

TECHNICAL SPECIFICATIONS AND BASIC CHARACTERISTICS

ROTARY WING UNMANNED AIR VEHICLE

COMAIR

Main Characteristics: COMAIR is a medium range Rotary Wing Unmanned Air Vehicle designed for day/night remote monitoring, transmission of video information to the ground control station in real time. The operation range is up to 100 km in line of sight from the ground point; operation time is up to 5 hours. Maximum take-off weight is 140 kg. The payload weight is up to 25 kg.



COMAIR is designed for the traditional monitoring of functions performance, actions coordination and surveillance:

1. Real time terrain surveillance, all-time, all-climate
2. Target search and acquisition, target video capture and position determination
3. Fully autonomous and self-sufficient
4. Operational on water areas, flat, cross-country and mountain terrain pursuant to the radio visibility between the UAV and the GCS
5. Deployable from transport condition to the take-off readiness within 15 min
6. 24/7 monitoring of specified territories, water surfaces, industrial objects, vehicles, boats, yachts, ships, groups of people, individuals etc.
7. Real-time video & infra-red detection
8. Information transmission and processing in visual and infrared spectres



9. Transmission to the ground control station up to 50 km within line of sight from a ground control station during 5 hours

Advantages of rotary wing UAVs - Rotary wing UAVs possess a number of advantages which open for aircrafts of this type a wide application perspective in different spheres.

The main advantages of this class of UAVs include:

1. **Lack of need for a qualified pilot** that allows not only to avoid the need to hold flight personnel, costly in preparation, but more importantly, to use UAVs in circumstances where there is a threat to life for manned aircraft pilot. This allows to use UAVs in various emergencies: fires, bad weather conditions, hostilities, areas with chemical or radioactive contamination, etc.
2. **Autopilot use** that controls UAV in robotic mode and eliminates the human factor. UAV operator only sets the flight mission that is run by UAV independently, including the functions of take-off and landing. Even in the case of control loss with the UAV from the side of ground control station, algorithms for autonomous behaviour are stipulated for UAV, including communication search mode, return to the point of take-off or landing in a beforehand designated evacuation zone.
3. **Lack of need for a runway**. Helicopters and planes can be based only in terms of airfields and specially prepared sites. This not only limits their operation range, but also taking into account the procedure of take-off preparation, significantly increases the response time. Rotary wing UAV system can be mounted on any cross-road chassis, can provide take-off from unequipped sites and can deploy until readiness to take-off within 15 minutes. This allows to significantly extend geography application, as close as possible to draw it near to the territory of the mission implementation.
4. **Extremely low heights, maximum proximity to the objects in space and hovering in direct proximity**. Unlike manned helicopters, rotary wing UAVs can operate at minimum altitudes (up to 1meter), and draw near to the monitored object, hovering close to it. This is important when conducting audits of power lines and pipelines, assessment of high buildings. But more importantly, rotary wing UAVs can be used effectively in the conditions urban terrain, having the ability to manoeuvre without restrictions between facilities. In this case, rotary wing UAVs of this class unlike electric UAVs can perform tasks for up to 5 hours and in severe weather conditions from - 35 till + 50 °C.



The potential of UAV application of such class is currently even not fully defined. This is an advanced technology, the application practice of which is limited to one decade. But now this class of UAVs is actively used in military and civil sectors.

For special purposes rotary wing UAVs are able to solve the following tasks:

1. **Monitoring of unrests** that in terms of growing threat of terrorism, especially in large settlements, can provide not only operational monitoring of the situation in uncontrolled territories, but also identify, implement target video capture and its automatic tracking. Besides UAV can automatically follow the target, keeping it in sight at a safe distance and displaying it not only in visible, but also in infrared and ultraviolet ranges.
2. **Monitoring of emergencies** that may occur during natural disasters, fires and man-made disasters. As a rule, the actions in each of these cases involve a risk to life of rescuers from fire, chemical or radioactive contamination. At the same time the efficiency and reliability of information in such cases determine human lives. Rotary wing UAVs can receive this information in the riskiest conditions, while ensuring its provision with those angles that any other means are not able to provide.
3. **Robotic audit of equipment** that with the use of thermal imagers, installed on UAVs, can detect deviations in temperature on the power lines, pipelines, surface of buildings and structures. The function of temperature deviations determination within thermal audit can work fully automatically, producing video capture of abnormal zone. This allows to use UAVs in remote areas in robot mode, which under pre-set route autonomously conduct monitoring of power lines, pipelines and process structure and transmit to the ground station exact coordinates of the detected deviation and videos. At the same time rotary wing UAV can draw near as close as possible to the test site and give the operator the opportunity of detailed assessment.
4. **Monitoring of man-made objects** where the influence of human factor is not allowable. Nuclear and hydroelectric power plants, chemical industry and similar facilities are forbidden zones for any flights, but there is a need for chemical and radiation measurements and air samples, as well as perimeter control. The definition of “closed zones” for UAV flight provides untouchability of forbidden territories, excluding the human factor while piloting.
5. **Monitoring of controlled areas** that is applied to the protection of nature reserves with the possibility to determine the migration of animals or unauthorized intrusion of poachers. Also, due to mobility and rapid deployment rotary wing UAVs are effective in monitoring of large areas that were not originally equipped with appropriate systems: festivals, sporting events, temporary refugee camps, closed zones of man-made disasters, etc. Rotary wing UAVs are applied while monitoring the unpopulated and remote areas: the jungle, the taiga,



the flood zone, the desert.

6. **Vaccination of wild animals** that in the traditional forms requires a manual layout of the feed processed with medicines, distributed over large areas in the places of animal migration. The procedure of manual vaccination depends on the scrupulousness of the staff, it is extremely laborious and difficult to control, and when it is violated it will not give proper effect. The application of rotary wing UAVs allows laying out of feed with vaccine along the given coordinates with a precise dosing. UAV follows a predetermined route and automatically throws dosed feed along the coordinates.
7. **Spraying of chemicals** that is used for the pests control or by sanitary services in the fight against parasites or carriers of life-threatening human diseases. Traditional forms of chemical treatment using aviation contain two major drawbacks: the threat to pilot's health and life, as well as environmental pollution. The latter is caused by the fact that the use of manned helicopters and planes suggests the minimum allowable heights from which chemicals are dispersed. And in order to achieve the required density of the spray from a greater height more toxic substance are dispersed. Rotary wing UAV can perform these works at very low altitudes – up to 1 meter and with maximum accuracy. This not only saves expensive chemicals, but also reduces the amount of substances that pollute the soil.
8. **Transportation of small cargos** in remote places that in addition to the traditional types of such areas include those that may pose a threat to human life (polluted or contaminated areas), as well as areas inaccessible to manned aviation: roofs of houses, decks of unequipped ships, grounds of high-rise structures, etc. The UAV is capable of delivering and dropping at the specified coordinates automatically or under the control of the operator medications, drinking water, spare parts, life raft, etc. up to 25 kg.

Types and kinds of the applied payloads can be selected depending on the performed tasks: electro-optical systems, thermal imagers, range finders, measuring equipment, spraying equipment, spreaders, etc.

The payload can be provided from the UAV board with control commands, power supply up to 1 kW, as well as data links.

Ground control station is designed for:

1. Remote controlling of the UAV and its equipment
2. Receiving and representing information with the installed payload on the displays
3. Supporting the work in the network, due to its architecture and compatibility with Ethernet



Ground control station can be easily and effectively integrated into the existing network systems, disseminating necessary information between users-eg. transmission of the intelligence information from the GCS to the headquarters while operations preparation

Ground support vehicle is designed for storage and transportation of two rotary wing UAVs, it can be mounted on cross-road chassis. Basis for the transport and logistic support is aluminium transport container with two lifting side panels & inner section where two UAVs are mounted and moored. Removable lifting eyes at the top, on the side racks allows to overload, moving and transportation easily and reliable. The container is equipped with the locks for fastening to the fitting locks.

System configuration



3	Ground control station (in the container)	GCS includes:	No
		1. Transport container is designed for mounting on any cross-road chassis and consists of two sections: 1.1 Control section, the life-support system of which includes air-conditioning, heating and ventilation system. 1.2 External system section of uninterruptible power supply with petrol generator	1
		2. Crew commander's workplace	1
		3. UAV operator's workplace	1
		4. Payload operator's workplace	1
		5. Specialized server of the ground control station with operational communication console	1
		6. Auto positioning antenna system of the ground control station with the telemetry channel ATA 5800 and an video camera installed on the positioning system for visual control during takeoff and landing of the aircraft.	1
		7. Telescopic mast for lifting of antenna positioning system of data link with the UAV	1
		8. Meteorological station with the mast equipped with automatic lifting mechanism	1

		9. Antenna of operative communication with the mast equipped with automatic lifting mechanism	3
		10. Portable UAV console for the operator on a runway	1
		11. Crew's communication facilities	1
		12. Radio direction-finding system for searching and Detection of UAV in case of emergency landing.	1
		13. Field tool kit. Contains tools and equipment for UAV and GCS deployment and maintenance in the field	1
		14. UAV preflight preparation system allowing diagnosing UAV systems before flight without GCS application.	1
4	Transport container	<p>Transport container is designed for mounting on any cross-road chassis.</p> <ol style="list-style-type: none"> 1. It consists of one storage section for 2 UAVs, spare parts, tools and accessories. 2. It is equipped with special racks for UAV transportation and storage. 3. It is equipped with two crane-beams for loading and discharge. <p>Fuel system with fuel tank for 200 l is installed (it is sufficient for 24 h of uninterrupted system operation).</p>	1
5	UAV repair kit No. 1 ²	<p>UAV repair kit No. 1 is designed for technical maintenance and prompt overhaul of the UAV.</p> <p>UAV repair kit No. 1 includes the kit of spare parts, tools, accessories and materials necessary for technical maintenance and UAV overhaul in standard operation terms.</p>	1
6	Operation documentation	<p>The set of operation documentation includes full kit of necessary documents in accordance with the requirements of technical standard: List of documentation on UAV</p> <ul style="list-style-type: none"> • Maintenance and operation manual • Flight operation manual • UAV operator manual • Payload operator manual • UAV maintenance regulation • Flow charts of types of UAV flight preparation • UAV lubrication chart • Illustration albums of system components • Electrical schemes albums of system items • Log books and passports of the system and its items • List of spare parts, tools and accessories • Flight preparation log books 	

Unmanned combat helicopter attack and reconnaissance

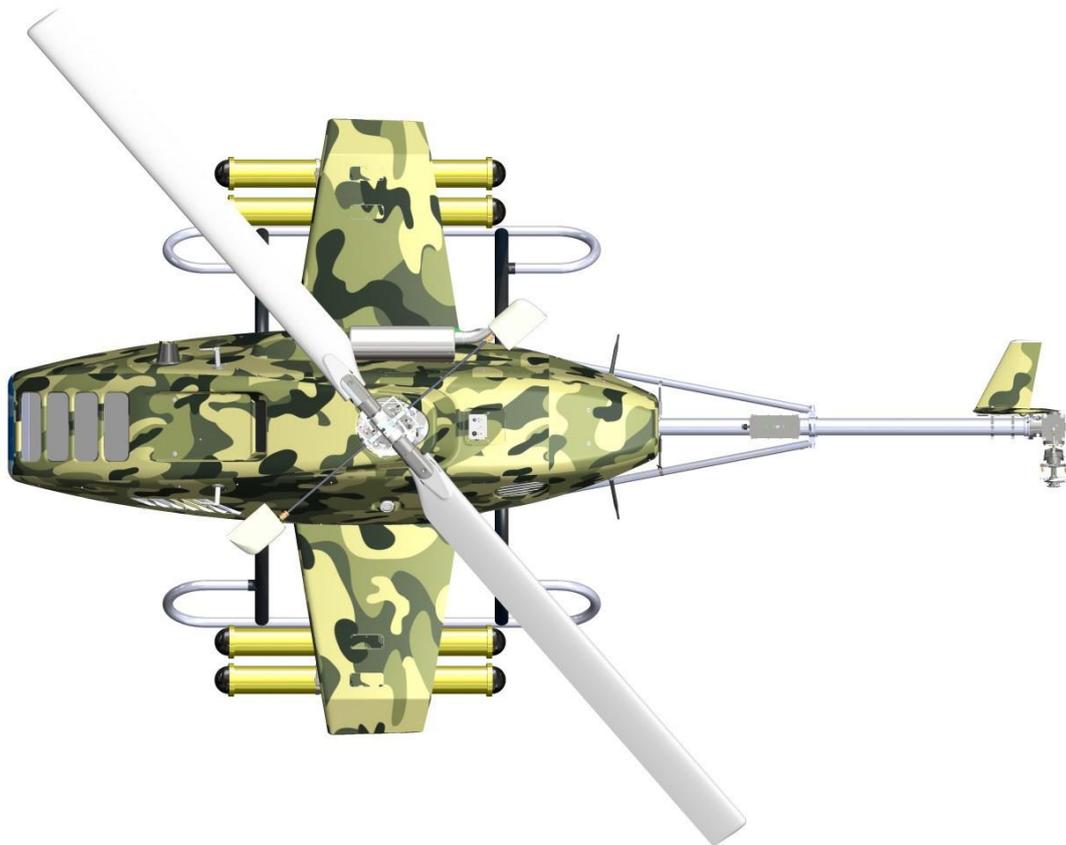


UAV military modification is a single-rotor helicopter, with fixed landing gear, auxiliary wing with four-point suspension of the payload and the internal combustion engine running on high-octane gasoline. UAVs equipped with avionics that provide in automatic mode: takeoff, flight and landing. UAV has ability to hover over an object to accomplish the mission and payload control and system of the data transmission.

Unmanned combat helicopter attack and reconnaissance is designed for the following

1. Incapacitate enemy manpower, located in open areas and in various kinds of buildings and structures;
2. Disabling light armored vehicles and automotive equipment, the destruction of fortified buildings or semi buried buildings of stone, brick or concrete;
3. Suppression of enemy firing points located in remote places (on the upper levels of multistage buildings);
4. Territory monitoring in real time mode;
5. Objects detection and tracking;
6. Coordinates determination of the detected objects;
7. Video data transmission in visual and infrared ranges.

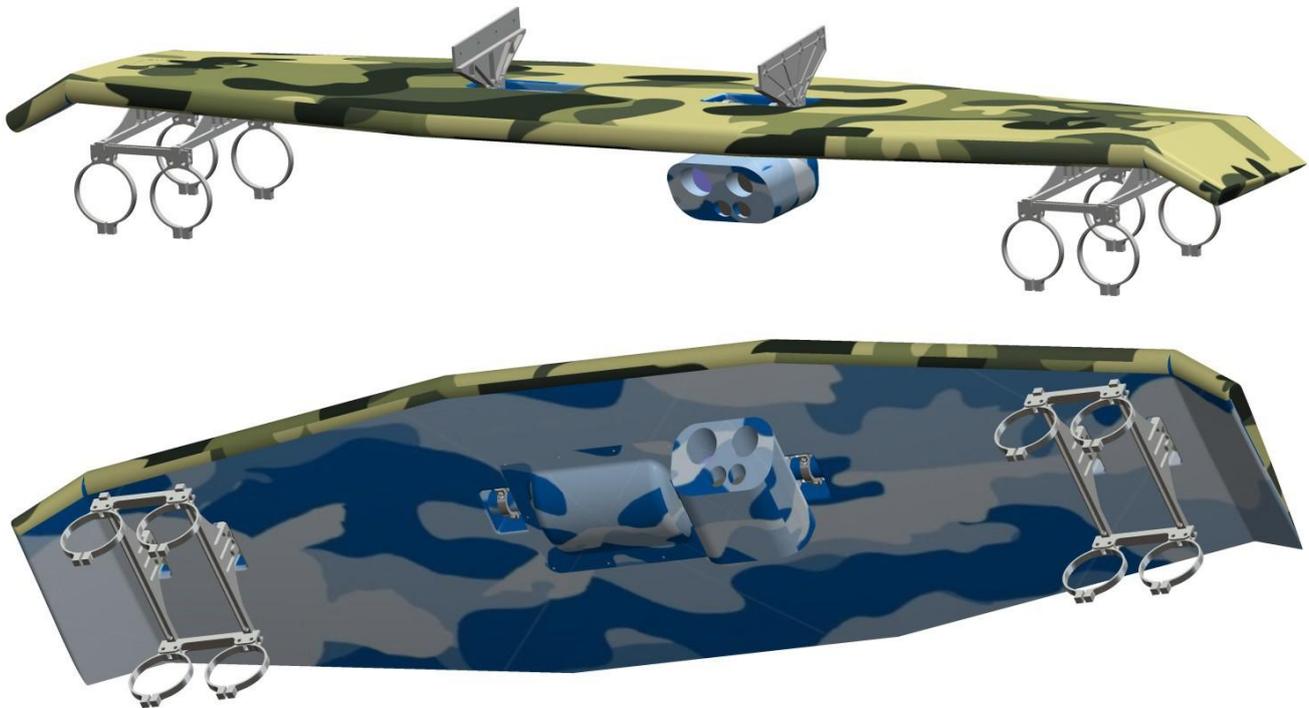
The UAV can be deployed at day and night hours in calm and severe weather conditions, performing automatic takeoff and landing from unprepared sites with the size 30x30 m.



WANKEL engine capacity (Four stroke, rotary, water cooled)	40	kW
Fuel consumption	5-8	kg/h
Length with main rotor	3787	mm
Length	3052	mm
Main rotor diameter	3400	mm
Height	1346	mm
Wheelbase	1180	mm
Maximum takeoff weight	150	kg
Standard fuel margin	29	kg
Cruise speed near the ground	70	km/h
Flight duration (height 100-500 m)	up to 5	h
Operating temperature (temperature mode is limited by the operating range capability of electronic components as well as by the operating temperature of the engine)	-20 +50	°C

Auxiliary wing

Auxiliary wing of small aspect ratio, wingspan 1.8 m made from composite materials. The wing offloads the rotor and is used for the suspension arms.



Four rocket-propelled grenades caliber 62 mm and optical-electronic sighting system is installed on four automatically adjustable suspension points on the auxiliary wing.

Optical-electronic sighting system consists of four modules (thermal imaging system, color camera, laser range finder, ballistic calculator), active stabilization, the determination of the distance to the target. This system allows you to fire day and night.

Application

Grenade is designed to incapacitate enemy manpower, located in open areas and in various kinds of buildings and structures. Disabling light armored vehicles and automotive equipment, the destruction of fortified buildings made of stone, brick or concrete and located on the ground.

Design

Each grenade at factory is packed in plastic transport and launch container (TLK), with the ends sealed by rubber covers. Caps are removed automatically when a shot. After the shot the grenade is stabilized on the trajectory by means of disclosing tail fin which is made from spring steel.



Tactical grenades specifications

Size - 62 mm

Length shot - 742 mm

The maximum firing range - 950 m

The minimum of firing range – 25 m

Accuracy of fire at ranges of 200 m - ≤ 0.5

Application temperature range - from -40 to +60 °C

Types of shots

High-explosive / thermobaric shot (with a charge of fuel-air explosive, with a TNT equivalent of about 6 kg) is designed to defeat unsheltered manpower on the area not less than 50 m², destruction and damage of buildings, incapacitate unarmored and lightly armored vehicles.

High-explosive shot - is designed to defeat of unprotected enemy forces on the area not less than 80 square meters, as well as the destruction of motor vehicles.

