

## **Dear Sirs!**

"SpetsTehnoExport" in association with Scientific Research Institutes and OEMs of Ukraine is ready to offer various multipurpose types of Unmanned Aerial Vehicles (UAV) of military and industrial purpose for accomplishment of the following missions:

- information support of ground forces and navy fleet actions;
- aerial observation, reconnaissance and target destination on the level of a company, batallion and artillery battery;
- Strategic air reconnaissance and supervision;
- Patrol of territories of geographically-extended objects and state borders;
- Radiocontrol support in an automode in the course of all motion on an itinerary, deposition on a digital map of co-ordinates of the revealed sources of electromagnetic radiation;
- information support of search and rescue operations in conditions of low visibility and adverse weather conditions;
- Detection of radio-controlled mines and explosives with further temporary (up to 2 hours) suppression of the radio source actuating the revealed explosives;
- Detection and identification of optical sighting aid and fire control;
- Detection and identification of electronic sighting aid and fire control

We can offer various UAV types with take-off weight from 2 to 150 kg, payload from 2 to 50 kg., flight time from 2 to 10 hours, flying range up to 1800 km., and speed from 100 to 400 km/h. Some more UAV types of vertical take-off and landing are under the flight test. We also inform that Ukraine has closed cycle of UAV development and manufacture.

We are ready to consider the possibility of joint development of new, or modification of existing UAVs for particular needs of Yours.

Brief technical overview of existing UAVs, payloads and some advanced developments in this direction you can find in this booklet.



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# **General information on the Unmanned Aircraft Complex of Ukrainian origin**

*Advantages of offered complexes, as compared with analogous air means.*

1. With equal take-off weight (up to 150 kg) a payload of the aircarrier is higher than with analogous complexes for 25-30 %;
2. Control systems and developed special form of fuselage of the carrier, allows to reduce probability of its detection in optical, radio and acoustical bands;
3. Twin navigational system, in case of GPS signal breakup, allows to execute the return of the aircarrier to base complex.
4. Propellant budget onboard the aircarrier and its navigational complex allow the flying range of up to 1200 km in conditions of complete radio silence and with operation of passive information gathering systems along all flight itinerary and over certain territories.
5. The Complex is executed and certified under NATO standards;
6. The Complex has high maintainability and is executed by medium technical level staff;
7. The complex structure includes the equipment, allowing to control process of video information accumulation received from the aircarrier, from ground trasport (by mean of control of optical pick-up heads) within the radius of up to 10 km from hovering point or from itinerary of its flight.
8. Overall dimensions of the air carrier main units allow to convey it to departure point and to execute control of all flight till its landing, using one minivan type vehicle;
9. Operation personnel of the complex is minimised and consists of 3 persons:
  - Flight operator- pilot;
  - Optical and other information accumulation operator;
  - Carrier maintenance technician.
10. Prominent feature of the aircarrier construction is that the carrier control is executed not by pilot, but by technician on data acquisition that essentially simplifies and increases efficiency of its application.
11. Robotized onboard optical gyrostabilized system allows to observe the territory along the flight itinerary of the aircarrier in accordance with preset co-ordinates in a day and night time and to operate in a aircarrier hovering mode over Emergency Situation place within the time required (up to 10 hours).
12. If necessary, the aircarrier in an automode can escort or monitor land or water trasport, following it, and executing necessary changes of aircraft attitude in air, for holding of controlled object at the centre of the optical system frame , for overseeing it, with transfer real time video information to a preset ground place at a distance of up to 150 km.

13. Operating over the areas, the complex provides automatic mapping of the received photoinformation on a digital map of the area of activities with fixation to co-ordinates, combining the received photoinformation from fragments of separate photos in unified picture.
14. Complex maintenance is possible at the outside temperature up to +60 degrees in various climatic zones.
15. The Complex is supplied with digital 3D maps of the areas of its activity.
16. The equipment of the complex allows to execute take-off of the aircarrier from one baseline, and landing at another.
17. In case of generator failure, the engine operation is provided by onboard battery within 60 minutes. In this situation the onboard computer independently works out a command on aircarrier return to a home base or to the nearest landing field (road segment or level ground).
18. The Robotized optical system of a complex is provided with functions allowing automatic set-up change depending on the area intensity of illumination considering meteorological conditions in the area of operations (snow, rain, fog), for adaptation of most effective operational modes.
19. The Complex is developed by experts with over 38 years experience of work in the field of creation of special flight vehicles and mathematical systems of their control.
20. The Flight platform can be started from catapult off-aerodrome and initiates execution of the program on a preset itinerary practically without participation of the operator.
21. The System is equipped with parachute for emergency landing or for aircarrier landing on preset territory without landing strip.
22. All information highways of a complex have a high-scale protection.

### **Possible spheres of application:**

- *For Miinistry of Emergency Measures missions*
- *For Defence Ministry missions ;*
- *For Ministry of Internal Affairs missions;*
- *For Ministry of Foreign Affairs missions ;*
- *For special missions;*

## **SPECIAL PURPOSE EQUIPMENT FOR USAGE ON UAV IN THE INTERESTS OF LAND FORCES AND NAVY**

The equipment developed by Ukrainian experts allows to use it on UAV in the capacity of:

- data support and engineering of reconnaissance and combat operations;
- means of secret supervision and data acquisition in places of local military conflicts and conductings of various military operations;
- patrol means in wide areas (up to 200 km from baseline and at altitudes from 20 to 5000 m) for disclosure and transfer of the revealed combat situation on a number of demasking factors to headquarters and control posts (with function of suppression of combat materiel and manpower of the enemy).

### **MISSIONS:**

- Sweep and detection of underwater mines in a shore front.
- Fulfilment of marine patrol-search activities.
- Detection of the explosive devices put in motor transport.
- search and exposure of people in forestlands and hills on sources of radio equipments in an active radio monitoring mode, as well as in visual and thermovisual modes.
- Examination of a short-range subsurface of the earth's mantle and detection of electroconductive and dielectric subjects in rocky and sandy-argillaceous soils (mines and ammunition).
- Detection of objects and areas with the increased level of radiation at significant distance from them.
- Electronic warfare activity support.
- Delivery and evacuation of various freights (up to 25 kg) in the range of up to 200 km from departure point.
- A capability of picking up the information from mobile phones and their neutralising at private supervision over controlled object moving in the car at a distance of up to 2 km.
- Detection of radio-controlled land mines and explosives with further temporary (up to 2 hours) suppression of the radio source actuating the revealed explosives.
- Detection and identification of optical sighting aids and fire control means.
- Detection and identification of electronic sighting aids and fire control means.
- Retransmission of radio and television signals from low-power sources to headquarters and control posts over a distance up to 150 km.
- Search of gaseous abnormalities in the surface layer of the atmosphere, detection and identification of their sources from a distance of up to 2 km.

Utilisation of the given equipment for conducting of operations in mountain-woody areas and in a shore front is mostly efficient.

## **SPECIAL PURPOSE EQUIPMENT FOR USAGE ON UAV FOR CIVIL PURPOSES**

Technical experts are engaged in creation of systems on the basis of piloted and pilotless flying complexes for distant scanning of an earth surface, vegetation, inundation in facilities areas, determinations of a state of water lines, energy networks, petro-gas pipelines etc. for more than 20 years. Accumulated practical knowledge, including across the Russian Federation, long-range and near abroad allows at the present day to create in Ukraine one of the best versions of an aeromobile complex for the solution of civil problems mentioned below:

- 3D maps and charts creation
- solution of the problems of an expert estimation and ecological monitoring of the earth's surface, especially potentially dangerous gaz - and oil pipelines networks, ammonia lines, water lines, automobile roads and railways, electric mains, ports, determination of state of water bodies, woods, exploration activities, including energy carriers on the basis of hydrocarbons.
- invisible (for outside observers) round-the-clock supervision over trunk-railways and separate objects, in the areas of their passage.

### **MISSIONS**

- Survey of aquatory in the area of marine activities and objects of a long-shore infrastructure.
- Customs control (distant, passive) for the uniformity of the stated freights in railway carriages, containers, etc.
- Sweep and detection of objects, shaping in visible and thermal bands of a water table maps with the revealed installations (dirt spots, vessels with a loopback, offshore drillers and their state) with accurate co-ordinate fixation to digital sea maps;
- Radiocontrol support in an automode in the course of all motion along an itinerary, mapping co-ordinates of the revealed sources of an electromagnetic radiation on a digital map.
- Data acquisition and creation of the automated database by onboard names of vessels in controllable area and by number of other characteristic parametres;
- Information support of search and rescue operations in conditions of low visibility and difficult meteorological conditions.

All the equipment used on UAV, and UAVs («OKO-3M», «777», etc.) themselves are made in Ukraine and by many parametres leave behind analogous samples of other manufactures.

Production of the indicated equipment and UAVs, as well as accomplishment of state and commercial structures orders on conducting the pursuance of the research is possible in cooperation with interested foreign structures.

# Unmanned Aircraft Complex «Chizh-L»



Unmanned Aircraft Complex "Chizh-L" on the generally accepted classification of military Unmanned Aerial Vehicles (UAV) belongs to the class of tactical short-range systems to meet the requirements of aerial surveillance, reconnaissance and target designation. For the Military purposes can be used as part of the intelligence information systems the company, battalion and an artillery battery level.

When designing the complex originally envisaged the possibility of its limited use in the open air space for the action of special units to meet the challenges of aerial surveillance in emergency management, supporting counter-terrorist, security and search operations.

## Specification of the complex "Chizh-L":

- modularity of the aircraft and payload - 7 basic options of payload;
- simultaneous synchronous flight (formation) up to 4 UAVs;
- modularity and high mobility of complex;
- all-season, 24-hour, off-airfield;
- the possibility of flights to areas with difficult terrain (mountains) and over the sea (take-off and landing on a ship);
- high availability of complex systems;
- redundant radio channels to UAV (VHF range and satellite system «Iridium»);

The unmanned aerial vehicle has a modular design. It's made of composite materials to provide low visual, acoustic, thermal and radar visibility. The power plant is based on 2.5 hp two-stroke piston engine

UAV flight can be performed offline on the programmed route within a radius of 200 km from the ground control station or in real time within a radius of 50 km in the mode of remote management and control.

The entire complex, including ground support equipment are packed in compact containers for the transportation, which ensures a maximum mobility when using any type of transport.

The complex is easy to maintain, can be applied to unprepared terrain and does not require special infrastructure.

### **Complex structure**

- UAV (from one to five) in shipping containers;
- Ground control and surveillance station in a secure briefcase;
- Ground radio terminal;
- Ground power supply system;
- catapult launcher;
- Set of spare parts and auxiliary equipment.

### **Complex functioning**

The operation of the complex is supported by (he team of four: a pilot-operator, a video surveillance operator, a mechanical engineer and an electronic equipment specialist. Deployment time of the complex for the start position does not exceed 30 minutes.

The aircraft takes off from a catapult launcher and performs the parachute landing completely automatically. The onboard computer manages the autonomous aircraft return in case of the command channel failure as well as the automatic emergency landing in case of a critical system fault, which assures the safe flight.

### **UAVs payload**

High-resolution color video camera, digital photo camera, infrared camera, video channel transmitter with antenna. The entire payload is placed in an easily replaceable nose module that provides different configuration options to broaden the scope of mission tasks.

### **The on-board computer system**

Provides an automated control, navigation, management and diagnostics. It is based on the inertial navigation system with a GPS correction. The UAV is either controlled by a pre-programmed set of three-dimensional waypoints, or switched into a semiautomatic mode to be controlled from the ground

### **The ground Control Station**

Provides mission planning, preflight on-board and ground systems diagnostics, aircraft equipment monitoring, (light and payload control, receiving and processing the surveillance video and photo data. Two operators manage up to four aircraft simultaneously.

<i>Main characteristics</i>	
<i>Length</i>	1.67 m
<i>Wingspan</i>	2.0 m
<i>Take-off mass</i>	13 kg
<i>Payload mass</i>	1.0 kg
<i>Endurance</i>	5 hours
<i>Range</i>	Up to 200 km
<i>Cruise speed</i>	110 km/h
<i>Max speed</i>	180 km/h
<i>Ceiling</i>	6000 m



## "Vorobey-M"

**Multi-purpose aircraft system for aerial surveillance, reconnaissance and monitoring based on miniature unmanned air vehicle**

The portable unmanned aerial system based on a "Vorobey - M" ("Sparrow - M") mini-UAV performs a wide range of surveillance and reconnaissance missions, including the antiterrorist and emergency operations, as well as the Earth surface and atmosphere monitoring. The air vehicle can be equipped with photographic, television, infrared and acoustic equipment along with radiation, chemical and other special sensors of modular design.

### "Vorobey - M" mini-UAV characteristic features:

- Long flight endurance
- Up to 20 km mission range
- Permanent operation availability
- Complete autonomy and ease of operation
- Stealthy deployment

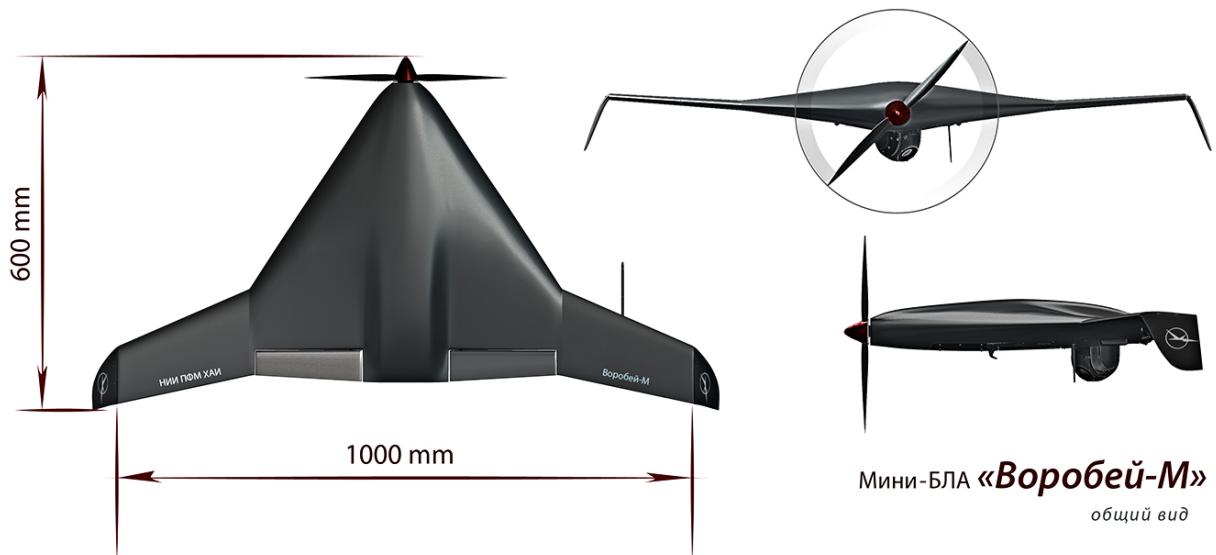
The air vehicle can take off and land at unprepared constricted areas and is able to cruise on the route and loiter over a designated area for a long time. The aircraft takes off using a bungee cord and then automatically lands into a special compact recovery device.

Equipped with an electric power plant, the "Vorobey - M" mini-UAV has integrated aerodynamic layout. Its airframe is made entirely of modern composite materials.

The small size of the air vehicle and low noise of its electric power plant provide stealthy deployment. Two aircraft together with the ground equipment get packed into a single small portable container.

The navigation, control and management systems provide the aircraft flight control and its onboard equipment operation, in either a pre-programmed autonomous or an automated remote mode. The mission plan can be reprogrammed during the flight. The command-telemetry and video channels provide two-way radio communication between the UAV and ground control station.

Due to the considerable automation, the UAV system is easy to operate and can perform complex surveillance and reconnaissance missions under day-time and night-time conditions without the operator having special flight skills.



*"Vorobey - M" UAV general arrangement*

***"Vorobey - M" mini-UAV prototype specifications***

<i>Length overall</i>	<i>600 mm</i>
<i>Height overall</i>	<i>150 mm</i>
<i>Wing span</i>	<i>1050 mm</i>
<i>Maximum take-off weight</i>	<i>2.5 kg</i>
<i>Maximum payload weight</i>	<i>0.3 kg</i>
<i>Engine type</i>	<i>electric</i>
<i>Engine power</i>	<i>350 W</i>
<i>Flight speeds:</i>	
- <i>max level</i>	<i>130 km/h</i>
- <i>cruising</i>	<i>90 km/h</i>
- <i>loitering</i>	<i>65 km/h</i>
<i>Maximum rate of climb</i>	<i>7 m/s</i>
<i>Service ceiling</i>	<i>3500 m</i>
<i>Maximum endurance:</i>	
- <i>in loitering mode</i>	<i>more than 1.5 h</i>
- <i>in cruising mode</i>	<i>1.0 h</i>

## "Vorobey - M VTOL"

**Vertical take-off and landing  
miniature unmanned air vehicle**



The portable unmanned aerial system based on a "Vorobey - M VTOL" ("Sparrow - M VTOL") mini-UAV performs a wide range of surveillance and reconnaissance missions for support of antiterrorist and emergency operations within the industrial and urban environment. The air vehicle can be equipped with photographic, television, infrared and acoustic equipment along with radiation, chemical and other special sensors of modular design.

### **"Vorobey – M VTOL" mini-UAV characteristic features:**

- Vertical take-off and landing
- Ability of hovering over an observable object
- Permanent operation availability
- Full autonomy and simplicity of operation
- Stealthy deployment
- Up to 10 km mission range

The air vehicle can take off and land vertically at unprepared constricted areas and is able to cruise on the route, loiter over a designated area for a long time and hover in a defined airspace location. The capability of UAV hand launch and recovery is envisioned.

Equipped with lift-cruise electric power plant, the "Vorobey - M VTOL" mini-UAV has integrated aerodynamic layout. Its airframe is made entirely of modern composite materials.

The small size of the air vehicle and low noise of its electric power plant provide stealthy deployment. Two aircraft together with the ground equipment get packed into a single small portable container.

The navigation, control and management systems provide the aircraft flight control and its onboard equipment operation, in either a pre-programmed autonomous or an automated remote mode. The mission plan can be reprogrammed during the flight. The command-telemetry and video channels provide two-way radio communication between the UAV and ground control station.

Due to the considerable automation, the UAV system is easy to operate and can perform complex surveillance and reconnaissance missions under day-time and night-time conditions without the operator having special flight skills.

### *"Vorobey - M VTOL" mini-UAV prototype specifications*

<i>Length overall</i>	<i>600 mm</i>
<i>Height overall</i>	<i>200 mm</i>
<i>Wing span</i>	<i>1050 mm</i>
<i>Maximum take-off weight</i>	<i>3.0 kg</i>
<i>Maximum payload weight</i>	<i>0.3 kg</i>
<i>Engine type</i>	<i>electric</i>
<i>Engine power</i>	<i>600 W</i>
<i>Flight speeds:</i>	
- <i>max level</i>	<i>160 km/h</i>
- <i>cruising</i>	<i>90 km/h</i>
- <i>loitering</i>	<i>30÷65 km/h</i>
<i>Maximum rate of climb</i>	<i>12 m/s</i>
<i>Service ceiling</i>	<i>3000 m</i>
<i>Maximum endurance:</i>	
- <i>in loitering mode</i>	<i>45 min</i>
- <i>in cruising mode</i>	<i>30 min</i>
- <i>in hovering mode</i>	<i>15 min</i>

## R-100 surveillance and reconnaissance UAV



R-100 executes a real-time observation and is used daytime, in the night, in condition of bad visibility or its full absence. On board are fixed day, night, IR cameras or scanners. Videodata and telemetry is transmitted on point of control (or the other user) real-time or may recorded onboard. The flights can be executed under program, or in mode of the remote control by operator. Time of preparing R-100 to flight not more than 5 minutes. Take-off - from catapult, landing - to net, with parachute (emergency mode) or on small ground area.

- Possible side wind under take-off - 10 m/sek.
- Length of start catapult - 3-6 m.
- Landing grid-trap - 2,5 \* 6 m.
- Dimensions - 1,8 \* 1,4 m
- 

### Specification

<i>Power plant</i>	<i>One cylinder 2,5 h.p.</i>	<i>Two cylinders 3,5 h.p.</i>	<i>One cylinder 6 h.p.</i>	<i>Two cylinders 12 h.p.</i>
<i>Endurance of flight, (hours) up to</i>	4	3	2	2
<i>Weight of gasoline,(kg) up to,</i>	do 4	do 6	do 8	do 9
<i>Payloads (kg)</i>	3	5	8	10
<i>Speed (km/hour)</i>	45-190	50-220	60-290	70-400
<i>Max. Take-off weight (kg)</i>	14	18	25	35
<i>Max. Altitude of flight (m)</i>	2000	2500	4000	5000



## R-100 AT, hi-speed Air Target



The series R-100 AT has been designed to include many customer recommended modifications. These modifications combine to improve both the maintainability and adaptability of the target.

Range	Optical tracking	10 km
	GPS tracking	100 km
Altitude	Max	7000 m
	Min	10 m

Payload	Smoke tracking flares; Infra Red flares or its combinations; Hot nose or tail (black IR source); Real time camera module; Any user's payload;
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### Specifications:

<i>Wingspan</i>	1.8 m
<i>Length</i>	2.4 m
<i>Dry weight</i>	16 kg
<i>Max take off weight</i>	32 kg
<i>Fuel capacity</i>	7.5 litres
<i>Endurance</i>	1.4 h
<i>Powerplant</i>	Two cycle piston 28 hp engine
<i>Max speed</i>	400 km/h



## R-400, surveillance and reconnaissance UAV



R-400 executes the surveillance in the real-time mode and used in the daytime, in the night or in condition of bad visibility. The flights can be executed by program, or in mode of the remote control by operator. Time of preparing R-400 to flight 20 minutes. As against R-100 has increased volume of a hardware compartment, and as an opportunity an arrangement of a videocamera in nose part of fuselage.

The installation of day time and night videos and IR cameras, or other equipment of the customer is stipulated. Configuration of the plane and the increased volumes of a hardware compartment allow to install the equipment with the large resolution.

- *Take-off - from catapult or from run way 10x50 m.*
- *Landing - in a grid or on a ground area 10x50 m.*
- *Possible side wind under take-off - 10 m/sek.*
- *Length of start catapult - 4 m.*

### *Specification:*

<i>Powerplant</i>	<i>Two cylinders 3,5 h.p.</i>	<i>One cylinder 6 h.p.</i>	<i>Two cylinders 12 h.p.</i>
<i>Wingspan, (m)</i>	2,5	2,5	3,5
<i>Length</i>	1,8	1,8	2,3
<i>Endurance of flight, (hour)</i>	4	5	10
<i>Weight of gasoline, (kg) up to</i>	5	10	До 25
<i>Payloads, (kg)</i>	6	10	16
<i>Speed, (km/hour)</i>	50-140	60-170	70-250
<i>Max Take-off weight, (kg)</i>	16	30	50
<i>Max Altitude of flight, (m)</i>	1500	3000	5000



## UAV A-3 «REMEZ»



UAV construction is executed from glass fibre plastics with a primary structure from aluminum alloys. It is adapted for manufacturing without application of complicated and expensive production equipment with the minimum expenses. At the same time due to application of qualitative materials and the processing methods proven by practice high resource, sufficient strength and maintainability of a hardware product is ensured.

The scheme of partitioning of a product is chosen so that in the disassembled state it can be packed in the container of minimum dimensions. Thus for vehicle assemblage at the application place the minimum time, and only universal tools are required. The power plant consists of one reciprocating engine. The UAV power plant feature is the propeller-ring propulsor. Application of specially profiled rings not only increases the thrust of a power plant, but also ensures safety of the personnel at the moment of an engine start-up, protecting the arm from hit in a propeller disk. The four-blade thrust propeller is executed from plastic with the metal hub. It allows adjusting angles of blades on the ground depending on conditions of application.

All equipment and power plant are allocated conveniently and with easy access. The equipment compartment (with fuel tank in it as well) is closed by full-length removable panel. The power plant compartment is closed by a removable bonnet. Due to usage of rich practical experience, accumulated at creation and trial of other test apparatuses and careful is volumetric-weight layout of a new product, it was possible to achieve extreme small sizes and weight of UAV A-3 "Remez".

One UAV control crew consists of two persons. UAV control is effected both on commands of the operator, and in an auto mode. With this the exact current position of the aircraft (A\c) and parameters of its trajectory are given by receiver GPS-35 of satellite navigation system NAVSTAR. The image, shot by onboard video camera, is transmitted to a control post in real time. The navigation situation is shown on the computer monitor, and the video image - on the small-size monochrome indicating device. Vehicle landing is executed on a wheeled undercarriage on starting point.

In 1998 they started flight development tests, which showed the exploitability of the theme. In 2001 the job on creation of general-purpose modification of UAV A-3 "Remez-U" started. The new vehicle can be supplied in several options. Additionally to the missions executed by basic version of UAV, it can drop small-size freights in preset area. One more important innovation which has received UAV "Remez-3U" is feasibility of start from a catapult. Take-off from a wheeled undercarriage is possible as well.

**UAV A-3 "Remez" allows executing on an operational basis a wide spectrum of missions:**

- Detections of various objects afield and determinations of their co-ordinates (fixation to the map);
- Patrol of extended or area objects;
- Imitation of an air target with air defense crews training objective;
- Reconnaissance of wood and peat fires areas, large technogenic catastrophes;
- Ecological monitoring.

*Technical data of UAV A-3 "Remez"*

<i>Length</i>	<i>0, 78 m</i>
<i>Span</i>	<i>2, 0 m</i>
<i>Take-off mass</i>	<i>10, 0 kg</i>
<i>Payload mass</i>	<i>3, 0 kg</i>
<i>Fuel mass</i>	<i>1, 5 kg</i>
<i>Engine power</i>	<i>1, 85 kW</i>
<i>Speed range</i>	<i>58 - 105 km/h</i>
<i>Radius of action</i>	<i>5, 0 - 20, 0 km</i>
<i>Flight time</i>	<i>2, 0 hour</i>

## UAV A-4K «ALBATROSS»



UAV A-4K "Albatross" with a radius of action up to 30 km and flight time of 2 hours is a powerful tool of reconnaissance and supervision. In 2000 the vehicle passed the test and now it is under series production. In the basic option the vehicle is equipped by the video camera, capable to work at a low light level. The on-board equipment provides image transmission to the Ground control post in real time.

**UAV A-4K "Albatross" allows executing on an operational basis a wide spectrum of missions:**

- Search and fixation of the revealed objects to a district map
- Ecological monitoring
- Major accidents and catastrophes regions reconnaissance
- Supervision of the guarded objects
- Information support of field units actions on a platoon - company - battalion level
- State border guarding.

Take-off of UAV A-4 "Albatross" is made from a wheeled undercarriage. The equal land with the length of about 75 m (for example, a direct site of highway) for this purpose is required. Start from a catapult is possible as well, at impossibility to use wheel start. Flight is executed on commands of the operator (in a manual mode) and completely in automatic mode, thus current position and parameters of a way path of the vehicle are determined by receiver GPS-35 and transmitted to the monitor of the PC, which is a part of the ground control complex.

For locality supervision there is a video camera with accessory lenses. The video camera is mounted on a swung platform, capable to deviate in two planes on commands of the operator. It allows to examine objects away from a flight path without a course change or to attend the chosen target within the sight.

***Technical data of UAV A-4K "Albatross"***

<i>Vehicle length</i>	1.42 m
<i>Wing span</i>	2.47 m
<i>The maximum take-off mass of the vehicle</i>	23 kg
<i>The maximum payload mass</i>	3.0 kg
<i>Weight of fuel</i>	2.0 kg
<i>Power of an engine</i>	2.3 kW
<i>The maximum time in flight</i>	2 hours
<i>A\C radius of action</i>	20-30 km
<i>Effective range of flying speeds</i>	60 ... 125 km/h
<i>Effective range of flying height</i>	40 ... 4000 m



## UAV A-11 "Strizh"



It is intended for management of television supervision of locality in real time in the daytime and in twilight. UAV can be used in the capacity of an air target equipped with passive or active means of reflection of signals of radar sets. In a thermal band radiated power can reach 11 kW (emanation of the mid-flight pulsing air-feed jet engine). Installation of a desk size RADAR of mm-range is possible.

### *Technical data of UAV A-11 "Strizh"*

<i>Take-off mass, not more than</i>	<i>30 kg</i>
<i>Payload weight</i>	<i>5 kg</i>
<i>Time in flight</i>	<i>20 minutes</i>
<i>Top speed</i>	<i>360 km/h</i>
<i>Minimum speed rate</i>	<i>110 km/h</i>
<i>Engine thrust</i>	<i>75 H</i>
<i>Radius of action</i>	<i>60 km</i>
<i>Altitude range of flight</i>	<i>100-4000 m</i>
<i>Fuel weight</i>	<i>7, 5 kg</i>



## UAV A-12 "Hurricane"



At antiterrorist operations in the conditions of a city it is necessary to execute flight between the buildings. For such situations the development of perspective UAV A-12 with vertical take-off and landing "Hurricane".

Since 2005 its flight tests are conducted. Take-off mass of the vehicle is 18 kg. It is equipped with gasoline engine of 7 h.p. Radius of action is 20 km, flight time- 1 hour. The equipment includes the video camera and other information gathering equipment.

The vehicle construction has protected lifting ventilating fan allowing safety flights in humble conditions of a city, wood or mountains.



# UNMANNED AIRCRAFT SYSTEM FOR SEA PATROLLING «OKO-3mp»

Unmanned aircraft system for sea patrolling “OKO-3mp” is robotized remote-acting watch facility and facility to collect information about earth and sea surface.



System «OKO-3mp» includes three basic parts:

1. Aero carrier.
2. Airborne optical, reconnaissance, and measurement systems.
3. Base and transportable point of flight control, collecting, analyzing and storing of information.

## **Solvable tasks:**

In the process of execution of sea patrol searching work System «OKO-3mp» provides with:

- visual observance of aquatorium and objects of coast infrastructure in the district where sea works should be executed;
- search and detection of the searched objects, performance of images of water surface with detected objects (dirt spots, vessel with plume, sea drilling and its state) denoting sharp coordinates connected with digital sea maps in visual and thermal diapason;
- performance of radio control in automatic regime in the process of moving by rout, performance on the digital map of coordinates of the detected source of electromagnetic signals;
- collecting of information and creating of automated data base regarding board titles of the vessels in the controlled region and any other parameters;
- performance of information in search and rescue operations in conditions of bad vision and bad weather.



Complex is equipped with update optical gyro-stabilized system to provide with photography data from the board of Aero Carrier in light and dark time.

## **System is executed by three persons:**

**Pilot** – manages all the phases of the flight (planning, flight, navigation etc.) of the Aero carrier.

**Operator** - is responsible for options of visual controlling, video interpretation and control of optical and measurement systems.

**Technician** – services Aero carrier and its systems.

### **Basic characteristics of optical gyro-stabilized system**

Distance of the following objects detection:

#### **Day time channel**

Target type	Detection (km) Narrow lens	Detection (km) Searching lens
Person in water	4.2	2.5
Vehicle	6.2	4.0
Small boat	10.0	7.0

#### **Night time channel**

Target type	Detection (km) Narrow lens	Detection (km) Searching lens
Person in water	3.0	1.8
Vehicle	4.2	3.5
Small boat	6.8	5

**Photo, television and measurement information from the board of Aero Carrier is rendered in the real time regime at the distance 100-150 km.**

**Board measurement system** is aimed to collect data over controlled aquatorium privately. Operating regime of System – automatic.

**Base** point of flight control, collecting, and storing of information situated at the home aerodrome, **transportable** – on the inspection vessel or on the one of the sea drilling platforms. It includes mobile station of flight control and receipt of photo information from the board of Aero carrier.

Flight control of aircraft system «OKO-3mp» is carried by two control desks. One controls the flight of the Aero carrier, the second one controls optical and measurement systems of information collecting.



## **Advantages of System**

1. Dual navigation system: if the signal GPS lost, navigation system allows the Aero Carrier to come back to home base.
2. System «OKO-3mp» includes high technological capability and could be serviced by staff of medium technical qualification;
3. System includes terminals that allow to get video information from Aero carrier and to control board optical systems (with the help of access code), from inspection vessels and drilling platforms in radius up to 10 km from the place of location in air.



4. Disclosure of ecological situation taking into account some characteristics and rendering of received information to points of control of System in the conditions of real time at the distance up to 150 km.
5. Automatic marking of photo information with detection of searched objects on the digital map of the region of work.
6. Run of the System is possible in different climate zones at the temperature of air from -30 up to +55 degrees.
7. If the generator fails, engine runs from the board accumulator within 60 minutes. In this case board computing system by itself produces the command coming back of the Aero carrier to its home base or to the nearest landing area.
8. Optical system is equipped with options that allow to change its settings depending on illumination of the location taking into account weather conditions (snow, rain, fog). The System is able to use the most effective regimes of work by its own consideration.
9. System is equipped with digital 3D maps of the district of work.
10. Included equipment allows to execute take off from one base and to land at the another one.
11. By the same take off weight (up to 160 kg) payload of Aero carrier is higher in comparison with the similar Systems in 25-30%.
12. The form of fuselage of Aero carrier and the particular work of the board systems allow to decrease the possibility to be detected in optical, radio-technical and acoustic diapasons.
13. Fuel capacity aboard of the Aero carrier and its navigation system allow to execute flights in distance up to 1800 km in conditions of total radio silence while working of the passive systems of collecting information along the whole rout and over particular territories.
14. Aero carrier and its devices performed by sea theme.
15. Transponder of the Aero carrier will be switched on in order to grant the norms of aircraft security in air.

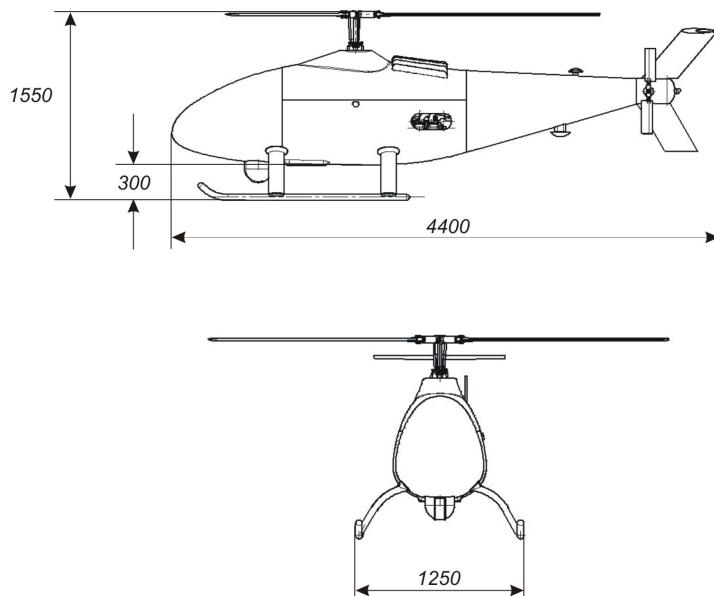
## Basic flight technical characteristics of Aero carrier

<b>Title</b>	<b>Parameters</b>
Length	4.20 m.
Wing span	5.50 m.
Height	1.20 m.
<u>Weight</u>	
Aero carrier	65 kg
Payload	Up to 50 kg
Fuel	Up to 60 kg
Takeoff weight	155 kg
Maximal takeoff weight	165 kg
Time of flight	Up to 16 hours
Minimal speed	60 km/h.
Cruise speed	120 km/h.
Maximal speed	180 km/h.
Ceiling	5500 m.
Distance from coast line	450 km.
Flight range regarding route	1800 km.

# Unmanned software-controlled Helicopter “Iceberg” 4-600 LR

## Basic characteristics:

Basic geometric, mass and aircraft performance characteristics of unmanned helicopter of ship-board basis to implement ice patrol are presented in the table 1. At the Picture 1 there are the basic geometric parameters of the helicopter.



*Pic. 1. Basic geometric sizes of the unmanned helicopter*

## Basic technical characteristics of helicopter

Sizes, m:	
Diameter of rotor	4,0
Diameter of anti-torque rotor	0,6
Total length with spinning anti-torque rotor	4,4
Total width (without rotor)	1,25
Height of machine	1,55
Engine:	1ПДROTAX 912 UL DCDI
Max. takeoff, kVt/h. p.	59,6 / 80
Weight and payload, kg:	
Maximal takeoff weight	270
Maximal paid payload	70
Weight of fuel	65
Weight of empty helicopter (standard)	135
Flight data (расчетные):	
Maximal speed, km/h	200
Cruise speed, km/h	170
Static ceiling without regard to ground effect, m	2000
Practical ceiling, m	4500
Flight range, km	600
Endurance, h	4
Operational temperature	- 45 + 40 °C

Board point of control and system of control UAV (Unmanned Air Vehicle) of helicopter type provides two regimes of operating – manual and automatic.

In the regime of manual operating the Operator implements path control by UAV and auto pilot provides the helicopter with stability along angle and line positioning, support given height and speed of the flight.

In the regime of automatic operating it is implemented the free flight according to the given rout in advance without Operator assistance (flight according to the given program).

It is acceptable also to interfere by Operator in order to correct the rout of the executing task.

Flight could be executed at any time of day. Path flight of UAV is displayed on the digital map of the ground point of control.

The parameters of flight and information about working state of some separate systems and also video supplied from the equipped aboard camera are displayed at the ship-board point of control in the sizes of near real time.

Distance between UAV and point of control is defined by distance of the used data communication channel (mainly up to 50 km).

UAV of helicopter type includes mainly optoelectronic system on the gyroscopically stabilized mount with cameras of high resolution in the visible and IK diapason.

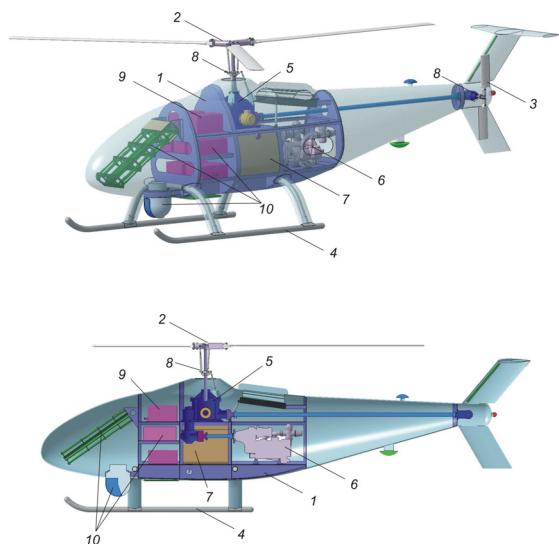
In comparison with another types of air mapping PCA includes the following advantages:

- All day and all weather mapping;
- There is no need to flight directly over the object of mapping;
- Wide zone of mapping (up to 20 km).

UAV is equipped with digital magnetometer of inductive type built in system of flight control to search vessels in fog and to be used while flight over ceiling edge of cloud.

## Components of unmanned helicopter

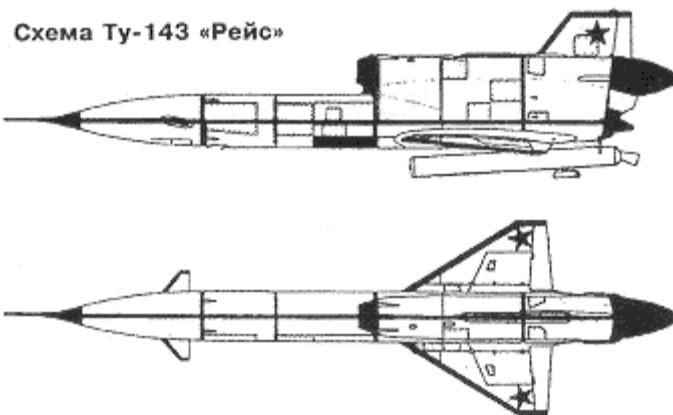
- 1 – carcase;
- 2 – main rotor;
- 3 – anti-torque rotor;
- 4 – chassis;
- 5 – transmission;
- 6 – power unit;
- 7 – fuel supply system;
- 8 – mechanical system of control;
- 9 – aviation electronics;
- 10 – purpose designed equipment.



## Air Target TU-143 «Reys»



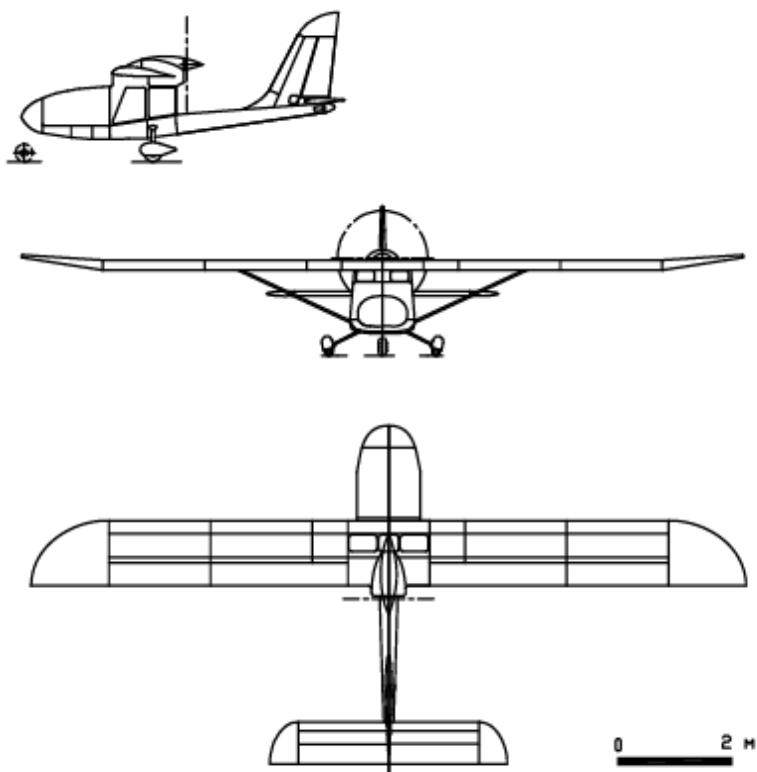
The Tu-143 was introduced as strongly resembled the Tu-141, and was substantially scaled-down. It was a short-range tactical reconnaissance system and had a low-level flight capability, which could be used as a target. It was truck-launched with RATO booster, recovered by parachute, and powered by a TR3-117 turbojet with 5.8 kN (590 kgf) thrust.



<b>General characteristics</b>	
<b>Dimensions, m</b>	
Length	8.06
Wing span	2.24
Angle of the wings, degrees	58
Wing area, m <sup>2</sup>	2.9
<b>Weight, kg</b>	
Takeoff weight	1230
<b>Flight data</b>	
Cruising speed, km/h	950
Range of flight altitudes, m	100-1000
Range, km	180
<b>Powerplant</b>	
Engine	Turbojet engine TR3-117
thrust, kN	5.8



## UAV A-10 «Phoenix»



UAV A-10 "Phoenix" is an initiative development on creation of high-altitude UAV. The vehicle represents reusable aircraft of an airplane configuration, a high-wing monoplane, a pusher propeller behind a wing, "Rotax-914F2" motor with a turbo-supercharging.

### **UAV A-10 "PHOENIX" missions:**

- 1 Major accidents and catastrophes regions reconnaissance,
- 1 Supervision of guarded objects;
- 2 Strategic air reconnaissance, active radio direction finding,
- 3 Electronic countermeasures,
- 4 Information support of actions of large ground forces and navy,
- 5 State border guarding.

## UAV A-5 "SEA EAGLE"

This vehicle is a modification of UAV A-4K "Albatross". It is specially adapted for conditions of high mountains and large water spaces.

### *Technical data of UAV A- 5 "SEA EAGLE"*

<i>Vehicle length</i>	<i>1.42 m</i>
<i>Wing span</i>	<i>3.00 m</i>
<i>The maximum take-off mass</i>	<i>28 kg</i>
<i>The maximum payload mass</i>	<i>7.0 kg</i>
<i>Fuel mass</i>	<i>4.0 kg</i>
<i>Engine power</i>	<i>2 * 1.9 kW</i>
<i>The maximum time in flight</i>	<i>5-6 hours</i>
<i>Radius of action</i>	<i>40 km</i>
<i>Effective range of flying speeds</i>	<i>60 ... 125 km/h</i>

# UAV A-6 "Golden eagle"

It is specially adapted for conditions of high mountains and large water spaces.

## A-6 "Golden eagle" solves problems:

- 1 Sweep and fixation of the revealed objects to a district map,
- 2 Oil and gas pipelines patrolling,
- 3 Major accidents and catastrophes regions reconnaissance,
- 4 Supervision of guarded objects;
- 5 Information support of actions of ground forces of regiment-division level and operations of the Navy,
- 6 State border guarding.

## *Technical data of UAV A-6 "Golden eagle"*

<i>Vehicle length</i>	<i>3.0 m</i>
<i>Wing span</i>	<i>5.00 m</i>
<i>The maximum take-off mass</i>	<i>160 kg</i>
<i>The maximum payload mass</i>	<i>50.0 kg</i>
<i>Fuel mass</i>	<i>20.0 kg</i>
<i>Engine power</i>	<i>2 * 10.0 kW</i>
<i>The maximum time in flight</i>	<i>4-6 hours</i>
<i>Radius of action</i>	<i>150 km</i>
<i>Effective range of flying speeds</i>	<i>65 ... 208 km/h</i>

