UKRSPEC SYSTEMS

www.ukrspecsystems.com

PD-2

Unmanned Aerial System

One stop UAS solution for military and civil applications

- 8 hours endurance
- 4500 m ceiling
- 7 kg standard payload
- 11 kg maximum payload
- 200+ km stable video and control link
- 1100 km maximum operation range

- ITAR free
- Fast supply
- Wide mission geographic range
- Low operational cost

*All numbers effective with UAV fully loaded (payload + fuel)

Evolution

People's Drone series

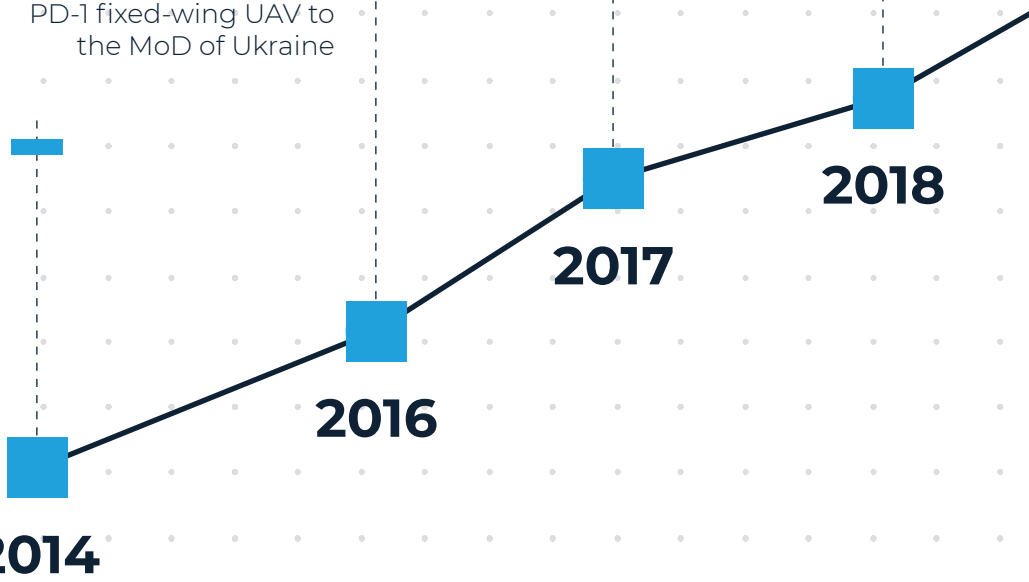
New facility
Relocation to new production facilities with more than 1800m² of space

First foreign contract
PD-1 VTOL delivered to the foreign MoD

New products
PD-1 VTOL and new gimbals development started

Building trust
First contract to supply PD-1 fixed-wing UAV to the MoD of Ukraine

UKRSPECSYSTEMS company foundation
Largest volunteering project in Ukraine emerging Into a UAV manufacturer



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2019

New products
PD-2 development started

2020

Approved for military operations
Final tests at The State Research Institute of Testing and Certification of Arms and Military Equipment successfully performed and permission to use PD-2 at Armed forces of Ukraine obtained

2021

PD-2 release to general public




The philosophy
of PD-2 UAS

While developing PD-2 UAS UKRSPECSYSTEMS team pursued a simple goal – to develop an efficient and versatile solution that may be operated in any environment or weather conditions, consumables and spare parts should be available worldwide, the configuration of the system should be changed within minutes to fit mission requirements as well as production time and export procedures should be reasonable.

PD-2 UAS is ITAR free, easy to export and to transport

Historically Ukraine faced issues while importing UAS. That was the reason why UKRSPECSYSTEMS was founded – it was way easier to manufacture UAS, than to import it. We understand that export/import procedures may be rough and time-consuming so we designed PD-2 UAS to be ITAR free. Components do not require any additional permission to export to third-party countries. The whole systems can be easily transported via civil flights.

Short supply time

Time – is the most valuable asset. That's the reason we've put a lot of effort to decrease production and supply time. We're ready to ship our unmanned aerial systems within 60 days from our factory in Ukraine.

All consumables must be available worldwide

The mission may lead you to the middle of nowhere and we want you to be sure there are no fancy, hard to get parts or equipment required to operate. UAV uses regular gas same as your car (A-95).

Reasonable maintenance cost

Mostly, the price tag is not conclusive. Eventually we were working with limited budgets and finding out the expenses related to operate foreign systems shocked us. That's why creating an economically efficient and reasonable system at use – was one of our highest priorities.

Wide geographic range

UKRSPECSYSTEMS did it best to design a solution, that may be operated despite of heat, cold and harsh environment or weather conditions.

Versatile and modular design

Order is an authoritative mandate. We can't afford the mission to be delayed or postponed due to lack of screwdriver. PD-2 UAV was designed to change its configuration within 15 minutes with no tools required, depending on the mission factor

Tests and trials

Our team is sure, that the success of the product comes only with the correct and adequate numbers related to unmanned aerial system. In order to be sure in the technical details we state, we've performed numbers of relentless tests of the PD-2 UAS with the help of State Research Institute for Testing and Certification of Arms and Military Equipment of Ukraine. Most of the trials performed may be compared to big aircraft standards.

Here is just a short list of the tests performed to ensure PD-2 UAS readiness to conduct a mission:

1 Vibration test for ground equipment.

The ground equipment withstood vibrations in the frequency range 5-80 Hz with a transition frequency of 22 Hz, a vibration amplitude of 2.0 mm, a vibration acceleration amplitude of 39.2 m / s2 (4 g). 5.37 g per UAV.

2 Vibration test for UAV.

The analysis of the random vibrations that occur during the flight of the unmanned aerial vehicles is important, as these random vibrations have random characteristic properties and have the ability to decrease the endurance of such systems. Both UAV and the payload withstood 20 mechanical impacts with a peak impact acceleration of 59 m / s2 (6 g), a shock pulse duration of 15 ms as well as the ground equipment withstood 20 mechanical shocks with a peak shock acceleration of 147 m / s2 (15 g), the duration of the shock pulse was 5-10 ms.

3 Impact tests.

UAS passed the test for transportation on the stand with the characteristics:

- ☑ Peak impact acceleration 20 g, duration of impact acceleration 5-10 ms, number of impacts 40;
- ☑ Peak impact acceleration 15 g, duration of impact acceleration 5-10 ms, number of impacts 400;
- ☑ Peak impact acceleration 10 g, duration of impact acceleration 5-10 ms, number of impacts 2000;

4 Temperature tests.

As for the temperature range:

- ☑ UAS may operate within the temperature range from - 25 ° C to + 50 ° C;
- ☑ Capable of withstanding changes in ambient temperature -20 ° C to +40 ° C;

5 As for various weather conditions:

- ☑ Resistant to high humidity of 93 ± 3% and atmospheric reduced pressure;
- ☑ May operate during rain;

All the trials performed correspond to GOST V 20.39.304 with all necessary documents approving this fact. It's worth noting, that after each testing series, the UAS was turned on to check its state and ready to work. We test our products without remorse, for our clients to be 100% sure of mission success.

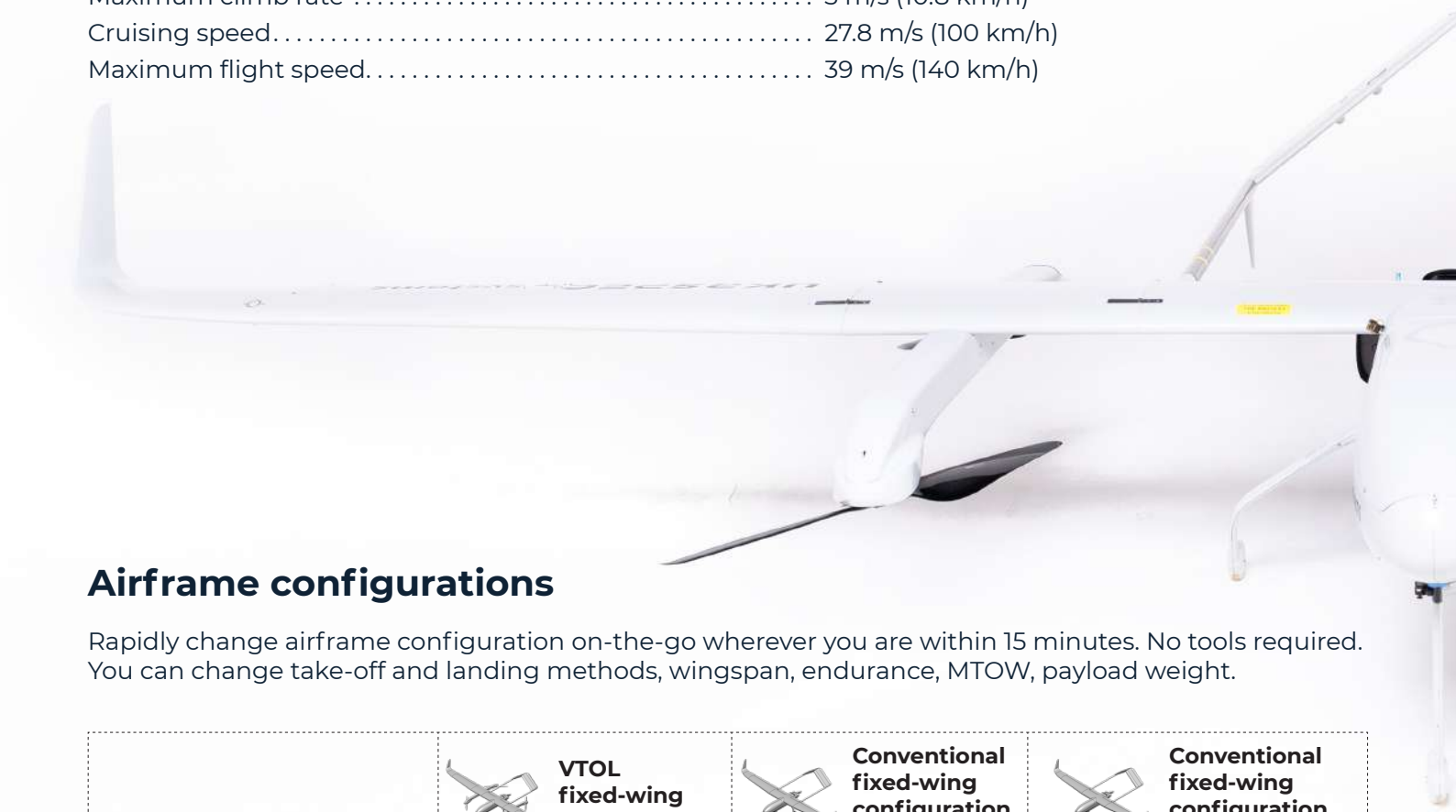
Video of tests

PD-2

vertical takeoff and landing unmanned aerial vehicle

PD-2 is versatile advanced aerial vehicle designed to conduct various missions in wide geographic range and approved by militaries for militaries.

Maximum take-off weight	55 kg
Wingspan	5 m
Endurance	8 hours
Encrypted radio communication distance	200+ km
Maximum flight altitude	4500 m
Engine type	4-stroke carburetor
Fuel type	gasoline
Maximum climb rate	3 m/s (10.8 km/h)
Cruising speed	27.8 m/s (100 km/h)
Maximum flight speed	39 m/s (140 km/h)



Airframe configurations

Rapidly change airframe configuration on-the-go wherever you are within 15 minutes. No tools required. You can change take-off and landing methods, wingspan, endurance, MTOW, payload weight.

	VTOL fixed-wing configuration	**Conventional fixed-wing configuration with chassis**	**Conventional fixed-wing configuration without chassis**
Take-off and landing	Vertical, using 4 electric motors. No runway needed, able to take-off and land on a ship deck	Conventional. Requires runway. Takeoff and landing using a runway and chassis.	Catapult launch and parachute recovery. No runway or chassis needed.
MTOW (UAV weight changes upon different configurations)	55 kg	55 kg	45 kg
Maximum payload weight, kg	11 kg	19 kg	11 kg
Maximum flight altitude, m	4500 m	4700 m	5000 m
Endurance, h	8	10	10

UAV

features and technologies

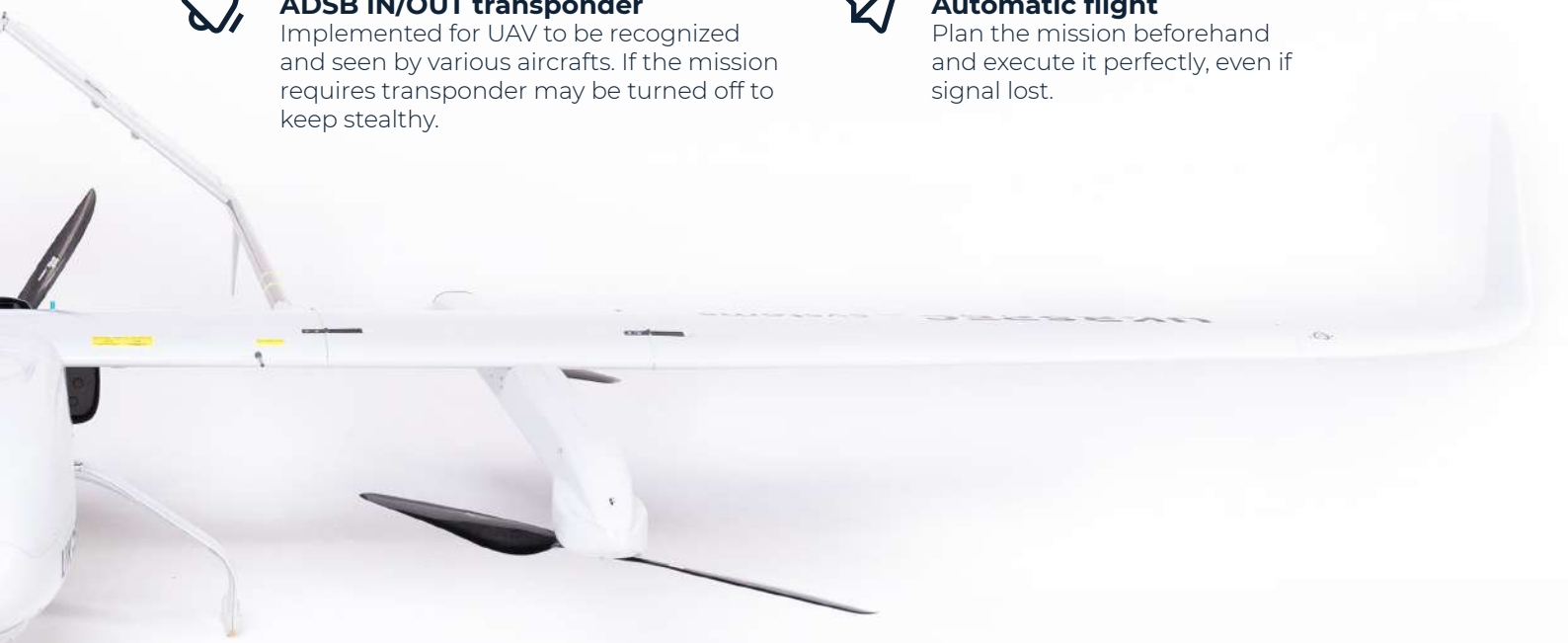
During the years of constant improvement our team received comprehensive feedback from the end-users. Based on our experience and expertise we've made a conclusion that first and foremost human factor should be eliminated to decrease critical issues and failures. We want you to have one of the most reliable drones on the market.

Low radar visibility
Due to fully composite airframe and absence of large metal parts, it is hard to detect and track the UAV with radars and anti–aircraft systems.

Navigation lights
Designed for drone to be visually detectable despite of various weather conditions. If the mission requires may be turned off to keep stealthy.

ADSB IN/OUT transponder
Implemented for UAV to be recognized and seen by various aircrafts. If the mission requires transponder may be turned off to keep stealthy.

Automatic flight
Plan the mission beforehand and execute it perfectly, even if signal lost.



Automatic take-off and landing
Simply place the UAV and give the command from the safe place. No human factor, fully automatic.

Anti-jamming technology
Allows to operate UAV despite datalink or navigation system jamming or other attempts of interference.

Laser rangefinder for automatic take-off and landing
Designed for precise process of landing and take-off.

Capable of operating in harsh weather conditions
From -25C to +50C, despite of rain, fog, wind or mist.

Charge batteries during flight
Onboard generator automatically recharges all the batteries of the UAV during the flight (both onboard and VTOL).

Various advanced payloads
Versatility is the key. 500W onboard generator and considerable payload compartment gives the opportunity to choose.

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PD-2 UAV

Engine unit

PD-2 UAV engine unit is a successor of the engine unit used in combat proven solution PD-1 UAV.

Historically, it was created to operate in harsh environments, be trouble-free and reliable aggregate. That's why its basis is an easy-to-use and maintain gas engine, that may be fueled by the mixture of A-95 gas with oil.

- 4-stroke internal combustion engine 100 cc;
- Remote start from GCS with a single button;
- Emergency engine start feature (automatic start during the flight in case of failure);
- Upgraded muffler to reduce acoustic signature;
- Active engine temperature control system (may operate in temperature range from -20 to +50);
- Air intake filter;
- Air intake temperature control sensors;
- 500 W onboard generator;
- Carb heating to prevent icing.

One may be curious why we used carburetor instead of fuel injection technology in our engine unit. The reason is simple and resonates with the philosophy of the UAS itself – the product should operate excellent in harsh environment, increase vitality as well as decrease points of failures. Fuel injection may face issues due to nozzle size and its possible pollution while fueling low-quality gas. Based on our experience carburetor is preferable, taking into account, that it may operate at 5700 m+ altitude with tuning once per 6 months.

Payload
types

ISTAR USG-series payloads were designed by our company (USG-211 or USG-212 in particular) and comes as part of standard payload with aerial photogrammetry package.

- Full-HD EO/IR with 30x optical zoom
- Scene lock
- Target tracking
- Digital video stabilization
- Anti-fog feature
- On-board recording and storage

Other high-end options from third-party manufacturers are also available (SWIR, MWIR and LWIR sensors were successfully integrated).

Visit website

Payload
types

PD-2 is multi-purpose UAS. Modular construction and flexibility allow to change the payload on-the-go depending upon mission tasks.

Optional payloads

LiDAR
industry standard tool for collecting accurate and dense topographic data at very high speed. Commonly used to make high-resolution maps, with applications in surveying, geodesy forestry or laser guidance.

IMSI catcher
is a telephone eavesdropping device used for intercepting mobile phone traffic and tracking location data of mobile phone users. May be used to locate smugglers, trespassers or enemy troops.

SAR
is capable of high-resolution remote sensing, independent of flight altitude, and independent of weather, as SAR can select frequencies to avoid weather-caused signal attenuation. SAR has day and night imaging capability.

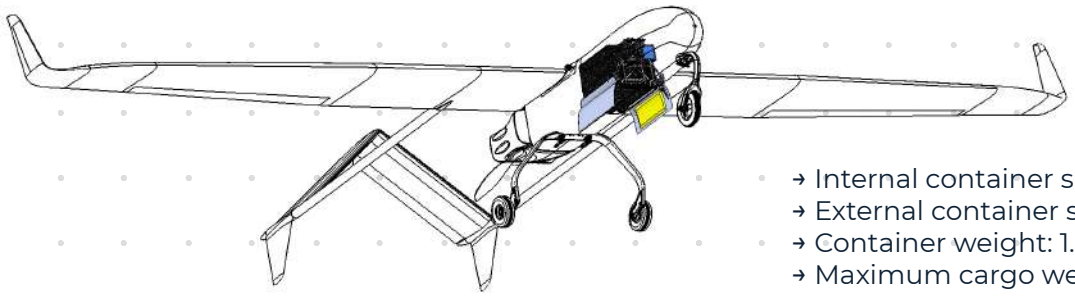
Radio repeater
enables signal relay to ensure stable communication and support for field troops.

Custom payload integrations →

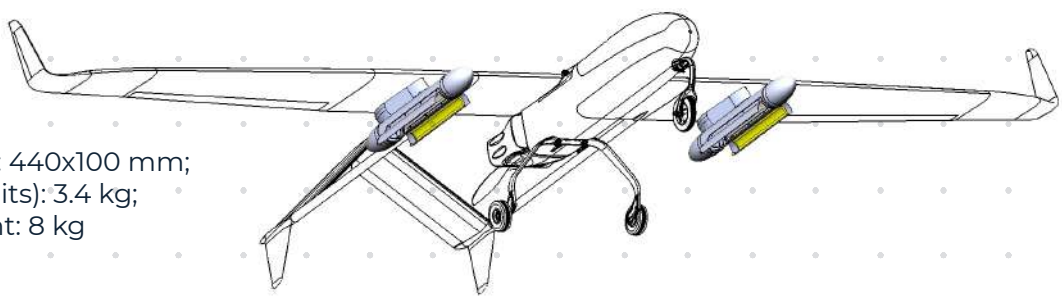
Having the biggest payload compartment within the class and 500W generator (32.5 l, 600*223*243 mm) gives the opportunity to be flexible.
Contact us for more info if interested in integration.

Cargo delivery

PD-2 UAV is capable of cargo delivery in different ways: dropdown via fuselage/wing modules or even landing the drone for load/unload and further take-off. Cargo delivery may be executed by command or at a predetermined point.



→ Internal container size: 250x210x180 mm;
→ External container size: 316x220x225 mm;
→ Container weight: 1.2 kg;
→ Maximum cargo weight: 8 kg.



→ External container size: 440x100 mm;
→ Container weight (2 units): 3.4 kg;
→ Maximum cargo weight: 8 kg

Communication

options

Control and communication are vital for the mission success. While designing PD-2 UAS our team did its best to ensure capability of working under different circumstances. This affects not only the weather conditions, but relief complexity and the communication channel preferred for mission success, depending upon various factors.

Line-of-sight communication

Effective range - 200+ km

Standard communication configuration contains line of sight ground control station, using radio connection. It has two datalinks (the main one, used for video and telemetry exchange within 200+ km range, and backup one, for telemetry only), with the feature of automatic hopping between them in case of GNSS or signal loss and AES-256 encryption.

3G/LTE communication

Effective range - unlimited (depends upon cellular network)

Data transmission is carried out using secure VPN technologies using TLS, IPSec, PPTP, L2TP protocols. This option allows you to establish communication with the UAV without range restrictions, provided that the cellular network coverage is stable. To ensure reliability, the modem registers itself simultaneously in the networks of two different operators of the cellular network and automatically selects the best one.

SATCOM

Effective range - unlimited

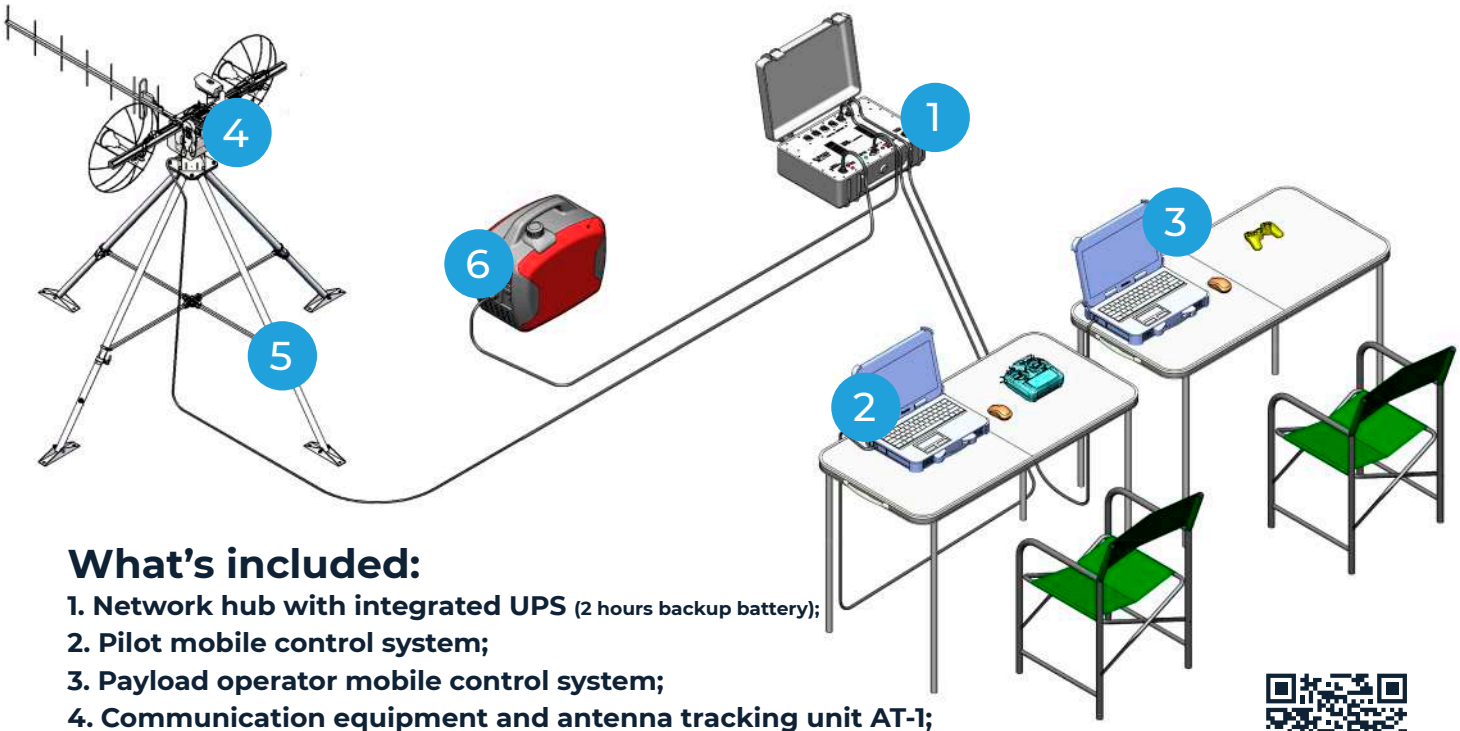
Line of sight type links certainly have their limitations due to range and weather interference. Satcom has historically been perceived as BLOS communication system, ensuring stable connection and data transmission at respective ranges. Provides low radio signature due to a narrow directional L-band antenna. Compatible with government grade encryption and secure communications standards, STU-IIIB, STE, TACLANE, KIV-7 and BRENT.

GCS

Ground Control Station

Ground control station is designed for remote control of PD-2 UAV and payloads carried.

GCS has two laptops for easy integration wherever you need (truck, container, etc). If the relief is flat and open it's enough to use quadropod, once mission faces difficult terrain motorized mast comes in hand. Ground control station automatically enables frequency hopping in case of GNSS or signal loss. Moreover, there's advanced software, that ensures features mentioned above to work perfectly on-the-go with no human intervention.



What's included:

1. Network hub with integrated UPS (2 hours backup battery);
2. Pilot mobile control system;
3. Payload operator mobile control system;
4. Communication equipment and antenna tracking unit AT-1;
5. Quadropod (automatic mast optionally);
6. Power generator.

Visit website

Tracking antenna unit AT-1

Features

- Automatic 5 m mast to increase range and signal strength;
- Two communication channels;
- Up to 200 km main datalink;
- Up to 150 km backup datalink;
- Built-in video camera;
- Powered by Silvus Technologies;
- More than 2 hours of autonomous work at full battery charge;
- MESH technology support (any UAV can be used to extend communication range of second drone);
- AES-256 encrypted.

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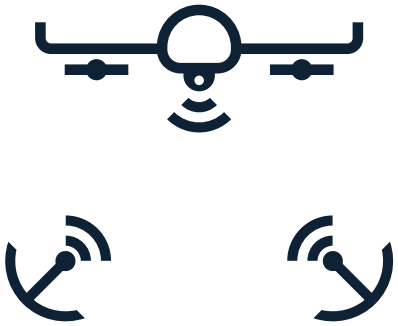
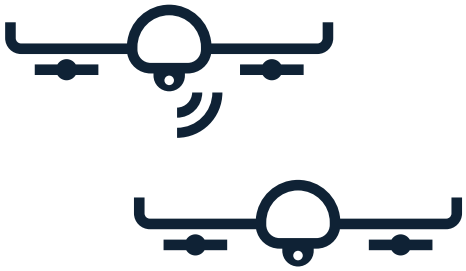
Ground control station is powered by advanced software solution providing features like:



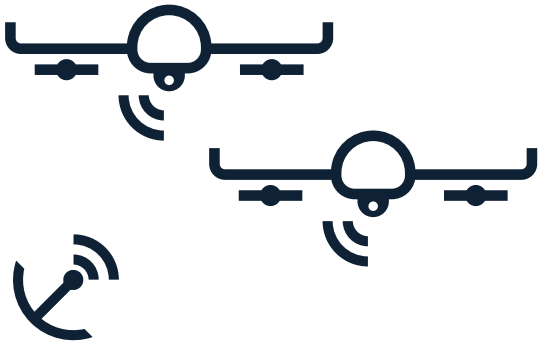
Control one UAV using multiple GCS

Extend mission range, hopping the control from one GCS to another during the flight.



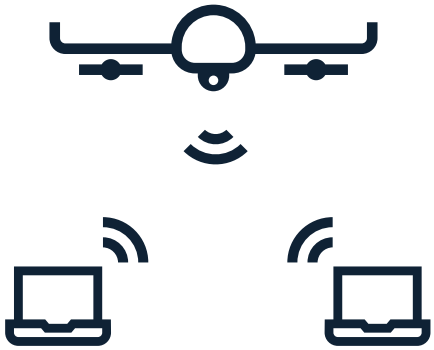
Signal relay from one UAV to other UAVs

Several UAVs may be operated via one GCS



Control of several UAVs from one GCS

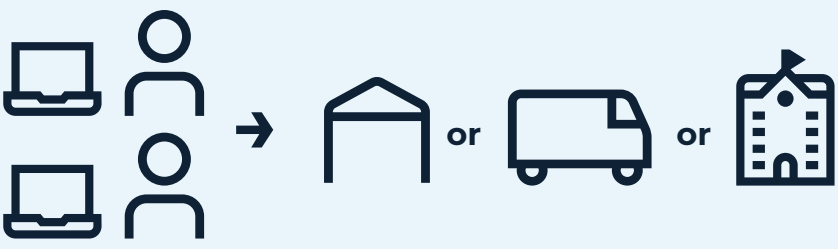
One GCS may easily operate several UAVs in rage in case if operation needs full cover of the area for precise data.



Live streaming to multiple GCS and RVT

The necessary information is available for operators, HQ and field troops at the same time

GCS may be integrated separately or mounted into military vehicle trailer system or bus.

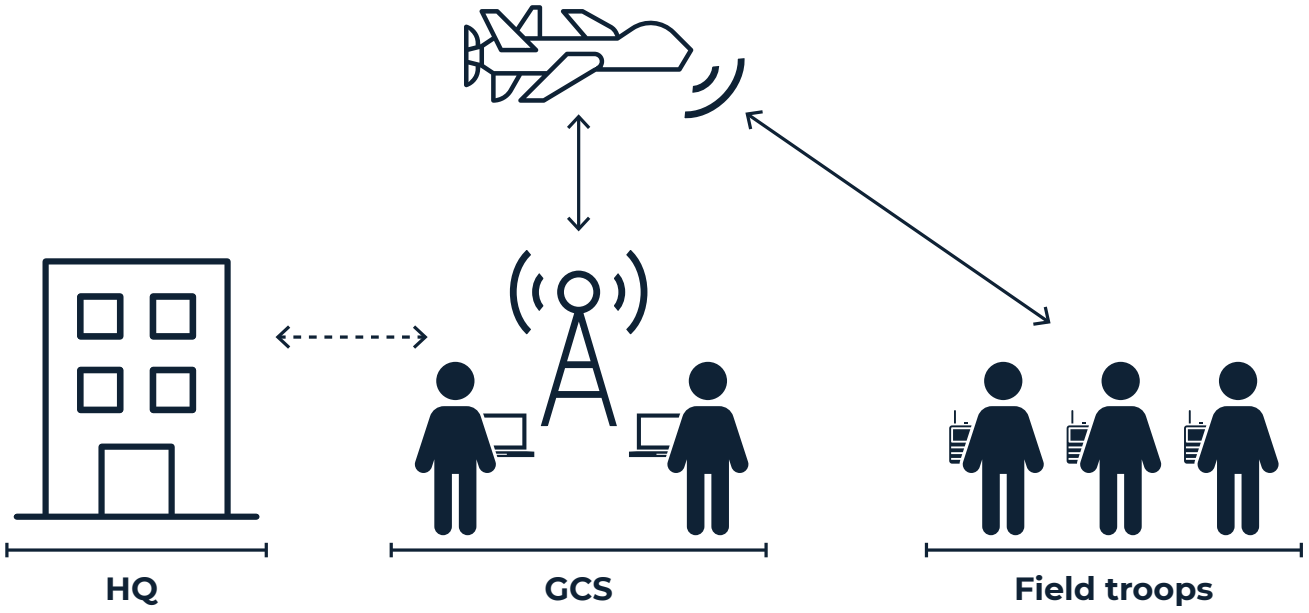


Strix

online software

Strix-online is specialized software developed for mission planning, processing gathered information, report generation and further transfer to external sources using API.

Client-server architecture ensures that the main asset of the mission – information, will be promptly transferred and processed. All the data may be gathered and worked up locally as well as sent to dedicated server at headquarters and backed up. In order to fully control the mission our team designed HQ-mode that allows to observe the current state of mission, at get live online footages. Advanced interface allows simultaneous work of several users with different access rights and storing all the information on predetermined dedicated server.



Features

- Mission planning
- Detect, identify and analyze targets
- Transfer to external sources via API
- Moving live map
- Augmented reality support
- Security protocols
- Add objects with one click
- Automatic combination of route with photos
- Get coordinates of the object
- Pdf report generation

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Spare parts

accessories and support

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UKRSPECSYSTEMS provides its customers with full training course to operate UAS. Moreover, there's an aftersales support and deep training of product, based on military experience gained at the East of Ukraine. We will teach you and your staff how to operate UAS to reach maximum efficiency.

Also, purchasing PD-2 UAS grants everything one may need for successful mission execution during 300 hours.

What you get

→ PD-2 UAV VTOL;

→ Ground control station (including antenna tracking unit AT-1 with automatic mast, rugged GCS for drone operator, rugged GCS for payload operator, network router, batteries);

→ Payload (USG series gimbal, high-resolution camera with camera control system)

→ Software license;

→ Spare engine unit;

→ Spare parts, tools and accessories (from engine spark plug, polarized sunglasses, USB flash drives, headphones with ear defenders and set of probes to battery voltage analyzer and various fuel and air filters).

All one may need is fuel for both UAV and men!

Applications

Military use

PD-2 UAS easily handles ISR missions, artillery fire correction (spotting) and general support missions.

Features

- **Low radar & acoustic signature**
- **Secure encrypted connection and anti-jamming features**
- **Live video from drone to multiple groups via remote terminal**
- **Integration with BMS and artillery spotting software**
- **Advanced payloads**

Border control and coast guard

Get clear view of the border with 24/7 air surveillance. A fleet of PD-2 UAVs allows for continuous surveillance over specific areas. Motion detection software allows to detect and track objects of interest to maximize effectiveness both from UAV and stationary CCTV. In case of water incident PD-2 UAV may deliver and drop the lifesaving kit, fixate coordinates of dropdown and share it to rescue team.

Features

- **Over 1000 km of border controlled by UAV**
- **Real-time information to ground troops for situational awareness**
- **Cover border with stationary cameras**
- **Instant alert on suspicious activity**
- **IMSI payload to locate smugglers and intruders**

More applications

Agriculture

Crop health inspections. NDVI inspections, real-time surveillance and much more.

Gas and oil

Real-time inspections and monitoring with high-resolution camera.

Firefighting

You can detect current fire locations, provide more reliable information and identify hot spots in wildland fires

Mining

Creating detailed images of the mining locations.

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Intelligence, Surveillance, Reconnaissance & sight

PD-2 UAS is capable of carrying wide range of payloads, including EO/IR payload, SIGINT equipment or other equipment to support your operation.

Features

- **Support your operations with in-depth intelligence**
- **Precisely detect cell phone location**
- **Support ground forces by carrying a radio repeater for their radios**
- **Find people by their cell phones**
- **See location changes and routes for cell phone movement**

Police and law enforcement

The police and law enforcement operations could be supported by “eye in a sky” offering real-time situational awareness and reduce time to take important decisions.

Features

- **Plan law enforcement operations using real-time information**
- **Traffic management**
- **Rapidly deploy VTOL drone in urban environment**
- **IMSI catcher to find individuals**

More applications

Energy

Sun battery farm inspections.

Power lines inspection

Real-time inspections and monitoring with SIGINT payload to locate energy leaks.

Wildlife

Wildlife monitoring to prohibit poachers’ operations.

Transfer
of technology

In case if UKRSPECSYSTEMS customer wants to become a drone manufacturer himself, the company offers simple process to start drone company and decide how far one wants to be involved in development and production process.

Stage 0	**6 months**	Facility preparation for operators training and servicing
Stage 1	**+6 months**	Assembly of the PD-2 UAV and subsystems from semi knock-down kits.
Stage 2	**+6 months since stage 1 finished**	PD-2 airframe production from semi knock-down kits at local facilities.
Stage 3	**+6 months since stage 2 finished**	Production at customer country.

Please note that moving between stages depends upon market researches and technical capabilities of customer and may be executed in a shorter time frame.

Technical detail

UAV configuration	PD-2 VTOL	PD-2 fixed-wing 4 m	PD-2 fixed-wing 5 m
Full length, m.	2,85	2,85	2,85
Height, m.	1,02	1,02	1,02
Wingspan, m.	5	4	5
Type of engine	4 stroke	4 stroke	4 stroke
Type of mixture preparation	carburetor	carburetor	carburetor
Glide ratio	15	14	19
Maximum takeoff weight, kg.	55	45	55
Payload weight inc. fuel, kg.	20	20	29
Max payload weight, kg.	11	11	19
Max. operation ceiling, m	4500	5000	4700
Max. climb rate, m/s	3	4,5	3,5
Volume of the fuel tank, (liters) dm3.	11	11	11
Max Flight Speed, km/h.	140	160	140
Cruising speed, km/h.	100	110	100
Stall speed, km/h.	65	65	65
Flight time with max payload weight, h.	8	10	10
Approximate length of the maximum route, km.	800	1100	1000
Radio range (C2 & Video), km	200+	200+	200+
Operating temperature, degrees Celsius	-10/+45	-25/+50	-25/+50

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