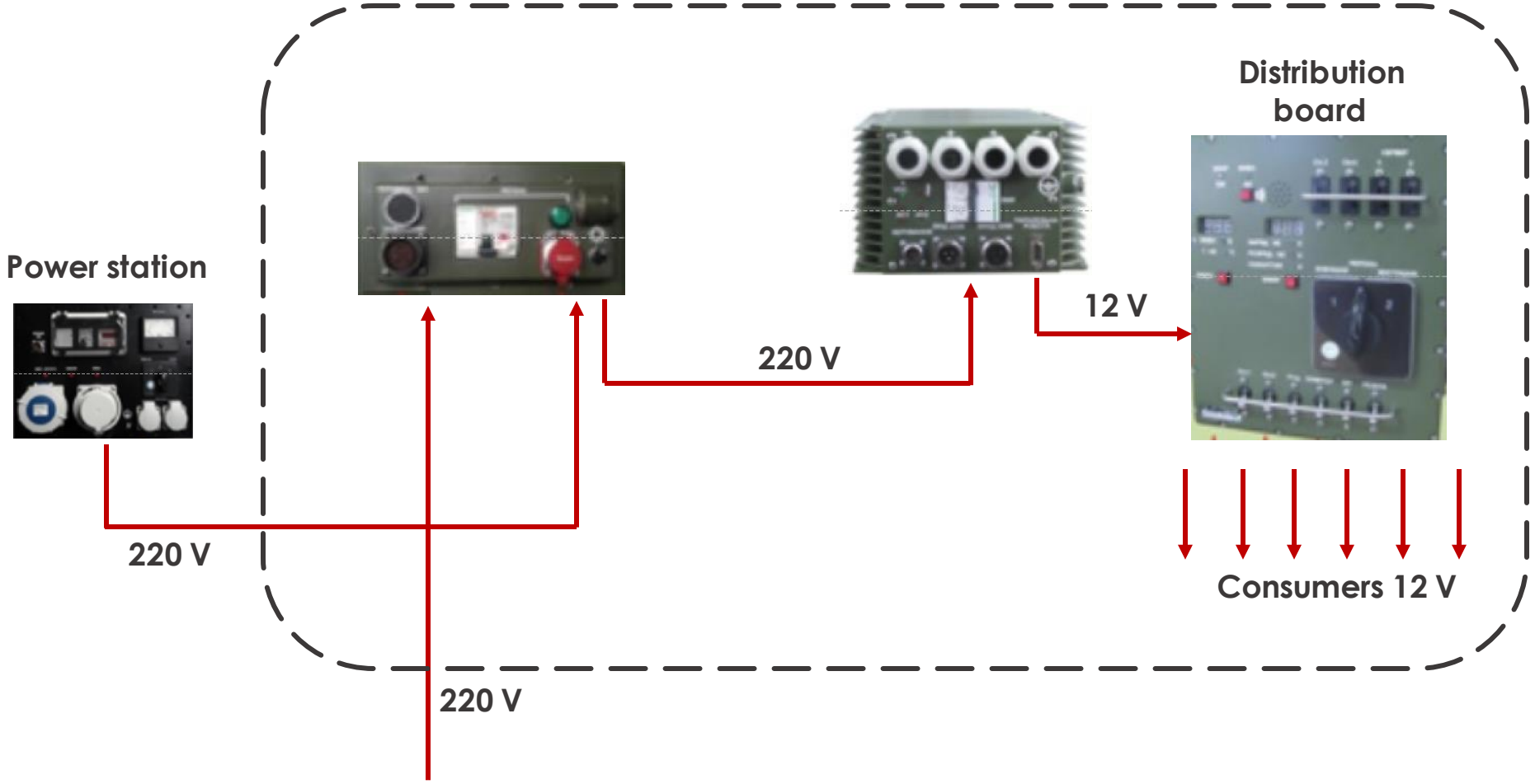
AIS receiver



Allows you to display additional information about vessels equipped with AIS transmitters and located in a protected area on the radar maps:

- MMSI number
- IMO number
- Dimensions
- Type of craft
- Coordinates (latitude and longitude)
- Valid course (relative to the ground)
- Course angle
- Valid speed
- Navigation status (for example there is no ability to control)
- Cruise information
- Destination point
- Arrival time
- Vessel draft
- Cargo Information
- The number of people on board, etc.

Power supply system



EFOY Pro Backup Power System

EFOY Pro fuel cells are the ideal power generator to meet all requirements for fixed and mobile applications.

Main features:

- Integrated anti-freeze function;
- Possibility to have up to 124 kWh of energy storage;
- The fuel cell is combined with an off-grid photovoltaic plant (7.68 kWh) that charges a 1,250 Ah, 48 Vdc battery pack.
- 10 days of back-up power supply in case of a fault of photovoltaic plant;
- All the components are stored inside a shelter located at the base of the radio tower;
- Savings on additional supply (gasoline, diesel generators, etc.)
- Maximum reliability

Self security system

- Engineering protection
  - High durability mesh fence with spiral cutter for protection against overlap
- Perimeter security
  - Detection of intrusion attempts
- CCTV
  - for remote monitoring of the protected area
- Access Control Systems
- Means of monitoring the basic parameters of life support and automation of survivability means :
  - temperature
  - humidity
  - smudges
  - smoke
  - fire
  - power supply
- PSIM software for managing your own safety and life support system

Life support system

Perimeter security

Monitoring 24/7

Voltage control

Fire control

Temperature control

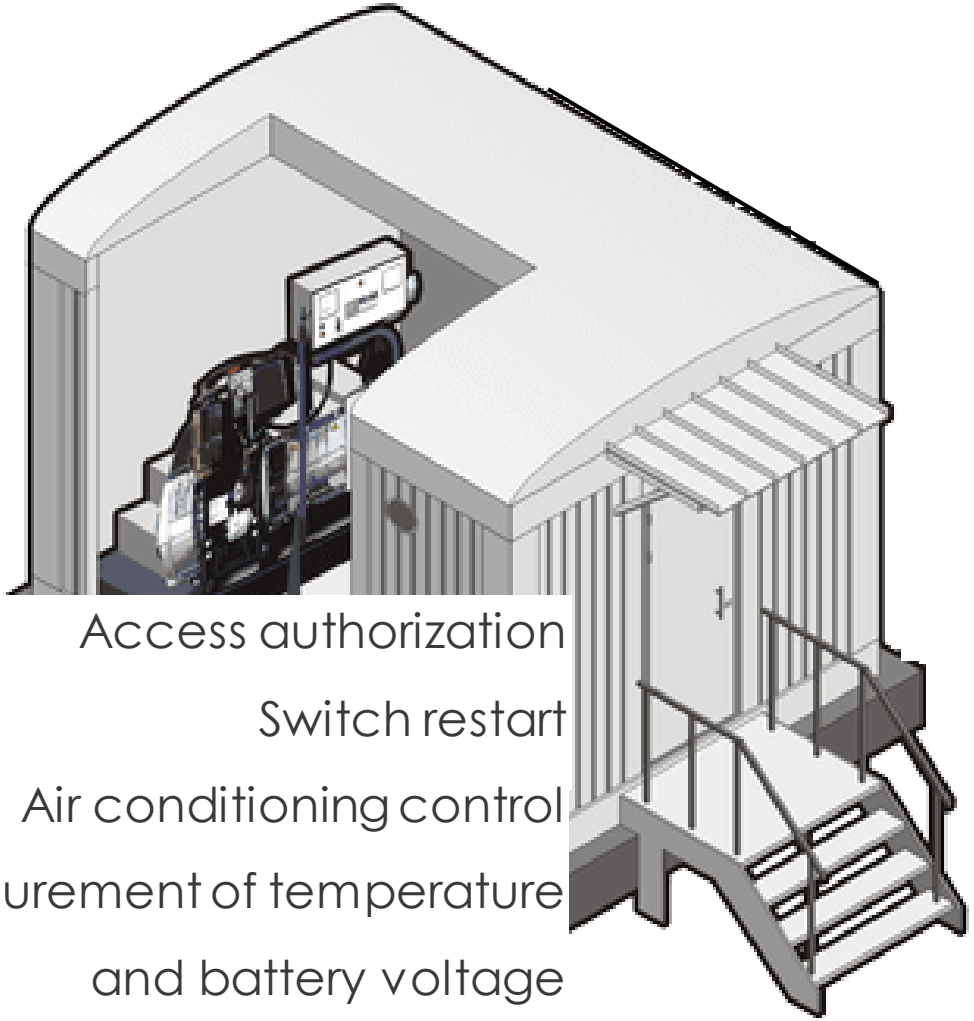
Autopsy control

Alarm control

Humidity control

Leakage control

Control of vital parameters



Access authorization

Switch restart

Air conditioning control

Measurement of temperature and battery voltage

Complex safety system

- PSIM – system – EFFECTIVE safety system
- Reducing the impact of the "human factor". Each operator's action is monitored and checked for compliance with accepted safety standards.
- Detection of threats and management of all stages - from detection to liquidation, followed by analysis of the measures taken.
- Protection of the facility in accordance with the current level of threat.

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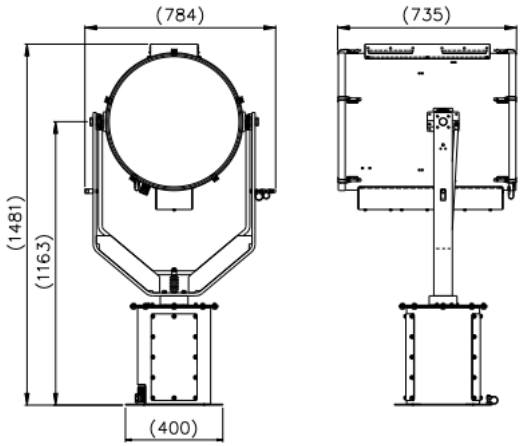
Advantages of PSIM - system

- **Integration**
  - Reduced vendor dependency
  - Preservation of the existing security system
  - Operational modernization of the system complexes
- **Analytics**
  - Reduction of false alarms
  - Operator awareness raising
  - Increased signal reliability
  - Prioritizing the operator to respond
- **Management**
  - Operator automation
  - Decision support
  - Execution of instructions and regulations of the enterprise
- **Monitoring and control**
  - Online monitoring of the situation at the facility premises:
    - relocation of employees
    - correct execution of instructions
    - change in the state of technical equipment
  - Providing the necessary analytics and investigation of events

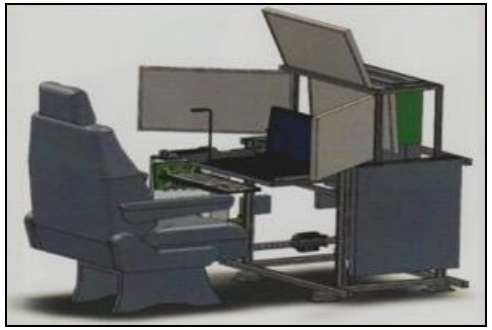
Additional equipment for multispectral monitoring station High-power marine xenon searchlight 3 kW

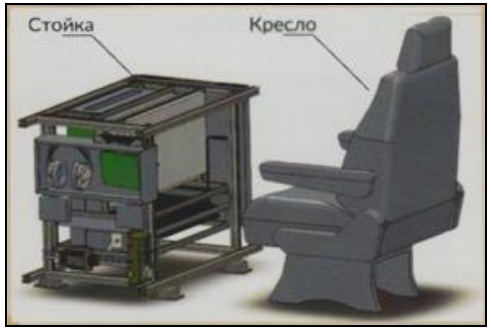


Main Features:

- Instant re-start. “Cooling” time is not required.
- Toughened super transparent front glass Optiwhite.
- Parabolic Glass Reflector Built from durable materials and fasteners
- Powder coating and enameling
- Rotation of the spotlight 385 °
- Control of a tilt angle + 30 °, -35 °.
- LED joystick with variable speed, with automatic initial position.
- RS485 connection.
- Blurred control panel.
- Variable speed of rotation from 1 to 23 ° / s (pan)
- Variable lifting speed from 1 to 8 ° / s (tilt).
- Operating temperature -52°
- Remote focusing of the lamp, from 1.5 ° to 10 °.
- Sealing - IP66 gearbox, IP56 searchlight, IP20 power supply
- Spotlight weight 82 kg, power supply 20 kg
- High quality electronic power supply suitable for 50/60 Hz

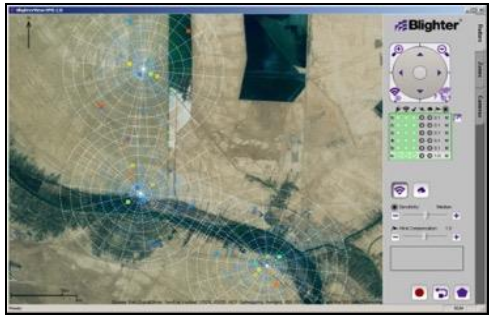
Automated operator workplace





- Software BlighterView HMI 2
- Intuitive graphical user interface for displaying and controlling one or more Blighter radars
- Microsoft Windows operating system
- Can work both on standard PC platform and on protected workstations
- Notifications and exceptions for user-defined zones
- Customizable audible and visual warnings, as well as external control channels
- Easy to download and calibrate background maps
- You can use satellite maps from Google Earth (or similar source)
- Constant recording of radar data with the ability to view using a separate software module
- Allows you to solve a wide range of tasks associated with the analysis and processing of graphic images.
- Comfortable seat provides long-term work
- Can be installed permanently or on moving objects

Blighter View HMI 2 Software



Intuitive graphical user interface for displaying and controlling one or more Blighter radars:

- Microsoft Windows operating system;
- Can work on a standard PC platform or protected workstations

Notifications and exceptions for user-defined zones:

- Customizable audible and visual warnings, as well as external control channels

Easy to download and calibrate background maps:

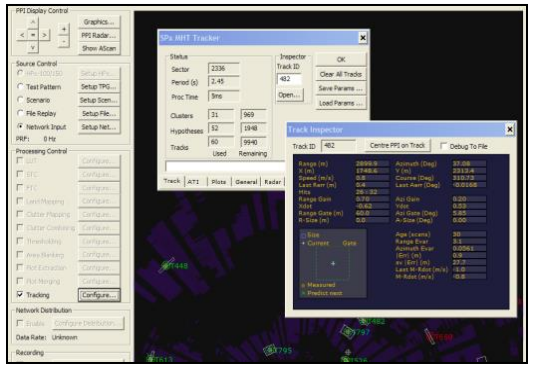
- You can use satellite maps from Google Earth (or similar source)

Constant recording of radar data with the ability to view using a separate software module

Automatic or manual control of surveillance cameras

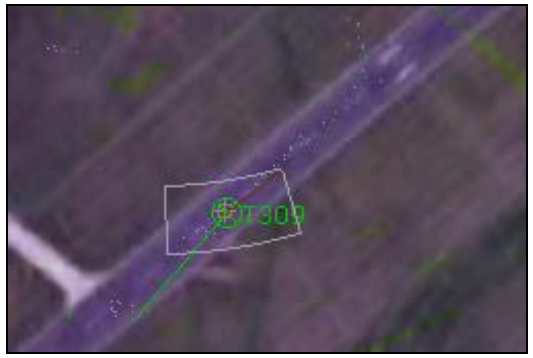
- Integrated terrain compensation ensures that the camera is positioned correctly

Blighter Track software



Additional module for tracking targets

- Allows you to track the movement of targets (each target is assigned a unique identifier);
- Microsoft Windows operating system (can work with Linux)
- Low Workstation Performance Requirements



High track building speed

Fully customizable track filtering mode

- Allows you to confidently build tracks for all known purposes.

Fully customizable target tracking filtering modes

- Allows you to safely track the goals of various types

Command center of displaying operational and tactical situation

Purpose:

Organization of the display of a tactical situation at the border and in territorial waters

Organization of the display of critical information and data from self safety and life support systems

Composition:

- work station
- network and switching equipment
- monitors (online mode)
- video wall
- means of communication

Additional equipment for complex AUDS – Anti-UAV Defense System

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DETECTION OF TARGET

- The AUDS Radar is a modular non-rotating, electronic-scanning (e-scan) system using power efficient PESA (passive electronically scanned array) and FMCW (frequency modulated continuous wave) technologies to provide reliable, small and slow UAS detection even in complex environments.

TRACKING OF TARGET

- The AUDS EO System is hosted as a removable EO sensor pod that easily attaches to the AUDS positioner, which is based on an in-service two-axis stabilized mount.
- The AUDS positioner has been designed to accommodate a wide range of sensors and payloads and offers excellent stabilization performance, allowing high magnification sensors to be fitted for observation of small and fast moving targets at extreme ranges.
- The azimuth axis has a centrally mounted special signal and coaxial slip-ring assembly to allow continuous rotation at speeds up to 90°/s.

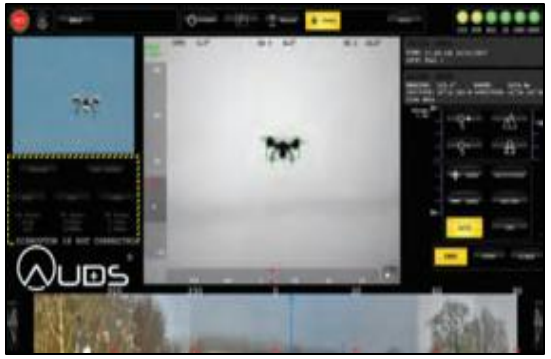
DEFEAT OF TARGET

- The AUDS RF Inhibitor is a purpose-designed multi-band system, engineered for maximum effectiveness against UAS command and control (C2) links.
- RF inhibition can be activated either selectively or simultaneously across the 400 MHz to 6 GHz spectrum, targeting five threat ‘bands’ which are designed to defeat the C2 links commonly deployed throughout the UAS threat landscape (i.e. 433 MHz, 915 MHz, 2.4 GHz, 5.8 GHz and GNSS bands).

AUDS – Anti-UAV Defense System

AUDS radar GUI

AUDS EO/RF Inhibitor GUI



- The AUDS system detects the drone using state-of-the-art electronic scanning micro-Doppler radar, tracks it using high precision infrared and daylight cameras and advanced video tracking so ware, before using a non-kinetic radio frequency (RF) inhibitor to defeat the drone.
- Using AUDS, an operator can effectively take control of the drone and force a safe landing.
- AUDS is field proven to detect all types of drones including fixed wing and quadcopters.
- All the system elements of AUDS: Radar, EO System and RF Inhibitor are fully integrated into the operator console. The AUDS Operator Console requires a single operator and comprises two screens.

AUDS operating principle

HOSTILE DRONE LAUNCH

↓

INBOUND THREAT DETECTED AND TRACKED ON AUDS RADAR
- Visual and audible alarm on entry to alert zone
- Automatic slew-to-cue of AUDS EO System from AUDS Radar cue

↓

VIDEO TRACKING ON AUDS EO SYSTEM
- Track Search / Acquisition / Lock
- Hostile threat identified

↓

AUDS RF INHIBITOR ENABLED

↓

DRONE DEFEATED

From DETECT to DEFEAT 10 to 15 seconds

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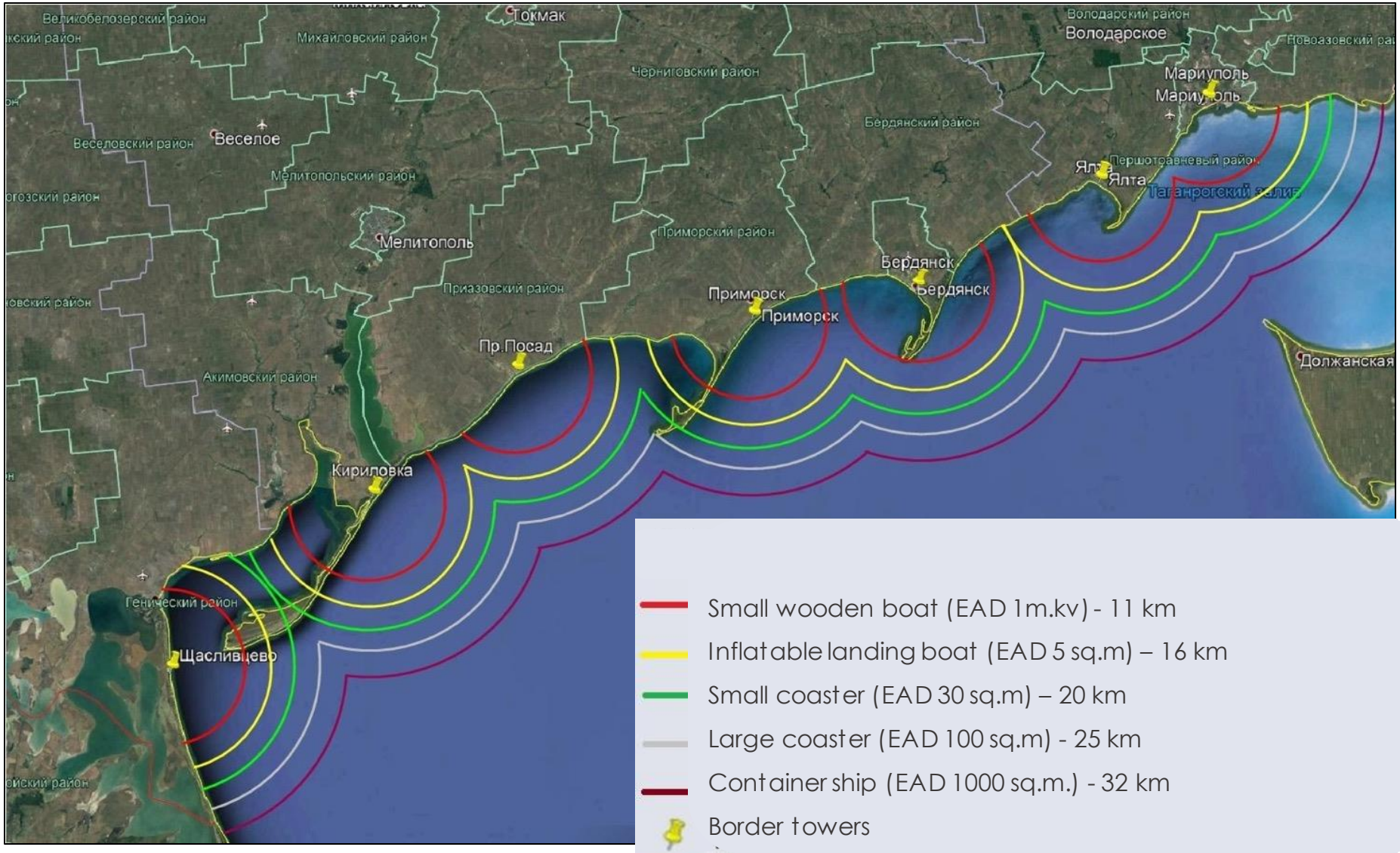
Plan 1 Deployment of elements of the complex on the Sea of Azov



- Small wooden boat (EAD 1m.kv) - 11 km
- Inflatable landing boat (EAD 5 sq.m) – 16 km
- Small coaster (EAD 30 sq.m) – 20 km
- Large coaster (EAD 100 sq.m) - 25 km
- Container ship (EAD 1000 sq.m.) - 32 km
- Border towers

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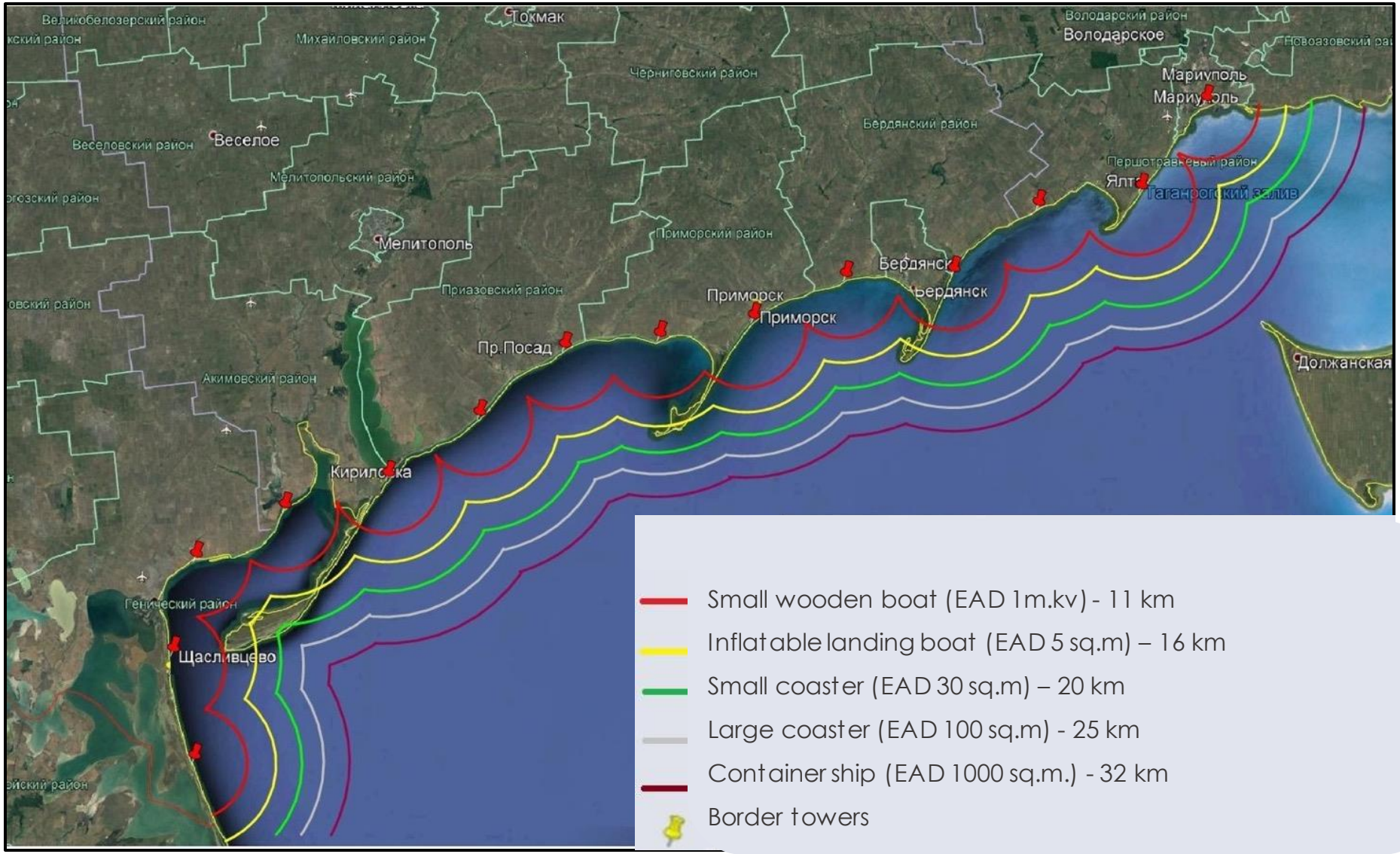
TO SEE THE TRUTH

Plan 2 Deployment of elements of the complex on the Sea of Azov



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Main advantages of the complex

- Unified system approach
- Application of unified modules
- Savings:
  - on spare equipment fund formation;
  - on repair;
  - on training engineering and operational personnel.
- Scalability:
  - the complex may consist of one or almost unlimited number of stations;
  - complex can be built up according to customer needs.
- Mobility - no costs are required to transfer the complex
- High efficiency of solving tasks
- Low power consumption
- Low cost of required engineering infrastructure and construction
- Low maintenance cost
- High reliability of equipment
- Ability to work in the existing departmental data network border service