MI-35M HELICOPTER MAIN PERFORMANCE AND DESIGN FEATURES

INTRODUCTION

This technical description of Mi-35M helicopter is a brief technical description based on Standard Specification, supplements to it, technical descriptions of the helicopter's systems and aggregates. The information is divided into five parts:

Part 1: General information on Mi-35M helicopter. In this part the information is given in the form of general brief data on the helicopter, geometrical characteristics and main performances.

Part 2: Armament complex. In this part the information on Mi-35M helicopter built-in gun armament, suspended missile and rocket armament as well as the coupling device for air troops installed inside the cargo cabin of helicopter.

Part 3: Equipment securing round-the-clock combat application of missile and rocket armament. In this part the following information is given: on KNEI-24E navigation and electronic indication complex on the base of multifunctional liquid crystal indicators, OPS-24N observation-sighting system, PrVK-24 sighting-computing complex, night vision goggles, adaptation of Lights for using of night vision goggles.

Part 4: Defense complex. In this part the information on active and passive helicopter defense means against enemy Air Defense means is given, as well as - against small arms.

Part 5: Brief description of helicopter systems and equipment. In this part the information on Mi-35M helicopter systems and equipment is given. These are such helicopter systems and aggregates as: fuselage structure elements, controls, power plant, hydraulic system, air conditioning system, fuel system, pneumatic system, aggregates cooling system, anti-icing system, instrument equipment and etc.

The given technical information is not completed. It serves for preliminary familiarization with Mi-35M helicopter structure and can be clarified and/or added at the contract preparation stage.

CONTENTS

Part 1

General information

PURPOSE OF THE HELICOPTER

Mi-35M army helicopter is a multipurpose having no analogues all over the world universal helicopter made under single-rotor scheme with a tail rotor, two engines and controlled by a crew of three persons.

The helicopter is intended for increasing of ground forces mobility providing them with fire support at the battle field, as well as for transportation of various cargos and transportation of troops and casualties.

THE HELICOPTER CAN BE APPLIED IN THE FOLLOWING VERSIONS:

In combat version:

- Destruction on front line of battle tanks, armored troop carriers, land forces combat machines, manpower in combat and pre-combat lines, artillery and tactical missiles at fire (starting) positions; radar posts, anti-aircraft means, front-line control points, as well as combat and transport airplanes and helicopters at parking sites;
- Elimination of air (maritime) assault troops and air-mobile regiments (platoons) in the landing area;
- Destruction of enemy's battle tanks and mobile forces broken through the front line, as well as its assault vessels for landing of assault troops;
- Providing of operative-tactical and air troops flies into landing area and support of their combat actions;
- Isolation of combat area and enemy's attack forces from approaching operative reserves, attacking of bridges, railroad units and stations, control points and communication means paths in mountains, airfields, maritime and river ports;
- Searching and destruction of small-size aerostats in air
- Searching and destruction at the day time at the depth of up to 250km from deployment airfield:
  - Movable and fixed small-sized armored targets;
  - High-speed caters, frigates and the maritime and river vessels;
  - Bridges, and other fortified targets;
  - Low-speed air targets and combat transport helicopters, transport airplanes with providing of high survivability of the helicopter in enemy's anti-aircraft hard counteractions conditions;
- Air surveillance of the enemy.

In assault version:

- Transportation of eight equipped troopers directly to combat action area through zones of firers, floods, mine fields, as well as through hard-to-access terrain areas for other types of transport;
- Landing of operative-tactical and tactical air troops by the way of landing trooping.

In transport version:

- Transportation of ammunition and small-size cargoes weighting up to 1500kg placed in cargo cabin;
- Transportation of large-size cargoes weighting up to 2400kg on external sling;

In ambulance version:

- Transportation of two laying on stretchers and two sitting on seats casualties with one medical attendant;
- Search and rescue of airplane and helicopters crews under emergency;

In ferry version:

- Ferry flight to maximum distance up to 971 (including guarantee fuel reserve of 190 kg (240 l) which is remaining fuel after landing) with four extra fuel tanks installed

Re-equipping from one version into another is possible in field conditions.

Mi-35M helicopter is created on the base of Mi-35 serial helicopter with the purpose to provide of round-the-clock combat tasks accomplishment, increasing of its combat power and improvement of its tactical-technical characteristics.

THE NEW MI-35M HELICOPTER PROVIDES ROUND-THE-CLOCK ACCOMPLISHING OF THE FOLLOWING MISSIONS IN REAL COMBAT APPLICATION CONDITIONS:

- combat application of guided and unguided helicopter armament in simple and limited-adverse weather conditions round-the-clock;
- implementation of route-flight at altitudes of 10-25 m at day time and 50-200 m at night over the ground surface with approaching the target in the preset area at the distance of 150-200 km at night over the ground surface with approaching the target in the preset area at the distance of 150-200 km with accuracy of ±150m.

Flight data, flight-navigation equipment complex and automatic control system allow the helicopter to perform flights at any time in simple and adverse weather conditions on visual flight rules, as well as on instruments along any air routs and over non-reference point terrain, and over water surface.

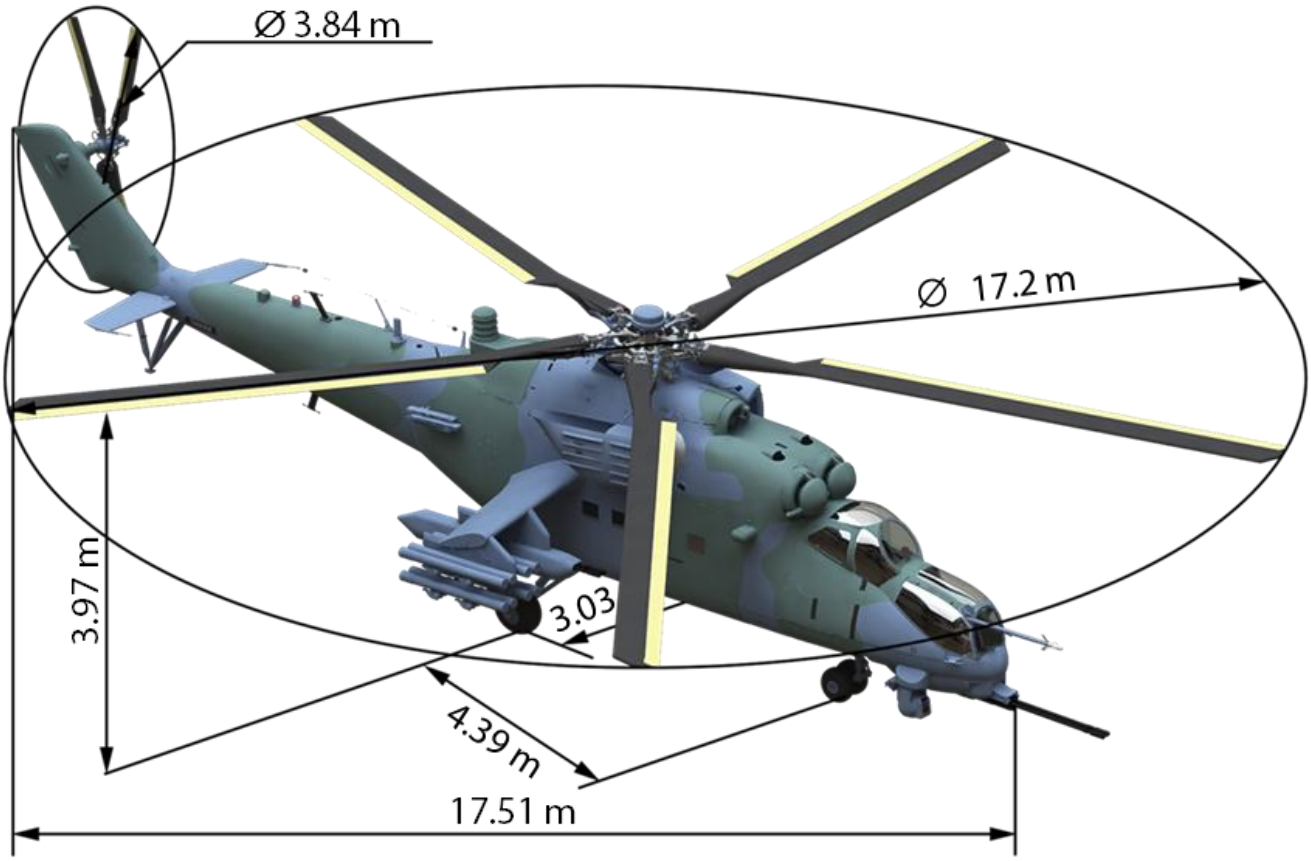
MAIN DESIGN FEATURES OF MI-35M HELICOPTER

The following items are installed on Mi-35M helicopter:

- VK-2500 engines;
- Main rotor with fiber-glass main rotor blades and new;
- X-shape tail rotor;
- Shortened wing with built-in load-lifting system;
- Non-retractable landing gear;
- NPPU-23 non-removable flexible gun;
- DB3-UV external store racks with removable locks.
- KNEI-24E navigation and electronic indication complex, allowing performance of flights at day-and-night and adverse weather conditions;
- PrVK-24 sighting-computing complex;
- 9K113K guided armament complex;
- OPS-24N observation-sighting system of round-the-clock application;
- GEO-ONV1-01M night vision goggles;
- Suspended fuel tanks each of 560 l capacity (in ferry version).

These changes allowed enhancing helicopter's weight characteristics and performance, considerably improve accuracy characteristics and combat efficiency of armament.

MAIN PERFORMANCE AND GEOMETRICAL DATA



Empty helicopter weight, kg	8360
Helicopter normal takeoff weight, kg	10900
Helicopter maximum takeoff weight, kg	11500
Maximum combat payload, kg	1625
Maximum useful payload, in transport version, kg	up to 2400
Crew, persons	3
Engine	VK-2500-02
Power, h.p.	2 x2200
Maximum speed, km/h	300
Service ceiling, m	5400
Hovering ceiling OGE, m	3470
Practical flight range, km	460
Ferry range, km	up to 971

Part 2

Armament complex

BUILT-IN GUN ARMAMENT

The built-in gun armament of the helicopter comprises non-removable flexible NPPU-23 gun unit, which is controlled remotely.

NPPU-23 unit is intended to destroy ground, surface, air targets, as well as enemy's manpower within the selected front sector of the helicopter at the range 800…3000 m, at altitude 20…200 m and airspeed 80…300 km/h when shooting is done by the gunner;
100…300 km/h when shooting is done by the pilot (in the initial position of the gun barrels).

NPPU-23 of the Mi-35M helicopter comprises:

- ✓ U-23 unit with GSh-23L gun and remotely controlled aggregates;
- ✓ Cartridges container and ammunition feed chute with electrical boost;
- ✓ Control and switching elements.

NPPU-23 is used along with PrVK-24 sighting computer and OPS-24N day/night observation-sighting system with MFI (from KNEI-24E complex).

NPPU-23 MAIN CHARACTERISTICS

Gun type	GSh-23L
Caliber, mm/inch	23/0,91
Rate of shooting, shots/min	3000…3400
Initial speed of round, m/s	700…730
Feed	Belt feed, continuous
Drive and shooting control	Electrical, remote
Charging and recharging	pyrotechnic
Sleeves and belt links ejection	outside the helicopter
Shooting angles:	
in vertical plane	$+ 10^0$; -40^0
in horizontal plane	$\pm 60^0$
Ammunition set, pcs.	450

VERSIONS OF SUSPENDED GUIDED ARMAMENT

"SHTURM" AND "ATAKA" MISSILES

Guided missile armament installed on the helicopter is intended for destruction of small-size lightly armored mobile and fixed ground (water) targets, field buildings of pillbox type, funk-holes and other objects, as well as low-speed air targets (helicopters and airplanes).

An upgraded 9K113K missile complex for day and night application is installed in the helicopter.

9K113K complex is matched conjugated with PrVk-24sighting computer complex and KNEI-24E navigation and electronic indication complex.

9K113K complex includes:

- ✓ OPS-24N observation-sighting system of day and night application;
- ✓ 9S477K-1 command radio-line equipment
- ✓ 9S476M ballistic computer

OPS-24N is a part of 9K113K missile complex ensuring day and night application of missile and rocket armament.

9K113K complex is designed for missiles launching: 9M120, 9M120F (Ataka) and 9M114, 9M114F (Shturm).

MISSILES MAIN CHARACTERISTICS "SHTURM" AND "ATAKA" MISSILES

	"SHTURM"	"ATAKA"
Caliber, mm	130	
Average flight speed, m/s	420	400
Hitting range, km	5	5,8
Armor piercing, mm	650	800 with dynamic protection
Weight, kg: starting / warhead	35,0 / 5,4	42,5 / 7,4
War head	Cumulative-shell, High-explosive	
Guidance system	Radio command, semi-automatic	
Ammunition set, pcs.	up to 8	

VERSIONS OF SUSPENDED UNGUIDED ARMAMENT

B8V20-A UNITS COMBAT APPLICATION VERSIONS

Unguided rocket armament of Mi-35M helicopters provides aiming and launching of rockets from the pilot's station. Aiming during launch is performed by the pilot. Launch of rockets is performed by pushing the button on pilot's cyclic control stick.

B8V20-A rocket pods are used on Mi-35M helicopters with S-8KO and S-8KOM rockets. The rockets are intended fro effective destruction of lightly armored targets, square targets, as well as fro destruction of enemy's manpower in shelters.

S-8KOM ROCKET MAIN CHARACTERISTICS

Caliber	80 mm
Length	1,57 m
Rocket weight	11,3 kg
War head weight	3,7 kg
Armor piecing capability	400 mm
Ammunition set, pcs	20

SUSPENDED SMALL ARMS

GUNS COMBAT APPLICATION VERSIONS

Removable small arms/guns include two containers UPK-23-250 with double-barreled gun in each.

UNIFIED GUN POD UPK-23-250

With a gun of 23mm caliber is intended for destruction of non-armored and armored ground (water) targets, enemy's manpower, as well as for destruction of low-flying air targets in the front hemisphere of the helicopter when using of its maneuverability in visual visibility conditions at day and night. Containers UPK-23-250 are suspended on internal store racks.

MAIN TECHNICAL CHARACTERISTIC

Rate of shooting	up to 3400 shoots/min
Initial velocity of cartridge	715 ±15 m/s
Weight of gun	51 kg
Ammunition set	250 pcs.
Weight of pod	
▪ without gun and ammunition set	Not more than 70 kg
▪ with gun and without ammunition set	120 kg

APU-8/4-U launcher, S-8 rocket packs and UPK-23-250 are suspended by means of locking mechanisms of DB3-UV external store racks. 4 pieces of DB3-UV external store racks are incorporated into the helicopter, 2 pieces on each stub-wing.

IN-BUILT LOAD LIFTING SYSTEM

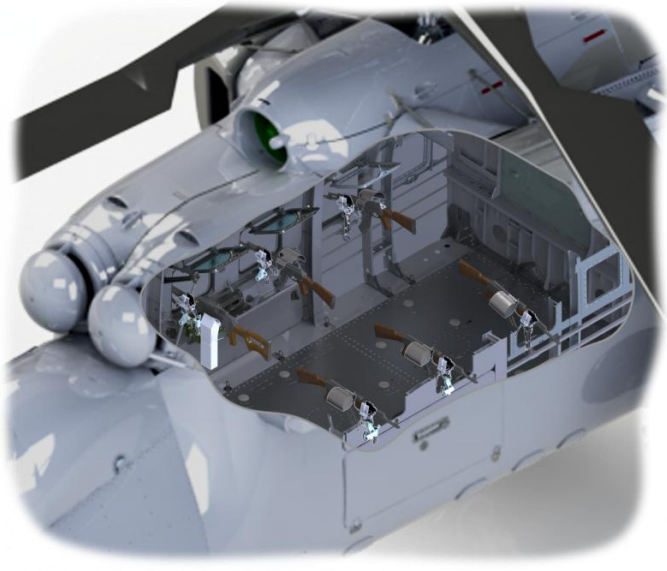
In-built load lifting system (ILLS) is intended for suspension of various special cargos to helicopter beam racks at any unequipped ground.

Main technical data:

– system weight, kg	3;
– winch cable length, m	5.80;
– weight of cargo being lifted, kg	500;
– maximum force at handle, kgf	30.

PIVOT-TYPE MOUNTS FOR SMALL ARMS

Pivot mounts are designed to fix small arms of troops in window and door openings in order to fire the AKM sub-machine gun and RPK machine gun at ground targets in flying in a visual environment.



To provide with opportunity to fire from sub-machine guns and machine-guns, the low clamshell doors are designed with quick removable pivot-type gun mounts to be used by troops with the upper doors of cargo cabin open and LH and RH lower ones closed, the upper doors being opened and fixed on the ground by locking pins prior to a mission.

Pivot mounts consist of:

- Six pivots to fix AKM sub-machine guns or RPK machine guns;
- Six empty case diverters for RPK and six empty case containers for AKM.

To avoid damage to the own helicopter structure, the movement of each pivot is limited both laterally and vertically.

Part 3

Provision of round-the-clock combat application

NAVIGATION AND ELECTRONIC INDICATION COMPLEX KNEI-24E

Navigation and electronic indication complex KNEI-24E allows to perform flying at any time in adverse weather conditions

KNEI-24E complex is intended for:

- ✓ helicopter's present position coordinates reckoning (P POS);
- ✓ correction of reckoned P POS using data from SN-3700 satellite navigation system;
- ✓ visual correction of P POS by typical reference points;
- ✓ programming and storing in permanent memory data on 8 flight routes (up to 24 WPT per route), on 99 waypoints (WPT), on 99 aerodromes (ADR), on 99 radio beacons (RB);
- ✓ on-line re-programming of route in flight;
  - ✓ storing in permanent memory of up to 10 operational waypoints (SWPT), their coordinates, date and memory time in the nonvolatile memory of MFC;
- ✓ route mapping against the background of the electronic map of terrain, or without it, providing change of image's scale and quantity of displayed objects;
- ✓ storing in permanent memory electronic map of terrain;
- ✓ receiving, processing and indication of flight-navigation data;
- ✓ receiving, processing and indication of data from OPS-24N;
- ✓ receiving, processing and indication of data on failures of KNEI-24E units and units interacting with the systems;
- ✓ receiving, processing and indication of data on achieving flight reference parameters, limits of operation tolerances in bank, pitch and speed depending on flight altitude, as well as descent lower than dangerous altitude set out on RV-5M altimeter;
- ✓ output of data displayed on one of the IV-86-2 indicators for recording in a form of a standard TV signal;
- ✓ output of data to coupled systems;
- ✓ control of electronic indication modes from IV-86-2 indicator's button framing;
- ✓ display of PrVK-24 sight data and its control from IV-86-2 indicator's button framing.

KNEI-24E complex ensures precise identification of helicopter position:

- in autonomous reckoning mode using data from DISS-15G-E and compass system	6% max from the passed distance
- in correction mode using data from satellite navigation system	160 m max
- Readiness time	3,5 minutes max

KNEI-24 complex includes:

- ✓ three IV86-2 multifunctional indicators (two in Pilot's-in-command cabin and the other operator's cabin)
- ✓ MVK-03 multifunctional computer;
- ✓ UVV-B input-output device;
- ✓ BRK-46 event signals unit;
- ✓ SN-3700-03 sensor of satellite navigation system;
- ✓ SVS-V1-1E air data computer system
- ✓ UR5-2 amplifier-splitter;
- ✓ power supply unit BP;

Arrangement of KNEI-24E complex on helicopter

Units MVK-03, UVV-B, SNS-3700-03, BRK-46, BP are arranged in the rear landing gear compartment. Unit UR5-2 is installed on RH side of operator's cabin. Unit VVS-V1 of SVS-V1-1E system is installed in the radio compartment on the LH side in direction of flight, and tempera-ture indicator P-104 – on fuselage skin near the radio compartment underneath on the RH side.

Antenna SN-3700-03 is installed on top of the tail boom. Gyro horizon AGR-29RS-15 is ar-ranged on pilot's instrument panel to the left. Helicopter indicator display modules IV86-2 yare installed on pilot's instrument panel (two) and in operator's cabin (one).

Indicator graphical converters are installed:

- ✓ of operator's indicator – on RH side of operator's cabin(front);
- ✓ of pilot's indicator (left) – on RH side of operator's cabin(rear);
- ✓ of pilot's indicator (right) – on RH side of pilot's cabin, underneath.

KNEI-24E complex main technical data

Helicopter position detection accuracy:
- in automatic reckoning mode from DISS-15G-E and course system GREBEN-1 and from traversed way within 1 flight hour, %, not more than 6
- in correction mode from SNS, m/feet, not more than 160

Power supply voltage and consumed power:
- from DC, 27V power system, Wt 240
- from AC 115V, 400Hz power system, VA 110
- from 3-phase AC 36V, 400Hz power system 42

Time of readiness, min, not more than 3,5
Weight, kg/pounds 33

IV86-2 MULTI-FUNCTIONAL INDICATOR

IV-86-2 helicopter indicator is intended to:
- ✓ To display information from MVK, data sensors, observation systems as information-parameteric shots, emergency signals of units from the complex set and conjugated systems;
- ✓ To display information from OPS-24N observation-sighting system and PrVK-24;
- ✓ To control KNEI-24E using buttons;
- ✓ Output of information to videotape recorder, displayed on IV-86-2 screen;
- ✓ Storing in permanent memory the electronic map.

Indicator consists of two monoblocks: display module and graphic inverter, connected by the cable.

MAIN TECHNICAL DATA

Screen type	Color LCD
Effective screen area	211.2x158.4 mm
Definition	600x800 px
Number of available color hues	256000
Number of brightness gradation of monochrome image	64
Maximum brightness	700 kd/sqm
Image contrast (when exterior illumination is 108000 lx)	10:1
Maximum permissible observation angles	
▪ Across	± 30°
▪ Upright	From +25° up to -5°
Types of displayed information	Alphabetical-digital, graphic and TV
Number of buttons	20
Interfaces and number of channels:	
▪ GOST 18977-79 (ARNC 429)	3 incoming, 1 out coming

▪ GOST 7845-79S (STANAG 3350, black-and-white TV signal)	1 incoming, 1 out coming
▪ VGA (color TV signal)	1 incoming
Time of readiness depending on ambient temperature	– 15s
Supply voltage	27V and 115V, 400 Hz
Consumed power	
▪ 27 V circuit with heating	200 W
▪ in 115V circuit	80 VA

LOCATION OF MFI IN PILOT'S CABIN

LOCATION OF MFI IN OPERATOR'S CABIN

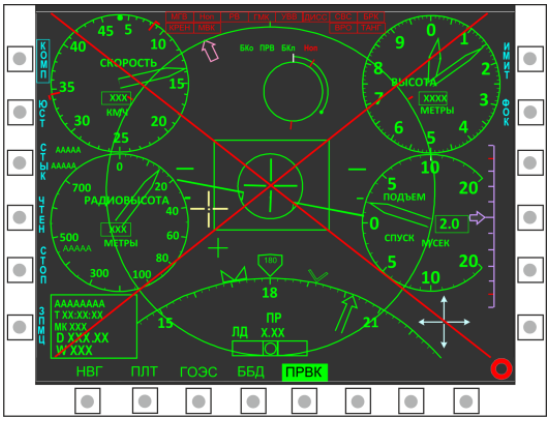
INFORMATION DISPLAYED ON MFI OF KNEI-24E COMPLEX

Frame “Navigation” ("Навигация") is a field of conventional map picturing current flight route around which elements of navigation environment indication are arranged.

A selected scale is displayed on a counter which is shown between the buttons. Scale value (1, 2, 5, 10, 20, 50, 100, 200) is given in km or miles against selected measuring system.

Frame “Flight” ("Пилотаж") is a set of indicators essential to fly the helicopter.

In “GOES” (“ГОЭС") mode the screen of IV86-2 shows infrared or television picture of terrain obtained by means of GOES-342 with overlapping flight, navigation and sighting data.



Frame “TSS” ("ПРВК") is the total of information shown in frame “GOES” ("ГОЭС") and sighting data of PrVK-24 against the background of infrared (television) image. “TSS” ("ПРВК”) frame is integral. It contains all graphical data which may be displayed in response to commands of PrVK-24.

The Airborne database is stored in the nonvolatile memory of MFC. Access to ADB is possible through pressing button “ADB” ("ББД"), page “Airborne database” ("Бортовая база данных") now opens.

ADB stores the following: navigation points (NP); airfields (AFLD); radio beacons (RB); operational waypoints (SWPT) (in ADB designated “Memory” ("Память"); routes (RTE).

MVK MULTI-FUNCTIONAL COMPUTER

Multifunctional computer MVK-03 (MFC) is intended to implement the algorithm of KNEI-24E operation, digital processing of data and provide interaction among systems incorporated in KNEI-24E and interfacing systems.

Power is supplied simultaneously from two independent sources of power-supply system (27 V DC).

Time of readiness considering necessary checks and transmission of control to user program – not more than 18 seconds.

UVV-B INPUT-OUTPUT DEVICE

Input/output device UVV-B is intended to convert data from analog systems of helicopter into SBC (ARINC-429) and communicate it to consumers.

BRK-46 EVENT SIGNAL UNIT

The discrete commands unit BRK-46 is designed for converting the discrete signals (discrete commands) of the “+27 V/break" ("+27 В/разрыв") or “ground/break" ("корпус/разрыв") type into a serial bipolar code (SBC) and vice versa.

The BRK-46 unit provides collecting discrete commands of serviceability from the airborne systems integrated with KNEI-24E system and discrete commands from armament controls as well as converting them into an ARINC-429 code for output to MFC and BCU-24.

SN-3700-03 SATELLITE NAVIGATION SYSTEM

The Sattelite Navigation System is intended for determining helicopte position and speed, as well as the current time by signals of navigation satellites and space navigation systems of "GLONASS" and "NAVSTAR" type in any point of the Earth, at any time of the day, in any weather conditions.

Satellite navigation system provides output to IDC of helicopter present location coordinates: altitude, speed, GLONASS system current time or Coordinated World Time State Standard (CWTSS).

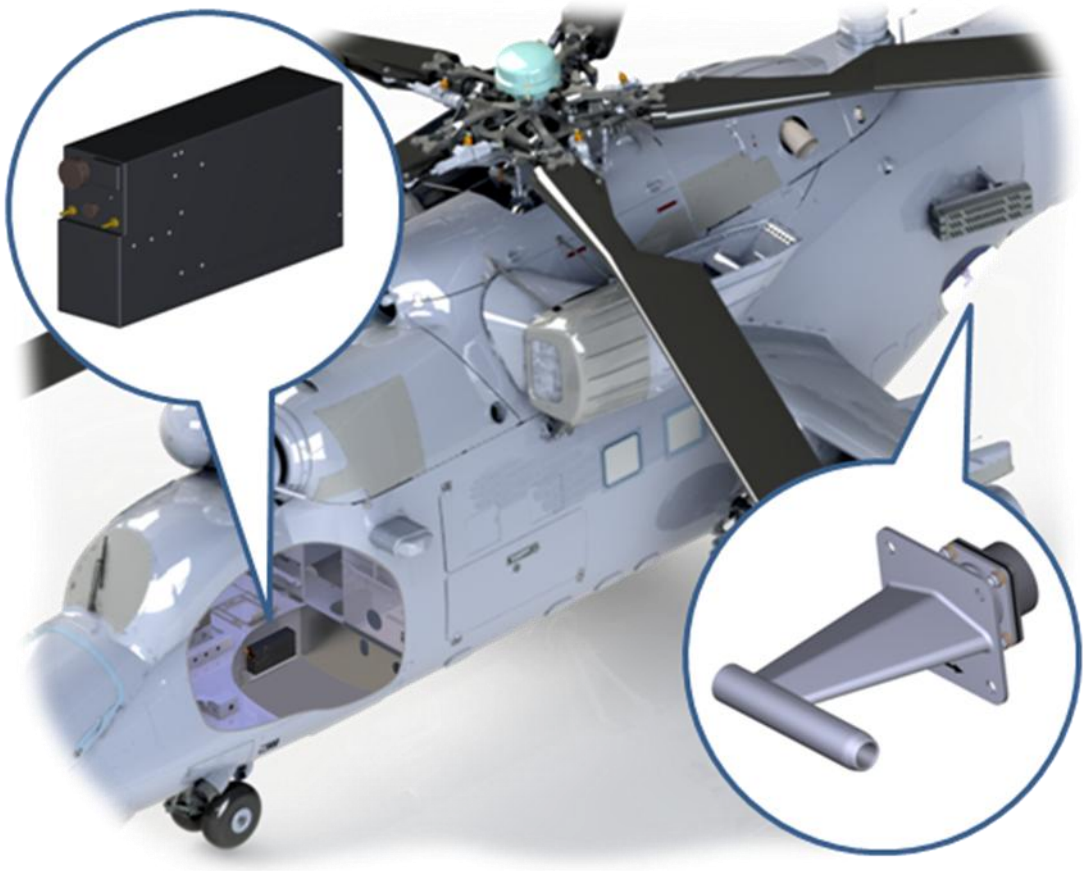
The satellite navigation system includes:

- ✓ antenna unit;
- ✓ receiver-computer.

MAIN TECHNICAL DATA

Description of parameter	Using GLONASS system	Using NAVSTAR system	Using GLONASS/ NAVSTAR sytem
Possibility of navigation parameters determination.	0,95	0,95	0,95
Error of navigation parameters determination:			
▪ by location coordinates, m	30	40	20
▪ by altitude above surface, m	40	70	30
▪ by speed components, m/s	0,1	0,5	0,1
▪ by current time, mks	0,1	0,1	0,1

SVS-V1-1E AIR DATA COMPUTER SYSTEM



SVS-V1-1E air data computer system is intended to determine and output of altitude and speed parameters to airborne systems.

The system includes VVS-V1 computer and P-104 stagnation temperature sensor.

SVS-V1-1E air data computer system is connected to pilot static tubes and secures measuring altitude and speed values and its digital output to MVK-03 multifunctional computer.

P-104 stagnation temperature sensor is intended for measuring air stagnation temperature and output of electrical signals, proportional to temperature of stagnated airflow, to air signals system.

OPS-24N OBSERVATION-SIGHTING SYSTEM

OPS-24N observation-sighting system is intended for providing round-the-clock combat application of guided and unguided weapons.

OPS-24N system includes TV, thermal-imaging, direction finding and distance measuring channel**s,** provides converting of optical signal of terrain image into TV signal and its output on MFI display from KNEI-24E set.

OPS-24N allows to perform the following tasks:

- Observation of underlying terrain , search, detection and identification by the operator on MFI of still and moving armored targets, engineering structures, low flying air targets of "helicopter" type round-the-clock in simple and partially adverse weather conditions;
- Targets tracking during "Shturm" or "Ataka" missiles approach to the targets.
- Measuring of slant distance to the target and output of data to PrVK-24 sighting computer;
- Pilot's shooting by unguided types of armament, such as rockets, NPPU-23 (in zero position), UPK-23-250.
- Sighting, preparation to launch, launch of missiles and output of shooting signal by NPPU-23 to the helicopter airborne equipment.
- Detection of angle position of "Sturm" and "Ataka" missiles relatively to the line of sight in all shooting ranges and shaping of missiles control commands.
- Sighting and output of data to PrVK-24 system to control firing from NPPU-23, when shooting on ground and air targets is performed by the operator;
- Output of data to 9S476M computer to determine shooting requirements in the viewing field of direction finder of OPS-24N, output of data to PrVK-24 to perform sighting when shooting is performed by fixed types of armament;
- Output of video signal to MFI as TV signal;
- Observation (in angle of sight range) of out-of-cockpit space at day and night.

OPS-24N observation-sighting system includes:

- GOES-342 gyro-stabilized optic and electronic system;
- Control panel;
- Modified units of 9S475 equipment for conjunction OPS-24N with 9K113K complex.

Purpose:

- round-the-clock detection and identification of ground and on-water targets;
- laser range-finding;
- guidance of missiles;
- Sighting for application of small arms and guns and rockets.

OPS-24N is designed for:

- ✓ identification of objects such as tanks based on MFI image with MRV > 10 km:
  - a) in a day-time at the range of 5000-6000 m
  - b) at night at the range of 3500…4000 m.
- ✓ control of angular position of line of sight within the angle range, degree:

in armament application mode:

a) azimuth ± 60;

b) Elevation minus 40 (down) ..plus 10 in NPPU-23 mode;
minus 20 (down) ...plus 15 in missile launch mode;

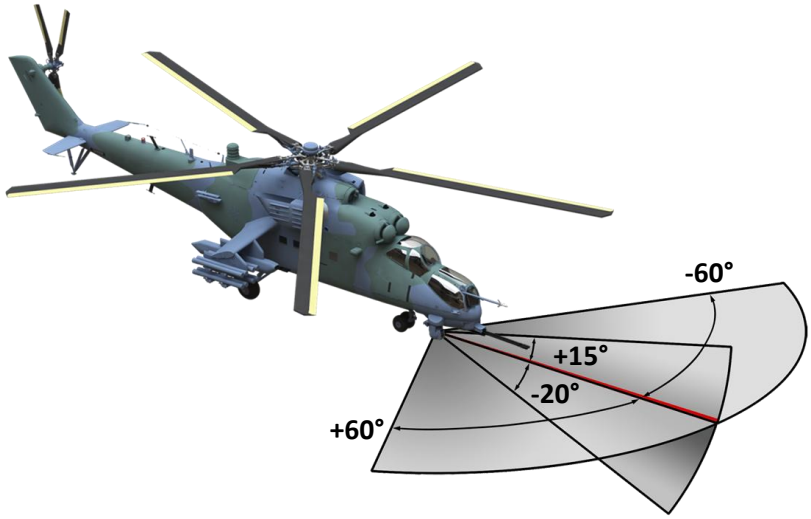
in observation mode:

c) azimuth ± 230;

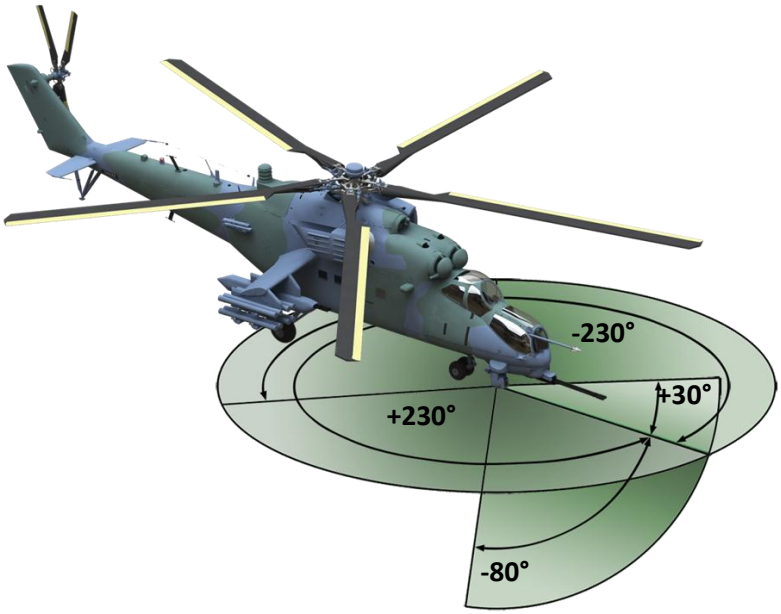
d) elevation minus 80…plus 30

- ✓ control of thermal-image and TV- channels operation modes
- ✓ measuring slant distance to target with MRV > 12,5 km – 0,3 …6,0 km with mean square error of ± 5 m in tangent plane
- ✓ output of angular coordinates and angular speed data of line of sight to PrVk-24 (BTsU-24) in pitch and heading.

DIAGRAM OF OBSERVATION AND GUIDANCE ANGLES
RANGE OF OBSERVATION ANGLES IN MISSILE ARMAMENT APPLICATION MODE



RANGE OF ANGLES IN OPS-24N OBSERVATION MODE



PrVK–24 SIGHT-COMPUTER COMPLEX

PrVK-24 sight computer complex based on BTsU-24 airborne computer is installed instead of the dismantled analogue computers VSB-24 and ATsVU-17, and is conjugated with 9K113K (OPS-24N) and KNEI-24E complexes.

PrVK-24 sight-computer complex is intended for processing of information from complex's equipment and conjugated helicopter's airborne equipment systems, calculating of ballistic corrections and output of information and commands for accomplishing special missions in all flight modes, as well as in on-ground preparation and test modes.

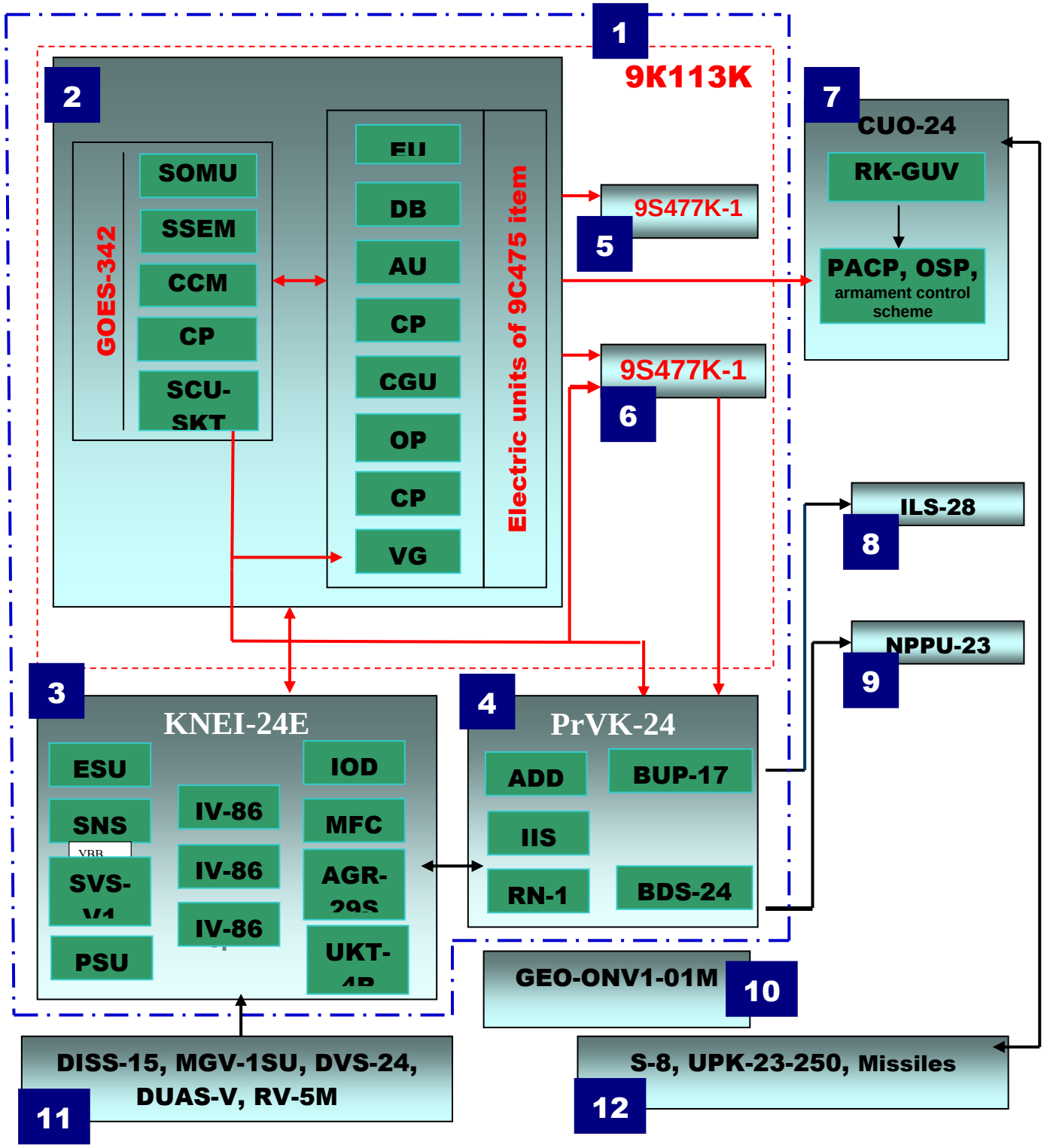
PrVK-24 is intended for sight shooting by missiles, rockets, flexible small arms/ gun armament by giving corrections of sighting mark and missiles shooting on ILS-28 head-up display and MFI (pilot's and operator's) of KNEI-24E complex.

When corrections are calculated the following information is used: slant range to the target from laser range finder, installed in OPS-24N observation-sighting system what increases armament application accuracy at any relief of underlying surface.

PrVK-24 complex accomplishes the following tasks:

- calculation of angular corrections and zones of permitted shooting range (Dr), prohibition of shooting at minimum distance to target ($D_з$), effective armament application range (De) and their output on indicator for providing rocket armament application (RA);
- calculation of angular corrections and remaining time before dropping, as well as commands " Warning on dropping", "Dropping" and their output on indicator for providing KMGU-2 application;
- calculation and output of helicopter's angle of additional turn on indicator, as well as commands to lead out the helicopter on heading;
- formation of data on complex's operational status in flight and output of complex signal on failure for indication and recording;
- carrying out of test modes of complex's equipment on-ground, detection of failure with accuracy up to replaceable unit and output of test results on indicator.
-

MI-35M HELICOPTER ARMAMENT AND BREO COMPLEX STRUCTURAL DIAGRAM



1. 9K113K- upgraded round-the-clock complex of missile armament
2. OPS-24N observation-sighting system
3. KNEI-24E – navigation and electronic indication complex
4. PrVK-24 - sighting computing complex
5. 9S477K-1 - commands transference equipment
6. 9S476M –ballistic computer
7. SUO-24 - armament control scheme
8. ILS-28 head-up display - (pilot's sight)
9. NPPU-23 – unified flexible gun unit
10. GEO-ONV1-01M – night vision goggles
11. Flight equipment
12. Armament

NIGHT VISION GOGGLES GEO-ONV1-01M

GEO-ONV1-01M night vision goggles – a helmet-mounted passive optronic night vision instrument of binocular type **intended for** observing objects on terrain in conditions of natural night illumination from $5x10^{-3}$ to 1 lx . They preserve their efficiency in conditions from twilight to dark night without using additional illumination sources. Special fastening of goggles to helmet's sight bracket provides their quick detachment.

Night Vision Goggles are used for visual flight at night and provide accomplishment of the following tasks:

- ✓ Take-off (landing) from unlit (unequipped) sites;
- ✓ Piloting at extremely low altitudes (true flight altitude from 50 to 200 m);
- ✓ Search of targets & objects on land as well as on water;
- ✓ Selection of landing sites from air and landing on them;

Helicopter flight conditions when using Night Vision Goggles:

- ✓ meteorological visibility range, minimum …3 km;
- ✓ natural night illumination level at which the flight, hovering, piloting and landing on unlit and unequipped sites is provided … from $5x10^{-3}$ lx to 1 lx.

Obstacles and objects detection range (reference) with a help of NVG in flight at altitude of 50-100 m and flight speed of 100-150 km/h against underlying terrain background covered with green grass in conditions of natural illumination $0.5x10^{-3}$ …1 lx and meteorological visibility range more than, not less than:

- ✓ electrical power masts … 1000 m;
- ✓ power lines poles … 600 m;
- ✓ ZIL-131 cargo truck of "KUNG" type … 1100 m;
- ✓ Detached tree (10 m height) … 550 m;
- ✓ forests boarders … 700 m.

GEO-ONV1-01M include:

- ✓ goggles;
- ✓ low-voltage converter;
- ✓ electric cable;
- ✓ counterweight.

ADAPTATION OF LIGHTS

Internal and external helicopter Lights are adapted for application of night vision goggles (NVG) operating within the range 640…900 nm with amplification factor of 25 000…65 000.

Adaptation of Mi-35M helicopter Lights (external and internal illuminating lights and warning lights) provides helicopter flying day and night (in night conditions both with night vision goggles and without them) at various levels of the terrain illumination.

Mi-35M helicopter Lights adaptation is performed by replacement of incandescent lamps and light filters directly in light plates, on control and instrument panels for light filters, light diode lamps adapted for operation together with NVG.

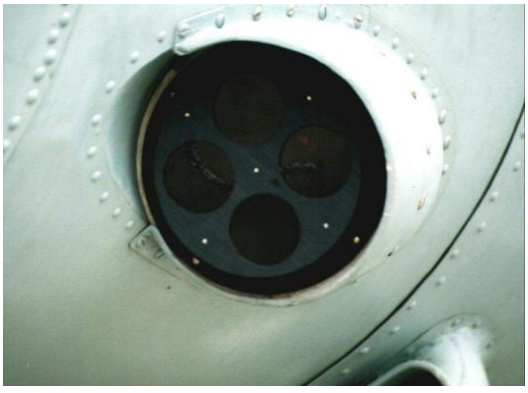
Regulation of Lights brightness (internal and external) is performed smoothly in two separate groups.

EXTERNAL ILLUMINATING EQUIPMENT

The helicopter external illuminating equipment includes ВППФ-1А light and FPP-9 taxiing light.

The helicopter searching and landing lights ВППФ-1А are intended for illumination of terrain when finding a landing site and illumination of the area when taxiing, taking off and landing in the absence of ground illuminating means at nighttime and in adverse weather conditions in the visible wavelength range without use by the crew of night vision goggles and in the infrared wavelength range with use by crew members of night vision goggles on the base of electrooptical converters of the third generation.

Removable light filter is provided for FPP-9 taxiing light.



Part 4

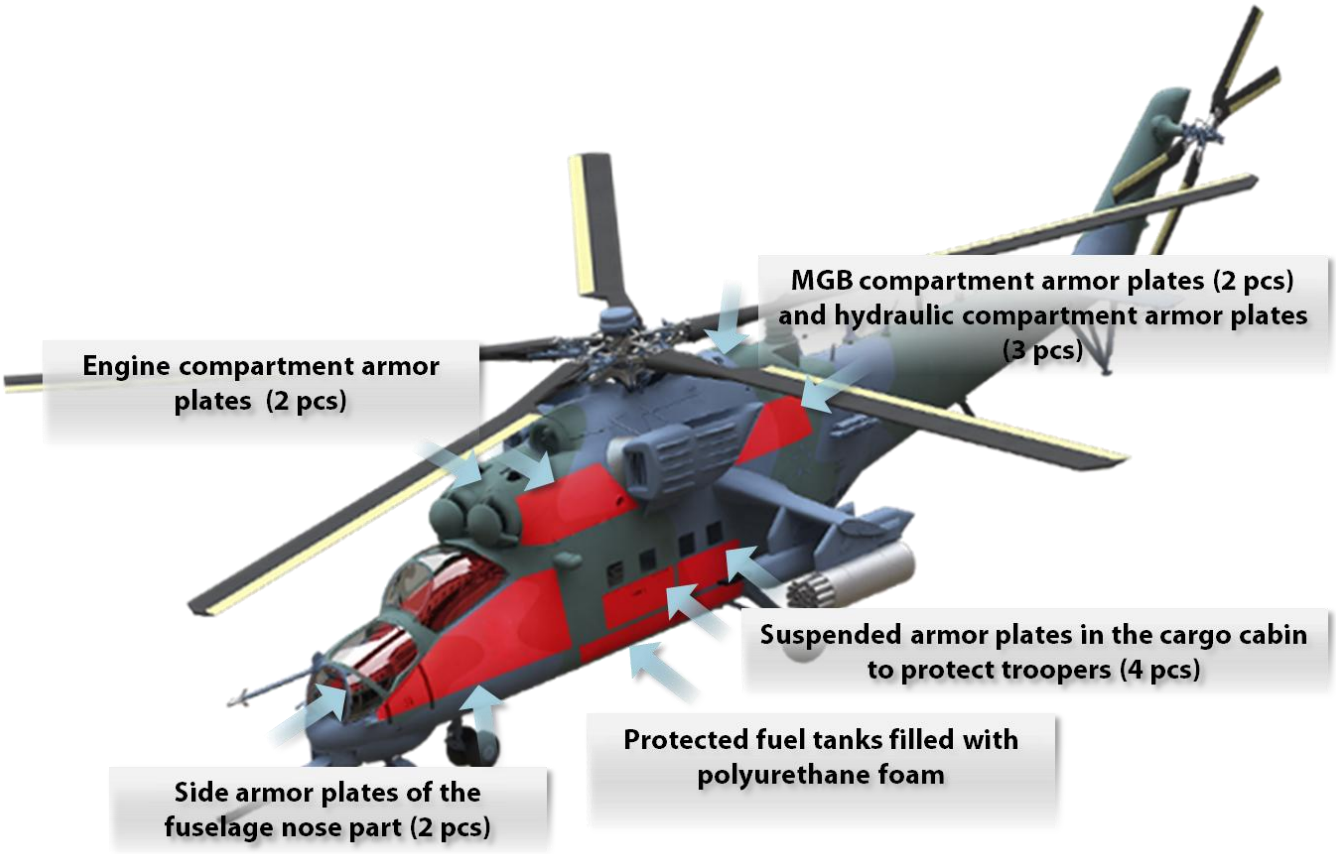
Defense complex

COMBAT SURVIVABILITY AND RELIABILITY

The helicopter is highly survivable in the counteractions conditions of modern anti-aircraft means, and, in the respect of combat survivability, it significantly surpasses all existing foreign and local analogues, what is provided by the following decisions:

- **double-engine power plant scheme** with two service fuel tanks, two independent engine fuel supply lines, and possibility of takeoff, flight and landing with one engine inoperative. Arrangement of the engines excludes their simultaneous damage by one bullet (projectile);
- **mutual screening of aggregates** and protection of major aggregates by minor ones;
- **fuselage structure stands hitting** not only by bullets and projectile particles, by also missiles of "Stinger" type, what allows the helicopter to continue flight and return back to basing site after the combat damage what is conditioned by rational selection of helicopter's vital aggregates and systems armoring complex;
- **selection of materials and structure sizes** providing absence of catastrophic destructions when damaging during the time enough for mission accomplishing and return back to basing site;
- **high reserve of gas-dynamic stability of engines** staying operable when dust protection device is damaged seriously;
- **engine and helicopter control double linkage** (from pilot and from operator) allowing piloting of the helicopter and perform safe landing by operator after injury or death of pilot;
- **two Mi-35M independent hydraulic systems**. Hydraulic aggregates of the systems are separated from each other what practically excludes simultaneous hitting of the systems by one bullet (projectile);
- **availability of two independent AC/DP power supply channels**, commutation equipment of which automatically switches power supply of consumers to a reserve channel, and, when damaging of both channels – to power supply from emergency storage battery;
- **fuel tanks design**: filling of the main fuel tanks with polyurethane foam what guarantees their full explosion safety at many damages in all flight stages; fuel loss reducing due to protection of fuel tanks;
- **Active doubled fire-extinguishing system** of bottle type with usage of chladon fore fire extinguishing in fuel tanks, main gearbox, engine and APU compartments with automatic actuation of fire extinguishing first line what excludes rise of fire in the compartments;
- **Airborne complex of protection** from missiles with various warhead types what significantly increases the helicopter chances to survive in case of its coming into zone of possible actions of enemy's anti-aircraft/missile complexes.

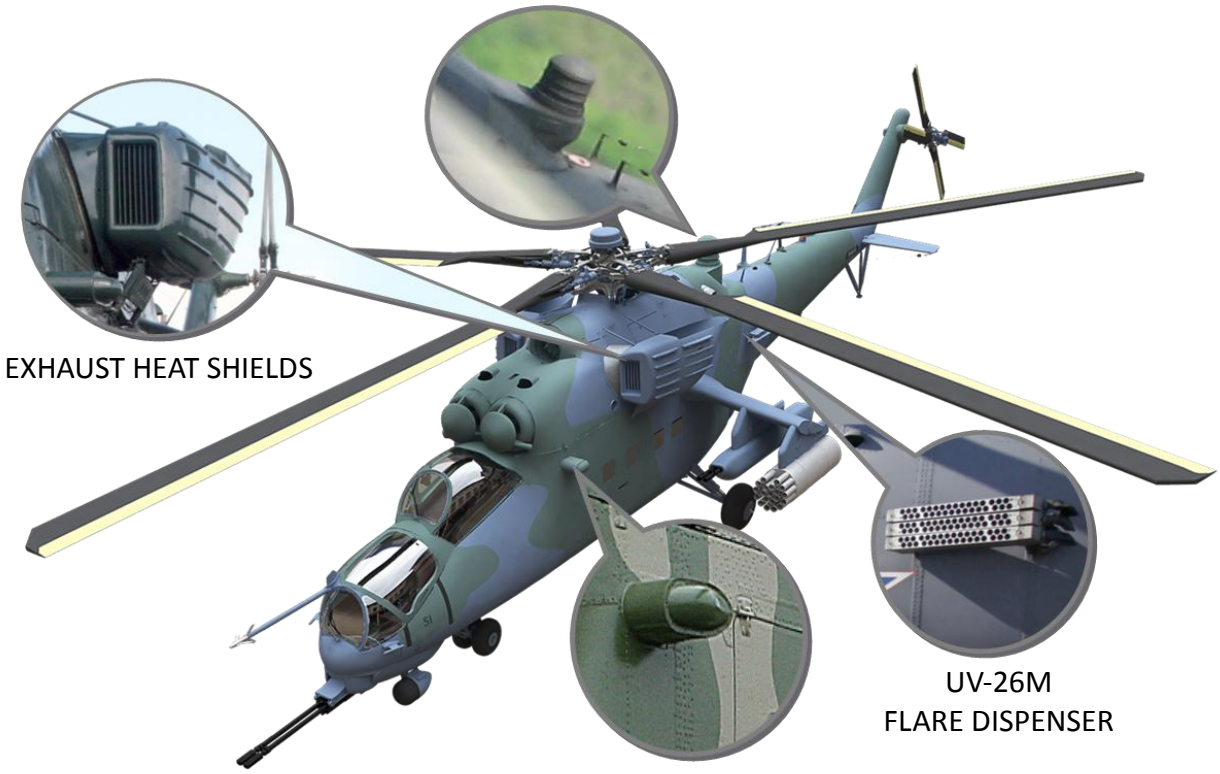
FUSELAGE ARMORING ELEMENTS ARRANGEMENT SCHEME



CREW CABIN ARMORING ELEMENTS ARRANGEMENT SCHEME

AIRBORNE DEFENSE COMPLEX

L-166V1AE EQUIPMENT CREATING AMPLITUDE-MODULATED INTERFERENCES



L006LM radar warning system is intended for outputting of illumination signals to the pilot from the indicator of equipment and voice warning through MSPD-A communication & data transmission module when illuminating of the helicopter by ground and air radars.

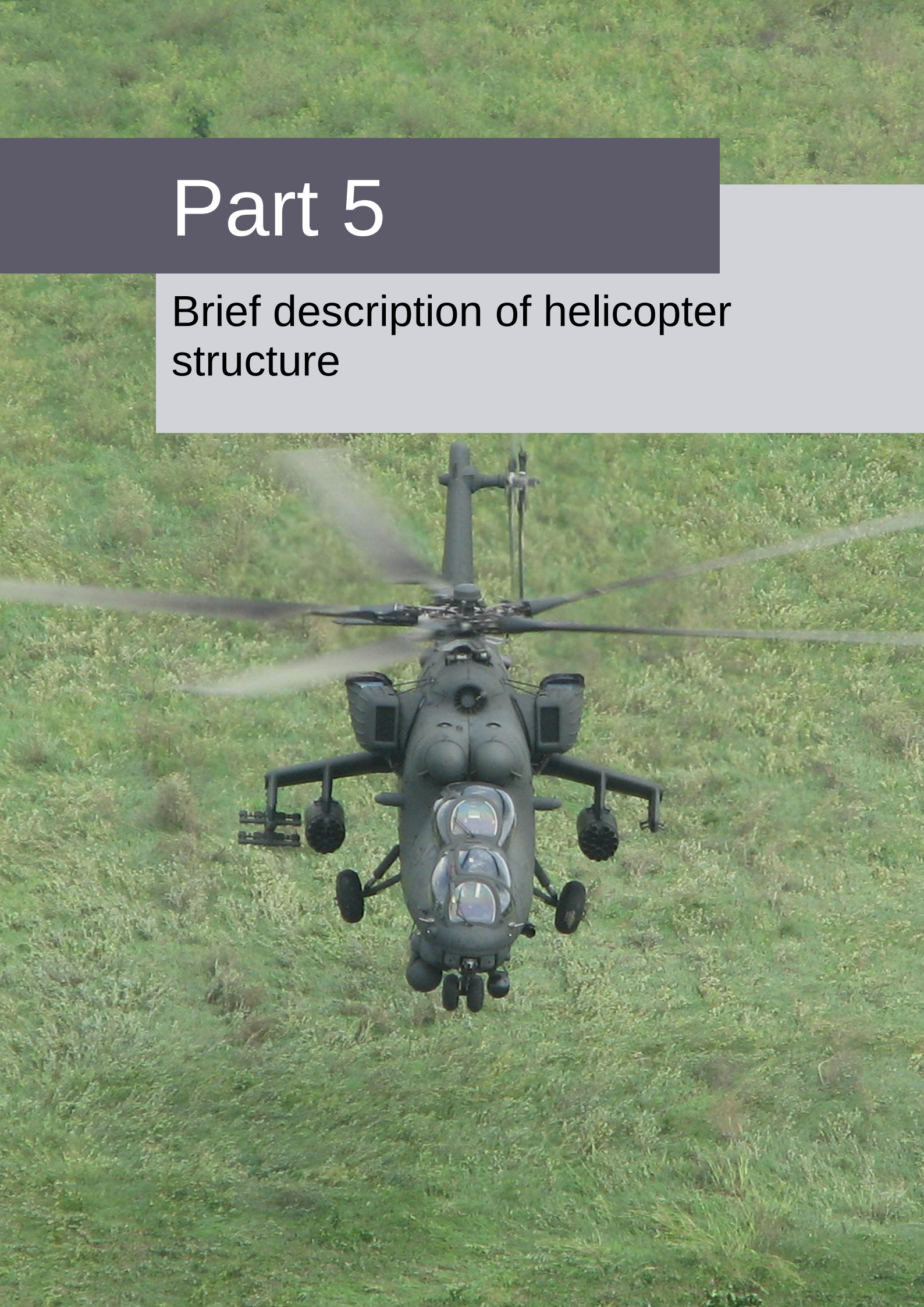
UV-26 flare dispenser is intended for making interferences in IR-range. It provides arrangement, transportation and shooting of flares based on signals coming from operator's control panel or by pushing button in pilot's cabin. The flares are shot as per eight programs with five changeable parameters: volley (V), series (S), series interval (SI), sequence (Seq) and sequence interval (Seq. Int). The capacity of each cassette is 32 items PPI-26-2-1. 6 cassettes are installed in the helicopter – 3 cassettes on each side.

L-166B1AE equipment intended for helicopter protection from missiles with heat seekers by way of creating infra-red amplitude-modulated interferences for heat seekers using for guidance method of amplitude modulation of target infra-red radiation.

Exhaust heat shields are intended to protect the helicopter from missiles with thermal warheads by the way of screening of IR-radiation created by heated parts of engines exhaust outlets, reducing of temperature and changing of exhaust gases direction. The exhaust shields are of ejection type and provide reducing of exhaust gases temperature and thermal contrast.

Part 5

Brief description of helicopter structure



FUSELAGE

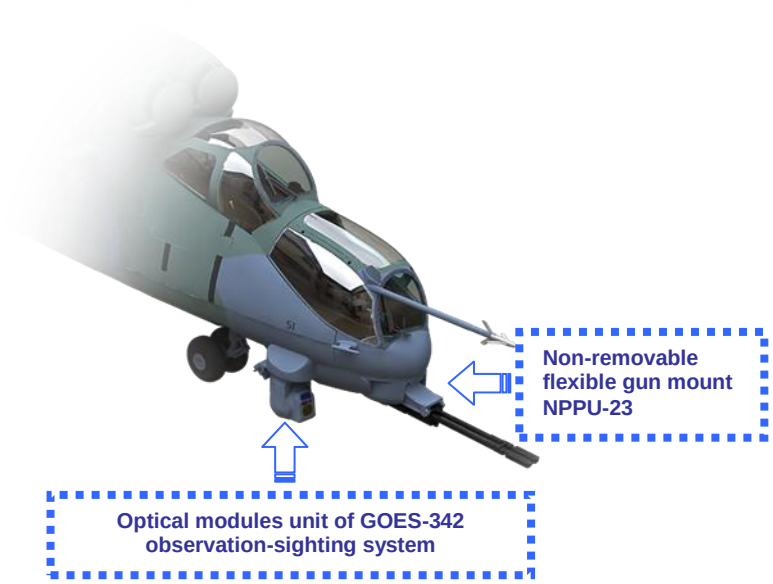
The fuselage is all-metal semi-monocoque of variable cross-section type. It has one production break and two structural joints and consists of nose and central sections, tail boom and tail rotor pylon.

Central section, tail boom and tail rotor pylon are diverted at an angle of 2°30' (to the right if looking forward) from horizontally located floor of the cargo cabin.

Nose and central section are attached to each other by riveting. Fuselage carcass consists of frames, stringers and beams. Duralumin stressed skin is riveted to carcass.

In fuselage skin there are necessary hatches to ensure access to the aggregates of power plant, transmission, control equipment, armament, as well as to fuel tanks, fuel servicing and draining points.

FUSELAGE NOSE SECTION



Fuselage nose section is a separate aggregate, where cockpit is located. Operator's station is arranged in the cockpit front part, pilot's station is arranged from behind and a little higher up.

On Mi-35M in front bottom of the crew cabin a non-removable flexible double-barreled gun mount NPPU-23 of 23mm / 0.91 inches is mounted.

At RH side of flooring and on outer skin there is a hole where optical modules unit of GOES-342 observation-sighting system covered by fairing is installed.

Crew cabin floor consists of two lateral beams, frames, profiles and diaphragms, flooring and external skin. The lateral beams have fitting for nose LG strut attachment axle. Over the floor there is additional flooring where helicopter control pedals are fixed.

Seats, helicopter controls, instrument panels with necessary instruments, systems control panels, as well as other equipment are installed on operator's and pilots stations.

Fuselage nose section together with cargo cabin comprises a pressurized compartment where excessive air pressure of 500-650mm lift (0.71÷0.92 lb/sq. inch) is maintained.

"Shturm-V" complex radio line antenna is installed on the floor LH side. Angle of attack and slip angle sensor beam is installed in the upper part of operator's armored windshield frame. A niche for air conditioning system aggregates is arranged on fuselage nose section LH side. The niche is closed by folding cover.

Pilot's door is located on RH side, and the operator's one – on the left. The pilot's and operator's doors are equipped locking mechanisms having internal and external handles and locks, as well as emergency release mechanisms. Engine attachment fittings are installed on ceiling of nose section.

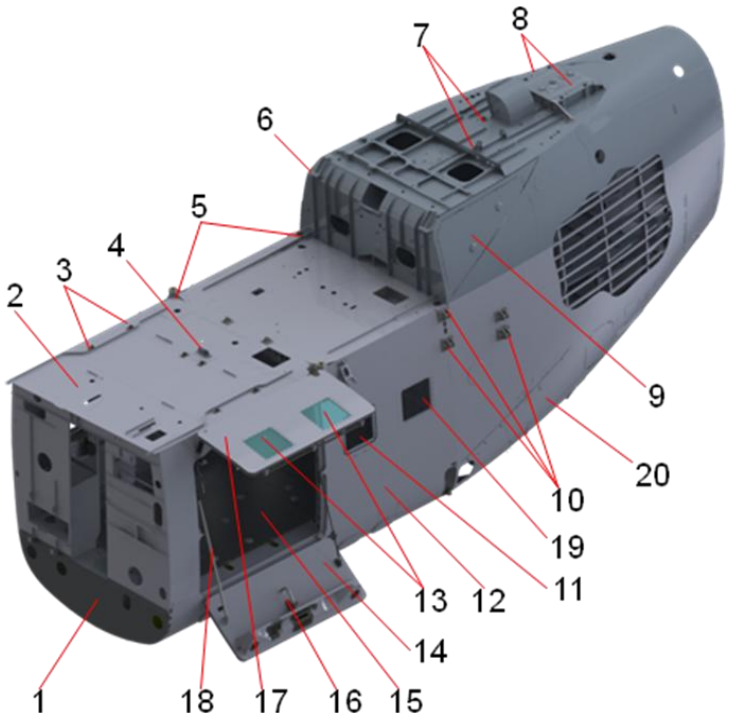
FUSELAGE CENTRAL SECTION

Fuselage central section consists of a carcass and external skin. Cargo cabin is arranged between frames Nos. 1 and 8, where, between frames Nos.1 and 2, frames for equipment aggregates are installed. Seats for eight troops placed in two lines facing the both sides of helicopter are installed in cargo cabin along to symmetry axis. Such placing of troops allows them to fire from their weapons directly from helicopter's sides from pivot mounts, placed in six front windows. There is an opening for communication with pilot and servicing the units in the wall of front frame.

Electrical and radio-electronic equipment aggregates and containers of fuel tanks Nos.1, 2 and 3, as well as storage batteries are arranged in rear special compartment of equipment. Landing gear compartment caisson is located in main landing gear struts are along symmetry axis of fuselage central section. Containers of fuel tanks Nos.4 and 5 are arranged inside of cargo floor. Tie-down fittings for fixing loads and fittings for attachment of troop's seats, as well as brackets for sanitary stretchers attachment straps are installed on the floor. Attachment fittings for external load sling are located at the bottom of outer side of the floor. Lower door wings of both doors serve as entry ramps in open position. In the upper door wings and along the sides there are windows with window leaves which are opened inside the cabin glazed with fiber glass. The upper door wings have brackets for pivot mounts to perform aimed fire from troops' weapons when the door wings are closed.

Attachment fittings of main gearbox, hydraulic units, APU AI-9V, cowlings, fan, wing, main landing gear struts, accessory gearbox, tail rotor drive shaft bearing supports are installed on the ceiling of fuselage central section.

Niches for arrangement KNEI-24E units in the place of non-used niches for main landing gear struts retraction are made along both sides of fuselage central section.



1. Floor
2. Ceiling panel
3. Brackets and devices for attachment of engine when main gearbox is removed
4. Cowling and fan attachment fittings
5. Gearbox shock mount attachment fittings
6. Cowling attachment fitting
7. AI-9V engine attachment fittings
8. Accessory gearbox attachment beams
9. Hatch cover for installation of service fuel tank No.1
10. Wing attachment fittings
11. Side panel windows
12. Side panel
13. Upper door wing windows
14. Lower door wing
15. Flooring
16. Lower door wing closing handle
17. Upper door wing
18. Lower door wing attachment rod
19. Side panel window
20. Niche for arrangement of KNEI-24E units.

TAIL BOOM

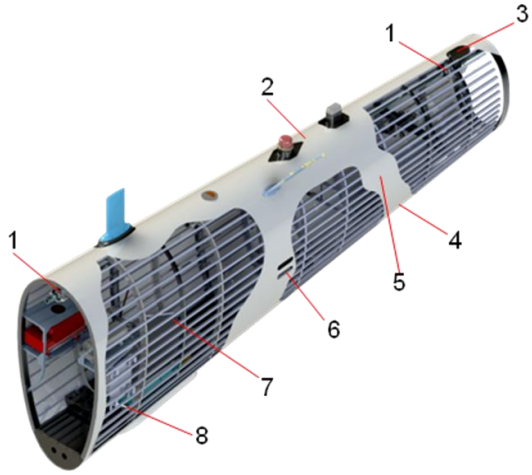
Tail boom converged to tail part has an oval shape in lateral section. The boom is of riveted structure and consists of lateral and longitudinal load-carrying set and working duralumin skin.

The lateral load-carrying set includes 11 frames, from which attachment frames Nos. 1 and 11 are reinforced. Bearing supports of transmission tail rotor drive shaft are attached to frames Nos. 1, 4, 7 and 10.

The longitudinal set consists of stringers made of pressed angular profiles. Stringers are attached to skin by glue and welding, and to frames and panels' joints – by riveting.

The following parts are installed on tail boom:

– bracket for attachment of rollers of tail rotor control cables;
– antennas «Prima-DMV»and «Prima-KV» radio stations, RV-5M radio altimeter and identification equipment;
– MSL-3 anti-collision light;
– hatch for servicing of tail rotor drive shaft;
– HF unit of DISS-15G-E equipment attachment fittings;
– tail rotor drive shaft attachment fittings.



1. Fittings for tail rotor drive shaft support
2. Upper panel
3. Hatch for measuring break angle of tail rotor drive shaft end section axis
4. Lower panel
5. Side panel
6. Flare launcher
7. Protective panel
8. DISS-15G-E equipment shock mount attachment fittings

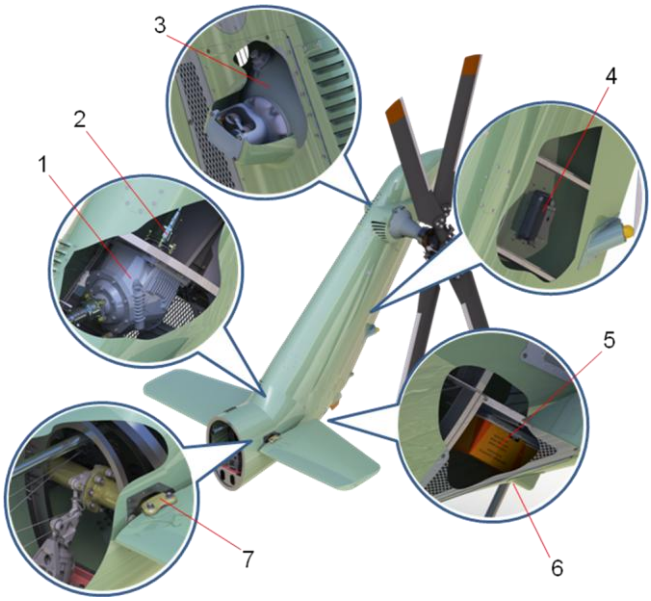
TAIL ROTOR PYLON

Tail rotor pylon comprises a riveted structure, lateral enforced set of which in the pylon's horizontal part consists of four frames, and nine ribs – in the inclined part. The lateral enforced set consists of a spar and stringers made of angular profiles. The skin is of duralumin sheets.

On frame No.3 the axis of tail rotor pylon is inclined upward for 42°30' relatively to tail boom axis. In assembled condition the inclined part of the pylon comprises tail fin with installation angle of 6º (tail part of fin is inclined rightwards relatively to helicopter symmetry axis).

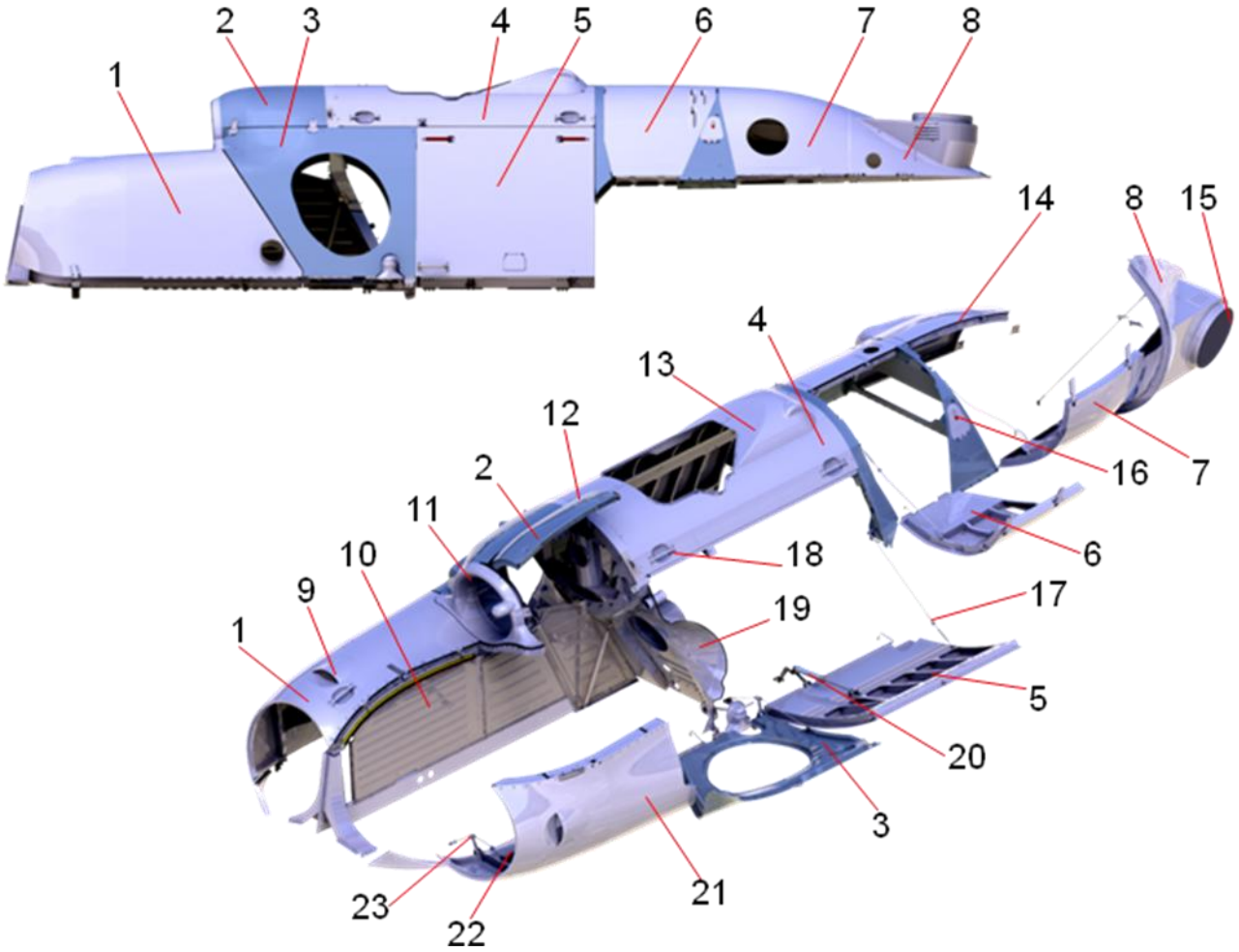
The following parts are attached to the tail rotor pylon:

1. intermediate gearbox;
2. tail rotor drive shaft;
3. tail gearbox with tail rotor;
4. identification equipment antenna 4280MSE-01;
5. flight data recorder from BUR-SL-1 set;
6. tail bumper struts attachment units;
7. stabilizer attachment units.



COWLINGS

Installed on the ceiling VK-2500-02 engines, VR-24 main gearbox, fan, AGS-60A hydraulic units and AI-9V APU are covered by common cowling.



1. RH engine compartment cowling cover.
2. Fan compartment cowling upper cover.
3. Fan compartment cowling side cover.
4. Gearbox compartment cowling upper cover.
5. Gearbox compartment cowling side cover.
6. End compartment cover for hydraulic aggregates.
7. AI-9V engine compart-ment cowling cover.
8. End fairing.
9. Air intake for ventilation of under-cowling space.
10. Longitudinal fire-protection fence.
11. Fan air intake.
12. Hatch cover for fan universal joint shaft lubrication.
13. Fairings.
14. AI-9V engine compartment cowling cover.
15. Adapter.
16. Service tank No.1 hatch cover of filler neck.
17. Support cable.
18. Handle.
19. Lateral fire-protection fence.
20. Hydraulic cylinder-damper.
21. LH engine compartment cowling cover.
22. Ramp.
23. Support cable.

Under-cowling space is separated by fire-protection fences and frame No.3 of the cowling for compartments of LH and RH engines, gearbox compartment and APU compartment. Such separation of under-cowling space for compartments creates better conditions for extinguishing of occurred fire.

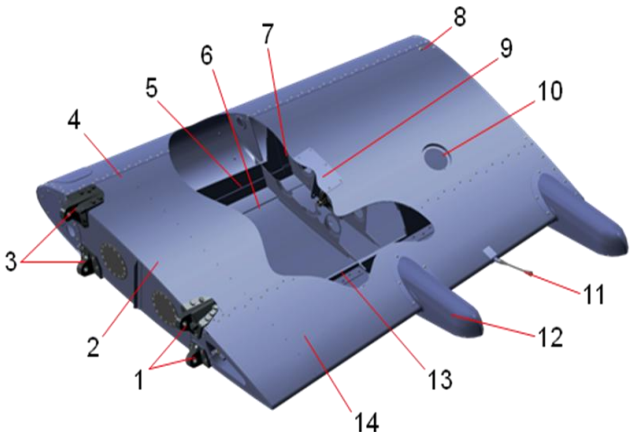
WING AND STABILIZER

WING

Wing with built-in load lifting system is installed on Mi-35M helicopter. A cantilever wing, riveted, with two spars is designed to release load on main rotor in flying and for arrangement of weapon elements.

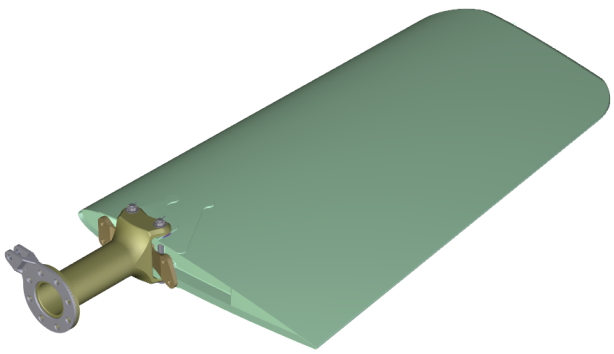
The wing consists of LH and RH consoles having length 1620 mm each.

1. Rear brackets of wing attachment
2. Upper panel
3. Front brackets of wing attachment
4. Nose panel
5. Front spar
6. Lower panel
7. Wing stringers
8. Holes of eye-bolt
9. Load lifting mechanism access hatch cover
10. Hole for formation light plafond
11. Static discharger
12. Rear parts of external store racks fairings
13. Rear spar
14. Tail panel



STABILIZER

In order to provide necessary stability and controllability of the helicopter, the in-flight-controlled stabilizer is installed on its tail boom, inclination angle of which is varied within limits from +7°40′ (upwards) up to minus 12°30′ (downwards) with main rotor collective pitch lever movement.



LANDING GEAR

Landing gear comprises nose and main landing gear struts, as well as tail boom bumper.

Landing gear struts are intended for perception and absorption of loads occurred during takeoff, landing and taxiing of the helicopter.

Nose strut wheels are self-oriented and without brakes.

Main struts' wheels have pneumatic disc brakes, and they are braked simultaneously. Brake control is performed by lever on pilot's cyclic control stick.

Landing gear struts have liquid-gas shock absorbers. Wheels have low charging pressure, what allows to land on unpaved airfield.

Tail boom bumper is intended for protection of tail rotor from impact on ground in case of rough landing of the helicopter in pitching. The bumper is attached to the tail rotor pylon and consists of a shock-absorber, two struts and a skid.

Pneumatic brake system is intended for braking of the helicopter during run and for braking of main strut wheels at parking.

Braking system includes:

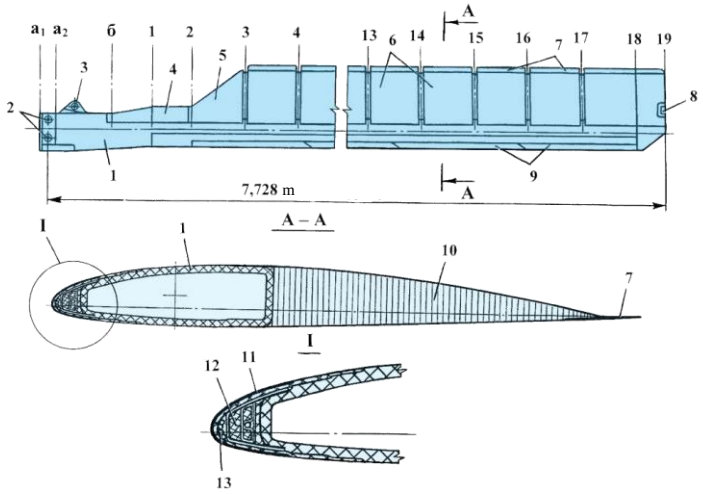
- Bottles with compressed air;
- Air filter;
- Reduction valve;
- Reduction accelerator;
- Check valve;
- Pressure switch brake control lever arranged on cyclic control stick.

In order to brake the wheels at parking, the lever in depressed position is fixed by locking device arranged on control stick.

Pressure in brake line is controlled by signal enunciator located on pilot's LH front panel which illuminates in case of pressure availability in wheel brake line.

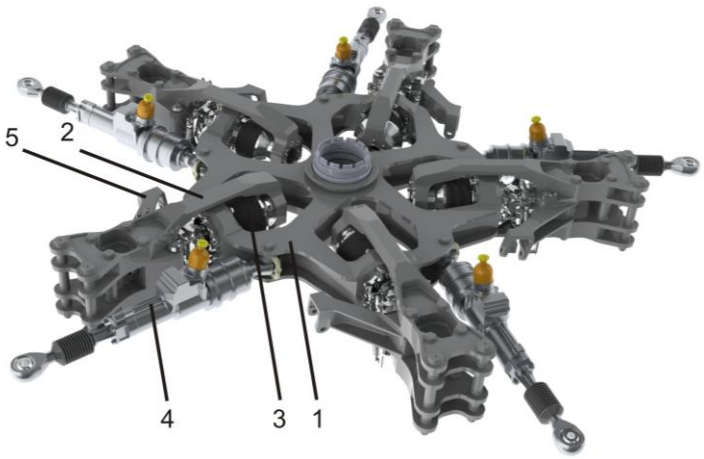
ROTOR SYSTEM

Main rotor blade with fiberglass spar and tail sections filled with honeycomb has rectangular shape in the plane with chord of 580mm (22.85inch). The blade is separated for 19 theoretical sections (a1; a2; b; 1÷19) and has 15 sections.



1. Spar
2. Joint holes for attaching blade to hub
3. Main rotor hub damper attachment bracket
4. Shank fairing
5. Shank section
6. Tail sections
7. Flaps
8. Tip light
9. Edgings
10. Honeycomb
11. Anti-icing system
12. Counterweight
13. Cable of anti-icing system

MAIN ROTOR HUB



Main rotor hub is installed on the main rotor shaft. It is designed to transmit the engine torque to blades and adjust pitch of blades. In flying, the main rotor hub absorbs and transmits to the fuselage aerodynamic and inertial forces and moments generated in blades.

The peculiarity of main rotor hub design installed on Mi-35M helicopter is application of elastomeric bearing for attachment the blade to the hub.

1. Hub casing
2. Frame
3. Elastomeric spherical bearing
4. Damper
5. Blade turning lever

Elastomeric spherical bearing comprises elastic element in which the thin rubber layers are alternated with metal spherical plates. Such bearing not only perceives the blade centrifugal power, but provides hinge attachment of the blade, due to all the plates of the bearing can be turned relatively to the common center. The bearing allows the blade to move in thrust and rotation planes as well as around its axis.

There are no swinging and slipping as well as wears typical for bearings of common type in electrometric bearing. It does not require any lubrication and other types of service.

Apart the electrometric bearing, other hinges use self-lubricated metal-fluoroplastic and fabric bearings, which do not require any lubrication.

Pendulum vibration damper can be installed on the main rotor hub to reduce helicopter vibration and enhance flight comfort
на втулке несущего винта

Main technical data of the hub

Hub scheme	With combined drag, flapping and feathering hinges and universal elastomeric bearings blade droop stops, centrifugal, unloaded type with ring spherical retainer.
Flapping hinge turning angle	7°28′
Damper	spring-hydraulic with rubber elastic element
Operating fluid	AMG-10 GOST 6794-75
Blade droop stop	centrifugal, of equilibrated type, with spherical ring stop
Ring spherical stop provides blades' deviation angles	
▪ upwards from rotation plane	21°±30′
▪ downwards from rotation plane:	
– at taken out droop stop mechanism	8°±30′
– at taken in droop stop mechanism	1°20′±30′
The hub overall dimensions, mm:	
– diameter	2300
– height	290
The hub weight, kg:	
– dry	411,0±4
– with charged dampers	413,5±4

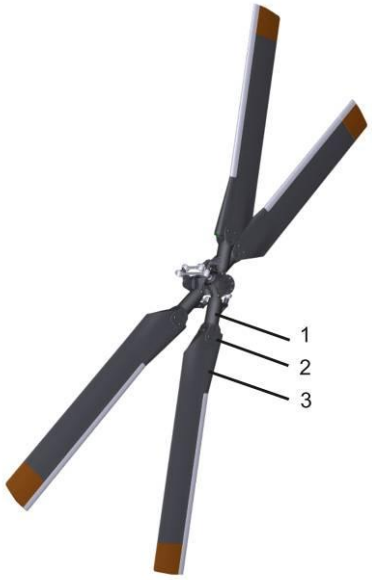
TAIL ROTOR

Tail rotor is a tractor propeller with changeable pitch in flying designed to balance torque reaction of main rotor helicopter direction control. The rotor is installed on the flange of output shaft of tail rotor gearbox and located on the LH side of tail rotor pylon. Tail rotor pitch control is performed from Pilot's cabin by foot-control pedals. Tail rotor installed on Mi-35M helicopter is made according to X-shape scheme in order to reduce noise and increase the effectiveness.

The tail rotor consists of hub attached to a shaft of tail rotor gear box and four blades attached with casings of the hub feathering hinges. Blades-to-hub attachment is performed by bolts of feathering hinges' casings.

Tail rotor hub consists of two modules installed one above other on the spike splines. Each module comprises connection of two sleeves of blades

Tail rotor blades consist of fiber-glass spar with reinforcement of titanium foil. The tail part consisting of honeycomb unit and skin made of fiberglass is glued to the spar.



1. Tail rotor hub
2. Attachment bolts
3. Tail rotor blade

Tail rotor main technical data:

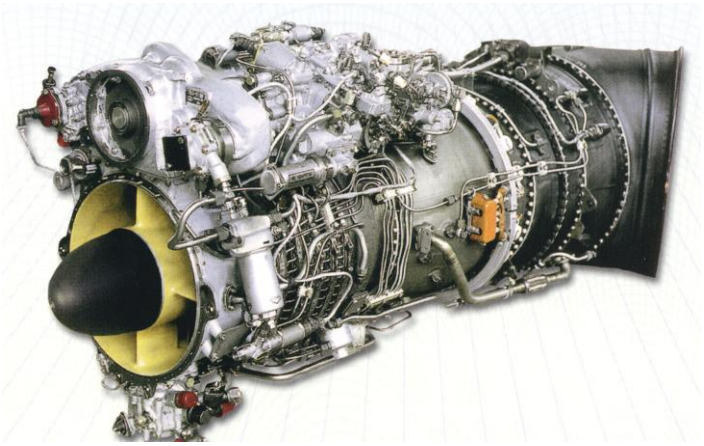
Number of blades, pcs	4
Rotor diameter, m	3.84
Hub weight, kg	68.08
Blades set weight, kg	28.60
Direction of rotation	clockwise when looking from driven side
Extreme blades adjustment angles	-9°…+24°
Extreme blades flapping angles	±10°

POWER PLANT

Power plant is designed to generate a torque and to transmit it via main gear box and transmission to the main and tail rotors.

The power plant of the helicopter comprises:
- two gas-turbine turbo-shaft engines of VK-2500-02 type;
- AI-9V auxiliary power unit;
- dust protection device (DPD);
- exhaust heat shields (EHS);
- engines air starting system.

VK-2500-02 ENGINES



VK-2500-02 engines can be applied in high-mountainous and high ambient air temperature regions (the stated characteristics are provided at temperature up to 370C), have enlarged lives and the following design features:

- materials of compressor turbine having more heat-proof ability are used;
- compressor turbine rotor first stage disc is reinforced;
- structurally eliminated the current concentrators on compressor turbine rotor discs;
- the compressor turbine cooling is improved;
- in order to increase the life, thermocouples are installed in area of lower temperatures;
- oil unit of increased liability and life is installed;
- instead of engine electronic governor and temperature regulator BARK-78 electronic unit is installed.

Installation of VK-2500 -02 engines envisages, in case of one engine inoperative (switching-off or failure of one engine), the following operating modes of a 2700 h. p. engine:

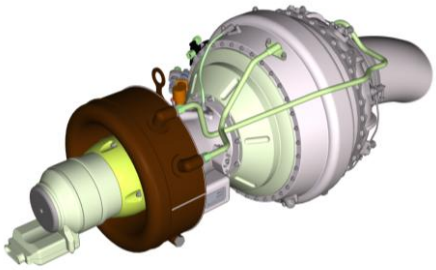
- 2.5-minutes power mode (it is allowed to be used 4 times within TBO with further repair);
- 30-minutes power mode instead of takeoff mode (it is allowed to be used once within TBO with further writing off).

VK-2500 engine main characteristics

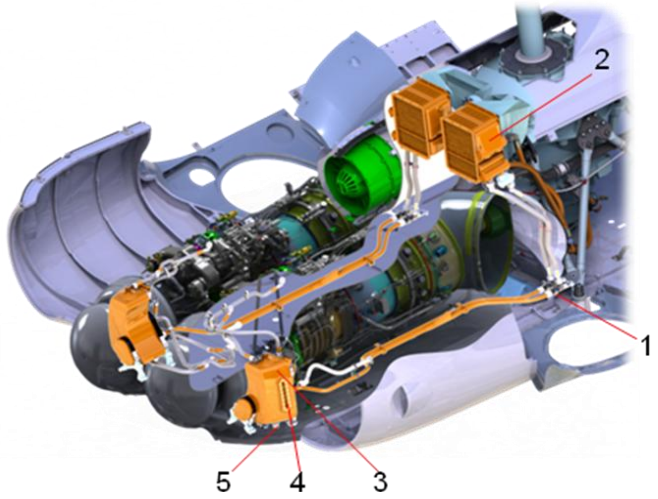
	VK-2500-02 (NTOF <= 2200 h.p.)
Assigned engine life/life time, (hours / years)	6000/-
Life/life time before 1-st overhaul (hours / years)	2000/10
TBO engine life / life time, (hours / years)	2000/10
Power in emergency mode with Dust Protection Device switched off, (h. p.)	2700
Power in take-off mode with Dust Protection Device switched off, (h. p.)	2200
Power in maximum continuous mode with Dust Protection Device switched off, (h. p.)	1700
Fuel rate in take-off mode with Dust Protection Device switched off, (gr./h. p. x hour)	214
Allowed time of continuous work in emergency mode (min)	up to 4
Allowed time of continuous work in take-off mode (min)	up to 30
Allowed time of continuous work in maximum continuous mode (min)	unlimited

AUXILIARY POWER UNIT AI-9V is designed to:

- air start the VK-2500-02 engines on the ground and in flight;
- to generate DC for helicopter mains in testing consumers on the ground;
- to generate AC for helicopter mains in flying in case of main alternator failure.

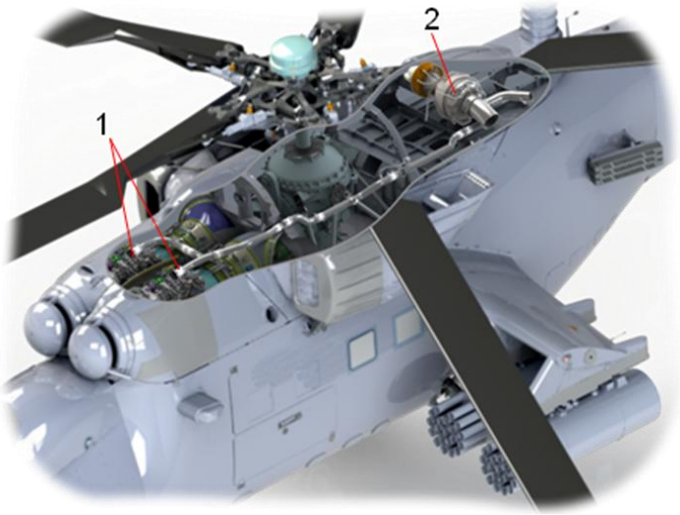


THE OIL SYSTEM is used to cool down and lubricate friction parts, i.e. heat dissipation and to carry away worn particles that accumulate during engine running. Each engine is provided with its own oil system, which provides for continuing running of the other system should the former fail.



1. Drain valves of engine oil lines
2. Air-oil cooler
3. Oil tank
4. Oil level glass
5. Oil drain valve of tank

THE AIR STARTING SYSTEM engines provides the acceleration of the compressor rotor to the RPM of 60÷65%.

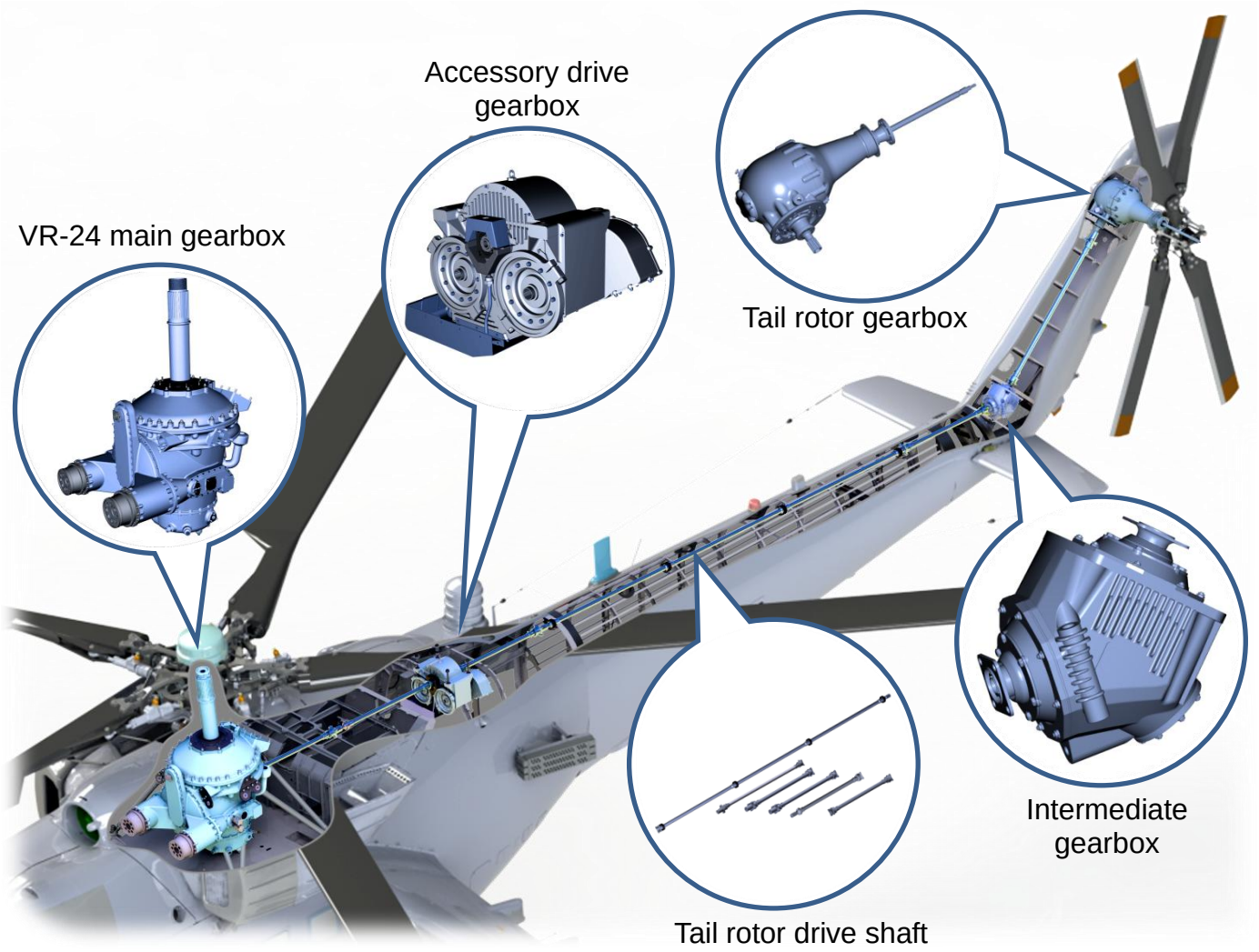


1. Air starters
2. Auxiliary power unit

THE DUST PROTECTION DEVICE provides separation of dust and foreign objects from the air entering compressors of running engines during taxiing, take-off, landing and hover over dust-laden areas. The DPD structure envisages air-heat and electrical anti-icing systems.

TRANSMISSION

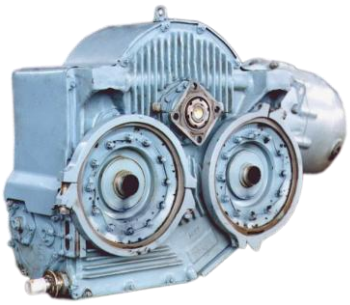
The purpose of transmission is to transmit reduced rpm. and torque from two engines to main and tail rotors, accessory gear box, fan and components installed on the main gear box and accessory gear box.



Transmission consists of a main gear box VR-24, accessory gear box, intermediate and tail gear boxes, tail rotor drive shaft, universal-joint shaft of fan and braking system of main rotor.

MAIN GEAR BOX VR-24 is designed to combine the power of two VK-2500-02 engines, transmit it to main rotor and tail rotor shafts with the corresponding rpms, drive auxiliary units built on a gear box

- Main gear box comprises following units and systems:
- Main rotor shaft;
- Rotor shaft casing;
- Gear box casing;
- Front cover;
- Tray;
- Main gear box mechanism featuring a planetary stage;
- Two freewheel clutches;
- Two accessory gear boxes;
- Oil system.



Accessory gear box type 24-1512-000 series 2 is intended to drive two alternators as well as to reduce tail shaft RPMs without drive direction change.
Accessory gear box is a two-stage gear box containing six cylindrical spur gear wheels on four shafts.

Intermediate gear box is designed to change the revolution direction of a tail shaft to 450 and transmit the torque from accessory gear box to the tail rotor gear box, RPMs being unchanged.

Intermediate gear box comprises following main parts: housing, sleeve with driving gear, sleeve with driven gear and oil system.

Tail rotor gear box is designed to hold and drive the tail rotor with specified RPMs, to change direction of the tail shaft center line to 900 and to change pitch of tail rotor.

Tail rotor gear box consists of the following main units: housing, sleeve with driving gear, cover housing driven gear, tail rotor control rod. Tail rotor control rod on the Mi-35M helicopter tail rotor gearbox 542-1517-000 is increased in length for control of X-shape tail rotor.
Tail gear box driving shaft end has slots to be inserted into inclined tail shaft and the outer end of the inclined shaft has a flange to be connected to the tail rotor.

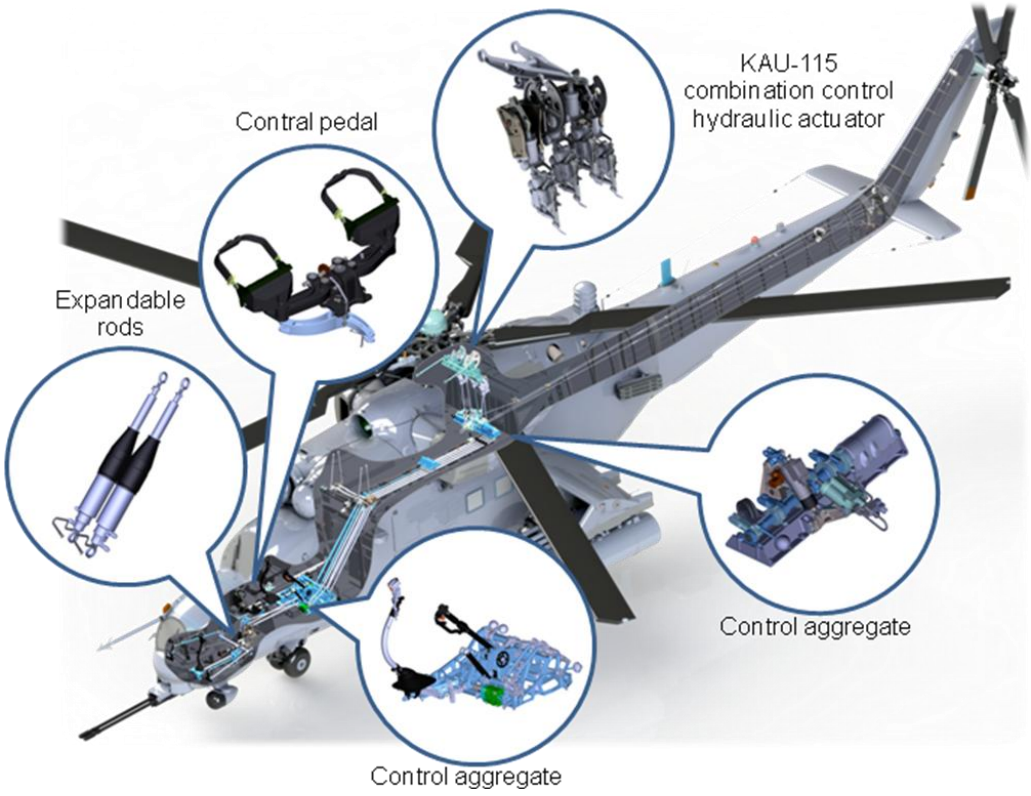
Universal-joint shaft is used to transmit the main gear box torque to the fan.
Universal-joint shaft is a tube having universal joints at its end. Joint forks are connected to the shaft tube using two cone-shaped. Joints are filled with oil.
Flange fork of the shaft is connected to the driving flange of the main gear box using four screws, and the slotted fork – to the fan shaft.

Braking system is intended to rapidly stop the running main rotor after engine shut down and also to arrest transmission in parking.

The system consists of:
- Main rotor brake;
- Control lever;
- Connecting wire rope system.

HELICOPTER CONTROL SYSTEM

Управление вертолетом относительно трех осей осуществляется изменением величины и направления силы тяги несущего винта и изменением величины силы тяги рулевого винта. На вертолете установлено двойное управление: одно – на рабочем месте летчика, второе – на рабочем месте оператора.



The helicopter controls include:

- Dual longitudinal/lateral control in which case both control sticks are cinematically intercoupled and connected to the swash plate;
- Spring loading control;
- Dual directional control by two pairs of pedals connected to the tai rotor;
- Dual combined pitch/throttle and elevator control in which case two pitch/throttle control sticks are cinematically connected to the slide of the swash plate and control leavers of the fuel control units installed on engines;
- Separated throttle control;
- Engine RPM control;
- Shut-down control;
- Main rotor brake control;
- Wheel brake control.

SWASH PLATE

Swash plate is a mechanism of tilting the blades thus providing for a change of the value and direction of resultant aerodynamic force of the main rotor (rotor thrust).

Helicopter control includes lateral, longitudinal and directional controls, combined collective-pitch and stabilizer control, separate control of engines, engine RPM control, engine shutdown control, spring-loading control (trimmers), main rotor brake control and wheel brake control. All controls are located in the flight compartment on pilot's and operator's stations. Longitudinal/lateral control stick may be disengaged and arrested, and directional control pedals stowed behind side plates. If required they can be replaced and coupled to the main pilot's control.

Helicopter control is carried out by KAU-115 boosters which also are autopilot servos. Directional control envisages a pitch limit system – SPUU-52-3.

The helicopter is fitted with an automated flight control system comprising VUAP-1E autopilot which in turn stabilizes the helicopter in roll, heading, pitch, altitude and air speed. It is coupled to the helicopter navigation equipment.

PILOT'S CONTROLS

Pilot's station is equipped with directional control pedals, combined controls, engine shutdown stick and main rotor brake control stick.

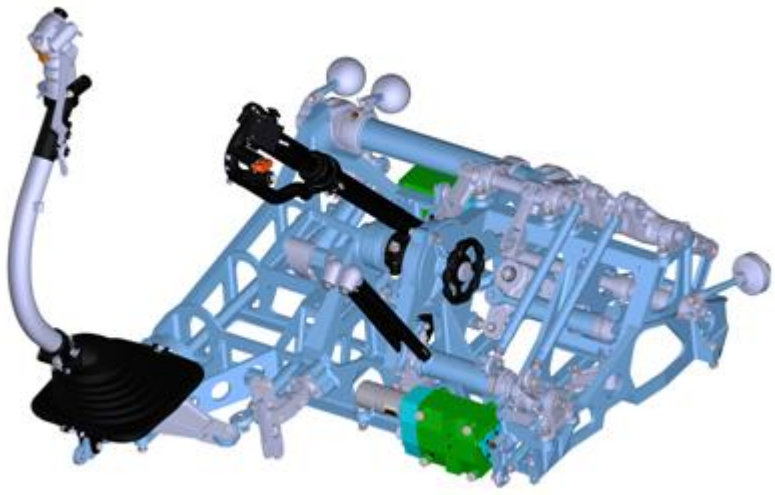
OPERATOR'S CONTROLS

Operator's station is fitted with emergency controls of the helicopter allowing to perform helicopter control and landing. The controls consist of longitudinal/lateral control, directional-control pedals and collective pitch control stick. The control levers have less length, and consequently, less travels in comparison with travels of main control analogous levers.

PILOT'S CONTROL AGGREGATE

The control aggregate comprises self-operated unit which is assembled separately and attached by bolts to the crew cabin floor between frames Nos.4N and 5N.

The control aggregate comprises the following units mounted on common plate: longitudinal-lateral control lever, collective pitch control lever, engines' separate control levers, spring mechanisms of loading of longitudinal-lateral controls with electrical mechanisms of MGU-1 power gradient, differential mechanism of engines' control system, inclined rods' counterweights, rods and bell-cranks connecting control sticks with output bell-cranks, power gradient mechanisms and the secondary controls (operator's).



OPERATOR'S LONGITUDINAL/LATERAL CONTROL

The operator's longitudinal/lateral control is a support-mounted stick fixed to the floor in front of the operator using four screws.

Control stick is hinge-way attached in the upper eye-lugs of horn. The stick is installed on two ball-bearings and fixed by a bolt which is an axle relatively to which it has a possibility to incline in longitudinal direction. At lateral inclination, the stick is turned together with the horn on ball-bearings.

This stick is similar to that of the pilot and differs in that it has a disengager to stow the stick in the flying condition, and lower button on left of the stick serves for disengagement of operator's stick from main controls linkage.

PILOT'S DIRECTIONAL CONTROL PEDALS

They are mounted in the cockpit floor along the symmetrical line of frame 3N in front of the pilot's seat. Rod from pedals is installed under the crew cabin floor and connected to output bell-crank installed on control aggregate. The pedals are of parallelogram-type and comprise a separate aggregate. Parallel movement of pedals is provided by two hinge rods on axles in the base and on supports. Extreme inclinations of pedals are limited by adjustable bolts-stops, screwed into the base.

OPERATOR'S DIRECTIONAL CONTROL PEDALS

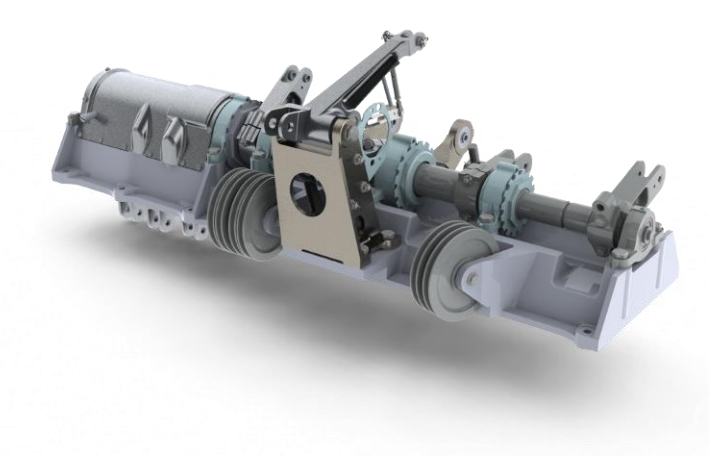
Each pedal is installed on a separate bracket of frame No.1A, on vertical plate, and connected with pilot's pedals' lever by system of rods and bell-cranks. In order to provide comfortable work of operator when he is not controlling the helicopter, pedal supports are moved to the sides aft vertical armor plates and fixed in stowed position. Unfixing of pedals is performed by cables connected with trigger on operator's collective pitch control lever. The pedal has cylindrical casing with welded lever. The lever is installed on bracket axle on two roller bearings. Pedal support plate in the shape of cylindrical rod is telescopically installed into casing.

OPERATOR'S COLLECTIVE PITCH CONTROL STICK

The operator's collective pitch control stick is installed on a shaft mounted on a bracket located on vertical armor plate.

The stick consists of casing and correction stick shaft. Casing with cone bolt is attached to shaft installed in bracket on ball-bearings.

LONGITUDINAL/LATERAL/DIRECTIONAL CONTROL AND MAIN ROTOR COLLECTIVE PITCH CONTROL AGGREGATE



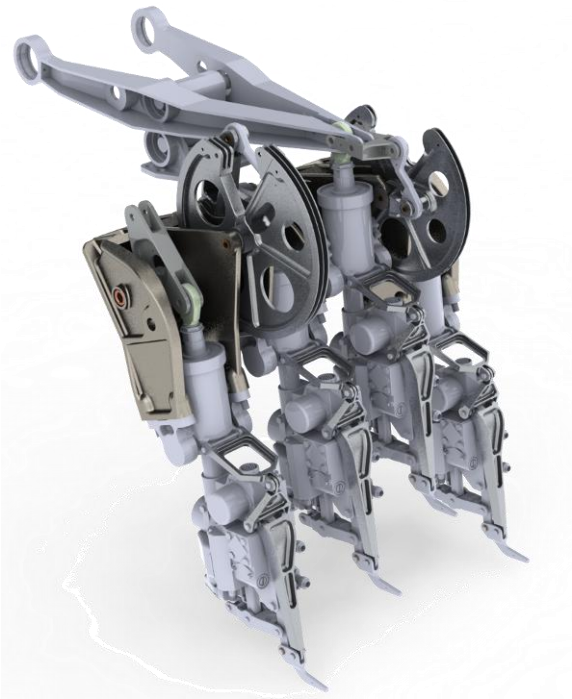
It is installed in the ceiling on external part of fuselage central section between frames Nos. 7 and 8. Its support incorporates the SDV-5000-0A hydraulic damper and MP-100M electrical mechanism of directional control adjustable stop system.

BRACKET WITH KAU-115 HYDRAULIC BOOSTERS

Installed in longitudinal, lateral and directional control systems of collective pitch KAU-115 are mounted on a common bracket which is attached to the rear of the main gear box. Each KAU-115 is mounted in journals and bearings and has freedom of rocker movement.

Bell-cranks of longitudinal, lateral, directional and collective-pitch control are coupled through tie rods to KAU-115 hydraulic boosters.

Bell-cranks are attached to bracket in hinge-way and connected to KAU-115 hydraulic boosters' rods. Longitudinal/lateral control bell-cranks connected with swash plate bell-cranks by rods. KAU-115 rod is connected to the swash plate lever of main rotor collective-pitch control. A link connected with by stabilizer control sector rod is installed on the lever. The bell-crank is connected with tail rotor control sector by a rod.



HYDRAULIC SYSTEM

Hydraulic system has been designed to boost helicopter controls. In case of main hydraulic system failure the auxiliary system is automatically started.

Hydraulic system consists of:

- Main system;
- Auxiliary system;

Hydraulic system simplified scheme

Hydraulic systems main aggregates:

1. AGS-60A common hydraulic unit, is intended to store, filter and feed hydraulic fluid to helicopter's main and auxiliary hydraulic systems;
2. NP-92A-4 variable capacity pumps (one per each system).

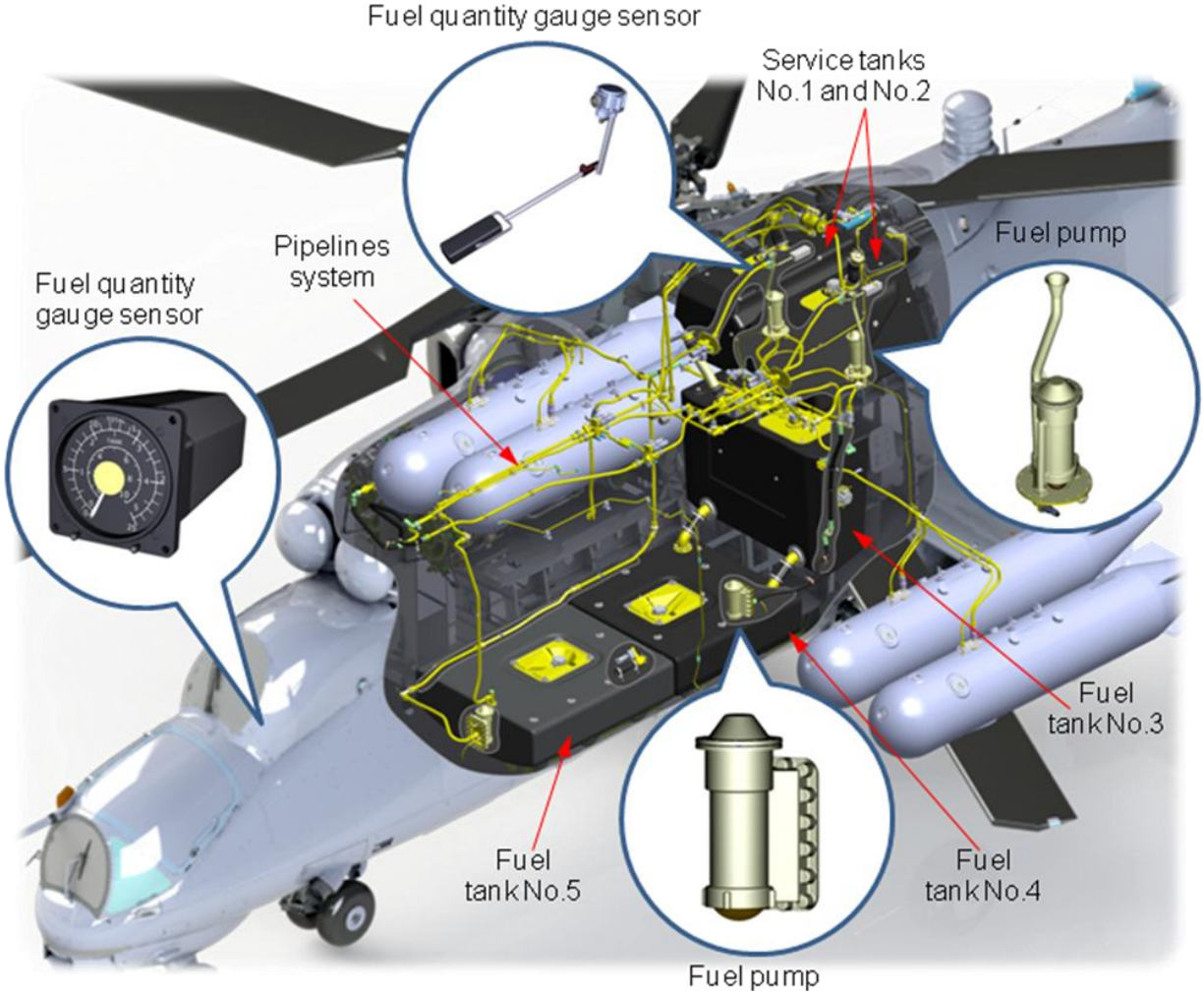
MAIN TECHNICAL DATA OF HYDRAULIC SYSTEM

Working fluid	AMG-10 oil
Working pressure	65±1 to 80±5 кg/cm^2

AMG-10 oil can be replaced by AeroShell Fluid 41 (MIL-H-5606C, D, E) of "Shell" Company.

FUEL SYSTEM

Fuel system is intended for fuel supply of engine and auxiliary power unit.



Fuel system consists of:

- Fuel tanks;
- Pump aggregate;
- Fuel measuring equipment;
- Floatable throttles;
- Shut-off and drain valves;
- Check valves;
- Connecting and drain pipelines.

Fuel is arranged in five soft tanks: two service (№1, №2), one vertical (№3) and two lower (№4 и №5). **In helicopter ferry version** it is possible to install on DB3-UV external store racks two or four extra tanks with increased capacity – 560 liters each.

In order to prevent explosion of helicopter fuel system's tanks, three main fuel tanks Nos.3, 4 and 5 are filled with polyurethane foam (block-shaped).

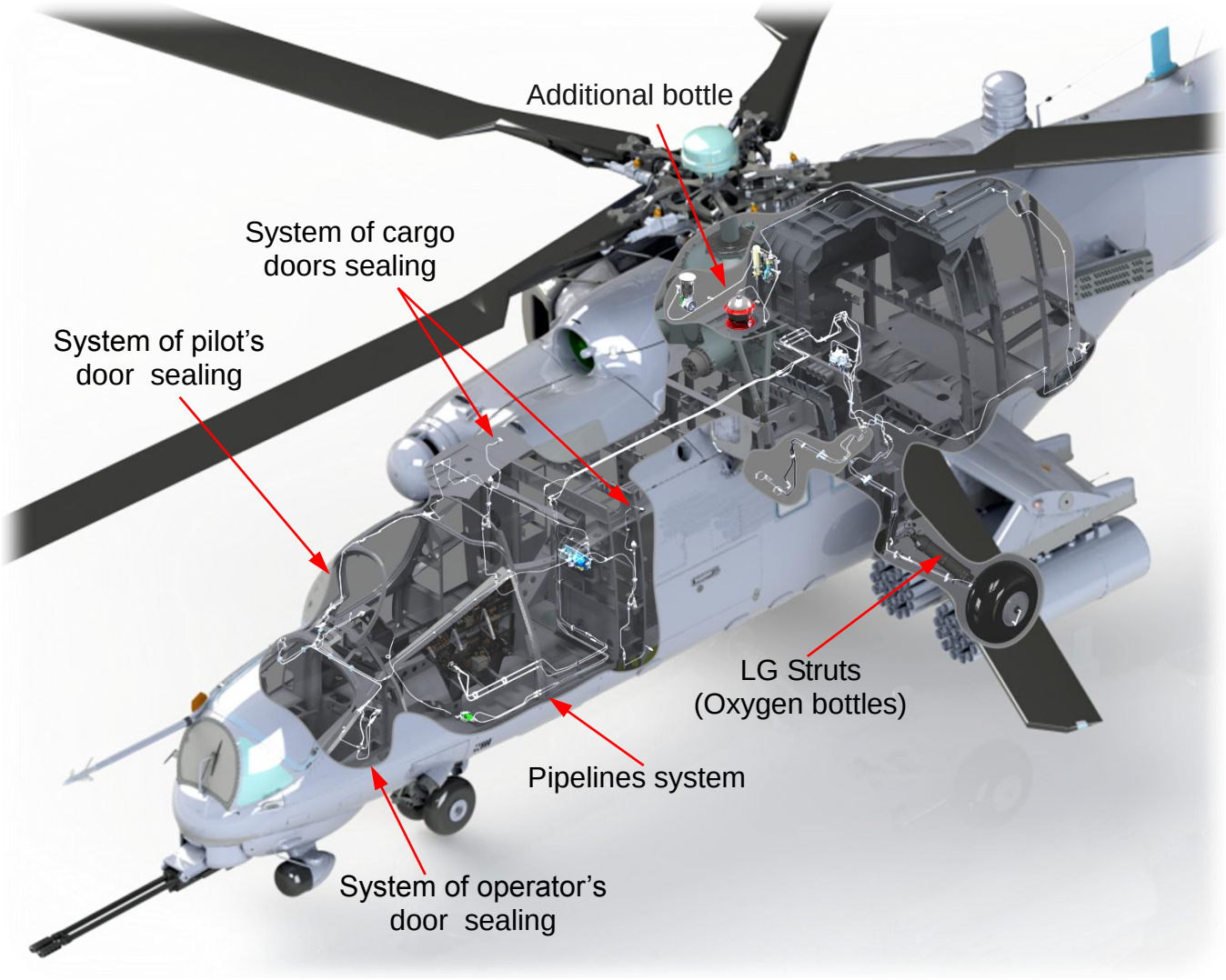
Fuel to be used:

Russian fuel	Foreign fuel
TS-1, RT GOST 10227-86	Jet A-1 DERD 2494
T2 GOST 10227-86	JP-4 DERD 2454
	Jet B DERD 2486

PNEUMATIC SYSTEM

The helicopter pneumatic system is intended to brake the main wheels of landing gear, cockpit, cabin, cargo compartment doors pressurization and to operate air pumps of windshield spray system. Compressed air is contained in two bottles arranged in main landing gear stays and one additional bottle.

Pressurization system for cockpit, cabin and cargo compartment doors is a tube system filled with compressed air to seal the doors.



Pneumatic system scheme

ANTI-ICING SYSTEM

The helicopter anti-icing system is intended for protection of main and tail rotor blades, crew cabin windshields, dust protection device (DPD), engine inlet ducts and pitot tube from icing.

Anti-icing system includes:

- Anti-icing system of main and tail rotors;
- Anti-icing system of crew cabin windshields;
- Anti-icing system of DPD and engine inlet ducts;
- Pitot tube heating.

Anti-icing system of main and tail rotors is intended for prevention of generation or removal of ice from main and tail rotor blades.

Main rotor blades anti-icing system: In order to protect blades from icing, they are equipped with anti-icing system of electric-thermal action with cyclic actuation of sections and anti-abrasive protection of front blade edge.

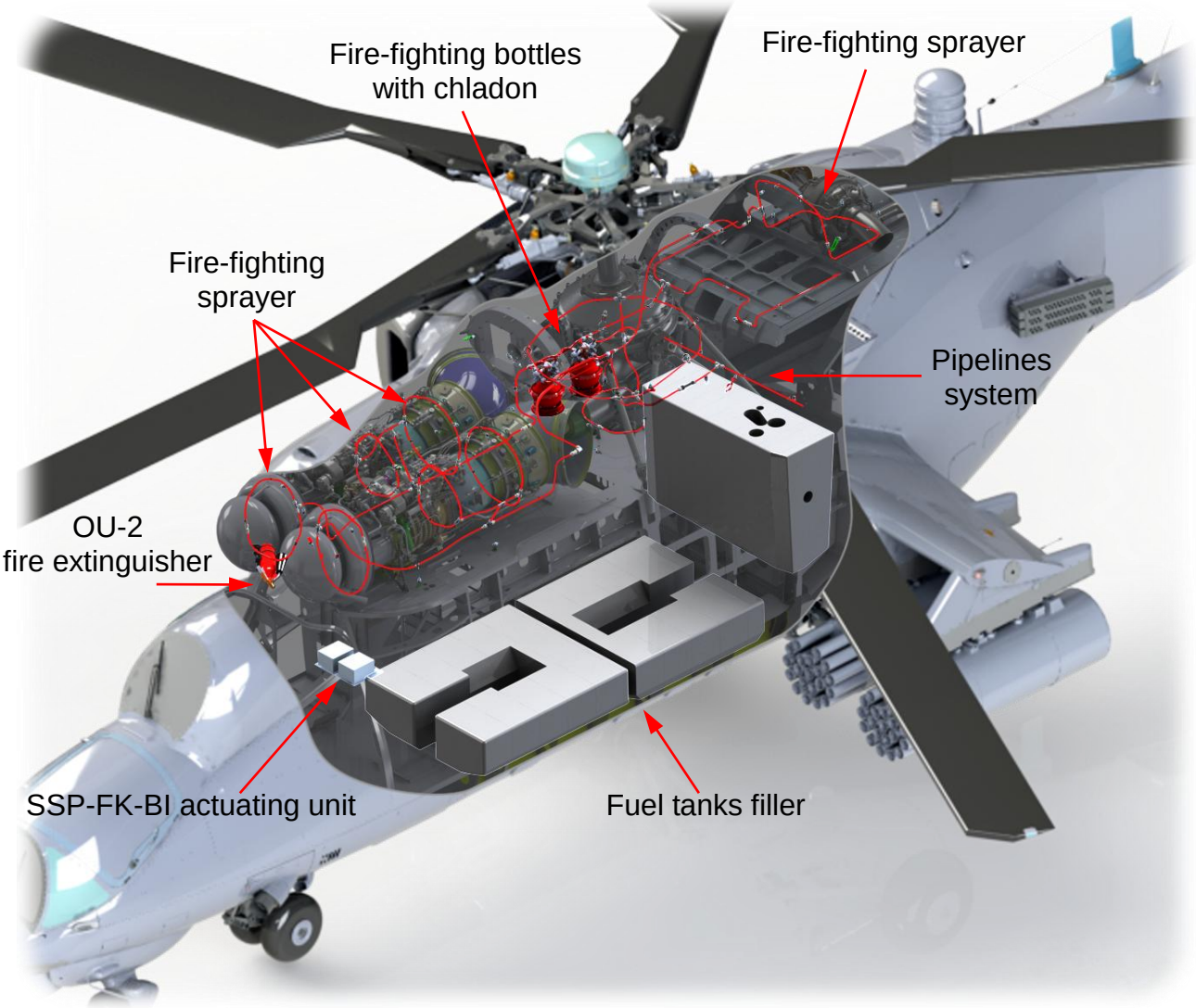
Tail rotor blades anti-icing device: tail rotor blades are equipped with electrical heating elements operating in automatic and manual modes.

Anti-icing system of crew cabin windshields is intended for preventing of generation or removal of ice, frost or water on the windshields. Anti-icing system of crew cabin windshields is electrically heated and includes windshield heating elements, thermal-electronic regulator and automatic transformer.

Anti-icing system of DPD and engine inlet ducts is intended for prevention of ice generation and removal of it from DPD structure elements and engine inlet ducts.

FIRE PROTECTION SYSTEM

The fire protection system has been designed to detect, warning and eliminate fires in fire-hazard areas.



The fire-hazard area is subdivided into 4 compartments by fire walls:

- Under-cowling compartment of SB engine;
- Under-cowling compartment of PS engine;
- Main gear box and service tank compartment;
- AI-9V APU and tank 3 compartment.

The fire protection system comprises:

- Detection and warning system;
- Fire extinguishing system;
- Explosion prevention of fuel tanks the main fuel tanks are filled with polyurethane foam, whet provides their full explosion safety at many bullet damages in all flight stages).

Fire warning system is intended for fire detection, automatic actuation of fire-extinguishing system and information of pilot about fire in protected compartment.

Fire-extinguishing system is intended for fire extinguishing occurred in protected compartments of the helicopter.

AIR CONDITIONING SYSTEM

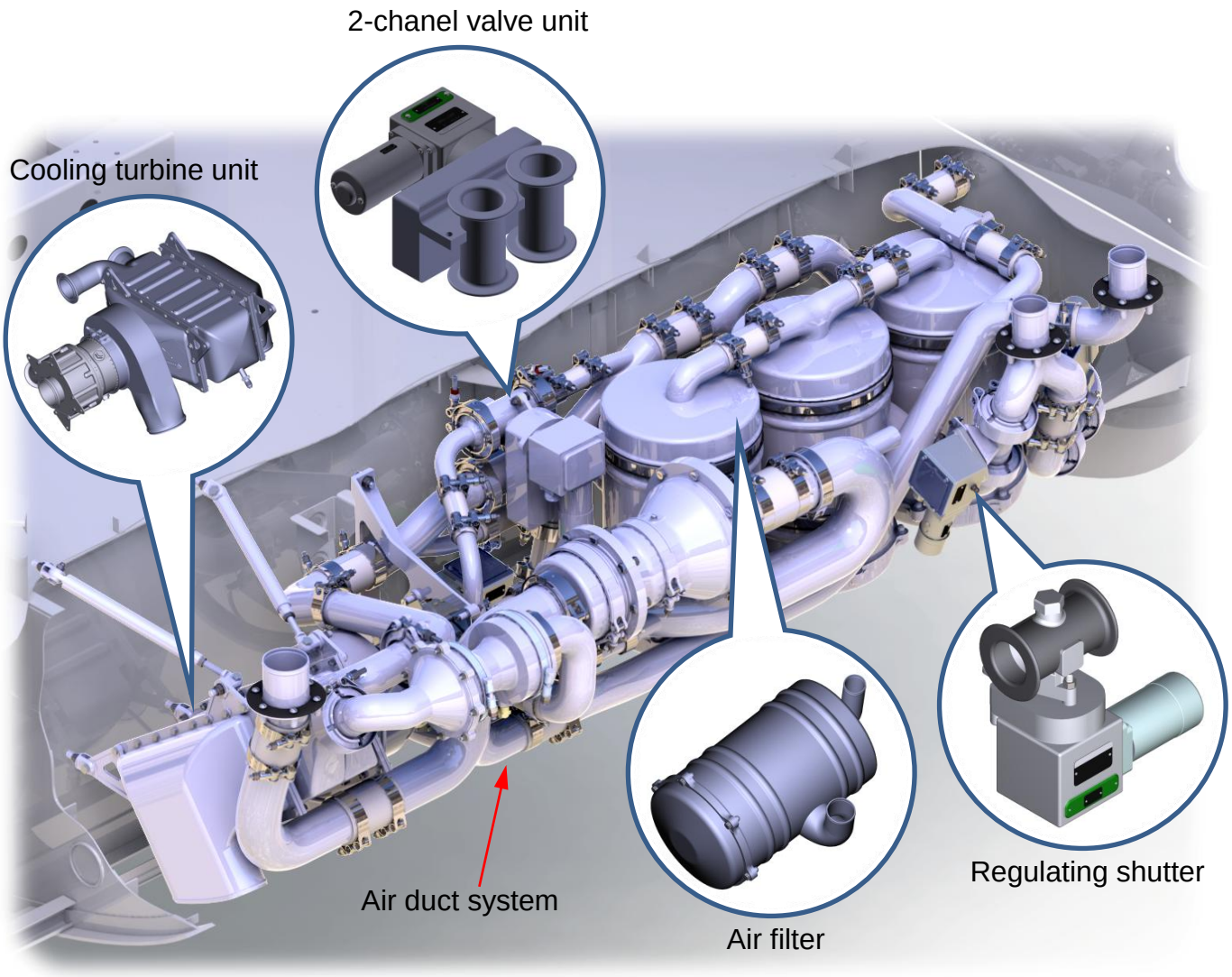
Helicopter air conditioning system is intended to:

- Maintain the required air temperature in cockpits;
- Heat up gunner's sight glasses;
- Blow up cockpit glasses.
- Set up air excessive pressure 200 mm of water in the cockpit;
- Ventilate the cockpit by ambient air.

The system comprises:

- Turbo-cooler;
- Air-to-air radiators;
- Dryer;
- Thermo-compensators;
- Non-return valves;
- Throttle valve for two-duct air outlet slides;
- Slide valves;
- Adjustment slide valves;
- Vent slide valve;
- Filter, filter inserts;
- Overpressure regulator;
- Automatic cockpit temperature control;
- Automatic air temperature control before filters;

Thermal switch and ejector.



COCKPIT EQUIPMENT

Cockpit equipment is used to provide normal environment for crew in flight.

This equipment comprises:

- Pilot's seat;
- Operator's seat;
- Instrument-flight curtain;
- Back-view mirror;
- Electrical fans;
- Emergency axe.

Ceiling in the cockpit and doors in the pilot cabin are covered by pliant foam-polyurethane panels and leather-cloth. Panels are attached by fasteners.

PILOT'S SEAT is armored and consists of seat, back and head support. The internal side of the back has a removable cushion and the seat houses a parachute. In front of the seat is a ring for automatic parachute release.

The seat is equipped with seat back inclination spring mechanism with ball-locks. The spring mechanism allows to adjust the seat with inclination backwards at angles of 16º, 21º and 26º from vertical plane. Seat back inclination control stick is situated on LH side of the seat. Seat vertical movement range is 160mm.

The seat is equipped with shoulder and waist safety belts with fast-operated lock. The seat if fitted with inertial mechanism of shoulder belts automatic fixing and intended for automatic and manual fixing of shoulder safety belts during g-load. The mechanism actuates at g-load not less than 0.8.

OPERATOR'S SEAT consists of seat, back, hydraulic dampers, frame and shoulder belt tightening mechanism.

The seat is made of magnesium alloy and attached to two fork-shaped levers in the hinge way. Parachute is placed into the seat. Parachute strap attachment ring is connected in front of the seat. The back is punched from duralumin sheet and attached to the seat by rivets. The seat has soft facing.

The seat can be adjusted upwards in the range of 132mm and fixed in one of four positions by fixing devices. Lifting of the seat is effected by torsions consisted of steel plates. In order to make softer of torsions actuation during lifting and lowering of the seat, two filled with oil hydraulic dampers are installed.

Longitudinal adjustment of the seat is effected within the range of 165mm with fixation in two extreme and five intermediate positions with pitch of 33mm.

The seat is equipped with shoulder and waist safety belts, fast-actuating lock with inertial mechanism of shoulder belts automatic fixing when the g-load is not less than 0.8.

Removable curtains can be installed in the pilot's station to simulate instrument-flight conditions in training. The curtain is of cap-shape. It is lowered and lifted manually. When the curtain is assembled it is suspended on four screws installed on frame No.5N.

Two back-view mirrors are installed in the Pilot's cockpit for viewing of the rear hemisphere. The first is installed on LH side on pilot's blister frame at axis of frame No.4N. The second mirror is installed on RH side between frames Nos. 3N and 4N on pilot's door blister frame.

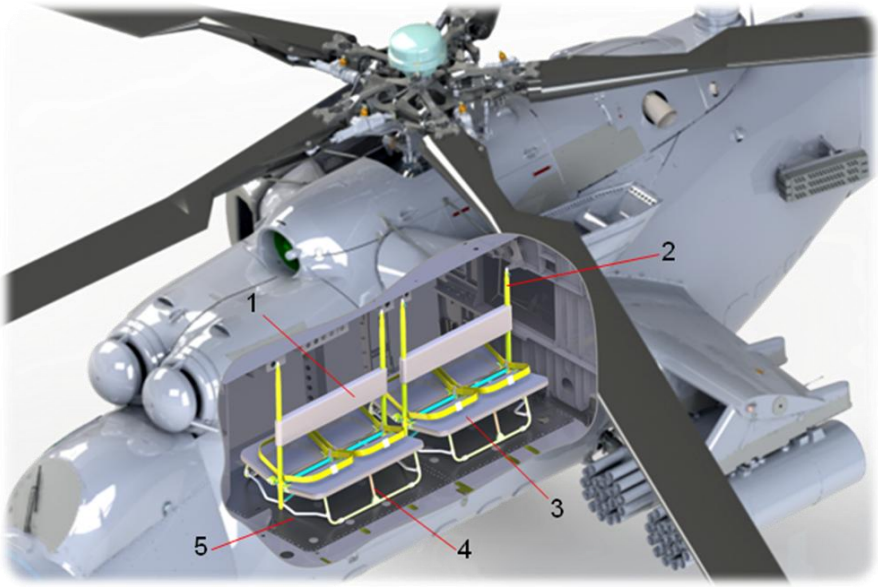
Electrical fans are used for creation of local air circulation in order to provide individual air-cooling of pilot and operator. Controlling of fans is done by switches located on LH side control panel of pilot and operator correspondingly.

An emergency axe is provided to the operator's left installed on the armor plate to brake through the canopy glass in case emergency landing.

CARGO CABIN EQUIPMENT

In a troop-carrier version the cargo cabin is equipped with two four-seat folding benches for 8 troops with full kit.

ARRANGEMENT OF SEATS

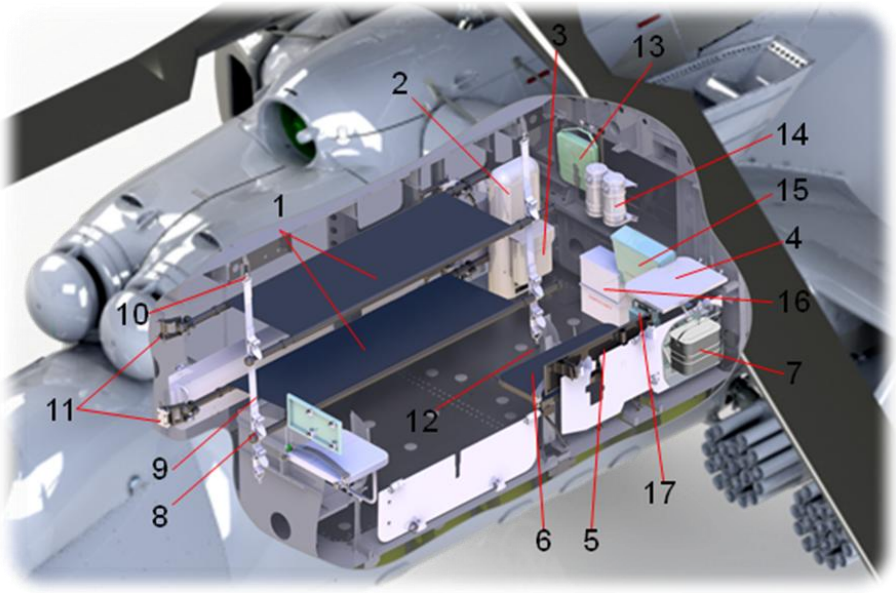


1. Seat back
2. Stay
3. Seat
4. Support
5. Rod

In ambulance version, the cabin is equipped with two stretchers, shelf and seats for one medic and two wounded as well as required sanitary accessories.

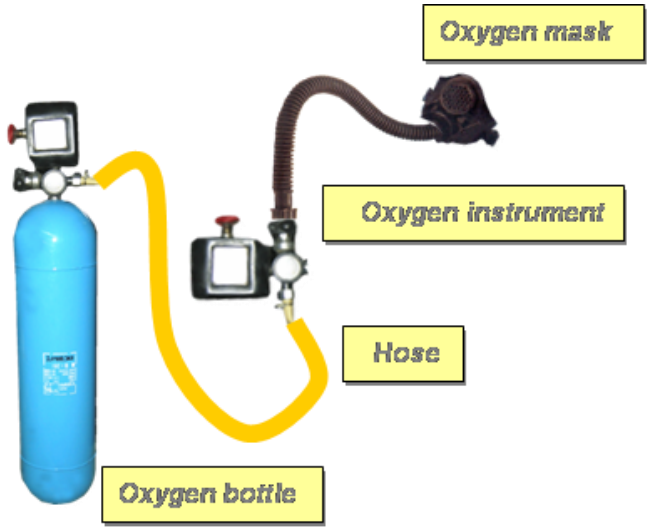
ARRANGEMENT OF SANITARY EQUIPMENT

1. Stretchers
2. Container for two oxygen bottles
3. Pocket for oxygen
4. Medical attendant's table
5. Upholstered back
6. Seat
7. Bucket
8. Hardness
9. Stretcher tie
10. Upper connection for tie
11. Lockable stretcher bracket
12. Lower connection for tie
13. First-aid kit
14. Thermos flasks
15. Bedpan bag
16. Sanitary bag
17. Water bottle bag



OXYGEN EQUIPMENT

Oxygen equipment is intended for supplying of crewmembers with oxygen in high altitudes and in ambulance version of helicopter to supply crew and wounded with oxygen correspondingly.



Two oxygen bottles 7.6 liters each having oxygen pressure of 30kg/cm^2 and with KKO-LS easy removable oxygen equipment complex are installed in pilot's and operator's stations.

Oxygen equipment comprises:

With a flight engineer onboard, an oxygen bottle and oxygen mask in a bag are provided in the cargo cabin for the engineer.

In ambulance version, two sets of oxygen equipment are provided in the cabin for casualties. Each set consists of oxygen instrument, bottle and mask.

ОСНОВНЫЕ ТЕХНИЧЕСКИЕ ХАРАКТЕРИСТИКИ

Oxygen supply to the mask:	
▪ up to 2000m altitude, l/min	Up to 2
▪ up to 3000m altitude, l/min	1÷3
▪ up to 4000m altitude, l/min	1,75÷4
▪ up to 6000m altitude, l/min	3,5÷6
Emergency oxygen supply to the mask, l/min	6÷20

TRANSPORT EQUIPMENT

Transport equipment consists of external sling and a set of tie-down equipment for fixing loads in the helicopter's cargo cabin.

External sling is used to hook on load and transport it by the helicopter to destination place, as well as for fast release of load at the delivery site.

Main data:

Lifting capacity, kg	max 2400
Cargo cable length, m	1÷24
Straps' length attached to the hook, m	4
Weight of cargo cable with straps, кg	47.1
External sling weight without cargo cable, кg	32.5

External sling consists of a beam structure, electrical quick-release lock, quick-release lock drive for in and out position, set of cargo cables with a hook and cargo straps with thimble and shackles.

Mooring equipment is used for secure fixing of materiel/loads to the cargo floor in flight. Mooring equipment set includes mooring nets and belts.

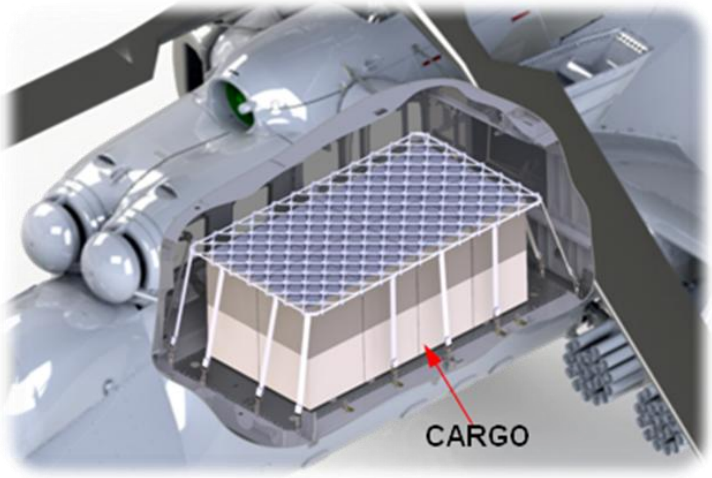
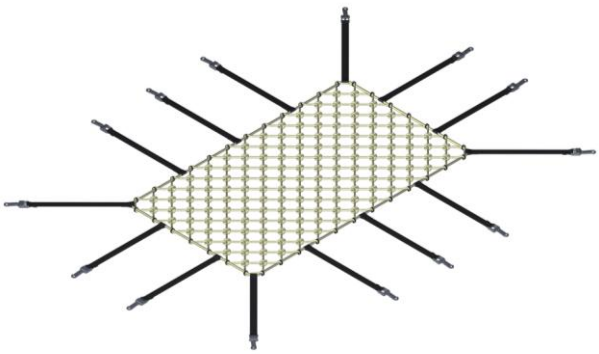
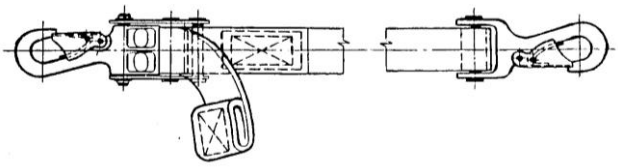


Diagram of cargo tie down in cargo cabin

Mooring nets are used for fixing of small loads to cargo floor. The set consists of two linen nets.

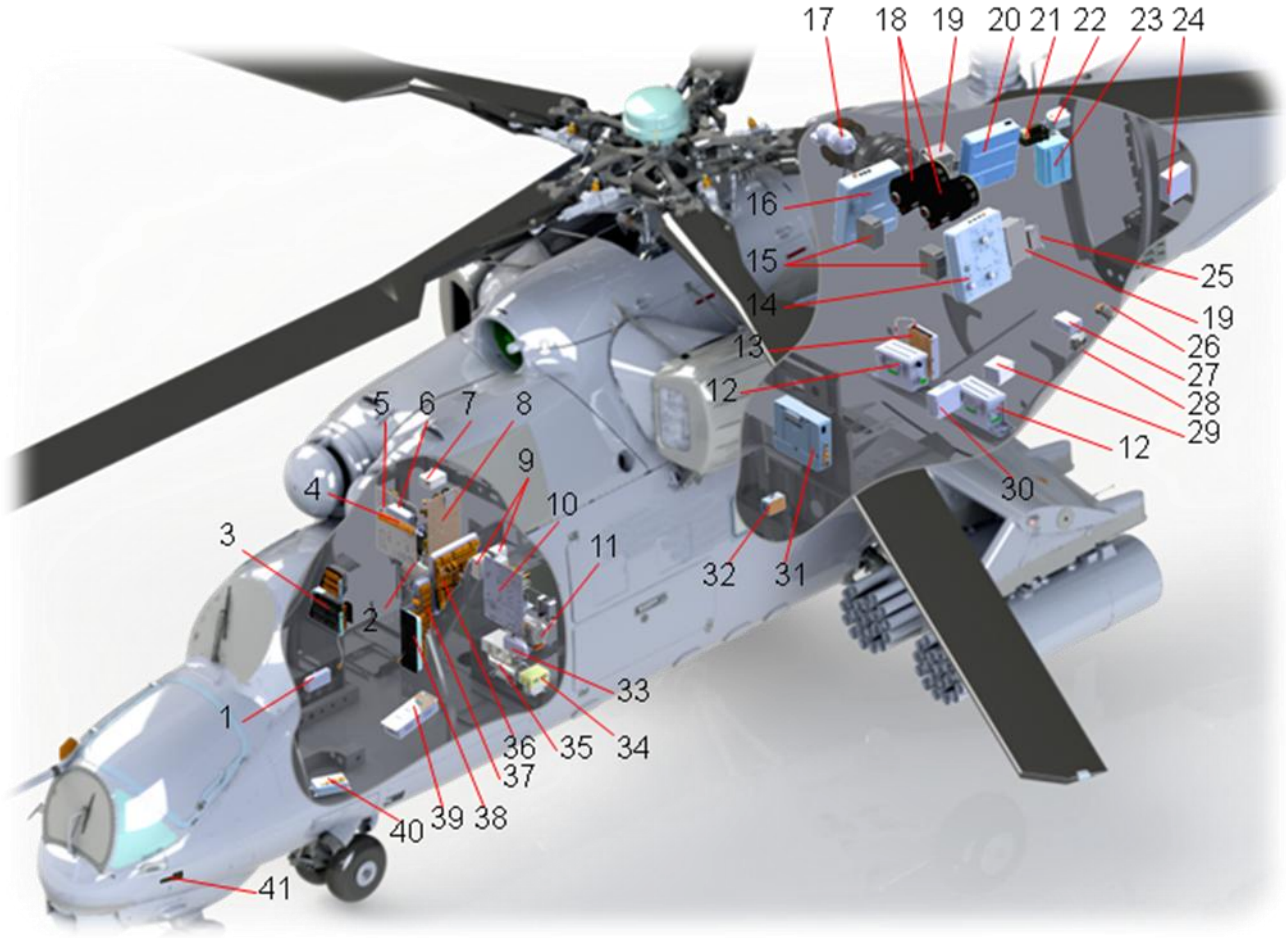


Mooring belts of nylon are used to tie down loads to the cabin floor.



ELECTRICAL POWER SUPPLY SYSTEM

Electrical power supply system is intended for powering of all of the consumers and includes an AC and DC power supply systems and airborne power system.



Arrangement of electrical parts

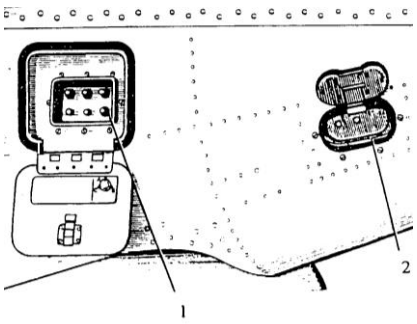
1. JB No.1 Day-Night
2. Right-handrectifier
3. Right-handcircuit breaker
4. Right-hand fuse panel
5. Right-handDC distributor
6. JB of anti-icing system automatic control
7. Power supply switch unit
8. Right-hand AC distributor
9. Power supply switch unit
10. Left-hand DC distributor
11. Left-hand rectifier
12. Storage battery
13. JB of charging current limitation
14. JB of left-hand generator
15. Voltage regulating unit
16. JB of right-hand generator
17. Starter-generator
18. Left-hand and right-hand AC generators
19. Protection and control unit BZU-4A
20. JB of storage batteries

21. Voltage regulator
22. Overvoltage circuit breaker
23. JB ofAI-9
24. JB of navigation and flight system
25. Box of programming mechanismPMK-4-2
26. External AC power supply plug
27. JB of stop
28. ExternalDCpowersupplyplug
29. JB of anti-icing system
30. JB of radio
31. JB of special equipment
32. Resistor panel
33. JB No.2 Day-Night
34. Three-phase inverter
35. Single-phase inverter
36. Left-hand AC distributor
37. Left-hand fuse panel
38. Left-hand circuit breaker panel
39. Lightingregulators and transformer panel
40. JB of left-hand panel
41. Device for helicopter grounding at the parking

<u>AC POWER SUPPLY</u> AC power supply system is intended for generation of electrical energy and comprises three-phase 200V, 400Hz and 36V, 400Hz and single-phase 115V, 400Hz and 36V, 400Hz. Three-phase 200V, 400Hz AC power supply system consists of:

- GT40PTch6 alternator;
- BRN-208M7A voltage regulator;
- BZU-4A safety and control module;
- BTT-40P transformer module;
- Control, safety, switch and signal units.

Single-phase 115V AC, 400Hz system is fed by three-phase 200V AC, 400Hz system.
Single-phase 36V AC, 400Hz system is fed by single-phase 115V AC, 400Hz system.



External power supply plug for three-phase 200V AC, 400Hz is located on the port side of the helicopter.

1. AC receptacle
2. DC receptacle

<u>DC POWER SUPPLY</u>

This system generates 27V DC and is a secondary system fed by three-phase 200 AC, 400Hz through rectifiers and comprises:

- Two VU-6B rectifiers;
- Two batteries 20NKBN-28;
- STG-3 starter-generator;
- DMR-200D differential under-voltage relay;
- RN-120U voltage regulator;
- AZP-A2 over voltage switch;
- Control, safety, switch and signal units;
- ShRAP-500K external power supply connector.

Batteries are a stand-by power supply used to:
- Power vital DC consumers indispensable in flying and landing;
- Independently start the VSU-9V APU in field conditions;
- Test helicopter systems and equipment with power on no external power supply.

External power supply plug for three-phase 27V DC is located on the port side of the helicopter.

<u>HELICOPTER AIRBORNE POWER SYSTEM</u>

This system is used:
- To supply and distribute electrical power generated by systems to consumers;
- To power and control power sources and consumers;
- To protect the electrical equipment from over-current/over-voltage and short-circuits.

Helicopter mains consist of:
- Wiring;
- Control and switch parts(switches, position switches, push buttons, limit switches, relays and contactors) and intended for direct control of the entire helicopter electrical equipment;
- Safety parts (switches and automatic circuit-breakers) intended to protect the electrical equipment from over-current/over-voltage and short-circuits;
- Mains filters and screens to diminish radio interference;
- Mounting-installation equipment (circuit connectors, distribution devices and junction boxes, installation parts)
- Distribution devices and junction boxes are intended for installation of commutation and control elements, protection.

INSTRUMENT EQUIPMENT

In order to provide piloting of Mi-35M helicopter equipped with KNEI-24E navigation and electronic indication complex, PrVK-24 sighting-computing complex, GEO-ONV1-01M night vision goggles and GOES-342 gyro-stabilized optronic system, instrument panels, panels, layout of pilot's and operator's control panels in crew cabin were adapted for night vision goggles application, and additional equipment is installed:

Pilots instrument panel

AGR-29RS-15 gyro horizon, IV86-2 two multifunctional indicators and OPS "0" switch are installed on pilot's instrument panel.

1. AGR-29RS-15 gyro horizon
2. IV86-2 multifunctional indicator
3. IV86-2 multifunctional indicator
4. OPS "O" switch

Crew cabins and out-of-cabin equipment is adapted fro night vision goggles.

AGR-29RS-15 GYRO HORIZON

AGR-29RS-15 gyro horizon is intended for indication of helicopter attitude in roll and pitch, side slipping, control commands on roll and pitch.

Combined type of indication in roll – "view on helicopter from ground", in pitch – "view on ground from helicopter" is applied in the gyro horizon.

Indication elements are painted in various colors for more clear perception of information.

AIRBORNE MEANS OF FLIGHT DATA CONTROL AND RECORDING

BUR-SL-1 airborne flight data recorder in installed on Mi-35M helicopter, which intended for collection, registration and storing of flight information in case of flight accident and solving tasks of helicopter's equipment and systems operating control. Processing of collected information is performed on ground processing device "Topaz" comprising personal computer compatible with IBM PC.

BUR-SL-1 flight data recorder records 15 analogous and 16 discrete commands.

Analogous signals.

1. Flight pressure altitude.
2. Flight geometric altitude.
3. Instrument flight speed.
4. Swash plate slider position.
5. Longitudinal position of control stick.
6. Lateral position of control stick.
7. Roll angle.
8. Pitch angle.
9. Tail gearbox shaft position.
10. Gas temperature before LH engine compressor turbine.
11. Gas temperature before RH engine compressor turbine.
12. LH engine compressor turbine rpm.
13. RH engine compressor turbine rpm.
14. Main rotor rpm.
15. DC voltage on distribution device bus.

Discrete commands.

1. Minimum pressure of main hydraulic system.
2. Auxiliary hydraulic system operating.
3. Low oil pressure in LH gearbox.
4. Low oil pressure in RH gearbox.
5. Minimum oil pressure at entry into main gearbox..
6. Special item launch.
7. LH engine high vibration.
8. RH engine high vibration.
9. Fire warning actuation.
10. Dangerous altitude.
11. Fuel usage from group of tanks.
12. Minimum fuel reserve.
13. Chips in oil of LH engine.
14. Chips in oil of RH engine.
15. Pushing "Radio" button for external communication output.
16. Actuating of inlet guide vanes' anti-icing system.
17. Accident.

BUR-SL-1 provides forming and recording of following service information:

- Current time (hours, minutes, seconds), reference is the moment of BUR-SL-1 readiness for operation after actuation;
- Number of actuation, set at each actuation;
- Helicopter registration No. from 00000 up to 65535, recorded to memory.

In case of power switching-off, saving of programs and collected information is provided without time limitation. BUR-SL-1 device provide recording of received information onto solid-state storage in "ring" mode with erasing of previously recorded information.

AUTOMATIC FLIGHT CONTROL SYSTEM

The helicopter is fitted with SAU-V24-1E flight control system intended for improvement of the helicopter stability and controllability characteristics, and for flight automatic flight control.

The system's functions:

- improvement of the helicopter stability and controllability characteristics;
- stabilization of angular position, air speed and barometric altitude of the helicopter flight in all flight modes;
- stabilization of preset track angle when flying along the route;
- providing of helicopter automatic hovering over preset point according to longitudinal and lateral components of ground speed outputting by DISS-15G-E equipment.

The system comprises:

- VUAP-1E autopilot is designed to lessen the workload on the pilot and can be used in any stage of flying;
- Hover/Route on/off control (PVM-24) to signal system status, on-condition of power and serviceability of interacting parts;
- Altitude/Landing on/off control (PVM-24) to signal the mode on-condition, on-condition of power and serviceability of interacting parts;
- BV-24 computer module;
- Coupler module to couple to BSV-24 altimeter;
- Shock-mount.

Diagram of automatic control system equipment arrangement

1. Auto flight control system distribution box
2. VUAP-1E control panel
3. SAU-V24-1E panels (Hover/Route PVM-24 and Altitude/Landing PVM-24 control panels and ZPU-24 course selector)
4. Auxiliary auto flight control system distribution box
5. Pitch compensation sensor
6. Roll compensation sensor
7. BV-24 computing unit and unit for communication with BSV-24 altimeter
8. IAS controller
9. Altitude controller
10. Readiness signalization units
11. Flight and navigation distribution box
12. DUSU1-18AS angular speed sensors

ADJUSTABLE STOP CONTROL SYSTEM

The SPUU-52-3 adjustable stop control system is designed to automatically change the position of the pedal movement stopper, thus the maximum adjustment of tail rotor blades subject to the air density.

SPUU-52-3 system consists of:

- BU-32-3 unit;
- IKD-27Da-400-830 pressure measuring complex;
- P-1 electrical resistance temperature gage receiver;
- Feed-back sensor.

RADIO-ELECTRONIC EQUIPMENT

Radio-electronic equipment installed on the Mi-35M helicopter is intended for providing:

- Two-way radio communication with ground radio stations, with radio stations of other helicopters (aircraft) in flight and between crew members;
- Speech recording during internal and external communication;
- Helicopter piloting over unmarked terrain;
- Omnirange and broadcasting radio station and locator beacon flights;
- Warning of crew about helicopter radar illumination;
- Voice warning of crew about emergency situations in flight;
- Output of reply signals to interrogation signals of all types of interrogators.

Radio-electronic equipment according to its intended purpose is divided as follows:

- Communication radio;
- Helicopter piloting radio;
- Identification and active response radio.

RADIO COMMUNICATION EQUIPMENT

«PRIMA-DMV» RADIO STATION

The helicopter is equipped with two «PRIMA-DMV» radio stations. Radio stations are used in frequency ranges from 30 to 80 MHz, from 100 to 150 MHz and from 220 to 399 MHz, and are coupled with MSPD equipment.

"PRIMA-KV" RADIO STATION

Two-way HF radio is intended for providing voice and code communication of helicopters with ground air traffic control centers and between each other. Radio station are used in frequency ranges from 2 to 29,999 MHz and are coupled with MSPD equipment.

MSPD COMMUNICATION AND DATA TRANSFER MODULE

Communication and data transfer module (further – MSPD item) provides:

- data exchange between elements of means of communication;
- internal communication between two crew members and three users of ground maintenance personnel with listening special signals and two radio-navigation devices;
- playback of 30 messages on emergency situation and transfer of necessary messages by radio channel.

B8-50E COMBINED CONTROL PANEL

B8-50E unit is intended for manual control of means of communication.
The unit provides:

- control of «PRIMA-DMV» radio MW1-MW2-McW in voice mode;
- control of short-wave radio;
- control of AVSK (intercom equipment);
- transfer of control to MSPD;
- indication of selected operating modes parameters BKS (airborne communication complex);
- transfer of BKS equipment to full-control mode;
- indication of malfunctions in operating modes and at test;
- setting up alphabet-digital indicators initial brightness level and automatic adjustment of brightness.

P-503M2 VOICE RECORDER

P-503M2 voice recorder is a voice data recorder using a solid-state recording medium.

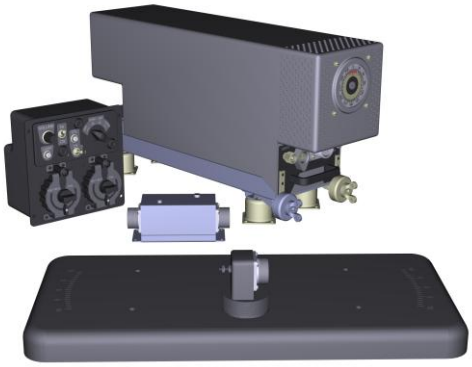
P-503M2 recorders provide recording of voice and time information on a protected medium (protected modulus of memory) and operating medium (removable modulus of memory).

P-503M2 recorders are inteneded for recording:

- helicopter crew's voice communication;
- aural signals of navigation equipment and voice information reporting systems enetring the headphones;
- pulse information of encoded time;
- for listening recorded information.

P-503M2 recorder ensures continuous recording in two independent channels for up to 16 hours.

HELICOPTER PILOTING RADIO EQUIPMENT



АРК-35-1 direction finder

Intended for providing continuous definition of radio relative bearing (CUR) and listening of radios call signals.

ARK-35 provides for solving the following navigational problems:

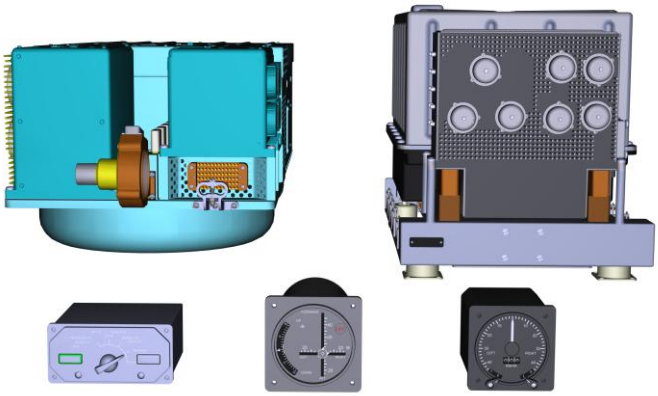
– flying to and from a radio station with a visual display of the relative bearing;
– automatic determining of the bearing to the radio station with the help of the radio-magnetic indicator RMI-2;
– continous reading of the relative bearing of the radio station;
landing approach by using the instrument landing system.

RT-600 (DF-517A NVG) aircraft direction finder

Intended for homing reconnaissance helicopters to UHF radio stations (radio beacons).

C406-2HM emergency radio beacon

C406-2HM emergency radio beacon is intended for transmitting distress signals for KASPAS-SARSAT space radio system on frequency of 406,025 MHz and for bearing by radio signals the place of helicopter crash by means of direction finders operating on frequencies 121.5 and 243.0 MHz.
When the transmitter is operating on frequency 406,025 MHz the helicopter location is put out with accuracy of 1…2 km, and when operating on frequencies 121.5 or 243.0 MHz – with accuracy 15.. .20 km.



DISS-15G-E Equipment together with GREBEN-1 Compass system and MGV-1SU Vertical Gyro installed on board is intended for automatic continuous measuring and indication of ground speed (GS) component in the low-speed mode, ground speed and drift angle in navigation mode, as well as reckoning and indication of the helicopter position coordinates and output of these data to other aircraft devices.

DISS-15G-E equipment together with other aircraft instruments (autopilot, radio altimeter etc.) allows:

- Flying the helicopter to a point with the preset coordinates;
- Hovering and landing in case of no information regarding wind direction and force.

Hovering and helicopter flight control in case of absence of visibility.

RADIO ALTIMETER RV-5M

is designed to measure the true flight altitude and output to the crew and to SAU-V24-1 Automatic Flight Control System:

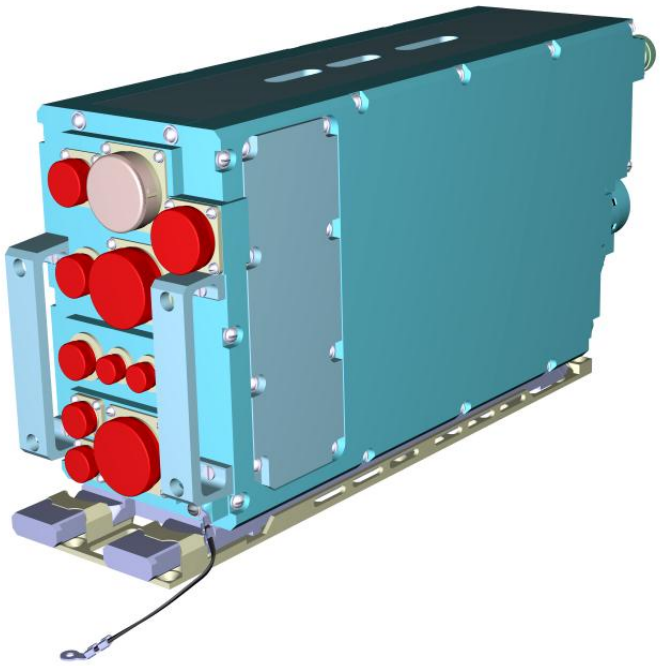
- visual data on current altitude from the Altitude Indicator;
- current altitude data in DC voltage of positive polarity in proportion to the altitude.

COMPASS SYSTEM «GREBEN-1»

The compass system is intended for definition of helicopter's heading and providing the helicopter's systems, taking part in accomplishment of navigation and piloting tasks, with current heading signals. The compass system is a centralized helicopter device integrating gyro and magnetic means for defining heading.

IDENTIFICATION AND ACTIVE RESPONSE RADIO

4280 MSE-01 RESPONDER



Item 4280MSE-01 represents a helicopter radar responder operating in the international identification system Mk–XA in all modes including requests of address mode "S" (with minimum level 2).

Besides, the responder provides transmitting signal "Accident" ("Авария") and position identifier "Sign" ("Знак").

The following recognition lines are provided in identification system Mk-XA: "ground – aircraft", "aircraft – aircraft", "ship – aircraft".

Identification system Mk-XA is compatible with secondary surveillance radar station for air traffic control (УВД) of ATC RBS type.

Responder 4280MSE-01 consists of:

– transponder (unit 4280Kh.1MS) – 1 psc;

– transmitting-receiving antenna (antenna unit) 4280A1.1-1R – 2 psc;

– installation parts set – 1 psc.

SVR-B VIDEO REGISTRATION SYSTEM

It is intended for registration video/audio/service information in flight in order to perform objective control and after-flight analysis.
The System provides recording of video data from MFDs and KT-2 Video Camera, audio signal from Means of Communication, additional information from aircraft Computer.

SVR comprises:

- aircraft video registration system (SVR-B) which provides recording of video/audio/service information on board;
- KT-2 Camera;
- Storage Adaptor which provides the possibility of data reading, recorded on removable storage device in SVR-N;
- BNV-1 aircraft video data storage device;
- Software which allows to process visualize the received data.

SVR-B has a removable storage device where all data are recorded.
Video information processing is carried out on the ground computer.

CONCLUSION:

Mi-35M is the helicopter which meets the requirements of modern helicopters and doesn't yield in its performance and operational characteristics to foreign analogues.

- **Helicopter performance** corresponds to the performance of helicopters of analogue type and what is very important doesn't become worse during its application in high-mountainous areas and in high temperatures conditions;
- **Effective round-the-clock combat application of missile and rocket armament in simple and adverse weather conditions**;
- **Capability to perform route flying at day and night at altitudes up to 50 m** thanks to equipping with night vision goggles of the third generation, modern avionics and digital computer complex;
- **Better criteria "cost-effectiveness".**