

# Scientific Center of Applied Electrodynamics JSC

Multifunctional small-size automatic  
unmanned aerial complex  
with vertical take-off and landing

Saint-Petersburg, 2021

# Technical characteristics

The UAV is built according to the normal airplane scheme with a high wing, a T-tail, and a front propulsion system with a tractor propeller.

The UAV body is built of a multilayer composite material with high strength and elasticity, which significantly extends the service life of the airframe. The airframe is manufactured using the vacuum forming technology in compression moulds.

The glider has high aerodynamic qualities due to full-scale modeling and blowdown in a wind tunnel. In addition to the ailerons, the glider has flaps, which allows more efficient use of the UAV capabilities.

- MTOW is not more than 29 kg  
Payload weight – up to 5 kg
- Full automatic flight (under operator's control, which makes possible to manually make changes to the flight plan)
- Maximum flight time – up to 5 hours
- Maximum flight range – up to 500 km (one way)  
Flight speed – 80 - 110 km/h
- Command telemetry radio link range (line-of-sight) – up to 100 km
- Maximum altitude (tested) – up to 3500 m  
Operating altitude – from 100 up to 3500 m
- Airframe spread – 2300 mm, wing spread – 3000 mm
- Time to reflight – 15 - 20 min

# Application

Multifunctional unmanned aerial complex consists of UAVs (up to 4 unit) and mobile control center (based on a car frame). It is designed for aviation monitoring of the underlying terrain and can perform a wide range of tasks. Due to relative small size the complex can be transported by one car with a trailer.

Operation is possible in adverse weather conditions: fog, rain (moderate), snow (moderate), high and low temperatures (-40 ... +50°C), wind gusts up to 15 m/s.

- Monitoring of disaster or emergency areas, determination of the exact coordinates and affected facilities.
- Provision of search and rescue operations.
- Monitoring of zones, where the detachable parts of booster rockets (DP LV) land.
- Aerial works for the security and protection of forests, collection and analysis of data on the forest sanitary state.
- Suppression of illegal business activities.
- Monitoring of transport and energy infrastructure (highways, oil and gas pipelines, power lines etc.)
- Remote sensing of natural resources and ecology. Locating wood logging area and its size.
- Monitoring, operative and independent assessment and control of the agricultural land condition.

# Payload

Options for UAV payload are coordinated with the Customer for specific requirements and tasks. The undeniable advantage of the UAV is its ability to quickly change the type of payload. Even more important is the possibility to carry up to 5 kg of payload, which is a very difficult technical and technological issue for this class of UAVs.

Besides the proposed payload there is an option to mount the payload provided by the customer.



## Professional cameras

Survey of large-scale and linear-extended objects of any size. Receiving highly detailed aerial photographs with geodesic reference to the terrain.

Creation of terrain orthophotomaps, digital elevation model (DEM) and 3D terrain model with a scale up to 1:500 (DTM, DSM).



## Multispectral cameras

Comprehensive survey of crops – complete information about the state of fields and plants.

Autumn and spring monitoring of winter crops is a simple and understandable way to assess the state of crops before and after wintering. Determination of vegetation indices, on the basis of which it is possible to draw a conclusion about the biomass, the concentration of chlorophyll in plant leaves, productivity and to predict yield.



## Small-sized laser scanner

Designed for high-precision determination of the spatial coordinates of objects with subsequent processing of the results obtained in specialized software in a 3D environment. Further use of the obtained data for various tasks related to the determination of geometric shapes of objects.

Possibility to create digital graphics and 3D measurements of exceptional quality, rich in structural and topographic details. Unlike photographs and flat images, the data obtained from laser scanning is 3D in nature, does not require orthorectification and can be obtained at any time of the day.

# Payload

Compact airborne synthetic aperture radar (SAR) of L and X bands is a proprietary development of «SCAE» JSC.

Advantages of radar monitoring:

- obtaining images in cloudy, smoky conditions and at night;
- binding of image objects in distance to the trajectory of the carrier.

Options:

- small-sized X-band SAR;
- small-sized L-band SAR;
- small-sized L and X-bands SAR.



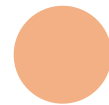
## Gas analyzer

Environmental monitoring of localities and transport hubs, patrolling industrial areas, detecting toxic gas emissions, forming a map of damage taking into account weather conditions. Providing situational awareness during emergency recovery operations, elimination of emergency consequences. Detection and measurement of gas concentrations, up to 10 channels.



## Observation system on a gyro-stabilized gimbal

The latest multichannel system designed to operate aboard various types of UAVs. It combines high-tech sensors (camera, thermal imager, laser rangefinder) installed on a gyro-stabilized platform controlled by gearless high-speed torque motors, which allows it to meet the latest requirements for surveillance and search.



## Synthetic aperture radar (SAR)

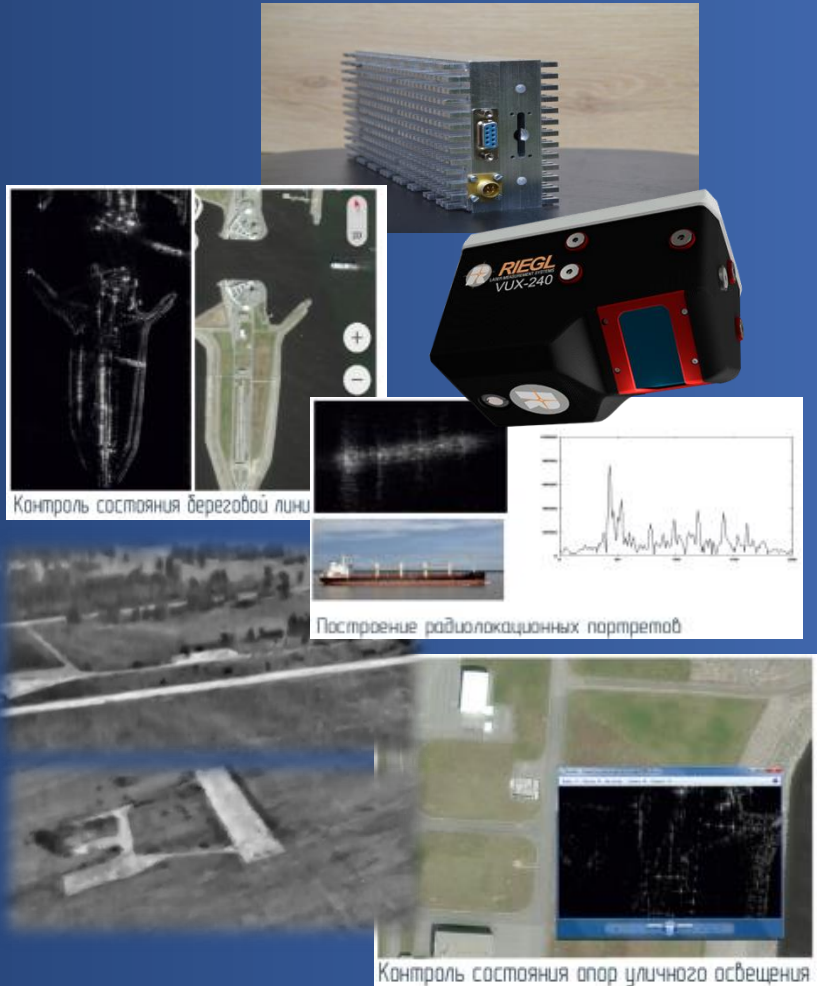
Features of **L-band** radar monitoring:

- observation of objects in optically opaque environments: under the foliage of trees, in dense vegetation, under snow and ice, under a thin layer of soil, under radio transparent domes;
- revealing the heterogeneity of the structure of optically opaque media: snow, ice, soil.

Features of **X-band** radar monitoring:

- high resolution images;
- smaller (in comparison with the L-band) dimensions of the radar antenna.

# Payload



## Quantum magnetometer

Volumetric study of the magnetic field due to multiple-elevation survey and development of the elevation profile.  
In geology, a magnetometer is used to search for minerals without the need to conduct test drilling to take samples.  
In archeology, a magnetometer allows you to react to building foundations hidden deep underground, statues and other objects that have residual magnetization.  
In seismology, magnetometers that respond to the Earth's magnetic field make it possible to predict an earthquake, since when the characteristics of tectonic plates change, the usual field indicators are disrupted.

## IR camera

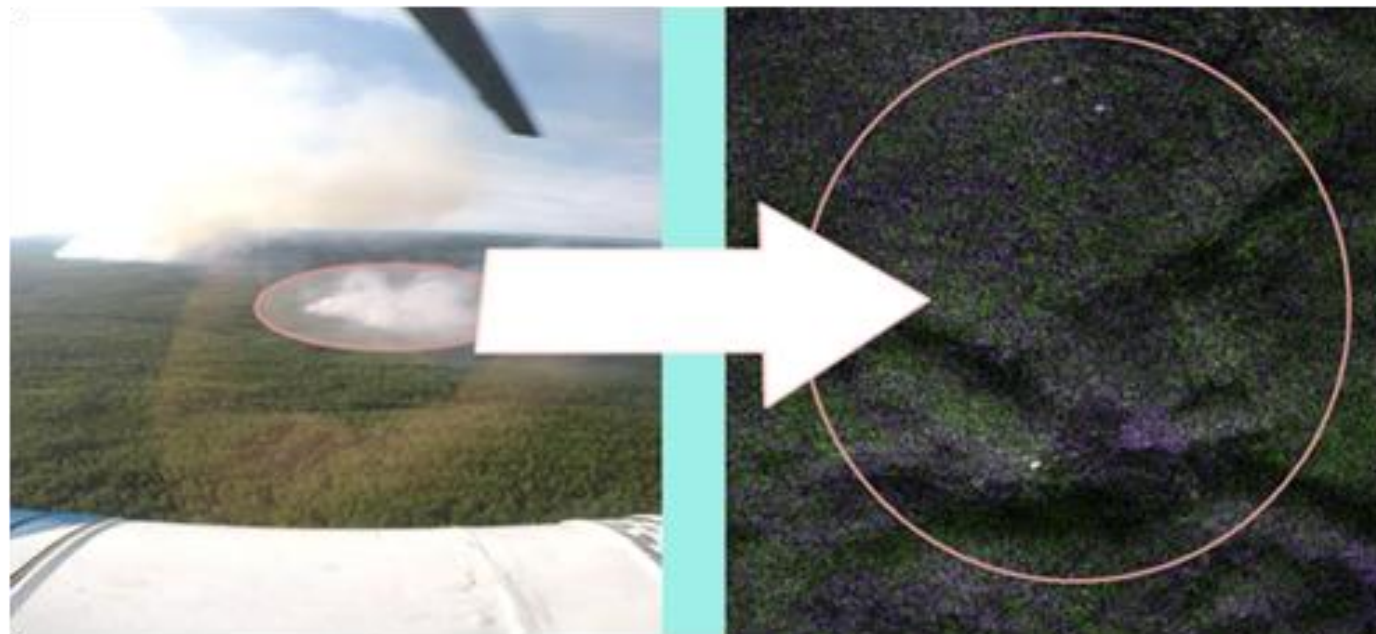
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## Complex ZOND-A

Remote monitoring of facilities containing sources of ionizing radiation (NPP power units, radioactive waste storage facilities, etc.).  
Detection and fixation of the field distribution of  $\alpha$ -,  $\beta$ - and  $\gamma$ -radiation sources of surveillance high and medium activity levels at a distance of up to 200 m.

# Approbation

Implementation of the UAV with a radar to determine the coordinates of the fall points of the separating parts of ILV Soyuz-2 in the area of fall No. 981 of the Vostochny cosmodrome (TsENKI, 2019).



# Further work



- Increasing detection range up to 300 km with two repeaters
- Increasing the range of object identification radars up to 30 km
- Development of improved domestic diesel engines for small UAVs with low fuel consumption
- Combination of identification radars with a weather radar
- Increasing the security of UAVs from external influences



# Contact us

In case of additional questions the company can provide more detailed information.

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