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GENERAL PROVISIONS

1.1. HELICOPTER REQUIREMENTS

The AK1-3 helicopter complies with the requirements of AP 27 Normal Category Rotary Wing Flight Suitability Norms, which comply with the FAA flight suitability standards for civil aircraft (FAR-27).

1.2. HELICOPTER CERTIFICATION

AK1-3 helicopter is registered for certification with the State Aircraft Department of Ukraine.

AK1-3 complies with the requirements of the certification basis for the helicopter developed according to:

- AP-27 normal category flight suitability norms;
- noise abatement requirements as laid down in Chapter 3 of Appendix 16 of the International Civil Aircraft Convention (Chicago 1944), volume 1, *Aviation Noise*, 3rd edition 1933; and the requirements of Part 3 of Aviation Rules (AP-36).

1.3. MATERIALS AND PRODUCTION TECHNIQUE

In producing the helicopter, the materials and techniques applied comply with the existing aviation standards and other reference documents.

1.4. SUPERVISION AND TESTING METHODS

The supervision and testing during manufacturing are carried out according to the existing reference documents.

1.5. HELICOPTER PROOFING

The helicopter's inner and outer surface proofing is carried out according to the existing reference documents.

1.6. STENCILLING AND INSCRIPTIONS ON THE HELICOPTER

All inscriptions on the helicopter's outer surface, stenciling and inscriptions in the cockpit and on the controls are in Russian. Under the customer's wishes, stenciling and inscriptions can be done in a foreign language.

A BRIEF DESCRIPTION OF THE HELICOPTER

2.1 CONSTRUCTIONS AND LAY-OUT DIAGRAM

2.1.1. The AK1-3 helicopter (Fig. 2.1) is a fabricated structure with a 3-bladed rotor and a 2-bladed anti-torque rotor.

2.2. HELICOPTER TYPE AND DESIGNATION

2.2.1. The helicopter falls into the normal category of light aircraft, and is designated to fulfill the following tasks:

- Patrolling (power lines, canals, pipelines, highways, hard-to-reach border regions);
- Agriculture (pollination, spraying, sowing, animal watch);
- Forest and wild animal protection;
- Advertising;
- Searching;
- Aerial inspection (aerial photography, geological and fishing exploration);
- Flying lessons for both military and civilian students;
- Participation in aviation sports competitions.

2.3 ENGINE TYPE AND QUANTITY

2.3.1. The helicopter uses one piston liquid-cooled engine produced by the Japanese Subaru, EJ-25 model, which is installed behind the cockpit.

2.4. DEVELOPER AND MODEL

2.4.1 The developer is Аэрокоптер Ltd., Ukraine.
Model: AK1-3 helicopter.

2.5. CREW PERSONNEL AND HELICOPTER'S TRANSPORTING CAPABILITIES

2.5.1. Depending on its mission, the helicopter crew may include one or two persons:

- A pilot;
- An observer (operator, trainee).

2.5.2. The helicopter is capable of transporting one passenger.

2.6 OUTER COATING

Coating and proofing of the helicopter's outer surfaces, engine, and components are carried out according to the existing norms and guarantee successful exploitation under different climatic conditions.

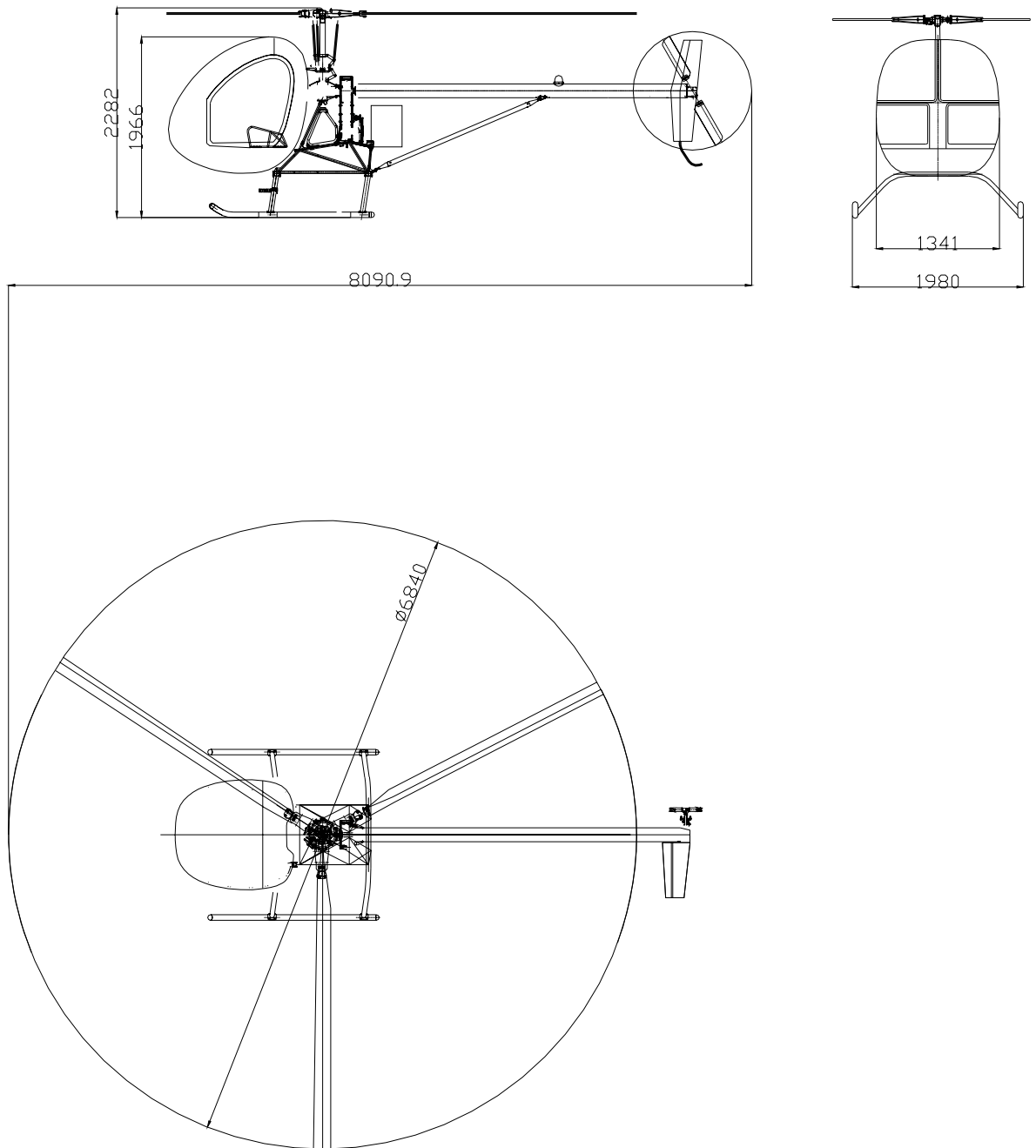


Figure 2.1. General View of the Helicopter

MAIN FEATURES

3.1. ESTIMATED WEIGHTS

3.1.1. Maximum takeoff weight	650 kg
3.1.2. Maximum weight of loaded helicopter without fuel	590 kg
3.1.3. Maximum payload weight (including pilot and fuel)	270 kg
3.1.5. Empty helicopter weight	380 kg
3.1.6. Helicopter equipment weight, including:	
- crew parachutes (2)	20 kg
- crew (2 persons)	160 kg
- protective helmets (2)	2.3 kg
- engine oil	3 kg
- unusable fuel	0,5 kg

3.2. REGULATION CURVES

Table 3.1

REGULATING DATA

#	Item	Deflecting direction	Deflection		Note
			degrees	mm	
1.	Slope angle of rotor axis	Forward	0		--
		Left	0	--	
		Right	0		
2.	Angle of rotor pitch	min	0	--	Crosshead traverse 24±1mm
		max	14°		
3.	Slope angles of wobble plate and control rod traverses that correspond to them	Forward	5°±20'	130	--
		Backward	4°±20'	110	
		Right	4°±20'	110	
		Left	4°±20'	110	
4.	Angle of incidence of anti-torque rotor a) with right pedal stopped b) with both pedals in neutral c) with left pedal stopped	--	+20°±20'	--	--
			+5°±20'		
			-10°±20'		
5.	Deflection of pedals from neutral	--	--	60±2	--

6.	Control rod labor not more than 3 kg.	--	--	--	Labor measurements are taken in the middle part of rods and footboards with TNV
7.	Foot pedals labor with anti-torque rotor attached not more than 7 kg.	--	--	--	
8.	Labor for the Lead/Gas shift, with normal shifting from one extreme position to the other taking no less than 20 seconds, not more than 5 kg.	--	--	--	> +15°.

3.3. CENTERING CHARACTERISTICS

3.3.1 Centering capacity during takeoff, flight, and landing:

- noseheaviness, before the rotor axis

38 mm

- bowheaviness, behind the rotor axis

59 mm

3.3.2. Longitudinal centering for an empty helicopter

173mm

3.4. FLIGHT CHARACTERISTICS

3.4.1. Maximum ground airspeed

186 km/h

3.4.2. Ground cruising airspeed

160 km/h

3.4.3. Rotation speed around vertical axis during hovering

< 45 degrees/s

3.4.4. Static ceiling for hovering

1500 m

3.4.5. Maximum ground climbing capacity

8 m/s

3.4.6. Minimal vertical descent rate while floating in autorotation regime at $V_{Desc}=90$ km/h

7,4 m/s

3.4.7. Flight duration at H=0 - 500 m with 5 % necessary fuel supply

3 hrs

3.4.8. Practical ground range ability with 5 % necessary fuel supply

450 km

3.4.9. Maximum exploitation load range

+0.5...+2.5

3.5. GEOMETRICAL DIMENSIONS

3.5.1. Tail unit	
Keel area	0.267 m ²
Stabilizer area	0.15 m ²
3.5.2. Cockpit	
Internal dimensions:	
- length	1.5 m
- width	1.4 m
- height	1.2 m
Entrance door	0.95x1 m
3.5.3. Undercarriage	
- length	1.8 m
- distance between skids	1.6 m

3.6. ENGINE INFORMATION

3.6.1. Engine quantity, type, and marking:	
one horizontal piston four-cylinder four-act liquid-cooled engine Subaru EJ-25.	
3.6.2. General characteristics of Subaru EJ-25:	
Engine working volume	2500 cm ³
Engine power	165 horsepower (121 kW)
Engine dry weight	110 kg
Overall dimensions of the engine:	
- length	0.8 m
- height	0.7 m
- width	0.5 m
3.6.3. Subaru EJ-25 operating limitations:	
Continuous working time in regime - unlimited	
3.6.4. Engine mounting units:	
- three shock-absorbing pads, of which two are on the engine mounting, and one near the flywheel.	

3.7. GEOMETRICAL ADJECTIVES OF THE ROTORS

3.7.1. Geometrical adjectives of the rotor	
- rotor diameter	6.84 m
- blade number	3
- carrier blade chord	0.17 m
- blade profile	NACA 63012/63015
- outline blade shape	rectangular
- peripheral velocity of blade tip	205 m/s
- duty factor	0.0475
3.7.2. Geometrical adjectives of the anti-torque rotor	
- rotor diameter	1.28 m
- blade number	2

- carrier blade chord	0.115 mm
- blade profile	NACA 63012
- peripheral velocity of blade tip	186.3 m/s
- duty factor	0.1144

3.8. ALTITUDE RANGES, OPERATING TEMPERATURE RANGES, AND WEATHER CONDITIONS

- 3.8.1. Temperature range: $-30\dots+30^{\circ}\text{C}$
- 3.8.2. Altitude range (limited by the absence of oxygen equipment) $0\dots3000\text{ m}$
- 3.8.3. The helicopter is designated for use under normal weather conditions in daylight according to visual flight rules in any latitudes.

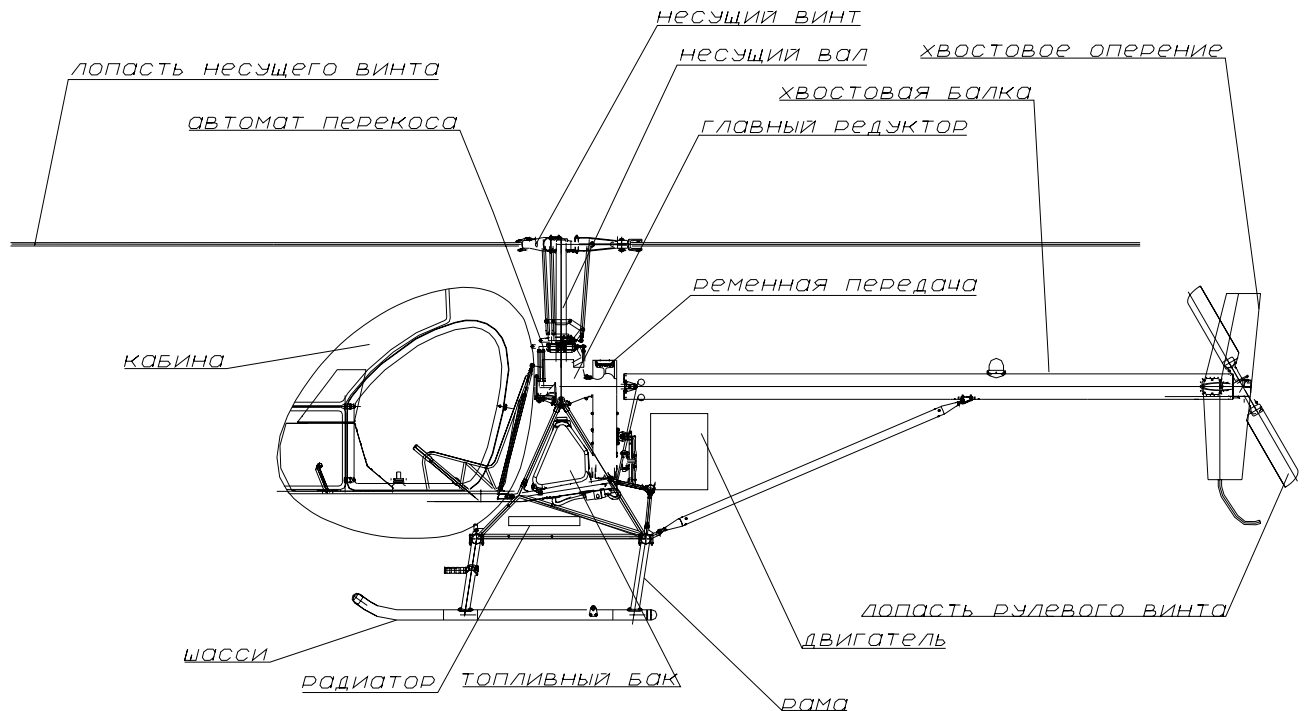
3.9. LIFETIME

The overall technical lifetime (design life) of the helicopter is 2,000 flight hours. The passing of design life is warranted by revisions and checkups that are included in regular technical service.

BRIEF DESCRIPTION OF THE HELICOPTER'S CONSTRUCTION

4.1. GENERAL PROVISIONS

AK1-3 (Fig. 4.1.) is a modular construction using different construction materials. In manufacturing the details and units we have considered the experience of similar production, technical documentation, and aviation building norms.



4.1. Legend:

Несущий винт	Rotor	Кабина	Cockpit
Лопать несущего винта	Rotor blade	Шасси	Undercarriage
Несущий вал	Drive shaft	Радиатор	Radiator
Хвостовое оперение	Tail unit	Топливный бак	Fuel tank
Хвостовая балка	Tail boom	Лопать рулевого винта	Anti-torque rotor blade
Автомат перекося	Wobble plate	Двигатель	Engine
Главный редуктор	Propulsion reduction gear	Рама	Framework
Ременная передача	Belting		

Figure 4.1. LAYOUT DIAGRAM

4.2. MATERIALS USED

The bulk of materials used in manufacturing the helicopter is presented in Table 4.1. Protective coating includes blueing, anodization, and painting.

Table 4.1

CONSTRUCTION MATERIALS

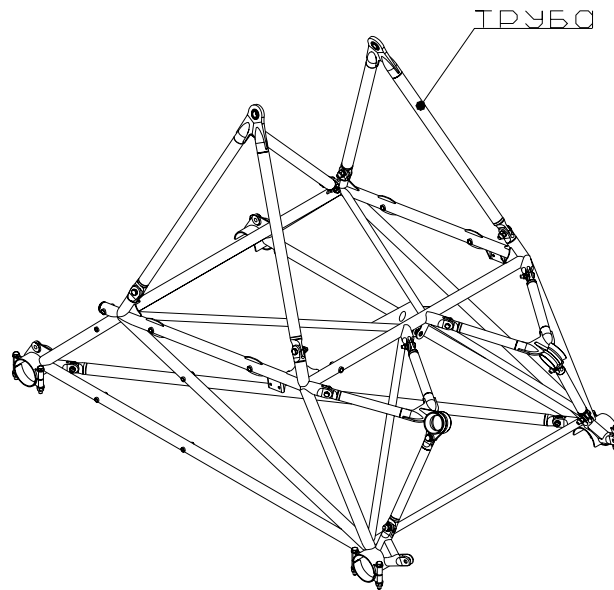
Name of component	Material
Rotor blades	Glass fiber cloth T-25 Organic fiber art.56313
Anti-torque rotor blades	Glue VK-41 TU1 596-67-80 Brass L63 GOST 931-70 Alloy POS-80 GOST 1499-91 Building agent EDT-69N Styrofoam Rohacell 51
Framework	Steel 30HGSA GOST 4543-86
Undercarriage	Steel 30HGSA GOST 4543-86 Alloy D-16T GOST 4784-97, PT 7-1
Wobble plate	Alloy D-16T GOST 4784-97, textolite, titanium VT 3-1 GOST 19807-91
Cockpit	Glass fiber cloth T-10-80 GOST 19170-73 Carbonic cloth Glass thread Lorit 287, 285, Styrofoam Acrylic plastic
Tail boom	Steel 30HGSA GOST 4543-86, titanium VT 3-1 GOST 19807-91, alloy D-16T GOST 4784-97, steel 08X15N5D2TS (VNS-2), rubber 7-B-14 TU 38405-395-78
Anti-torque rotor hub Rotor hub	Steel 30HGSA GOST 4543-86, VT 3-1, D-16T, bulk graphite zytel polyamide TU 6-05-988-93, , steel 08X15N5D2TS (VNS-2), glass fiber cloth T-25, building agent EDT-69N
Floor	16 mm plywood, glass fiber cloth T-10 Carbonic cloth Lorit 287, 285

4.3. FRAMEWORK

The framework (Fig. 4.2) is a welded construction made of pipes, and serves as a base for different components of the helicopter.

Overall dimensions:

1133x720x878 mm



Legend:

Труба	Pipe
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Figure 4.2. FRAMEWORK

4.4. COCKPIT

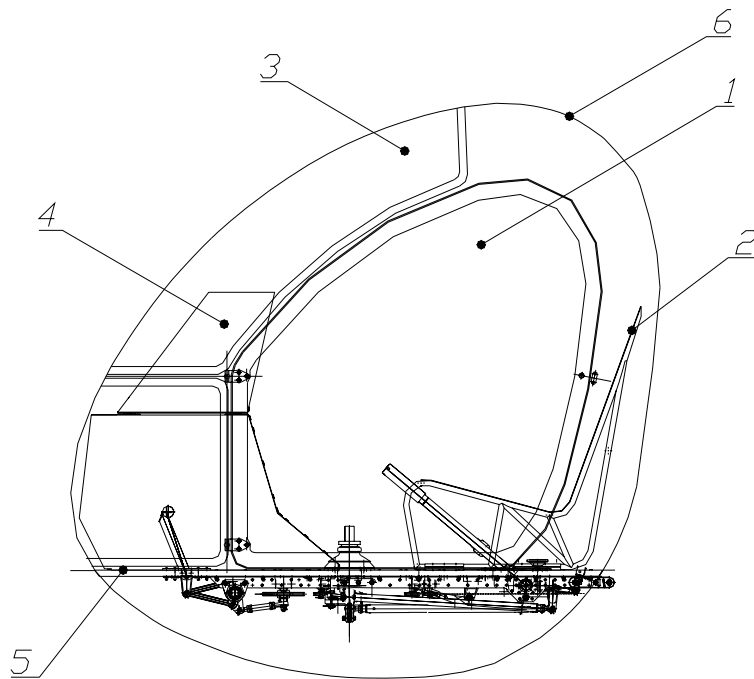
The cockpit (Fig. 4.3) is designed for the crew, the controls, and the equipment.

In the fore-part of the pilots' cockpit is a control panel with monitoring, В передней части кабины пилотов расположена приборная панель с комплектом контрольно-измерительных, aviation, and radio equipment. In the control panel's base is the cockpit heater. On the cockpit's ceiling are the headset holders; on the back panel is a n internal lighting lamp.

The cockpit's floor is a load-bearing element in itself, holding on it: pilots' seats, controls, control panel; and under it, elements of the control system for the rotor and the anti-torque rotor, elements of electric system, heating and ventilating systems.

The cockpit's glass paneling provides f good field of vision ahead, ahead down, left, right, and up.

The crew seats are not adjustable, since the field of vision is good in any position. The seats are also equipped with safety belts. Shoulder and lap belts are designed for reliable fixation of crew members during all stages of the flight.

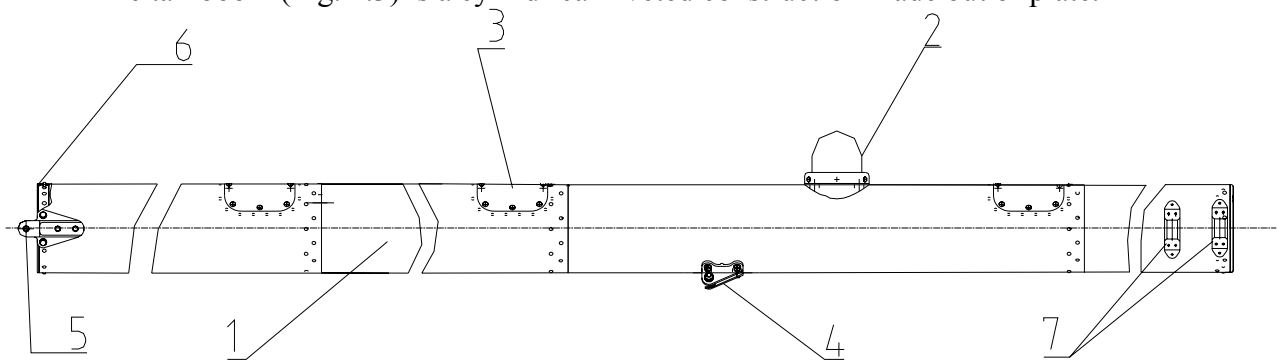


- | | |
|-------------------|------------------|
| 1. Door | 4. Control panel |
| 2. Seat | 5. Floor |
| 3. Glass paneling | 6. Cowl |

Figure 4.3 COCKPIT

4.5. TAIL BOOM

The tail boom (Fig. 4.3) is a cylindrical riveted construction made out of plate.



- | | |
|---------------------|-----------------|
| 1. Pipe | 5. Fork |
| 2. Light indication | 6. Frame |
| 3. Hatch | 7. Support fork |
| 4. Strut fork | |

Figure 4.4. TAIL BOOM

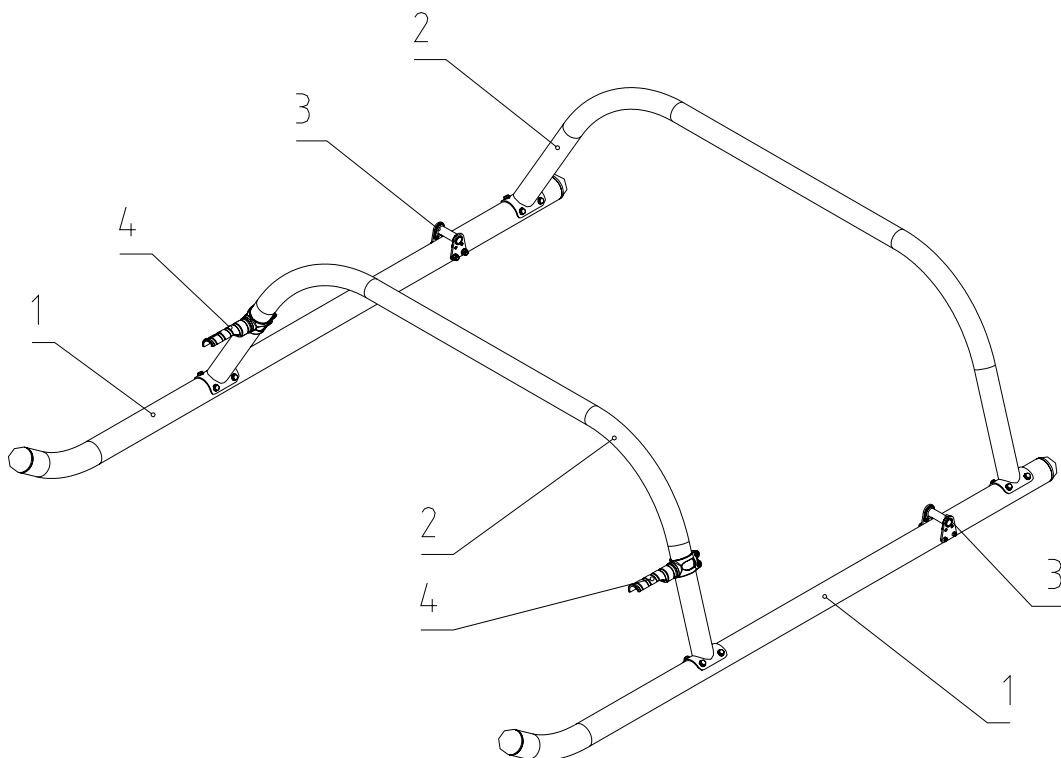
The tail boom holds:

- helicopter's light indication;
- four hatches (to access the main units of the tail boom);
- strut fork (the strut keeps the tail boom horizontal);
- fork attaching the tail boom to the V-belt drive;
- nine frames (for main units of the rotor control, and also as a wireframe for the pipe);
- fork for support and attachment of stabilizer.

The helicopter's stabilizer provides the necessary characteristics of directional stability and controllability in the main flight regimes for saving the necessary resources of directional control. The vertical empennage provides for yaw stability and relieves the rotor at high speeds.

4.6. UNDERCARRIAGE

The helicopter's undercarriage (Fig.4.5.) are skid-equipped.



1. Skids
2. Tubular spring
3. Rolling device fitting point
4. Footboard

Figure 4.5. UNDERCARRIAGE

The skids are made of jointless pipes.

For softening the impact during incorrect landing, the helicopter is equipped with springs made of bent pipes. The skids are equipped with holders for the detachable rolling device for land transportation of the helicopter within airports or hangars.

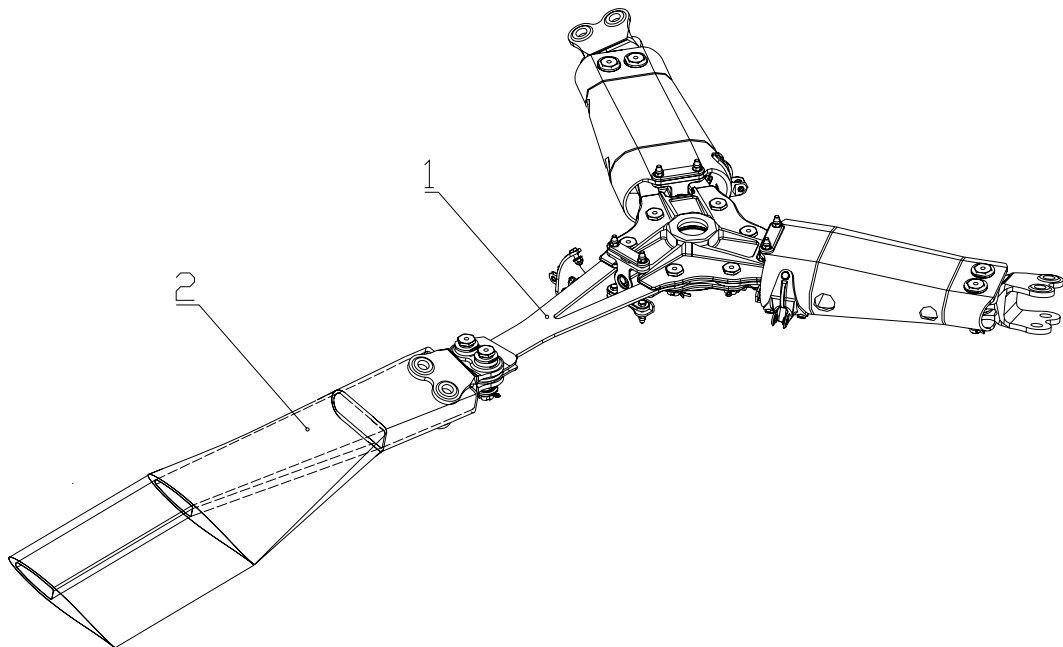
To make getting into the cockpit more comfortable, the footboards are attached to the fore springs.

4.7. ROTOR

The rotor (Fig. 4.6.) moves the helicopter.

There are three blades of rectangular shape made of composite materials with nonlinear twist and variable in width symmetric profile.

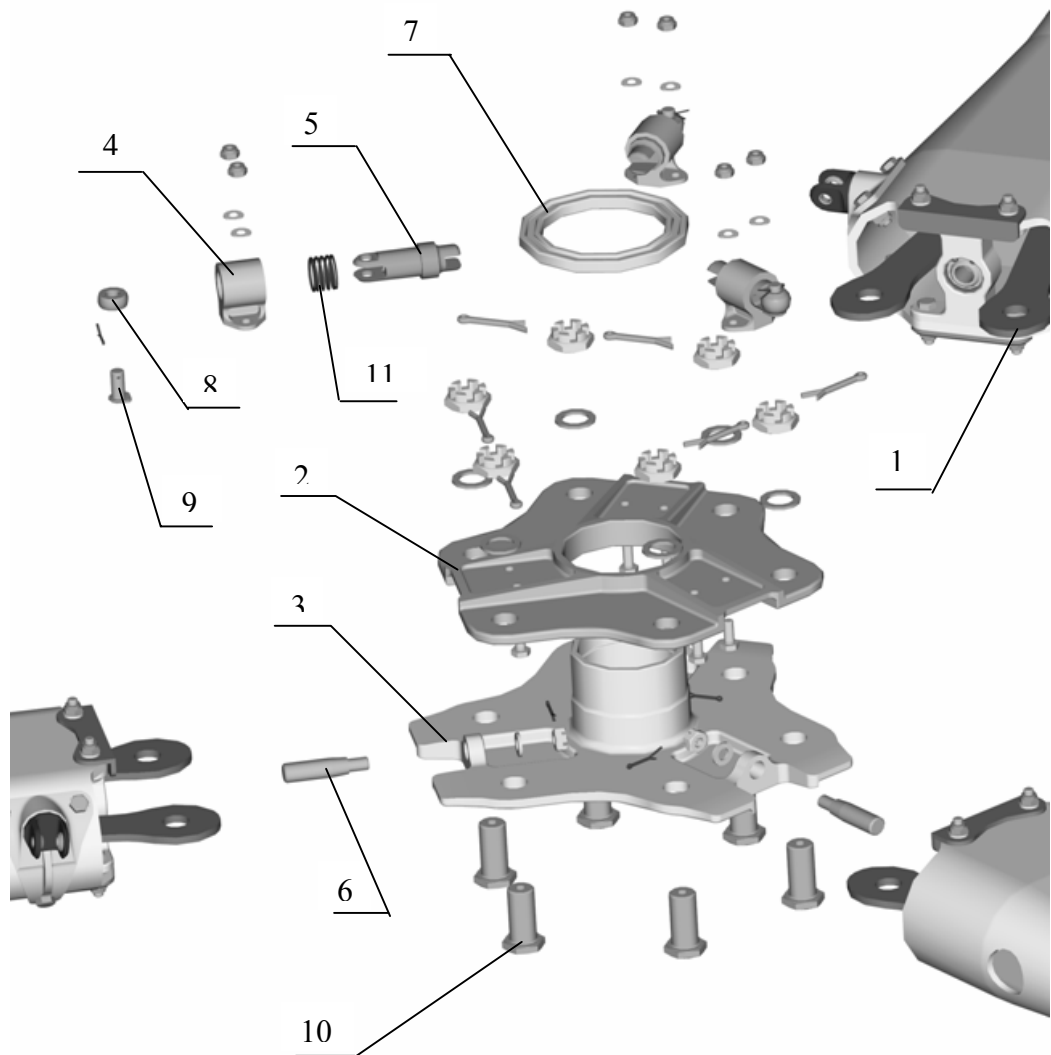
The blades are torsion-attached. Steel detail package VNS-2 serves as a torsion bar.



1. Torsion bar
2. Blade

Figure 4.6. ROTOR

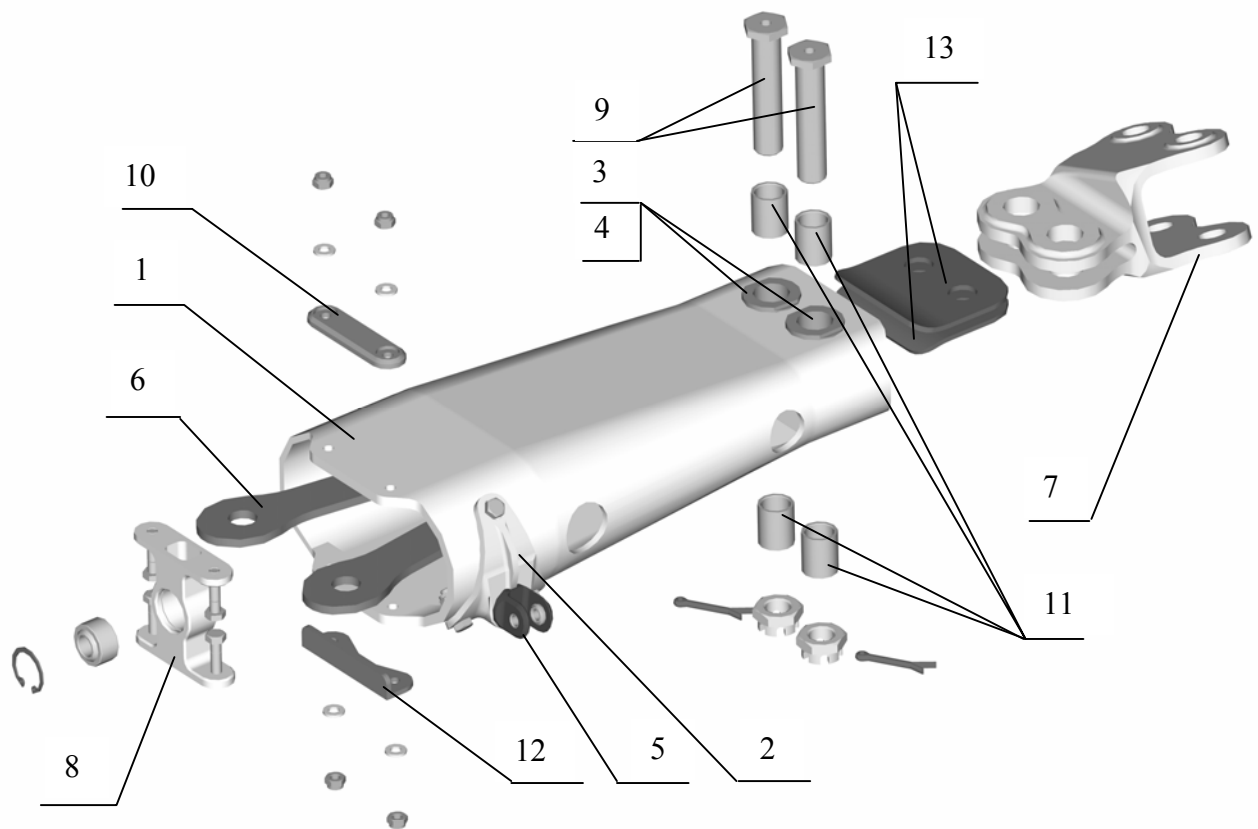
Torsion rotor hub (Pic 4.7.) successfully solves the problem of reliability of the blade fitting point, is easily manufactured, requires no service, and has a good weight characteristic. The hub details are corrosive-resistant.



1.рукав в сборе
 2. Тарелка нижняя
 3. Тарелка верхняя
 4. Корпус
 5. Ось

6. Штырь
 7. диск
 8.сфера
 9. ось
 10. болт
 11. пружина

Pic 4.7. Torsion rotor hub



- | | |
|---------------------|-----------|
| 1. Casing | 8. Body |
| 2. Ear | 9. Bolt |
| 3. Hub | 10. Plate |
| 4. Nut | 11. Hub |
| 5. Fork | 12. Rest |
| 6. Torsion bar | 13. Plate |
| 7. Torsion bar fork | |

Pic.4.8. ARM

4.8. ANTI-TORQUE ROTOR

The two-blade anti-torque rotor serves as a balance for the reactionary torque of the rotor and provides controllability. It is attached to a generic horizontal joint. The blades are made of composite materials.

The hub (Fig. 4.9) is made of aluminum alloys and steels.

The parameters of anti-torque rotor and transmission provide the necessary speeds of rotation around the vertical axis.

PROPULSION AND TRANSMISSION

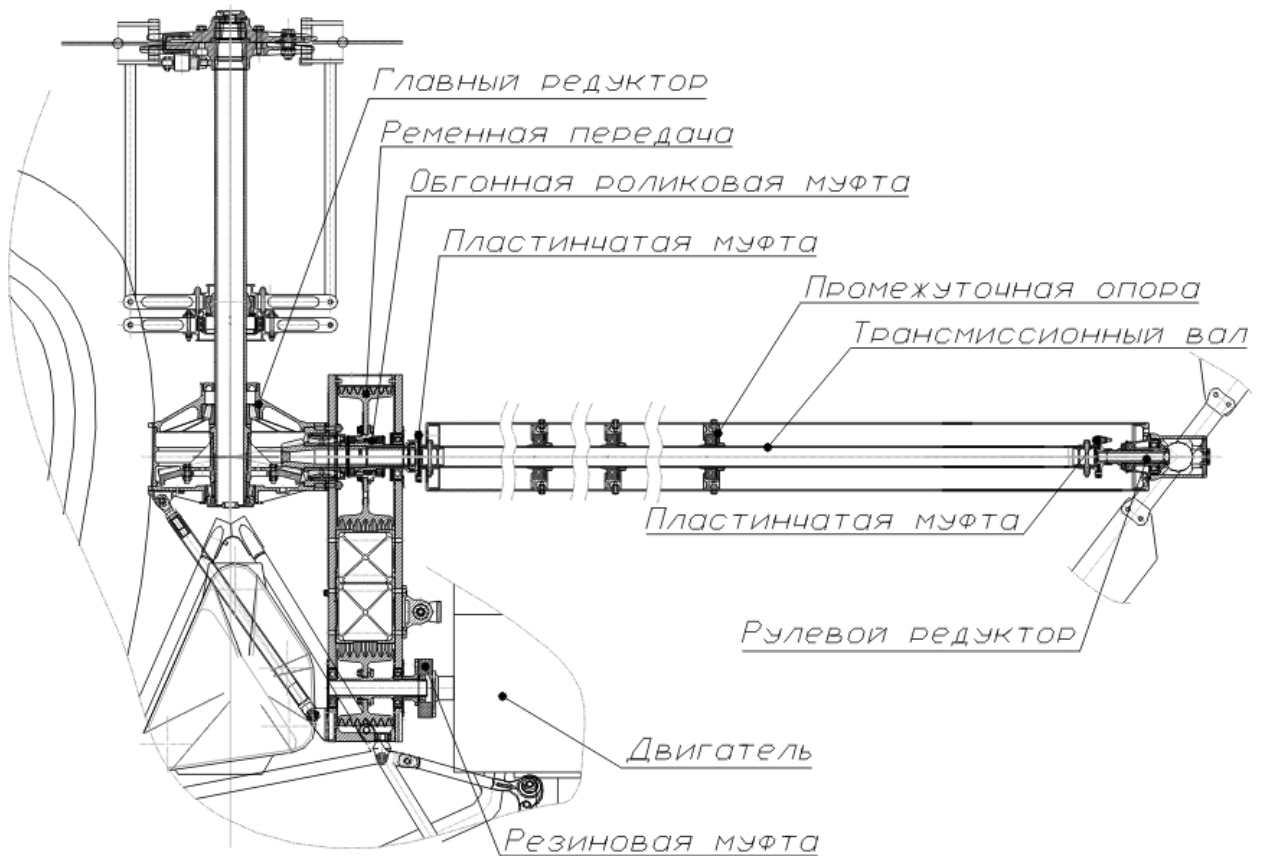
5.1. GENERAL INFORMATON

The helicopter's propulsion is mainly produced by the engine.

The helicopter features a piston engine Subaru EJ-25, which is horizontal, four-cylinder, opposed, four-act, and liquid-cooled. Its working volume is 2500 cm³, power – 165 horsepower (121 kW). The engine has a sixteen-valve gas-distributing mechanism with a distribution shaft in each of the two cylinder heads.

The engine is flexibly affixed to the framework. It is positioned in such a way, that with a specified centering it provides easy access to the devices which demand frequent service.

The helicopter's transmission (Fig. 5.1) provides the power transfer from the engine to the rotors, with rotary speed being the most advantageous for both rotors. Transmission is also responsible for the concrete direction of rotors and the power transfer for other devices and mechanisms.



Главный редуктор	Propulsion reduction gear	Промежуточная опора	Pillow block
Ременная передача	Belting	Трансмиссионный вал	Transmission shaft
Обгонная роликовая муфта	Free-wheel roller clutch	Пластинчатая муфта	Plate clutch
Пластинчатая муфта	Plate clutch	Рулевой редуктор	Steering reduction gear
		Двигатель	Engine
		Резиновая муфта	Rubber clutch

Fig. 5.1. TRANSMISSION LAYOUT

5.2. ENGINE

5.2.1. The engine's design philosophy:

- pyramidal combustors with spark-plug in the center and four valves (2 exhaust, 2 admission ones) for one cylinder;
- valve-levers are equipped with gap hydro-compensators;
- distribution shafts (in the left and right heads) are activated by one cogged belt, which also activates the cooling system pump situated in the left engine half-block. The cogged belt's tension is regulated automatically;
- the supporting crankshaft is positioned in the five main-bearings;
- the cylinder block is made of aluminum alloy through pressure die casting and is equipped with dry cast-iron liners mounted into the floor of the block.

5.2.2. Cooling system.

The propulsion cooling system is liquid-based. The cooling system radiator is situated in the lower part of the frame and forcibly cooled by the airflow created by two electric fans with step-by-step activation, mounted on the fan baffle above the radiator. For air supply from the approach flow, there is a fresh-air intake.

5.2.3. Engine starting system

The engine starting system is regular. The engine is equipped with an electric starter, a starter relay, and a starter button. The engine is started from a storage battery with the capacity of 60 Å/hr.

The storage battery is charged by a 12 V 70 Å generator, which includes a voltage control box and an electronic rectifier.

5.3. TRANSMISSION

5.3.1. The belting is responsible for power transfer through the flexible rubber clutch and the free-wheel roller clutch from the engine to the reduction gear drive shaft. The belt is a V-belt. There are seven belts.

5.3.2. The propulsion reduction gear is single, transmitting the rotational moment from the engine to the rotor shaft. The transmission is conical, with a circular cog. The propulsion reduction gear has one entrance.

The power is transmitted from the engine through the belting and the free-wheel clutch to the control shaft and the rotor shaft. The control shaft, through the flexible plate clutch, transfers the power to the transmission shaft, mounted on three pillow blocks. The transmission shaft, through the plate clutch, transfers the tension to the steering reduction gear.

The reduction gear uses bubbling oiling. The oil is filled through the filler neck, which is closed with a breather lid. Oil level monitoring is done with the help of the level indicator. To control the oil temperature, there is an oil-temperature sensor in the propulsion reduction gear, with indication appearing on the pilot's control panel.

5.3.3. The steering reduction gear is designated for rotating the anti-torque rotor. It has a 90° transmission. It has two conical cog-wheels with circular cogs, which are mounted on the frictionless bearings. The reduction gear case is made of aluminum alloy, and is attached to the tail boom's mainframe. The anti-torque rotor collective pitch control system is mounted on the takeoff shaft of the steering reduction gear.

5.3.4. The anti-torque axis shaft transmits power from the propulsion reduction gear to the steering reduction gear. The shaft consists of a pipe with plate clutches mounted on one end. It has three fulcrums, which include closed frictionless bearings in rubber casings. The units' mounting is done with the help of frames positioned in the tail boom.

5.4. NOISE LEVEL

The noise level produced by the helicopter is in compliance with the ICAO and environmental norms. Appendix 16 of the International Civil Aircraft Convention, *Aviation Noise*, vol. 1, chapter 3.

CONTROLLING SYSTEM

6.1. GENERAL PROVISIONS

To change the helicopter's flight configuration and counteract external disturbance, the helicopter uses an unassisted control system, with the help of which the pilot, operating the rotor and the anti-torque rotor, provides the helicopter's necessary position.

The control system is mechanical (Fig. 6.1).

The control linkages are rigid in the circular and collective pitch channels, and mixed in the itinerary channel.

6.2. WOBBLE PLATE

The wobble plate is the most responsible device in the controlling system.

The wobble plate is a mechanism which provides simultaneous angle of pitch change for all blades and circular pitch change depending on the blades' azimuthal location.

Moving the wobble plate along the rotor's rotational axis, with the control levers turning the blades to the same value, makes the blades' angle of pitch change.

Tilting the wobble plate relative to the rotor's rotational axis does the blades' circular pitch change. Rotating a tilted plate leads to displacement of the rotor thrusts, which connect the plate with the blade control levers, making the plates rotate relative to their longitudinal axes, which changes the azimuth pitch.

The wobble plate consists of rotating and nonrotating movable rings. It is mounted to the rotor shaft with a spherical joint, which slides along the shaft.

6.3. CONTROLS

The controls are situated in the cockpit and are divided into the main and auxiliary ones.

The main controls include the circular pitch knob, the rotor collective pitch lever, and the airway control pedal.

The auxiliary controls include the cockpit heater door control knobs.

The engine power correction twist-knob is mounted on the rotor collective pitch lever.

The change in collective pitch automatically changes the throttle plate position, which means the engine power correction twist-knob does not have to be used in flight.

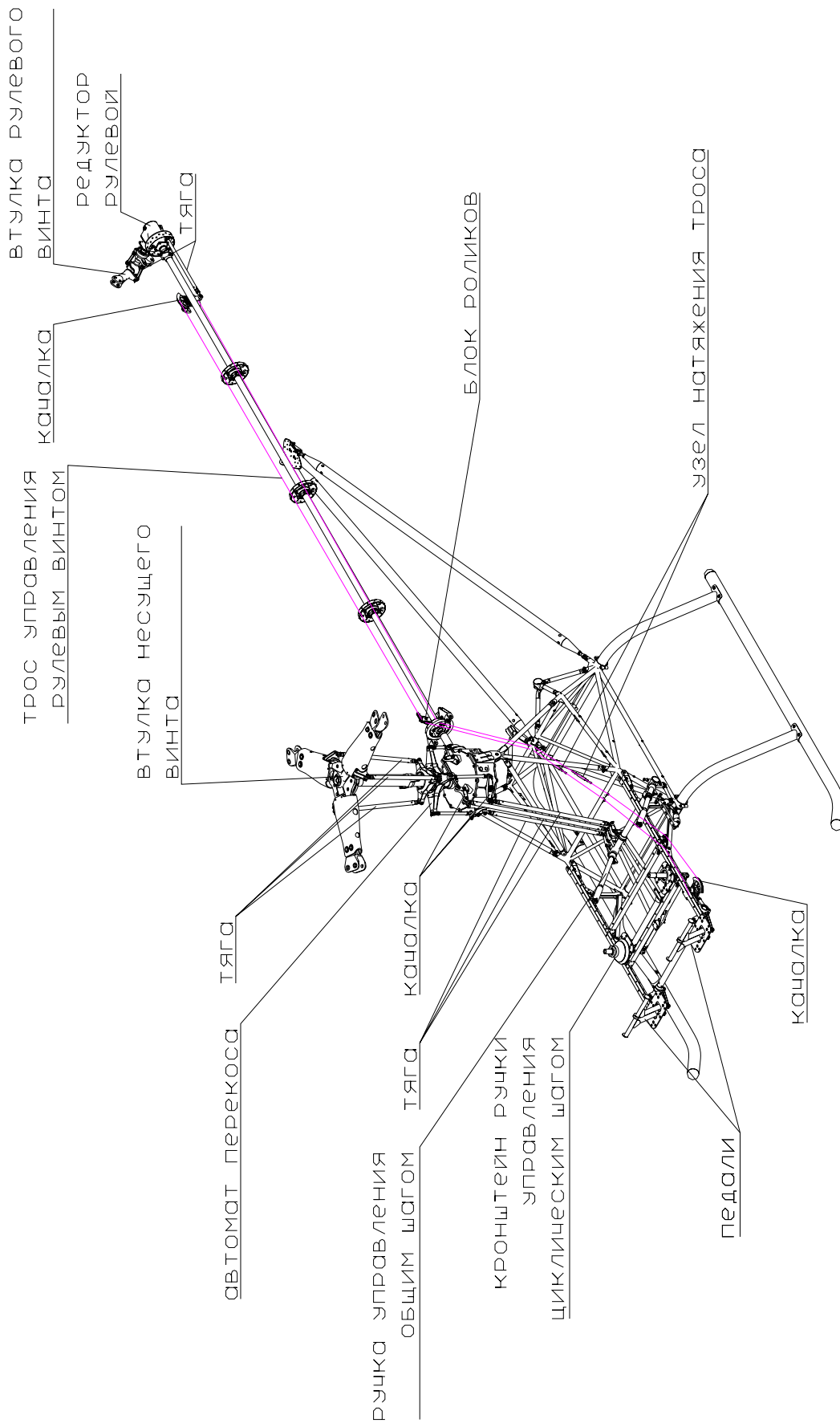


Figure 6.1 CONTROL SYSTEM LAYO UT

Legend:

Трос управления рулевым винтом	Anti-torque rotor control cable
Качалка	Walking beam
Втулка рулевого винта	Anti-torque rotor hub
Редуктор рулевой	Steering reduction gear
Автомат перекося	Wobble plate
Тяга	Rotor thrust
Ручка управления общим шагом	Collective pitch control knob
Блок роликов	Roller block
Кронштейн ручки управления циклическим шагом	Circular pitch control knob holder
Узел натяжения троса	Cable tension node
Педали	Pedals
Качалка	Walking beam

POWER-SUPPLY SYSTEM

7.1. GENERAL PROVISIONS

The helicopter's power-supply system (Fig. 7.1) is centralized and provides energy for the helicopter's equipment. It includes the 12V and 27V direct-current system and the 36V three-phase alternate current system.

7.2. 12V AND 27V DIRECT-CURRENT SYSTEM

The direct-current system includes:

- a 12V, 60 A/hr acid storage battery;
- a 12V 70A generator;
- a PN-27 transducer.

7.3. 36V THREE-PHASE ALTERNATE CURRENT SYSTEM

The 36V 400 Hz three-phase alternate current system includes a PT-3-36-400 static transducer.

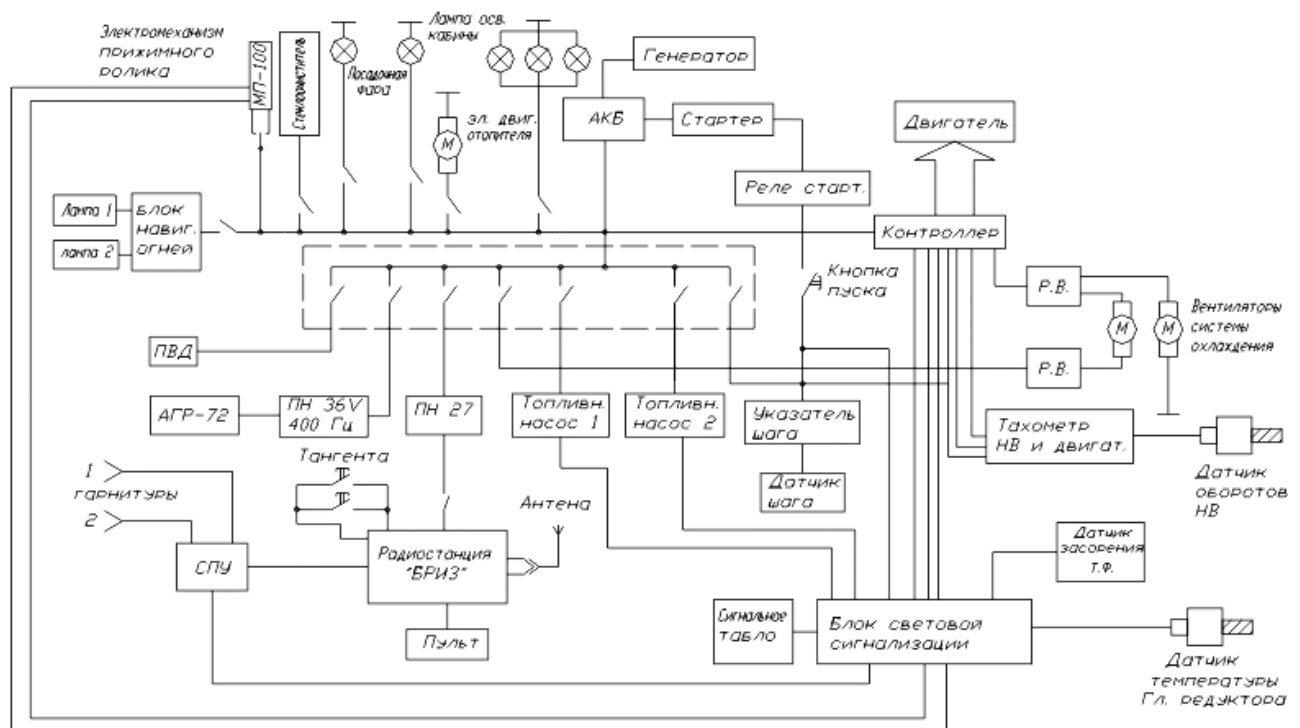


Figure 7.1. ELECTRIC CIRCUIT DIAGRAM

Legend:

Электромеханизм прижимного ролика	Clamping roller electric mechanism
Стеклоочиститель	Screen wiper
Лампа освещения кабины	Cockpit lighting lamp
Электрический двигатель отопителя	Heater electric engine
Генератор	Generator
Стартер	Starter
Реле старт	Start relay
Двигатель	Engine
Лампа	Lamp
Блок навигационных огней	Navigation lights block
Контроллер	Control unit
Кнопка пуска	Start button
Вентиляторы системы охлаждения	Cooling system fans
Топливный насос	Fuel pump
Указатель шага	Pitch indicator
Тахометр НВ и двигателя	Anti-torque rotor and engine tachometer
Датчик оборотов НВ	ATR rotation sensor
Гарнитуры	Headsets
Тангента	Flap
Антенна	Aerial
Датчик шага	Pitch sensor
Датчик засорения	Blockage sensor
Радиостанция «Бриз»	Breeze radio station
Пульт	Control panel
Сигнальное табло	Annunciation panel
Блок световой сигнализации	Annunciation unit
Датчик температуры главного редуктора	Propulsion reduction gear temperature sensor

FUEL SYSTEM

8.1. GENERAL PROVISIONS

The fuel system (Fig. 8.1) is designed for storing fuel in the helicopter and supplying the engine with it. The fuel used is high-octane petroleum of no less than 95 quality. Fuel tank capacity is 80 liters. The fuel is supplied from the tank to the engine through two fuel pumps. The fuel quantity in the tank is monitored by a fuel gauge, which has an indicator in the middle of the control panel. Monitoring of the pumps is done through annunciation panels.

Monitoring the engine fuel supply is done with the help of pressure indicator, which is situated on the control panel.

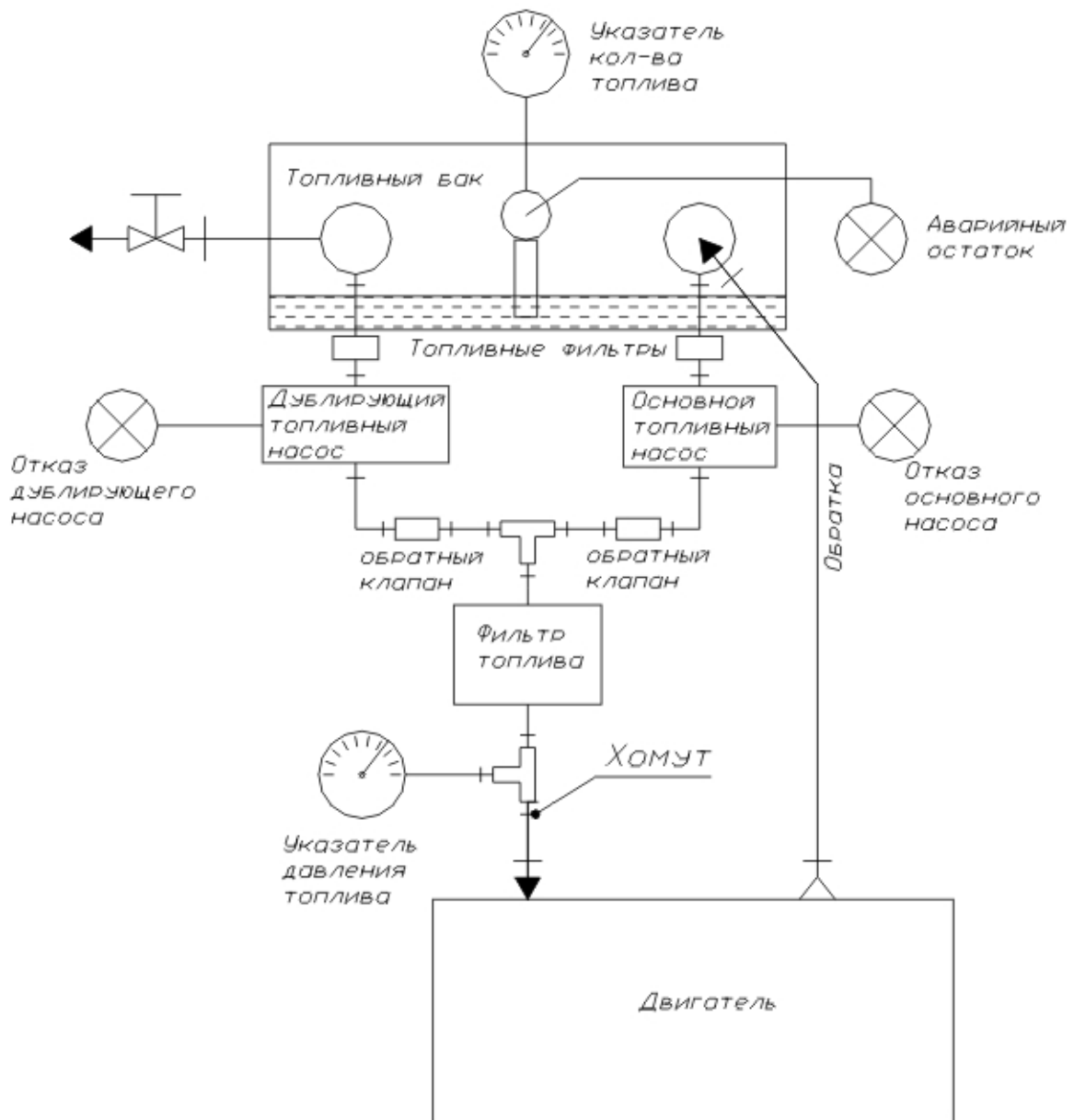


Figure 8.1 FUEL SYSTEM DIAGRAM

Legend:

Указатель количества топлива	Fuel quantity indicator
Топливный бак	Fuel tank
Аварийный остаток	Emergency resource
Топливные фильтры	Fuel filters
Отказ дублирующего насоса	Backup pump failure
Дублирующий топливный насос	Backup fuel pump
Основной топливный насос	Main fuel pump
Отказ основного насоса	Main pump failure
Обратный клапан	Check valve
Обратка	Feedback
Фильтр топлива	Fuel filter
Хомут	Clamp
Указатель давления топлива	Fuel pressure indicator
Двигатель	Engine

HEATING AND EVAPORATION SYSTEM

9.1. GENERAL CHARACTERISTICS

The heating and evaporation system (Fig. 9.1) provides hot or atmospheric air supply into the cockpit, and also for air-cooling the glass paneling. In heating regime, the air is taken from the atmosphere or the cockpit and into the heating unit, which is situated under the control panel and covered by boards. The heating unit includes:

- a liquid-based radiator;
- an electric fan;
- a plastic casing;
- plastic air ducts.

The supply of hot liquid to the heating unit's radiator from the helicopter's evaporation system is done by metal pipelines. Choke and liquid supply controls are situated on the lower electric panel in the cockpit. The choke regulates air supply from the atmosphere or the cockpit. In the back part of the cockpit there are ventilation slits.

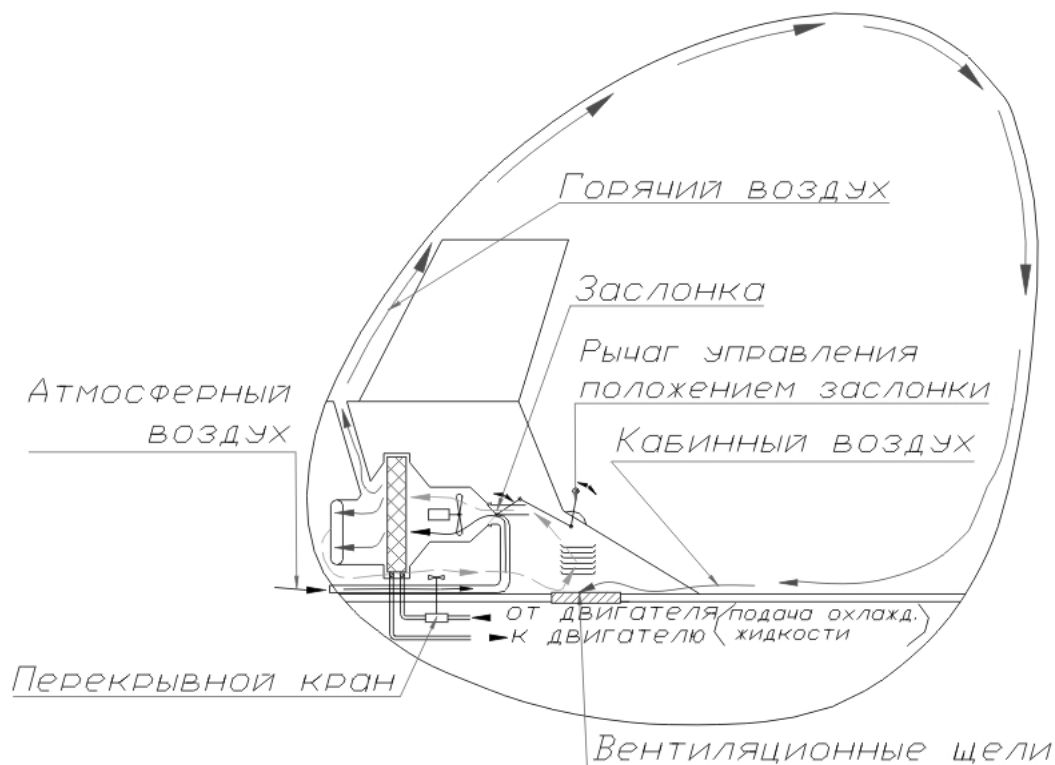


Figure 9.1 HEATING AND EVAPORATION SYSTEM DIAGRAM

Legend:

Горячий воздух	Hot air
Заслонка	Choke
Атмосферный воздух	Atmospheric air
Рычаг управления положением заслонки	Choke control lever
Кабинный воздух	Cockpit air
Подача охлаждённой жидкости от двигателя/к двигателю	Cool liquid supply to/from the engine
Перекрывной кран	Shutoff valve
Вентиляционные щели	Ventilation slits

GENERAL PROCESS TECHNOLOGY CHARACTERISTICS

- 10.1. Process technology development is basic in preparing the AK1-3 helicopter for production.
In developing process technology the source information was considered: design drawings of details, technical precision requirements, surface roughness parameter, and other quality requirements, such as yield. Technological processes were developed with regard to their regulation. This includes estimate and norm-setting in completing the work process; estimating the work category; estimating the material consumption norm.
- 10.1.1. Technological processes in part cutting
Before developing the technological processes for part cutting, each specific part's construction and function in a unit (mechanism) was examined, and manufacturability analyses were carried out. Design drawings of details contain all the data necessary for full understanding of the detail's manufacture and control, and comply with the existing standards.
- 10.1.2. Technological processes in part assembly
The technological processes of part assembly were based on assembly drawings, inspection specifications, and reference materials.
The assembly diagrams based on assembly drawings make the work process easier. There are subassembly diagrams for the elements which are dismounted unsorted and are parts of the article. And the parts dismounted separately are directly a part of the general assembly. The technological processes of part cutting and assembly are presented as flow-sheets and operational sheets.