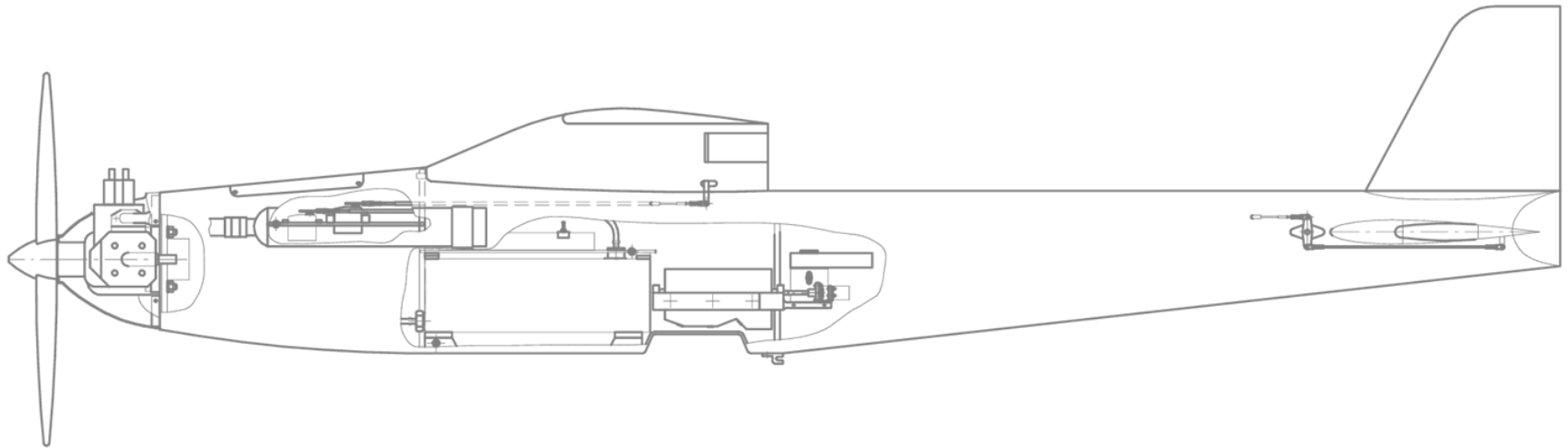


SCIENTIFIC CENTER OF APPLIED ELECTRODYNAMICS JSC

MULTIFUNCTIONAL MOBILE COMPLEX FOR AERIAL MONITORING



Saint-Petersburg, 2020

MMCAM purpose and tasks

MMCAM is designed for aviation monitoring of the underlying terrain and can perform a wide range of tasks for the needs of various agencies, for example:



Ministry of Emergency Situations

- Monitoring of disaster or emergency situations areas.
- Provision of search and rescue operations.
- Monitoring of radioactive and chemical contamination of terrain and air in a given area.
- Determination of the exact coordinates of disaster areas and affected facilities.
- Detection and monitoring of congestion and overflowing.



Federal Forestry Agency

- Aerial works for the security and protection of forests.
- Forest pathology research, collection and analysis of data on the sanitary state of forests.
- Suppression of illegal business activities.
- Monitoring of forest fires and possible fire sources.



Ministry of Transport and Ministry of Energy

- Monitoring of highways, oil and gas pipelines, power lines and other objects.
- Monitoring of transport and energy infrastructure.



Ministry of Environment

- Remote sensing of natural resources and ecology.
- Locating wood logging area and its size.



Ministry of Agriculture

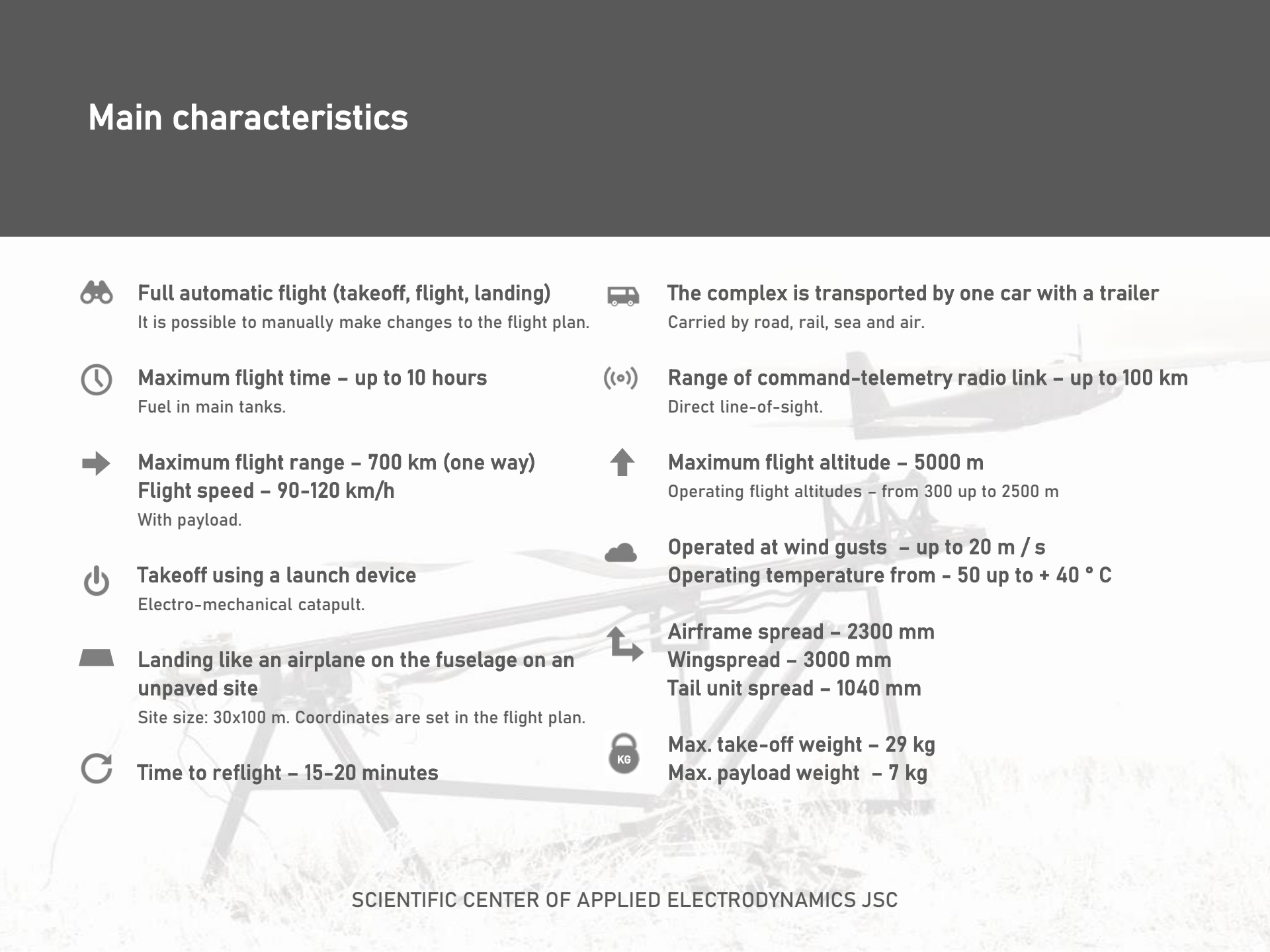












- Monitoring of agricultural lands.
- Control of agrotechnical measures.
- Operative and independent assessment of the land condition.



Federal Space Agency

- Monitoring of zones, where the detachable parts of booster rockets (DP LV) land.

Main characteristics

- 
-  **Full automatic flight (takeoff, flight, landing)**
It is possible to manually make changes to the flight plan.
 -  **Maximum flight time – up to 10 hours**
Fuel in main tanks.
 -  **Maximum flight range – 700 km (one way)**
Flight speed – 90-120 km/h
With payload.
 -  **Takeoff using a launch device**
Electro-mechanical catapult.
 -  **Landing like an airplane on the fuselage on an unpaved site**
Site size: 30x100 m. Coordinates are set in the flight plan.
 -  **Time to reflight – 15–20 minutes**
 -  **The complex is transported by one car with a trailer**
Carried by road, rail, sea and air.
 -  **Range of command-telemetry radio link – up to 100 km**
Direct line-of-sight.
 -  **Maximum flight altitude – 5000 m**
Operating flight altitudes – from 300 up to 2500 m
 -  **Operated at wind gusts – up to 20 m / s**
Operating temperature from – 50 up to + 40 ° C
 -  **Airframe spread – 2300 mm**
Wingspread – 3000 mm
Tail unit spread – 1040 mm
 -  **Max. take-off weight – 29 kg**
Max. payload weight – 7 kg



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MMCAM components

Mobile UAV Control Center

1 unit



Unmanned Aerial Vehicles (UAVs)

up to 4 units





Tasks

- Information exchange, data processing and analysis
- Control and monitoring of up to 4 aerial vehicles simultaneously
- Changing and adjustment of flight plans and tasks in real time
- Primary processing and rapid results transfer via radio and satellite channels to the concerned departments

Mobile UAV Control Center



The mobile control center is mounted on an UAZ car frame (it is possible to use another frame). The main criteria of a vehicle are **high cross-country capability, capacity and autonomy**. Some vehicle finalisations and additions were made:

- 8-meter pneumatic telescopic mast with communication antennas (mounted into the car frame);
- additional remote control station with a 5-meter mechanical telescopic mast (used to increase communication range up to 150 km or for the possibility to utilize non-specific car frame);
- detachable residential compartment for a crew of 4 persons and an operator workplace;
- autonomous power supply system (allows to work for up to 4 hours without recharging from external power supply);
- alternate power supply system (makes it possible to operate with a portable electric generator);
- SDS (specially designed software) for the management of aerial vehicles and their payload;
- integrated fire extinguishing system (as an option).

The car trailer is equipped with two containers for the UAVs transportation, a device for the launcher transportation and spare tools and accessories.

Unmanned Aerial Vehicle



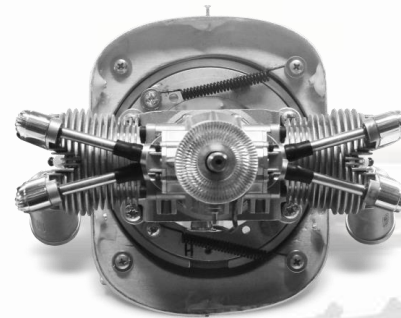
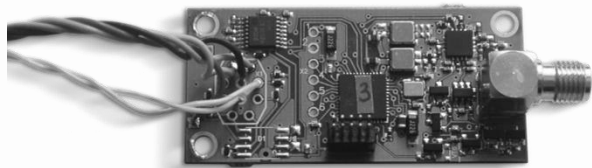
The UAV is built according to the normal airplane scheme with a high wing, a T-tail, and a front propulsion system with a tractor propeller.

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.



UAV. Avionics, propulsion system



Airborne Avionics includes:

- engine cylinder temperature sensor;
- electronic computing board (ECB) of the piston engine;
- UAV automatic pilot system;
- wireless modem, which has the following unique characteristics:
 - light weight and size;
 - range of communication of the command and telemetry radio link (CTRL) is up to 150 km;
 - unique BER parameter
- GPS antenna with a cable.

The propulsion system is mounted in the front part of the airframe on the vibration dampening unit. It is based on a piston four-stroke two-cylinder engine with a capacity of 5.2 h. p. The fuel is a mixture of gasoline (A-92 or AI-95) and synthetic engine oil.

UAV. Starter-generator

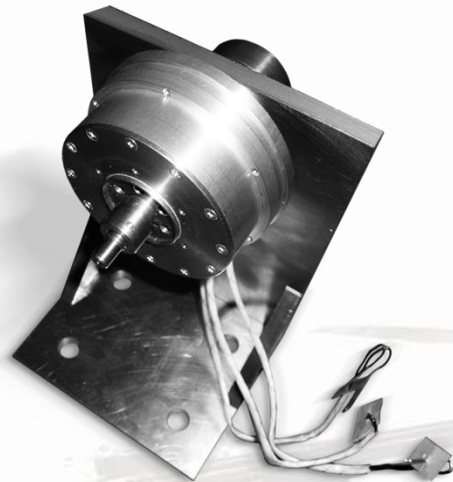


Starter-generator of an internal combustion engine (ICE).

In modern UAVs, ICE starter-generators with direct drive are most often used for the following reasons:

- reliable starting of the ICE is achieved by driving the engine shaft at the required speed without any external devices, which increases the autonomy of operation;
- the presence of the generator allows to increase the UAV specific power, not being limited to the battery in terms of power and energy reserve. Modern electronics makes it possible to perform the functions of a starter and a generator with only one electromechanical converter (EMC) mounted directly on the engine shaft without intermediate gears, which increases the reliability of the system.

The starter-generator has a number of unique characteristics, in particular, the engine starts at a speed of 200 m/s, power is up to 300 W.



Aluminum Launcher (Catapult)



The catapult is designed to launch the UAV and provide it with the initial required launch speed during the take-off.

The "Catapult" aluminum launcher involves a lot of unique technological solutions, e.g. low weight, high power-to-weight ratio, the ability to launch various UAV classes, an interchangeable carriage, high maintainability.



UAV Payload



Setting the payload for the UAV is 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 7 kg** of payload, which is a very difficult technical and technological issue for this class of UAVs.

To the date, our company can offer the following payload types:

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 three-dimensional 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 three-dimensional in nature, does not require orthorectification and can be obtained at any time of the day.

UAV Payload



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. Illumination of the work area, light identification of the aircraft affiliation (Ministry of Emergencies, Ministry of Foreign Affairs).

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.

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 α -, β - and γ -radiation sources of surveillance high and medium activity levels at a distance of up to 200 m.

UAV 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

Thermal imaging devices installed on UAVs expand the capabilities of traditional monitoring and surveillance systems, providing full control over the space, regardless of the time of day and the challenges of weather conditions.

The ability to obtain an IR image in real time at a distance of up to 10 km.

Surveillance, detection and control for ensuring the safety of the observed objects, and for rescue and other special tasks.

Contact us



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

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